Exploring the Enabling Effects of Project Management for SMEs in adopting Open Innovation - A Framework for Partner Search and Selection in Open Innovation Projects

Abstract

Open Innovation (OI) facilitates a multitude of innovation opportunities through allowing access to a broad variety of external partners, expertise and knowledge. Although OI has been established in academia and the corporate world, implementation by SMEs remains a formidable challenge, especially concerning the identification and selection of suitable OI partners. Given methodical support for such an endeavour is currently lacking, this article investigates how project management can support OI projects. Based on evidence from an exploratory multi-case study with four SME's, this article develops a Situational Open Innovation framework that provides methodical support for SMEs in leveraging the complementarities between OI and project management towards effective partner search and selection. The findings illustrate how sensing capabilities for OI opportunities can benefit from systematic problem and stakeholder analyses as they allow for identifying and focussing on the most relevant innovation tasks and partners.

Keywords

Dynamic Capabilities; Open Innovation; Partner Selection; Project Management; Knowledge Transfer; Small and Medium-sized Enterprises

1 Introduction

This paper explores the enabling effects of project management (PM) for small and medium-sized enterprises (SMEs) in adopting Open Innovation (OI) and develops a framework for searching for and selecting OI project partners. OI describes an open but purposeful collaboration and exchange of organisational-internal and external knowledge (Chesbrough,

2017; Chesbrough and Bogers, 2014; Chesbrough *et al.*, 2006; Dahlander and Gann, 2010). OI goes beyond outsourcing of R&D activities (Chesbrough and Crowther, 2006) and combines traditional as well as new types of collaboration forms and partners (Enkel, 2009; Herzog and Leker, 2011; Huizingh, 2011; Salvador *et al.*, 2013) including traditional customer and supplier collaboration (Enkel *et al.*, 2011), new crowdsourcing techniques (Dahlander and Gann, 2010; West and Lakhani, 2008) and cross-industry innovations (Brunswicker and Hutschek, 2010; Enkel and Gassmann, 2010).

Over the last 15 years, OI has been well established in academia, the corporate world as well as the public sector (Stanko *et al.*, 2017; Brunswicker and Chesbrough, 2018). However, despite its numerous benefits (Enkel, 2009; Huizingh, 2011; Vanhaverbeke *et al.*, 2008), applying OI is particularly challenging for SME. In line with generally limited methodical and formal PM expertise (Meyer, 2013; Spithoven *et al.*, 2013), key issues include a trial-and-error application of OI (Gassmann *et al.*, 2010; Huizingh, 2011) and lack of systematic OI planning approaches (Hienerth and Lettl, 2011; Keinz *et al.*, 2012; Chesbrough and Brunswicker, 2014; Giannopoulou *et al.*, 2011). Due to resource constraints (van de Vrande et al., 2009), SMEs show a low risk appetite and motivation to adopt new approaches (Meyer, 2013). This results in a reluctance of SMEs to adopt OI (Hossain, 2015), despite the particular benefits for SMEs (Hossain, 2013; Barge-Gil, 2010). Notwithstanding their economic relevance, literature also has not sufficiently considered the use of OI in SMEs but focused on large multinational enterprises and consumer products (Hossain, 2013; van de Vrande *et al.*, 2009; Vanhaverbeke, 2017).

In particular, identifying suitable OI partners is difficult for SMEs (Bogers and West, 2012; Enkel, 2009; Barge-Gil, 2010; Lee *et al.*, 2010) as efforts are often saturated in uncertainties (Giannopoulou *et al.*, 2011; Lee *et al.*, 2010; Lopez-Vega *et al.*, 2016; Bogers and West, 2012; Emden *et al.*, 2006). Typical pitfalls include (1) local search biases (Lopez-Vega *et al.*, 2016), i.e. focussing on the "usual suspects" neglecting other potential partners, (2) a focus on operational partners for solving the focal innovation problem but neglecting strategic partners

who ensure the long-term success (>reference to own study<), and (3) a primary focus on external stakeholders and partners but neglecting internals (Haneda and Ito, 2018; Lazzarotti *et al.*, 2017; Slowinski and Sagal, 2010). In OI, selecting a partner can mean choosing specific individuals and organisations as well as deciding for a crowd-based approach like problem broadcasting (Jeppesen and Lakhani, 2010). Selecting unsuitable or missing relevant partners can result in wasted resources or missed opportunities (van Beers and Zand, 2014; Blair *et al.*, 1996), which is particularly threatening for SMEs with limited resources. Slowinski and Sagal (2010) describe the development and management of OI partnerships as one of the most complex and challenging organisational activities.

Existing studies indicate that especially prescriptive and operational guidance, which helps SMEs to navigate the challenging initiation of OI projects, including identifying and selecting partners, is highly relevant (Gerhards, 2013; Salvador *et al.*, 2013; Huizingh, 2011). However, such methodical support is limited (Bogers *et al.*, 2017; Huizingh, 2011) and usually either too abstract, only descriptive or too focussed on specific aspects. While existing research presents OI frameworks describing ***what*** to do (Lee *et al.*, 2010; Vanhaverbeke, 2017; Slowinski and Sagal, 2010), often with a focus on specific OI partners and collaboration forms (e.g. Gassmann, 2013; Hippel, 2005), methodical support is rather limited in terms of ***how*** to successfully identify and select OI partners.

In addition, researchers stress the need for investigating OI on project level, in addition to organisational level (Du *et al.*, 2014; Chesbrough *et al.*, 2006; Kim *et al.*, 2015). One of the reasons behind this is the fact that the majority of OI activities are being executed as sub-projects within overarching innovation projects (Chesbrough, 2003; Kim *et al.*, 2015; Lopez-Vega *et al.*, 2016), given this is a typical form of organising innovation activities (Midler *et al.*, 2016). In addition, first-time application of OI within OI pilot projects are of particular relevance in “seizing” activities (Teece, 2012) towards building OI capabilities (Boscherini *et al.*, 2010). Due to their defined scope and decoupling from company processes, they allow for testing and

building trust in OI with reduced risk in case of project failure (Boscherini *et al.*, 2010; Chesbrough and Brunswicker, 2013; Chiaroni *et al.*, 2010; Loren, 2011).

PM focuses on successfully planning and managing projects and building according capabilities. It comprises a multitude of guidelines, processes, methods and tools to effectively and efficiently execute PM activities across a project life-cycle and to ensure the defined quality of outcomes (PMI, 2013). However, the use of PM for OI has not been systematically explored to date. Therefore, the present study tackles the research question:

How can PM support SMEs in adopting Open Innovation with a focus on project partner search and selection?

An exploratory multi-case study approach with four SMEs is used to develop a Situational Open Innovation (SOI) framework as part of OI project management (OI-PM). SOI combines approaches from different disciplines, such as OI, lead user theory, PM and stakeholder analysis, to an integrated OI planning framework with a focus on searching for and selecting relevant OI partners. It specifically addresses the uniqueness of each OI project and the dependency on its context or "situation" (Dittrich and Duysters, 2007; Huizingh, 2011; Solesvik and Gulbrandsen, 2013).

This study contributes to PM and OI literature alike by building a better understanding of how PM can support the systematic selection of OI project partners in OI projects. Thus, it illustrates how companies can build "sensing" capabilities (Teece, 2012) through systematic problem, stakeholder and partner analyses, given they allow for identifying and focussing on the most relevant innovation tasks and partners.

The structure of this paper is as follows. Section 2 provides an overview of extant literature concerning partner search and selection in OI and PM. Section 3 explains the research method, while Section 4 contains the within-case as well as the cross-case analysis and the derived Situational Open Innovation framework. Section 5 discusses the derived insights from

a dynamic capability perspective followed by section 6 which concludes the paper and details the respective contributions and limitations.

2 Searching for and selecting project partners in open innovation and project management

2.1 Searching for and selecting Open Innovation partners

A number of studies and articles analyse the successful application of OI, many of them even with distinctive titles around “managing” OI (e.g. Bogers and West, 2012; Chesbrough, 2004; Chesbrough and Brunswicker, 2013; Du *et al.*, 2014; Vanhaverbeke, 2017) or “turning OI into practice” (Giannopoulou *et al.*, 2011). However, from a project planning and partner search and selection perspective, many studies are quite broad. They provide an overview and high-level frameworks to structure OI as a concept (e.g. Huizingh, 2011; Fetterhoff and Voelkel, 2006) or analyse the effects of OI on a higher level, including general recommendations concerning *what to do* but not *how to* search for and select OI partners (Kirschbaum, 2015; Pullen, Annemien J. J. *et al.*, 2012; Du *et al.*, 2014; Giannopoulou *et al.*, 2011; Chesbrough, 2004; Vanhaverbeke, 2017). Slowinski and Sagal (2010) stress the importance of identifying suitable OI partners and provide generic recommendations on how to identify them. Responding to these limitations, studies have started to go into more detail, e.g. using in-depth case studies (Bilgram *et al.*, 2013; Chiaroni *et al.*, 2010)on specific types of OI and OI partners, such as crowdsourcing (Gassmann, 2013) and cross-industry innovation (Echterhoff, 2014); or recommending particular partner types for specific innovation problems (van Beers and Zand, 2014). The present study builds on these approaches with the intent to increase generalisability.

A successful partner search requires the selection of appropriate search methods to ensure a positive cost-benefit ratio of the search (West and Bogers, 2014), which, however, is often only addressed as a side note. Giannopoulou *et al.* (2011) stress the importance of systematic processes to select the right knowledge sources and balance exploration and exploitation activities. They found that a higher degree of openness benefits exploration activities while

exploitation benefits from a more closed approach. Similarly, Lazzarotti *et al.* (2017) found that more openness supports radical innovation while closedness helps with IP-sensitive issues. A differentiated analysis of openness as breadth and depths of partner search and engagement revealed an inverse U-shaped relationship between the number of OI partners and the resulting innovation performance (Laursen and Salter, 2006; Laursen and Salter, 2014). This aligns with other studies, concluding that too much breadth negatively affects the innovation performance, i.e. novelty and efficiency (Bengtsson *et al.*, 2015; Markovic and Bagherzadeh, 2018).

While this stresses the importance of a purposeful OI partner search and selection, a key challenge is the so called “local search bias”, i.e. companies tend to engage already known partners (Solesvik and Gulbrandsen, 2013). Lopez-Vega *et al.* (2016) present a conceptual framework to overcome this through supporting a decision between four general search paths (analogical, scientific, situated, sophisticated) based on the preferred search space (local, distant) and search heuristic (experimental, cognitive). In the context of managing OI in SMEs, Vanhaverbeke (2017) provides general recommendations when selecting OI partners, such as ensuring the right attitude of partners, similar ambitions, personal relationships and right capabilities like knowledge, resources and risk appetite. Aloini *et al.* (2016) offers support by providing a checklist of potentially relevant socio-technical selection criteria. Further studies present and evaluate specific partner search methods from various disciplines. These can be clustered into the following categories <reference to own paper>:

Pool-based searches aim at identifying potential partners from an existing pool or group of actors, such as screening based on lead-user criteria (Hippel *et al.*, 2006), innovative capacity-based screening (Matthing *et al.*, 2006), co-branding partner search (Newmeyer *et al.*, 2014) and netnography (Belz and Baumbach, 2010; Langer and Beckman, 2005).

Database searches use specific databases, such as supplier and patent databases (Byungun Yoon and Bomi Song, 2014; Yamada *et al.*, 2013; Jeon *et al.*, 2011b). This can range from key word-based searches to complex proximity/distance mapping to identify potential partners.

Network-based searches build on existing company networks and relationships between potential partners to identify and pre-assess partners. For instance, pyramiding uses a snowball-like approach (Hippel *et al.*, 2009). In simplified terms, an initial group of experts is asked if they know other more experienced experts for a given problem. These are asked the same until enough potential project partners are identified. It also allows for identifying cross-industry experts (Poetz and Prügl, 2010).

Algorithm-based searches use optimisation models and algorithms to derive suitable partners (Su *et al.*, 2015; Büyüközkan *et al.*, 2008), as well as big data analyses (Meige and Golden, 2011). The latter can search large unstructured amounts of data but require sophisticated search algorithms.

Open searches are independent from specific groups and networks and can result in an infinite number of potential partners, e.g. media-based cross-industry searches (Echterhoff, 2014; Li *et al.*, 2008; Chen, 2014) or search engine-based searches.

Open call searches, in contrast to the other search methods that are actively executed by a company, requires a company to publish a call for participation followed by a self-selection of potential partners. This includes broadcast searches (Jeppesen and Lakhani, 2010), ideation/innovation contests (Piller and Walcher, 2006), marketplaces and other crowdsourcing approaches (Diener and Piller, 2010; Piller and Reichwald, 2009; Nguyen *et al.*, 2014).

Delegating the search through contracting OI intermediaries, brokers and scouts (Gassmann *et al.*, 2011), which, however, is not within the scope of this article.

Innovation toolkits and similar approaches are also not considered in this paper as they can enable knowledge exchange but do not provide direct support for identifying OI partners. Despite the variety of current OI and user innovation approaches, they are usually rather abstract or focus on specific OI types, such as crowdsourcing and lead-users, and do not allow for a holistic consideration of OI partners. In particular, support and guidance for SMEs in

choosing and applying suitable search methods appear lacking. OI partner searches in practice are often ad-hoc based and suffer issues like a local search bias. Therefore, a systematic OI partner identification and selection approach is needed to enable OI in SMEs.

2.2 Project management approaches for collaborative projects

PM focuses on systematically handling projects as a unique and temporary venture to achieve a specific outcome, including defined resources, schedules and stakeholders (PMI, 2013). It provides processes, methods and tools to support the success of a project, addressing all project life cycle phases from initiating, executing and closing a project. Similar to OI, a key phase is the planning phase, which includes defining the objectives, scope, resources and project partners (PMI, 2013; Haskins, 2006). Particularly, the analysis and engagement of stakeholders is crucial for PM (Aladpoosh *et al.*, 2012) but far from trivial (Gattringer *et al.*, 2017). Blair *et al.* (1996) provide a detailed analysis of risks resulting from suboptimal stakeholder involvement, which range from wasted resources and missed opportunities to serious project failures.

Literature suggests different ways to identify and select stakeholders, such as mindmap-based stakeholder maps (AccountAbility, 2011; Freeman, 1984), nine predefined search directions (Vries *et al.*, 2003), respectively search dimensions (internal, inter-firm network, external) and selection criteria (functional; geographical location; knowledge/abilities; hierarchical level) (Ballejos and Montagna, 2008). The latter also allow for a more detailed stakeholder evaluation than the traditionally yes/no assessment of power, legitimacy and urgency of stakeholders and the derivation of rough engagement strategies (Mitchell *et al.*, 1997). Bryson (2004) provides an overview of different methods and tools to evaluate stakeholders concerning their interests, power, issues and ethical fit, and to derive generic engagement roles, such as informing, consulting and involving stakeholders - aligning with other authors (Karlsen, 2002; Savage *et al.*, 1991). The resulting engagement plan defines which stakeholders need to be involved at which point in time of the project and why.

Although PM struggles in managing cross-boundary collaboration (Adler *et al.*, 2009; Gattringer *et al.*, 2017) with a diverse group of geographically distributed partners (Vom Brocke and Lippe, 2015), the structured approaches and tools bear great potential for OI projects – the systematic analysis of strategic and political motives and interests of stakeholders, in particular. Gould (2012) already postulated the importance of stakeholder analysis for OI in terms of relationship building to support successful knowledge retention and exploitation. However, detailed guidance on how to interlink both approaches and implement them in practice is still missing in literature.

3 Research methods

3.1 Research design

The combination of PM and OI applications is characterised by a high level of complexity, such as dynamics and situational dependencies from the focal company, context, OI project and innovation problem (Dittrich and Duysters, 2007; Huizingh, 2011). Using a multi-case study approach allows for exploring this new field in a real-world context and to derive in-depths insights (Yin, 2014). Since the interaction of PM and OI is an emerging field in research and practice (Hossain, 2015), four exploratory in-depth cases are used to build a basis for future research using a combined approach of interpretive sensemaking and contextualised explanation (Welch *et al.*, 2011). To specifically explore the use of OI in non-consumer product SMEs and to allow for general comparability of cases, all four companies needed to be (a) manufacturing SMEs (b) producing industrial products for (c) B2B customers (d) without specific OI experience. Still, to understand the effects of PM onto OI adoption in detail, it was important to explore different OI settings. Therefore, the four cases were selected so that they varied in (A) type of industry and (B) type of OI problem. Case1 allowed to explore how OI-PM could bridge the contradiction of a broad open partner search and a sensitive automotive environment. Case2 explored how OI-PM could address a long-standing industry-wide construction technology problem. Case3 explored how OI-PM could help develop new service models for manufacturing plants. Case4 involved a start-up developing a shared-economy

product-service-system of laundry machines involving B2B and B2C customers. Cases1-3 were part of a two-year industry-funded research project to explore OI-PM in SMEs.

3.2 Data collection

Different data were collected to allow for triangulation and validation of insights. An initial workshop with high-level managers at the start of the overarching two-year research project of Case1-3 gathered company expectations and concerns around OI to be addressed in the project. This was complemented with a requirement analysis of necessary OI-PM practices with each case-specific project team. In quarterly half-day status meetings of the overarching project, field-notes of discussions, questions and feedback were taken. The latter included feedback by team leaders and managers concerning case1-3 and the resulting cross-case insights. Field-notes were also taken of observations, questions and feedback of three half-day workshops per case, where company teams applied different PM techniques to plan their OI project. In addition, informal communication with project participants during meeting and workshop breaks were captured, along with phone calls to answer questions around specific PM techniques and tools. Emails allowed additional insights into company questions and struggles. Closely linked to these sources, PM artefacts like stakeholder maps were analysed concerning completeness, quality and company issues. A feedback form was sent out to each project team after the projects' ends capturing the overall positive/negative experience with OI-PM as well as specific OI-PM aspects of stakeholder search and selection.

3.3 Data analysis

These empirical data were analysed in two stages: within- and cross-case analysis using an explorative iterative analytical process of data collection and analysis (Gioia *et al.*, 2013). This included pattern identification and matching, explanation building and identifying alternative explanations to increase the validity of findings (Yin, 2014), along with comparisons to literature to strengthen the quality of theory building (Eisenhardt, 1989). In weekly team meetings, the four-person academic team discussed company observations and questions, potential underlying reasons and resulting actions. Discussions at industry status meetings and

workshops strengthened findings and conclusions. To understand the role of PM for OI, the analysis categories were the effectiveness of PM techniques along with additional upcoming issues. Analysing these first order findings concerning underlying reasons helped identifying second order insights. The within case analyses were the basis for the cross-case analysis of similarities and differences between cases. While similarities indicated potential general aspects and built the basis of the OI-PM framework, differences indicated areas where the framework needed to allow for context-dependent flexibility.

4 Findings

4.1 Within-case analysis

4.1.1 Case1: Developing a high-performance alloy in a sensitive automotive context

This case explored a complex innovation problem in a highly sensitive environment with a focus on a broad search for new potential partners. The family-owned SME was a B2B supplier of high-performance customer-specific mechanical connection components for automotive OEMs in a worldwide and highly competitive market. The OI project focused on developing a new alloy including the respective mass manufacturing process. Since existing suppliers were not experienced enough with this alloy, the OI project aimed at identifying new R&D partners. The highly sensitive market environment required a high level of secrecy and an incognito partner search.

First, the OI team analysed the OI goal concerning necessary expertise and capabilities of potential OI partners. These were prioritised and documented as “operational” OI partner characteristics, such as expertise with the focal alloy and process development. In addition, three “strategic” partner characteristics were defined to evaluate the political-strategic influence on the project. Subsequently, within a workshop, the OI team analysed existing stakeholders and their dependencies. The results were visualised using a stakeholder map and structured based on the company’s innovation process.

Due to the high need of secrecy, open call searches were excluded in favour of fully controllable search approaches: a media-based search in public databases (e.g. supplier portals) and search engines yielded a first set of potential partners, along with a specialised industry trade fair. To allow for an incognito search, the academic team represented the company at the fair. The screening approach used interviews including search criteria derived from the operational OI partner characteristics for detailed capability insights. In addition, a pyramiding search was conducted involving experts from a university institute. They used their networks to identify leading companies and research institutes. Through analysing their websites concerning R&D projects and partners, further potential OI partners could be identified through 'incognito pyramiding'.

As a result, approximately 180 potential OI partners were identified and their characteristics prioritised into basic (using publicly available information), performance and nice-to-have. 45 partners fulfilled all basic characteristics, 55 partly fulfilled the basic characteristics and the rest suffered from a lack of assessment-relevant information.

For a full overview, all 180 potential OI partners were clustered in a matrix according to the type of organisation (industry, academia) and geographical location (Germany, Europe, international). On this basis, the OI team discursively selected their TOP-5 OI partners based on their product portfolio, expertise and location. Although one of the companies was an existing partner, its expertise in the focal area had not been known. Along with the already department-spanning members of the OI team, additional OI partners were involved from the process development department as interface between advanced development and production, as well as from the purchasing department.

4.1.2 Case2: Developing new solution concepts for a long-standing problem in construction technology

This case explored the potential for innovations in an already well analysed but unsuccessful field by designing a solution for a decades-old innovation problem. The family-owned SME was a leading manufacturer of building technology products. The product in focus suffered

from a differing quality of its central component, which had been known but unsolved for 30 years in the industry. Hence, the OI project aimed at identifying new OI partners to develop ideas and concepts to improve the central component. The need for secrecy was high due to the strategic relevance of a potential solution.

The OI team defined two linked sets of operational OI partner characteristics for search and assessment. The search characteristics were derived from a TRIZ-function model (Orloff, 2006) of the focal system. As they were too broad, additional assessment characteristics were defined more narrowly to allow for evaluation and ranking of potential OI partners. They were clustered in basic and performance characteristics. In addition, five strategic characteristics were identified.

Within a workshop, the OI team defined relevant innovation process phases and stakeholder classes and identified a first set of existing internal and external stakeholders and their dependencies. The stakeholder assessment informed a Search-Field-Matrix combining the dimensions of the innovation process and the operational OI partner search characteristics, resulting in three search fields: (1) "*replacing a specific component*", (2) "*improving a specific useful system function*", and (3) "*avoiding a specific harmful system function*". The subsequent search focused on potential partners from other industries.

The search mainly used a combination of media-based searching and pyramiding. Via a media-based search in online search engines and supplier portals, potential OI partners were identified as well as interesting trade fairs. Analysing their websites concerning partner organisations provided indications for further potential industry and academic partners. The OI partner assessment was iteratively conducted in combination with the search using the sharpened OI partner assessment characteristics. In total, 55 potential OI partners were identified and assessed. Existing stakeholders were primarily evaluated concerning their strategic relevance to the success of the OI project, while new partners were assessed concerning their operational potential for solving the defined problem. On this basis, the OI

team selected the TOP-8 OI partners, ensuring a large variety of knowledge and avoiding competitors.

The selected OI partners were engaged in a cross-industry workshop. To avoid potential resistance of internal stakeholders, the OI team decided to involve internal OI partners into the problem-solving process. The underlying idea was to use their expertise as well as to ensure their support and avoid NIH syndrome. The workshop yielded 250 ideas, which were consolidated into four solution concepts rated as highly promising by the OI team.

4.1.3 Case3: Developing new product-service systems for manufacturing plants

This case explored OI project management for service innovations. The involved SME was a world market leader for packaging machines. The goal of the OI project was the development of a new integrated product-service-system. As prior experience was limited, the OI project should identify OI partners for analysing the underlying drivers and requirements of such a product-service-system as well as first solution ideas.

The OI team defined different strategic and operational partner characteristics and key innovation process phases. Key stakeholders were identified and captured in a stakeholder map. All stakeholders were assessed concerning the operational characteristics. Clustering the stakeholders in a Search-Field-Matrix supported the differentiation of internal and external stakeholders. Since each relevant search field contained a minimum of two stakeholders, the OI team decided against a search for new potential partners to speed up the process.

Nevertheless, the academic team conducted an additional search to evaluate the decision of the OI team. The focal search fields were regulators and rules affecting the legal regulations of the new service as well as potentially interesting companies from other industries with experience with similar services. Regulators and rules were identified using a web-based search that built on the operational partner characteristics. Building on the approach of Echterhoff (2014), interesting cross-industry sectors with similar characteristics were identified.

Within these sectors, specific experts and companies were subsequently identified. The resulting list of additional OI partners was considered as highly valuable by the company.

Next, the OI team assessed all stakeholders in detail. Due to the lack of information about the newly identified organisations, their assessment was based on discussions within the OI team and rough estimations. Mapping the assessed potential partners into a Strategic-Operational Portfolio (Guertler, 2014) allowed for selecting suitable OI partners, which could roughly be differentiated in B2B customers and cross-industry manufacturers.

Due to the specificity of the topic, the limited number of organisations in both groups and the absence of direct competitors, the OI team decided for a combined lead-user and cross-industry workshop. The idea was to allow for a combined identification and discussion of customer needs as well as existing service models and experience from other industries. However, the OI project was stopped before this workshop when the OI team manager left the company. Along with lacking support from the new manager, an unsuccessful crisis meeting revealed that the team members had not fully understood the OI project and did not support a continuation.

4.1.4 Case4: Developing a product-service system in a spin-off in shared economy context

This case explored the application of OI-PM to develop a product-service system in a shared economy start-up. The OI project was with a newly founded spin-off of a large white-goods manufacturer. It focussed on product-service-systems of shared laundry machine services. Based on an existing product-service-system concept, the overarching goal was to develop the product-service-system including the hardware controlling the laundry machines as well as the front-end and back-end of the web-based booking, user and machine management system. A key challenge was the fast pace of the start-up and product-service-system development, which required quick decision making. Therefore, the start-up wanted to use OI-PM techniques to retrospectively evaluate and back their intuitive decisions.

The problem and stakeholder analyses were conducted with the three founders to capture complementary knowledge and views. The OI team defined different strategic and operational partner characteristics, including the two basic characteristics of “experience in communal/shared washing” and “partner reliability”.

Subsequently, all stakeholders were assessed. The according discussion also revealed four types of users depending on whether they were already using communal washing and whether they had a supportive or negative attitude. Mapping all assessed stakeholders into a Search-Field-Matrix highlighted that enough potential partners were known to skip a dedicated search.

Mapping the stakeholders into a Strategic-Operational Portfolio highlighted four suitable operational OI partners, including smart home providers and competitors. The analysis differentiated positive competitors like laundromats and student organisations from negative competitors like laundry machine manufacturers.

The OI team did not fully agree with the partner rankings in the portfolio: from their view, smart home providers and laundromats were overrated, while customers, users and suppliers were underrated. A systematic discussion and analysis revealed that the basic partner characteristic “experience in communal/shared washing” was less critical than expected and had also caused the exclusion of many customers, users and suppliers. Thus, the OI team updated their stakeholder assessment by changing this basic into a performance characteristic. The updated OI partner ranking showed a higher relevance of customers and users, which aligned better with the OI team’s perception. For each selected OI partner, a suitable type and time of engagement was defined and documented in an involvement planning matrix, as suggested by Bryson (2004).

4.2 Cross-case analysis and implications for an open innovation project management framework

Table 1 provides an overview of the four OI projects including key aspects of the company feedback, highlighting the different boundary conditions, constraints and focus of each project. Although case3 was not successfully finished, such projects are particularly valuable and

important from a research and learning perspective (Tucci *et al.*, 2016; Shepherd and Wiklund, 2006). PM literature stresses the relevance and opportunities of learning from project failures (Liu *et al.*, 2017; Magazzini *et al.*, 2012; Tjosvold *et al.*, 2004). Contrasting project parameters of successful and failed projects allows for identifying implicit success and "hygiene" factors.

Table 1: Comparison of the four OI projects

Project	New alloy and manufacturing process	New mechanical construction solution	Manufacturing plant product-service-system	Laundry product-service-system (PSS)
Goal	Development of new alloy and manufacturing process	Solving a decade-old and industry-wide mechanical problem	Develop new service models as part of an integrated PSS	Develop new PSS in context of sharing economy
Core team	Manager and expert of specialised department, innovation manager, brother of owner	Manager and engineer from specialised department, purchase expert	Two managers and an expert of specialised department (expert had deep experience in purchase)	CEO, COO, intern
Previous OI experience	None but motivated to test it	Collaboration experience with customers, suppliers and universities, including cross-industry collaborations	No particular experience with OI but collaborations with academia and customers	OI experience from previous jobs
Duration of OI project	12 months	12 months	9 months	6 months
External constraints	Need for high secrecy due to strategic relevance	Need for secrecy due to strong and highly flexible competitors	Need for secrecy to avoid raising wrong customer expectations	Limited resources of start-up
Focus of partner search	• Many new partners • Highly specialised expertise • B2B	• New partners from within and outside the focal industry • B2B	• Pragmatic search (suitable but not the best possible partners) • B2B	Broad spectrum of potentially interesting partners due to B2B customers and B2C users of PSS
Complications	• Handling of large numbers of potential OI partners • Long timeline of alloy developments • High workload of core team	• Challenging definition of OI partner characteristics suitable for search as well as assessment	• Change of company project lead • No senior management or owner family directly involved in OI project • Besides team manager, no buy-in of the team into the OI project	• Dynamic start-up context reduces currency of assessments • Updated stakeholder assessment bears risk of biases • Capacity limitations do not allow for

			• Indications that OI project was just added to normal workload	lengthy planning
Enablers	• Involvement of member of owners' family ensured strategic support of OI • Intrinsic appetite to learn more about OI and PM	• Involvement of senior innovation manager ensured strategic support of OI • Intrinsic appetite to learn more about OI and PM	• N/A	• Small company size supports planning and decision-making processes • Direct involvement of founders ensured strategic support of OI
Outcomes	• Selected OI partner for development of new alloy and manufacturing process • Broad range of new potential partners • Updated knowledge about known partners capabilities	• 250 ideas • Clustered into 4 solution concepts • Project stopped/paused when funding of OI project ended	• N/A due to cancellation of OI pilot project	• Evaluation of intuitively selected OI partners
Company feedback: positive	• Systematic OI-PM methodology was beneficial • It helped to overcome of local search bias • Systematic analysis of company context was beneficial • Methods can also be / are used for internal R&D • Stakeholder analysis (in this form) had been unknown	• Methodology overcomes thinking patterns and broadens solution space • Structured problem analysis allows to identify the actual issue • Methodology supports transparent decision-making process • Methods can also be / are used for internal R&D	• Methodology can enhance intuitive and experience-driven approach • Methodology helped to identify valuable stakeholders and inputs • Potential applications beyond OI and R&D identified • Consistency and completeness of supported OI project planning steps	• Following the German VDI 2221 process without SOI • Support of knowledge transfer between disciplinary silos • "Low-tech" methodology ensures transparency • Possibility to apply methodology also within a one-day workshop
Company feedback: challenges	• OI-PM methods require expertise of user • Remaining subjectivity of	• Suitable problem scoping for OI projects • Not only focus on suitability but also	• None provided	• Need for more intermediate results • Need for support to interpret

	analyses and decisions	positive diversity of OI partners • Method cannot prevent subjectivity and political bias • Method quality depends on input quality and user expertise		results like portfolios • Strenuous analysis steps need to be designed in a more motivating way • Time dilemma: early results have highest value, but early input is often of low quality • Support of better-informed estimates of project managers

The company feedback in line with the observations demonstrated the benefits of methodical PM, especially to reduce the risk of neglecting important aspects and to broaden the solution space, such as overcoming a local search bias (case1) and thinking patterns (case2). Analysing the PM process of all cases, building a profound problem understanding, analysing stakeholder networks and systematically identifying and assessing OI partners evinced to be key. This forms the basic structure of the "Situational Open Innovation (SOI)" OI-PM framework (Figure 1). Responding to SMEs in case1 and case2, which expressed that OI-PM requires experience or guidance, SOI focuses on guiding companies. This aligns with the call for a "decent [OI] cookbook" (Huizingh, 2011). Aligning with Massis *et al.* (2017), the initial requirement analysis and company discussions stressed the importance for SMEs of staying in control. Therefore, OI-PM tools need to be simple and transparent to provide decision support but without any automatization like filtering.

All four cases highlighted the analysis of existing stakeholders as a key aspect of OI-PM, which is particularly important for SMEs with strong stakeholder networks (Massis *et al.*, 2017). Especially internal stakeholders proved to be critical to use their expertise (case2) and avoid the not-invented-here-syndrome (case1-2). Ensuring high-level support was crucial, such as the owner families (case1-2) and the founders (case4). Although high-level support was given too, case4 failed when the project lead changed. A simple explanation might see all fault with

the new project lead. However, the crisis workshop revealed that the other OI team members lacked an understanding of the goal, purpose and process of the OI project, so they did or could not argue for continuing the project. This could have been just due to a lack of time besides daily work. Still, observing the high level of intrinsic motivation in the other cases around the opportunity to learn indicates a lack of low-level team buy-in while the high-level support was too far removed to be a direct influence.

This revealed another OI-PM key feature in all four cases: a differentiated and equal consideration of operational and strategic OI partner characteristics as suggested by Guertler (2014). While traditional OI and user innovation research focuses on operational characteristics (Piller and Ihl, 2010) like necessary capabilities to solve an innovation problem, strategic characteristics consider “soft factors” that ensure a project’s success, such as interests and attitudes. Although the latter is a strength of stakeholder analysis in PM, the four cases in line with Gould (2012) showed that it needs to be adapted for OI-PM as, for instance, a traditional primary and secondary stakeholder categorisation is not sufficient. Equally considering operational and strategic characteristics when selecting OI partners was essential in all four cases. In addition, case3 showed that this already applies to the OI team composition and full team involvement beyond team lead and high-level management. As this had happened automatically in the other cases, it had not been explicitly considered. Hence, the failed case3 helped to reveal this implicit OI-PM hygiene factor.

Given the complexity of innovation tasks and OI-PM, it was important in all cases to have interdisciplinary OI teams to combine different expertise and backgrounds, aligning with Karlsen (2002). The project workshops had several “aha-moments” when team members shared information that was not widely known. To overcome the barrier of interdisciplinary knowledge often being tacit, tangible PM artefacts like stakeholder maps proved to be successful to explicate knowledge and foster discussion, aligning with Nonaka (1994) stating that tacit knowledge is context-specific and often grounded in action.

Aside from these similarities, the four cases are rather different involving a broad open search (case1), a technical problem analysis as basis for cross-industry OI (case2), a pragmatic lean partner search (case3) and using OI-PM to safeguard intuitive decisions (case4). This variety of OI projects aligns with other OI studies (Sisodiya *et al.*, 2013; Hsieh and Tidd, 2012; Huizingh, 2011) and means a "process blue-print" OI-PM solution is not possible.

Instead, a "situational PM" (Vom Brocke and Lippe, 2015) approach is required, i.e. a flexible modular OI-PM framework. Using the basic structure of SOI, observations and company feedback of all cases allowed for indications of suitable process steps and how to tailor them. These six steps (Figure 1) are explained in the following and can be adapted to accommodate broad searches with multiple new stakeholders (case1) as well as pragmatic searches focussing on only known stakeholders (case3). Providing guidance to when, where and how to tailor process steps was critical in terms of the companies' wish for control as well as purposefully investing limited SME resources. Here, existing PM tools along with newly developed tools like a search-field-matrix proved to be advantageous and also addressed the wish for useable intermediate results to increase team motivation (case4).

4.3 Situational Open Innovation: A framework for identifying and selecting partners in Open Innovation projects

Based on the cross-case analysis, the modular process structure of the "Situational Open Innovation (SOI)" framework for identifying and selecting OI partners was derived (Figure 1). As described in detail in the following, its six steps can be flexibly tailored to specific OI settings to allow for a situational PM support (Jankovic *et al.*, 2015; Lippe and Vom Brocke, 2016), i.e. steps can be adapted, scaled or skipped.

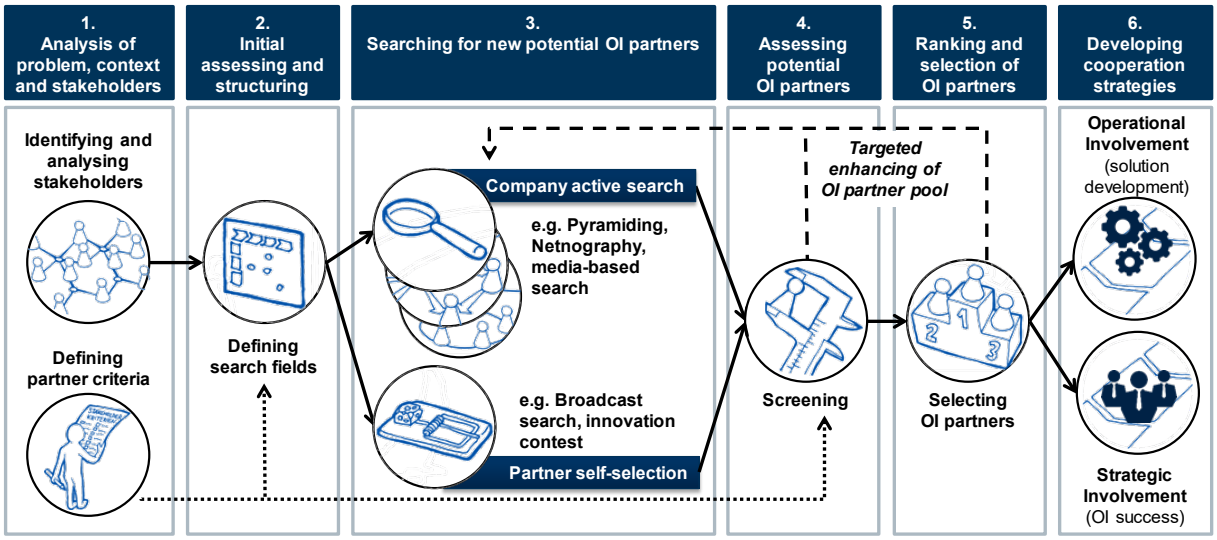

Figure 1: Situational Open Innovation PM framework for identifying and selecting OI partners

4.3.1 Step 1: Analysis of problem, context and stakeholders

All cases highlight that suitable partners and OI-PM approaches depend on the innovation problem and project context including resulting constraints like a high need for secrecy (case1). Systematically analysing and understanding the specific innovation problem proved to be critical to scope an OI project. This also allows to derive required characteristics of OI partners following the identified differentiation in operational (e.g. skills, expertise) and strategic characteristics (e.g. interest, power). Especially case1 showed the importance to prioritise the characteristics (e.g. basic/essential, performance, nice-to-have) to support a subsequent stepwise assessment of OI partners.

The cross-case analysis also stressed the importance of analysing existing stakeholders as they can offer valuable expertise and project support (case1-4) and a basis for further partner searches (case1). Based on the cases, an enhanced stakeholder map was developed (Figure 2), which helps inexperienced companies to navigate through the stakeholder analysis. Differentiating internal and external stakeholders and allocating them to high-level, but OI project-specific, innovation process phases offers a helpful structure. An additional checklist of typical stakeholder categories, derived from literature, proved to be helpful. If relevant, categories can be further detailed and put into the Stakeholder Map (Figure 2), which also allows for modelling stakeholders dependencies.

External stakeholder categories		
customers (B2B / B2C)	users	suppliers
universities / research institutes	legislator / norming organization	interest groups / activists
media / social media groups	competitors	etc.

Internal stakeholder categories		
entrepreneur / owner families	innovation manage-ment	internal service providers
managers	legal department	internal customers
shareholders	IT department	etc.

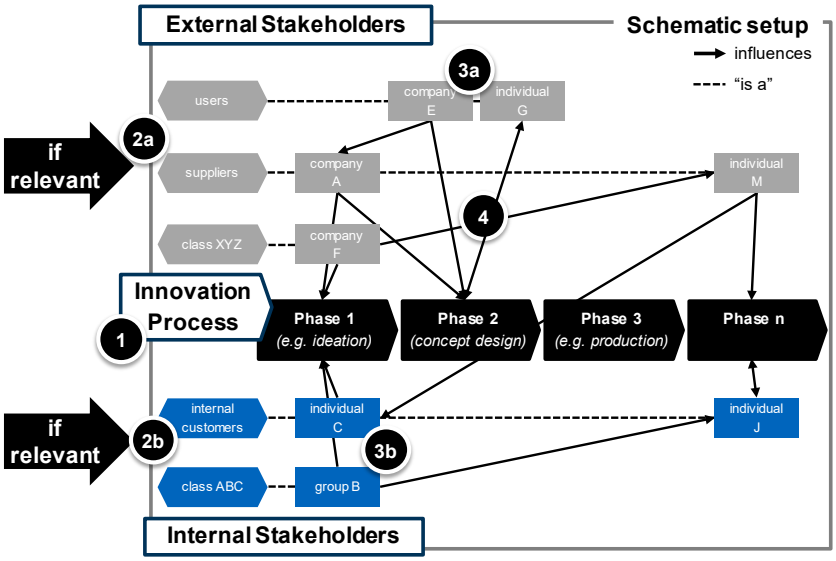

Figure 2: Stakeholder Map

4.3.2 Step 2: Initial assessment and structuring of stakeholders

A key question in all four cases was if and where to search for new potential partners to purposefully use scarce resources: e.g. a broad open search (case1) versus no extra search (case3). Addressing the companies' wish for a structured tool, a Search-Field-Matrix (Figure 3) was developed and successfully applied, which adapts and enhances existing stakeholder approaches (section 2.2). Using the previously defined innovation process and the fulfilment of central partner characteristics as dimensions evinced to be helpful to initially and quickly assess and structure existing stakeholders. Companies stated that the innovation process dimension triggered them to also think about necessary partners to implement a later OI solution. Structuring stakeholders into fields provides an overview where how many potential partners exist, i.e. fields with sufficient partners and fields that are (almost) empty and promising for a search. The fields also allow for prioritisation, delegation and parallelisation of search tasks. However, the Search-Field-Matrix needs to be critically discussed as sometimes fields were empty due to technological or organisational reasons.

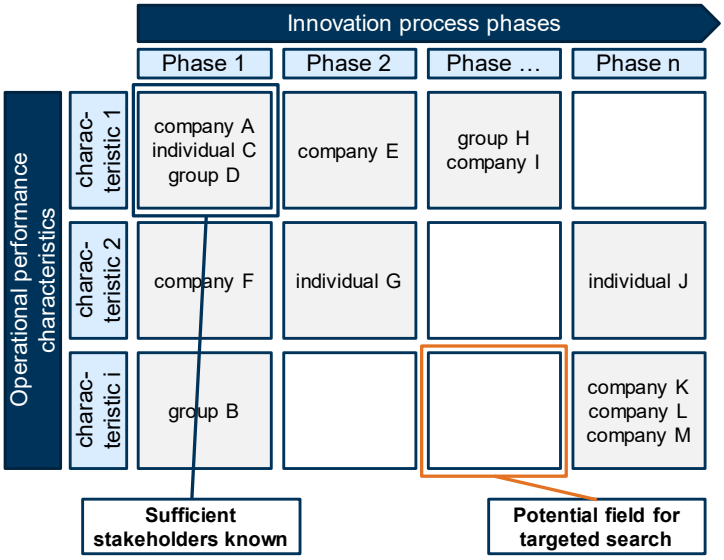

Figure 3: Search-Field-Matrix

4.3.3 Step 3: Searching for new potential OI partners

Along with whether and where to search, how to search was another key issue due to the lack of OI experience. Providing OI teams with one-pager documents summarising the key features, requirements and constraints of different search methods helped to discuss advantages and disadvantages and to select suitable methods. Differentiating an active and passive search path helped companies to consider their project constraints like a high need for secrecy (case1).

4.3.4 Step 4: Assessing potential OI partners

Challenges around partner assessments included the effort of assessing large numbers (case1) and accessibility of reliable information (case1-2). Linking to step 1, prioritising partner characteristics proved to be effective and allowed for a stepwise assessment. Yes/no basic characteristics using publicly accessible information like websites enabled to quickly narrow down the potential partner pools and focus the subsequent more detailed assessment of performance characteristics only on promising partners. The latter included information from fair visits, conversations with third parties and anonymous conversations with potential partners using the university as a proxy.

4.3.5 Step 5: Ranking and selection of OI partners

To use the assessment results and select OI partners, the companies wished for a transparent, ideally "low-tech" tool (case4) that does not autonomously filter options but leaves the decision to the OI teams. Literature provides different approaches such as portfolios allowing for multi-dimensional prioritising including the attitude power portfolio of Bryson (2004).

In this study, the strategic-operational portfolio of Guertler (2014) proved to be beneficial to rank stakeholders and visualise dependencies. It ranks stakeholders concerning their strategic relevance as well as their operational potential (Figure 4) – both dimensions represent the standardised sum of the respective partner characteristics. A high operational potential indicates a partner's capability to contribute to solving the focal innovation problem. A high strategic relevance indicates the influence on strategic decisions and the success of the OI project. Here, stakeholders with a negative/opposing attitude can also be highlighted. Mapping stakeholder dependencies (from the initial stakeholder map) into the portfolio enables identifying potentially dangerous dependencies between stakeholders, which might risk the success of an OI project.

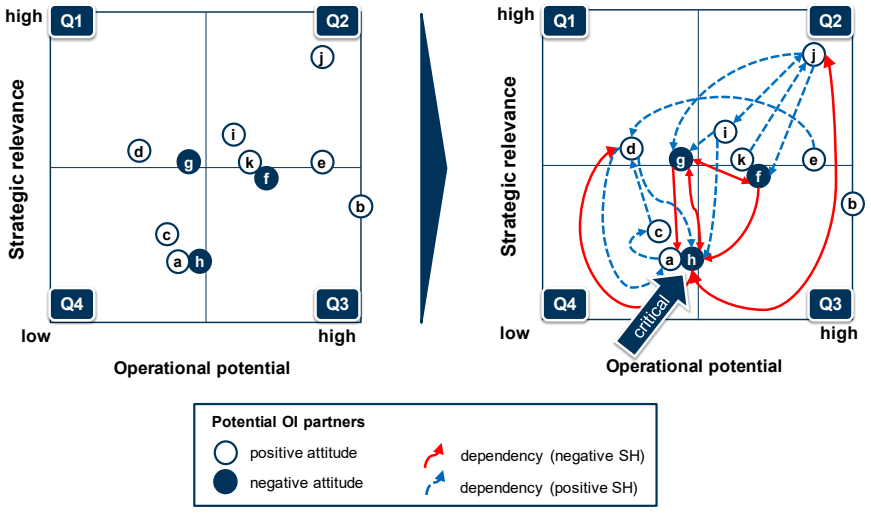

Figure 4: Strategic-operational portfolio (based on: Guertler, 2014)

4.3.6 Step 6: Developing cooperation strategies

Closely linked to ranking and selecting OI partners was the question how to involve them into the OI project. The study proved that particularly the strategic-operational portfolio (Figure 4)

can support identifying a general way of involving selected partners (Guertler, 2014) based on their operational problem-solving capabilities and strategic influence. While partners in Q2 qualify for an active role in co-designing a solution due to their high operational and strategic relevance, partners in Q3 can be valuable in contributing additional expertise or perspectives, such as cross-industry expertise. Partners in Q1 can be important for the strategic and political success due to their high strategic relevance, such as decision makers. Q4 indicates stakeholders with low relevance to the OI project. While this tool and this step help to select a general way of involvement, detailed engagement plans need to be created in subsequent PM activities.

5 Discussion

5.1 Overarching insights into managing OI by projects

This study demonstrates how PM can support OI projects and build "sensing" capabilities to identify and evaluate innovation opportunities (cf. Teece, 2012). Gould (2012) stressed the benefits of stakeholder analysis to improve relationship building to support knowledge retention and exploitation in OI, but left it to other researchers to develop a specific engagement process.

An interesting observation in this regard was an apparent discrepancy between advanced academic knowledge and practice in industry lagging behind. This spans from single PM techniques, such as TRIZ function analysis (Orloff, 2006) and multi-criteria assessments (Marques *et al.*, 2011), to OI itself – although "research on obtaining innovations is the largest and most vibrant in OI" (West and Bogers, 2014). This might be due to a reported generally limited methodical knowledge and functional use of formal PM tools in SMEs (Meyer, 2013; Spithoven *et al.*, 2013).

However, a second observation could indicate another reason. Although experienced in managing innovation projects, the SMEs seemed reluctant or overwhelmed in applying their existing expertise for planning OI projects. This aligns with Hernandez-Vivanco *et al.* (2018), who identified an insufficient integration of OI and internal management systems. Discussions with the SMEs indicated a vague feeling that OI, as a new approach, would need new

underlying management methods. Another reason of the academia-practice gap might be that literature often focuses on isolated aspects like ideal numbers of OI partners (Laursen and Salter, 2006) and describing WHAT is important to do (West and Bogers, 2014; Gould, 2012) but not HOW to operationalise this in practice. The study indicates that PM allows to translate OI research into actionable frameworks like SOI. This can help to bridge the academia-practice gap (Gera, 2012) and build sensing and seizing capabilities around OI whilst enabling for "layered collaboration schemes" (Bogers, 2011), i.e. purposefully combining expertise of different partner types (Laursen and Salter, 2006).

This study revealed that neither PM nor open and user innovation approaches are sufficient when used in isolation. Instead, their strengths evinced to be widely complementary. OI and lead-user search approaches are strong in identifying actors with specific problem-solving capabilities and allow for identifying unknown OI partners through pyramiding and cross-industry innovation (Poetz and Prügl, 2010). This can help to go beyond the "usual suspects" of partners and overcome a local search bias (Lopez-Vega *et al.*, 2016). While PM can struggle with communication, commitment and power distance problems in geographically dispersed teams (Vom Brocke and Lippe, 2015; Gattringer *et al.*, 2017), self-selection-based OI crowdsourcing approaches have specific strengths in this respect.

Furthermore, the study insights indicate that knowledge and knowledge carriers cannot easily be separated. In this respect, stakeholder analysis approaches are strong in analysing interests, power and dependencies of existing stakeholders. This is particularly important for SMEs with a high customer-orientation and strong external partnerships based on trust and strong social ties to employees (Hamer, 2013), who in general show a high work motivation but limited appetite to adopt new management approaches (Meyer, 2013). Similar to traditional projects (Vom Brocke and Lippe, 2015; Adler *et al.*, 2009), a common problem of OI projects is an insufficient consideration of different, often conflicting stakeholder interests particularly of internal stakeholders (Gould, 2012), which can cause issues like the "not-invented-here

syndrome" (Grosse Kathoefer and Leker, 2012). As case3 shows, a lack of buy-in can even be an issue within the OI team itself.

OI has an ambivalent role concerning the limited resources of SMEs. While OI allows for enhancing own resources and capabilities, resource limitations can affect project planning as in case4 (Spithoven *et al.*, 2013; van de Vrande *et al.*, 2009). The study stresses a limited opportunity for failure resulting in risk aversion and wish for high management control aligning with (Alberti and Pizzurno, 2013). A structured approach helps to reduce the risk of wasted resources of partnering with unsuitable partners and of missed opportunities when neglecting suitable partners (Blair *et al.*, 1996). This is evidenced in, for instance, insufficiently managed crowdsourcing projects attracting a wrong audience or a "local search bias" (Lopez-Vega *et al.*, 2016).

Therefore, SMEs can benefit from a methodical approach like SOI and help to overcome limited methodical PM capabilities (cf. Spithoven *et al.*, 2013). This can even enable OI projects in sensitive, usually closed settings like case1, and can help to manage the "paradox of openness", i.e. internal knowledge needs to be revealed first to yield external knowledge (Laursen and Salter, 2014; Lazzarotti *et al.*, 2017).

In general, boundaries between PM and OI have started to blur. While PM approaches like stakeholder analysis started to consider boundary-spanning collaboration and competences (e.g. Gattringer *et al.*, 2017), OI recognises a strategic perspective, for instance, in the context of social barriers and incentives for OI partners. This contributes to general calls to link PM with other disciplines (Vom Brocke and Lippe, 2015) and provides a particular answer to how OI and stakeholder analysis can be integrated (Gould, 2012).

5.2 Overarching challenges towards OI project management

Although the SOI framework addresses success factors and challenges of OI-PM, the study also reveals overarching challenges, which require further research. Selecting the right partners for an OI project is crucial for the project performance and the long-term success of the overarching innovation project. A key challenge is managing large numbers of potential OI

partners in addition to already known stakeholders. Particularly a time and resource-efficient assessment of their project relevance is difficult. The study shows that prioritising OI partner characteristics and a stepwise assessment can help to quickly filter unsuitable partners.

However, defining suitable OI partner characteristics is not trivial and challenging especially for inexperienced companies, which aligns with findings from defining lead-user selection criteria (Hippel *et al.*, 2009). While partner characteristics need to be broad enough to allow for identifying a range of new potential OI partners, they also need to be specific enough to allow for an efficient evaluation of a partner's suitability. A compromise can be the use of two different sets of characteristics, including a broad search and a narrower assessment set (case2). It is also possible to refine and revise characteristics, while being careful not to tune assessment results to meet expectations (case4).

Access to reliable information to assess stakeholders has been a challenge for PM but is a particular issue for new OI partners. This lack of information increases the uncertainty and effort of partner evaluation, including the exclusion of suitable partners due to missing information. Partner characteristics need to be defined and prioritised with respect to the information available. If information needs to be estimated, different experts should be involved to reduce subjectivity. Politics and information sensibility can be additional issues especially when assessing internal stakeholders like colleagues and superiors.

Due to their often-short timeframes and multitude of external stakeholders, dynamics of OI projects and their boundary conditions are a central issue. Since each PM technique depends on the quality of input data, these dynamics need to be identified and considered, such as appearing or disappearing of stakeholders and changing partner characteristics (cf. Elias *et al.*, 2002).

Another issue is the often-long timespan between an OI project and the achievement of tangible outcomes of the overarching innovation project (like case1). This complicates an efficient project and project planning performance measurement (Vom Brocke and Lippe, 2015; Hilgers *et al.*, 2011).

Finding the right point in time for applying OI-PM methodologies is not easy, for fast-paced OI projects in particular. Although planning results would provide the most benefit early in the planning process, the quality of available input is usually insufficient. When sufficient planning input is available, the project has often already progressed beyond the focal planning data. PM techniques supporting well-informed estimations instead of full decision-making tools might be an alternative approach.

This also links to the application effort of PM techniques. Along with fast-paced OI projects and a general impatience to generate results, SMEs struggle with resource limitations and constant "firefighting" (cf. Hossain, 2015). SMEs perceived the analysis steps as often too tedious. Providing pre-defined stakeholder categories can support stakeholder analysis but can be a creativity or cognitive barrier and might risk neglecting additional stakeholder types. Resulting questions include how gamification elements could motivate team members and how PM methods could be simplified. Such lean methods could also contribute to managing agile projects.

6 Conclusion

The key aim of this research was to explore how PM can support a successful application of OI in SMEs. While this provides insights in how both disciplines can benefit from each other, it also supports the development of new integrated OI-specific PM approaches like SOI. This study indicates that PM allows for enhancing OI approaches and transforming them into an actionable form, which helps to overcome the knowledge transfer barrier between academia and industrial practice (cf. Gera, 2012). Especially supporting a systematic understanding of OI problems and contexts and selecting OI partners as problem solvers as well as strategic-political enablers can help companies to strengthen their sensing capabilities (Teece, 2012).

In addition to the advancement of OI and PM theory, the insights of this research provide a range of practical implications. SOI helps SMEs to systematically navigate the early phases of OI projects with a focus on identifying and selecting partners. The consideration of internal and external as well as operational and strategic OI partners helps in involving the right partners.

This reduces the risk of involving unsuitable partners and missing relevant ones. This helps SMEs to purposefully use their limited resources, increases the likelihood of OI project success and reduces OI risks. Most importantly, SOI is compatible and adds to existing PM techniques and capabilities in the companies supporting an easy implementation.

Notwithstanding the theoretical and practical impact of the work, there are several limitations. The exploratory character of the OI-PM research field calls for qualitative methods, resulting in the typical limitations of case study research. Although the cases have been carefully selected, the insights are, to a certain extent, dependent on the context of the cases. Further research is therefore encouraged to broaden and deepen the claims made in this study in different contexts (Jankovic *et al.*, 2015). As this study focussed on identifying and selecting OI partners, other project planning activities need to be investigated in a similar way. Although this study indicated the relevance of pilot projects to build OI seizing capabilities (Teece, 2012) in line with Boscherini *et al.* (2010), this needs further investigations in the future. A general superordinate research challenge is the delay between a research project and the visibility of results. This complicates a detailed evaluation in the short-run along with problems of access to companies and teams to evaluate long-term effects. Moreover, future research could add more objective, quantitative search elements such as patent analyses (Jeon *et al.*, 2011a).

7 Funding

This work was supported by the KME – Kompetenzzentrum Mittelstand GmbH.

8 Acknowledgements

Figure 1 uses free icons made by Freepik from www.flaticon.com.

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