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Challenges and Dilemmas in Open Innovation: Ambidexterity as Management Approach

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Abstract. What are the relevant management challenges for open innovation, and how do companies tackle these challenges? This study adds to the research of open innovation management by investigating different management dimensions and their inherent dilemmas. By applying the concept of organizational ambidexterity as an approach to pursue apparently conflicting objectives, we extend previous research in two key aspects: First, in contrast to most studies we do not focus on a single management dimension but consider a wider set of dimensions which we found evidence to be relevant for open innovation. Second, unlike previous studies which consider ambidexterity for managing open innovation, we do not limit our discussion to ambidexterity as a whole but consider different modes of ambidexterity. Our findings support this approach: We find structural ambidexterity for the degree of innovation, organizational configuration, intellectual property management and motivation. We also find temporal and contextual ambidexterity in two additional dimensions.

Keywords: Open Innovation, Management Dimensions, Challenges and Dilemmas, Ambidexterity

1 Introduction

Without innovation and the constant search for new products, services, and business models, companies are not able to survive in the market in the long run. Dynamic capabilities, i.e. the ability to adapt to change and develop new competences, are required in order to react to changing business environments [1]. The classical approach how companies dealt with the innovation challenge was to set up large research and development (R&D) units, allocate large budgets to R&D, and protect knowledge against competitors via intellectual property protection mechanisms, especially patents. This protectionist innovation strategy was named “*closed innovation*” by Professor Henry Chesbrough, who in 2003 described a new paradigm which he called “*open innovation*” [2]. He found that successful companies also perform R&D in collaboration with external partners, allowing external knowledge to flow into the company and also allowing externals to make use of internal knowledge. Although collaborative R&D was not new [3],[4], the globalization of the world economy, increasing competition, and improved possibilities from IT – especially web technolo-

gies – led to a stronger diffusion of the open innovation concept and accordingly to a growing body of knowledge over the past years [5]. However, despite the significant number of studies about open innovation, we still lack a deeper understanding of the key management challenges and best practices for open innovation [6]. From our point of view, this relates to the fact that managing open innovation is a multi-dimensional challenge and can bear conflicts and dilemmas in many different management dimensions.

This study makes use of the *organizational ambidexterity* concept as theoretical lens for explaining how companies can deal with the dilemmas. Organizational ambidexterity has been predominantly discussed in the context of exploitation and exploration [7]. But to our understanding and in line with other authors [8-11], this is not a logical limitation. Especially with regards to (open) innovation, studies have shown that ambidexterity can be applied to other management dimensions as well: For instance, Rothaermel and Alexandre [8] discuss ambidexterity as an approach to balance between internal vs. external technology sourcing. Argyres and Silverman [9] found hybrid (ambidextrous) structures where innovation processes are executed by centralized and decentralized units. And Henkel [10] identified an ambidextrous approach to intellectual property management, what he calls “selective revealing”. Based on these studies, we postulate that conflicts and dilemmas exist in manifold management dimensions, and ambidexterity can be used to balance between conflicting tasks and thus resolve these dilemmas [11]. We also suggest that there is no singular ambidexterity mode: According to Raisch and Birkinshaw [12] ambidexterity can be applied on organizational and individual level, and it can be implemented by a structural, temporal, or contextual division of conflicting tasks. Building upon these studies we define the following two research questions:

1. For which management dimensions can we find ambidexterity as an approach to dealing with potential dilemmas in open innovation?
2. If we find ambidexterity in one or more dimensions, which ambidexterity mode is being applied in the respective management dimensions?

We will analyze and discuss these questions based on an explorative case study with a major multinational enterprise. This enterprise has established an open innovation environment with different formats of internal and external open innovation processes, supported by dedicated web-based IT platforms.

The remainder of this paper is structured as follows: In section 2 we provide the theoretical background by discussing the concepts of open innovation and organizational ambidexterity in further detail. In section 3 we develop a conceptual framework of different management dimensions for open innovation, based on the extant literature. Supposing that in each management dimension there is no unambiguous and straightforward direction, we aim at identifying potential dilemmas which could be handled using ambidextrous approaches. In section 4 we describe our case study and the research methodology. In section 5 we summarize our case findings, and in section 6 we discuss the findings and develop conclusion for theory and practice.

2 Theoretical Background

2.1 Open Innovation

The innovation process by general definition begins with the ideation phase, followed by an idea selection phase. The selected ideas then get developed and tested, and new developed products or services will be introduced to the market [13]. This process is largely the same for closed and open innovation, except that in open innovation the boundaries become permeable at certain stages of the process, in one way (inbound) or the other (outbound). We talk about open innovation when the innovation process has an interface – inbound or outbound – at one or more stages to one or more external parties. This also includes interfaces to peripheral inside innovators [14], i.e. employees inside the organization but external to the R&D department. We call this *internal open innovation*, as opposed to *external open innovation* with external parties outside the company.

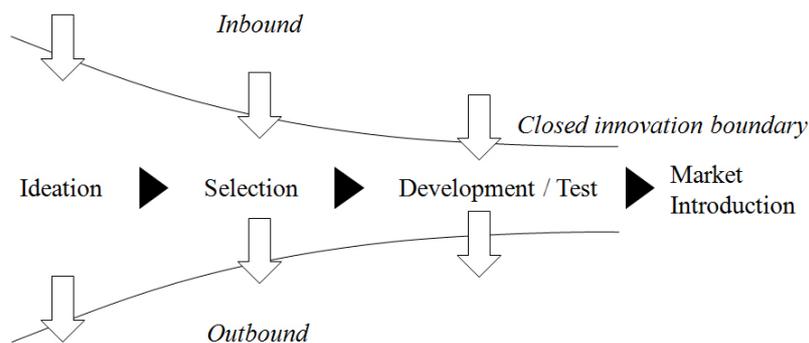


Fig. 1. Innovation Process in Open and Closed Innovation

Managing the innovation process requires dealing with manifold complexities: Different actors have different roles in this process, they may have different and sometimes opposing motives and objectives, and their dispersed knowledge must be coordinated and aligned towards achieving common objectives. If the innovation process has external interfaces, complexities are usually even larger due to the need of coordinating these interfaces and balancing heterogeneous objectives.

In order to follow a common terminology in the following, we refer to the *open innovation process* when we talk about singular innovation efforts with a specific innovation result (see figure 1). Open innovation processes by this definition can be very different, ranging from engaging external individuals in the ideation phase up to long-term research collaborations involving many companies and research institutes. We subsequently refer to an *open innovation environment* when a company has established structures and policies for professionally executing open innovation processes on a continuous basis.

2.2 Ambidexterity

Managing innovation does not only include the coordination and supervision of the innovation process, it also requires *making decisions* and *resolving dilemmas* wherever different options are at hand. The classical example is the dilemma between exploitation and exploration [7]. Companies should not simply focus on either exploitation or exploration, but rather balance between the two concepts and thus pursue both innovation strategies simultaneously. March's seminal work has become part of a wider academic discussion about the challenges and dilemmas in organizational design for innovation. There is common agreement that organizations require different structures for *finding new* innovations on the one hand and *being efficient* in their existing business on the other hand [15],[16]. In order to pursue both objectives simultaneously, successful companies have implemented what Duncan [17] called the "*ambidextrous organization*". By "hosting multiple contradictory structures, processes, and cultures within the same firm" [18], companies manage to balance between contradictory objectives and thus create an optimal setting for a sustainable business development. *Balancing* in this context does not mean finding a punctual equilibrium, but rather excelling at both ends of the continuum [19-20]. The application of this concept to organization science has become widespread in the past decades – for a detailed recent overview see [12].

Organizational ambidexterity can be applied in different forms: *Structural ambidexterity* can be achieved by implementing dual structures [17], i.e. separate units focusing on either alignment or adaptation. Dilemmas are then resolved by assigning conflicting objectives to different business units. Structural ambidexterity can also be implemented beyond the boundary of the company, when conflicting tasks are divided between internal units and external parties [8]. Alternatively, ambidexterity can also be realized on a temporal basis when the entire organization temporarily alternates between conflicting objectives in cyclical phases [21], [22]. We denominate this as *temporal ambidexterity* [11]. As a third alternative, dilemmas may not only be resolved on organizational level but also on individual level [11]. In this so-called *contextual ambidexterity* a set of systems, processes, and beliefs "enables and encourages individuals to judge for themselves how to best divide their time between the conflicting demands" [12]. Table 1 summarizes the three predominant modes of ambidexterity.

Table 1. Different modes of ambidexterity

Ambidexterity mode	Basic definition
Structural	Conflicting objectives and tasks are divided at organizational level (different sub-units)
Temporal	Conflicting objectives are pursued by the organizational unit temporarily in cyclical phases
Contextual	Individuals are enabled to decide context-based how to divide their time between conflicting tasks

3 Conceptual Framework: Open Innovation Management

Due to the aforementioned complexities in managing open innovation, it is crucial to understand where these complexities arise and how they are shaped in their respective dimensions. Therefore, as a starting point for our analysis, we develop a *conceptual framework of different management dimensions* which (1) are relevant for open innovation environments and (2) in which we had evidence to believe that ambidexterity could be applied. The conceptual framework is based on a thorough review of the existing literature: Starting with the renowned open innovation literature [2], [23], [24] and a recent literature review [25], we identified a first set of dimensions relevant for managing open innovation. We further used these dimensions to perform a database search in leading R&D and innovation related journals [25]. Subsequently we extended the body of literature by iteratively screening the list of references from relevant sources and used these findings to refine the framework. We chose this methodology due to the absence of an existing comprehensive management framework for open innovation. As Gassmann et al. noted in 2010, “industry is starting to professionalize the internal processes to manage open innovation” but “nevertheless, it is currently still more trial and error than a professionally managed process” [5]. Because there is no integrated cookbook for managing open innovation [26], our conceptual framework is rather built upon a broader number of articles that focus on particular open innovation management dimensions. In the following we develop the conceptual framework considering each of these management dimensions:

Degree of Innovation. Taking the exploitation-exploration dilemma, we have already discussed the need for a company to simultaneously optimize its current business and also develop new capabilities in order to cope with changing markets and demands. We can relate this challenge also to the terms *incremental* and *radical innovation*, which denote the innovation’s proximity to the current technological trajectory and customer/market segment [27]. Incremental innovations rather support business improvements, whereas radical innovations result in new products, services, or even new business models. The question is whether we find a clear tendency towards incremental or radical innovation in an open innovation environment, or if companies can pursue different degrees of innovation within singular open innovation processes.

Organizational configuration. Several authors have investigated organizational configurations and especially *centralized* and *decentralized structures* for innovation and R&D [22], [28-29]. Based on previous studies, we could find support for temporal and structural ambidexterity: Siggelkow & Levinthal [23] found that a *temporary* decentralization and later reintegration yielded in the highest exploration performance. Argyres and Silverman [9] found that companies implement *hybrid structures* with both central and decentral elements, thereby combining the advantages of both approaches – high proximity to market demands and high impact of R&D for the entire firm. We will investigate in our case study whether we find support for a temporal or structural ambidexterity combining central (firm level) and decentral (business-unit level) aspects.

Target setting. Defining innovation targets and measuring the innovative performance should be seen as a core innovation management responsibility [30]. Such *measures* often include R&D expenditures, number of patents, patent citations, and new product announcements [31]. With regards to open innovation environments, much less *systematic target setting* can be found [5]. A prominent example is the company Procter & Gamble which follows an explicit open innovation strategy and aim at acquiring 50% of their innovations from external collaboration and external sources [32]. However, so far no similar approaches have been found, maybe because most companies are still at an early stage of adopting open innovation concepts [33].

Decision making policies. Decision making in open innovation is clearly different from closed innovation. Actors outside the R&D unit must be motivated to participate, often realized via a democratization of the innovation process [23]. But in contrast to predominantly democratic innovation systems like open source software development, the majority of open innovation environments are organized as a community of creation, “governed by a central firm that acts as the sponsor and defines the ground rules for participation” [34]. This environment requires a set of rules which define the degree to which the external actors join the decision making process, and whether decision making policies are more *hierarchical* or *flat* [35].

Intellectual property. Intellectual property (IP) is a proprietary asset which secures commercial success of innovations [36]. The private-investment model supports traditional practices where IP is *protected* and innovators receive private returns from their investments. In contrast, in the collective-action model the innovators *reveal* their knowledge and contribute to the creation of public goods [37]. In open source software development a combination of both models exists: Companies that use embedded Linux in their technical devices have been found to share some modules and extensions with the external community while keeping other pieces of that code internally [10]. We will investigate whether simultaneous IP protecting and revealing can also be found in open innovation environments other than open-source settings.

Motivation and incentives. Even in closed innovation environment where all R&D employees receive their salaries, social psychologists found that there is more than money that motivates employees and influences their innovative behavior. Intrinsic motivation – e.g. interest, curiosity, enjoyment, or a personal sense of challenge – will foster employee creativity [38]. And also leadership mechanisms in terms of intellectual stimulation, offered autonomy, resource availability, feedback, recognition, and career opportunities will influence motivation and innovation performance [39]. In an open innovation environment, it is specifically important to consider motivation for each group of actors. External innovators may have different motives for participating in an open innovation process [40], and therefore the mix between *monetary incentives* and factors supporting *other personal gains* should be deliberately chosen for the particular open innovation configuration [41].

The following table summarizes the conceptual framework. It constitutes an initial set of management dimensions for which we found support in the literature. In the

course of our case study, we intended to review and revise this framework for best possible results. The balancing dilemmas are further used for analyzing our research questions whether we find ambidexterity, and which ambidexterity mode is applied.

Table 2. Conceptual framework

Management dimension	Balancing dilemma in open innovation context
Degree of innovation	Pursue incremental or radical innovations
Organizational configuration	Central (firm-level) or decentral (sub-unit level)
Target setting	Hard KPI targets or soft qualitative targets
Decision making policies	Hierarchical (top-down) or flat (democratic)
Intellectual property	Protect IP or reveal to outside market
Motivation and incentives	Monetary or personal gains

4 Research Methodology

4.1 Case Setting

We have designed this research as an embedded case study with a major DAX 30 and EURO STOXX 50 company (in the following called „*InnoMaster*“). Founded more than 100 years ago, InnoMaster has become one of the largest integrated technology enterprises worldwide, operating in more than 150 countries. With more than 25,000 R&D employees across the globe, InnoMaster spends significant efforts in constantly developing new innovative products and services. InnoMaster also has a long history of *collaborative* R&D: Suppliers and customers are involved in innovation projects, collaborations with universities and innovation labs have been established, and intellectual property which is not seen as strategic asset is being commercialized via spin-out projects. A couple of years ago InnoMaster established a central open innovation unit (OI unit), based on a systematic white spot analysis of potential open innovation areas. This analysis identified three major gaps in the existent portfolio of open innovation processes: (1) idea generation via internal and external innovation contests, (2) collaboration with communities of external scientists for problem solving, and (3) knowledge management via company-wide expert networks. To fill these gaps, the OI unit has developed specific methods and tools for these open innovation processes.

We have designed and conducted this case study following the process defined by Eisenhardt [42] and taking into account further guidelines from Yin [43]. We used the theoretical approach of a „soft positivism“ [44], assuming that the management dimensions and the dilemmas for open innovation management are existing phenomena which we can discover and validate. The conceptual framework served as starting point for our case interviews. We were expecting to extend this initial framework by additional management dimensions in an interpretive manner. A single case study design was chosen in order to contribute to knowledge and theory building on the managing open innovation and to provide fundamental insights for future investiga-

tion. We believe that InnoMaster can be classified as a case which is *representative* for many large technology-focused enterprises that have implemented an open innovation environment [43]. Random case selection was not required in this research setting [42]. Instead we have deliberately selected InnoMaster as case study partner because of their established and well structured open innovation practices.

4.2 Data Collection and Analysis

We conducted structured interviews with managers from different business units in different divisions at InnoMaster. Interview partners were selected from the central OI unit and also from operating business units where different open innovation processes are being executed. To prepare the interviews, we developed a slide deck which we shared with our interview partners. The slides contained an introduction of the research team and the research project, a definition of our research focus, and the conceptual framework of management dimensions as a starting point for the discussions. Before we run the interviews, we scanned the Internet to collect all relevant and publicly available information about InnoMaster and its open innovation activities (including press clippings, descriptions of open innovation processes, and interviews). In addition, we conducted several informal talks with other company representatives in order to understand their view and their experiences with open innovation processes at InnoMaster. The informal talks and formal interviews took place between February and October 2011. Table 3 provides shows overview of the interviews:

Table 3. Interviews with InnoMaster managers

Interview Partner (position)	Format	Date	Length
Head of Central OI Unit	Face-to-face	Feb 2011	01:33h
Project Manager, Central OI Unit	Face-to-face	Feb 2011	01:33h
Head of Innovation Strategy Mobility	Phone	Mar 2011	00:35h
Investment Manager, IP Commercialization	Face-to-face	Sep 2011	01:24h
Head of Working Group Energy Efficiency	Face-to-face	Oct 2011	00:58h
Senior Consultant Sustainability	Phone	Oct 2011	00:39h

The interviews were audio-recorded and transcribed. The transcripts comprised more than 100 pages and were systematically coded. For coding we focused on the management dimensions of our conceptual framework, but we also tried to identify additional dimensions which we did not find in our review of the literature. The coding results were then analyzed with regards to the research questions of this study: Can we confirm that the postulated management dimensions are relevant for an open innovation environment? Should we consider additional management dimensions? What are the peculiar dilemmas in each management dimension? Can we confirm that

the concept of *ambidexterity* is applied? And if yes, which ambidexterity mode? The research process for our study is shown in figure 2:

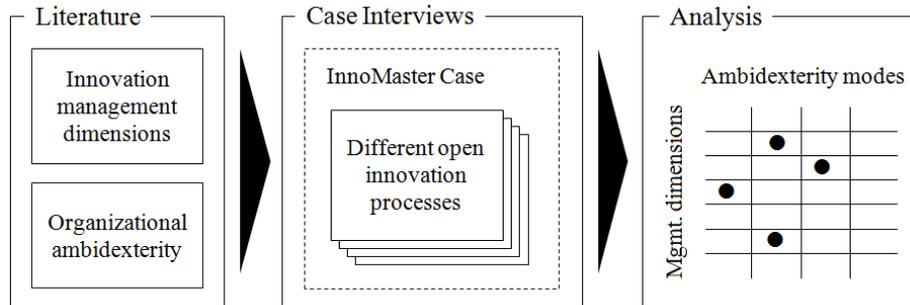


Fig. 2. Research process

5 Case Findings

In the following, the findings from the case interviews are structured by the management dimensions introduced in the conceptual framework (section 3):

Degree of Innovation. The open innovation environment at InnoMaster is designed as a multi-purpose construct which supports a variety of different open innovation processes: Internal open innovation with employees outside R&D as well as external open innovation with experts from outside the company; Low complexity idea generation initiatives (e.g. idea contests) as well as specific and more complex searches for solutions to specific technical problems; and both inbound open innovation as well as outbound open innovation. According to our interviewees the involved operating business unit always has certain expectations with regards to the outcome – in some cases the innovations will be rather incremental and in other cases they can be more radical. One idea contests for instance was aiming at “new business models that change the game” and “disruptive technologies to enable a smarter world”, whereas other open innovation processes rather aim at incremental innovations. We can interpret this setting as a structural ambidexterity because different degrees of innovation can be achieved (even in parallel) via different open innovation processes within the overall environment.

Organizational configuration. The central OI unit develops structures and concepts, identifies technical solutions and solution providers, advertises the concepts across the business units, and supervises the open innovation processes. The decentral operating business units are mainly responsible for the execution, with guidance and sparring from the central unit. The trigger for starting an open innovation process, e.g. an idea contest, can originate from the central OI unit based on their understanding of the global business and their view of potential opportunities; the trigger can also come

from the operating business units where demand for innovation is identified. Both the central and decentral units are required in this organizational setup and each unit has their specific role. One of our interview partners from the central unit stated that “open innovation must never be executed solely centrally”. He also acknowledged that a minimum of central coordination will remain essential even when open innovation will have become a well established concept across divisions and operating business units. We conclude that also in this dimension, a structural ambidexterity has been implemented in the organizational setting of central and decentral business units.

Targets setting. In contrast to Procter & Gamble, InnoMaster does not define specific measurable targets or success KPIs, neither for individual open innovation processes nor for the central OI unit and the entire open innovation environment. Certainly the operating business units have their expectations with regards to the outcome (e.g., number of new ideas, degree of novelty, feasibility, etc.) and they take measures to attract a broad range of participants and steer the community into a certain direction. But hard KPI targets are not defined, mainly because the success of an open innovation process is not only perceived by measurable results but also in terms of organizational learning and community engagement. The head of the central OI unit also pointed out that the use of global targets for the entire open innovation environment would not be feasible because the different business divisions and their technical product lines are too heterogeneous in their R&D and therefore provide very different opportunities to involve external parties. We conclude that in this set-up there is no management dilemma and hence ambidexterity is not applied.

Decision making policies. The open innovation environment at InnoMaster is designed as a community of creation where the fundamental rules and policies are set by the company [34]. This implies that the management always has the final decision authority. However, in many of the idea contests which InnoMaster has run so far, we could find a combination of flat and hierarchical decision making policies: Short-listing of ideas is done through the votes of the participants (flat governance and bottom-up decision-making), and a jury of managers and experts perform the final selection (hierarchical governance and top-down decision making). This setting enables the business unit to stay in control over the selection process and simultaneously motivate the community to engage in the contest. We classify this as temporal ambidexterity because the bottom-up voting and short-listing temporally precedes the final top-down jury selection.

Intellectual Property. The long history of successful R&D at InnoMaster has always been accompanied by efforts to protect knowledge and technological advance. This is still valid: The total number of active patents exceeds 50,000 and this number is even increasing. With regards to IP in the open innovation environment, we found different approaches in different open innovation processes: For inbound open innovation, for instance idea contests, the general approach is that participants are required to grant a “non-exclusive, irrevocable, world-wide [...] license to use or have used participant's entry in its original or in any modified form and in any known or currently unknown

way” (as stated in the terms and conditions). But InnoMaster also performs *outbound open innovation*: A dedicated business unit looks for un-used patented technologies which do not fit with the business strategy but could be externally commercialized. By founding spin-offs which over time shall become independent businesses, InnoMaster also reveals IP to the outside market. We classify this set-up as structural ambidexterity because revealing and commercializing IP is the responsibility of a separate dedicated unit.

Motivation and incentives. With regards to this dimension there are differences between internal and external open innovation processes. For internal open innovation with employees, InnoMaster primarily relies on their intrinsic motivation and mostly non-monetary extrinsic factors. Rather than giving high monetary awards, firm recognition and reputation among peers as well as possible advantages for career development play a major role. For example in an internal idea contest, employees were offered to present the winning ideas in front of a top-management jury, which was perceived as a major chance to develop their careers. Monetary awards have been found much more relevant when involving externals: In external idea contests, participants could win prizes worth 15,000 EUR and more. Similarly, monetary incentives were significant for specific problem solving challenges published on external expert network platforms (e.g. Innocentive). Our interpretation is that InnoMaster applies structural ambidexterity in this dimension, supposing that internal and external formats are understood as different structures for open innovation.

Resource allocation. As shown in table 4 (last row), we could find another interesting management aspect in the entire open innovation environment at InnoMaster: With regards to internal open innovation practices, employees are legitimized to participate, but not given dedicated time for their efforts. Employees are rather expected to decide on their own whether they dedicate time to contribute and how they manage their daily routine work in parallel. We classify this approach as contextual ambidexterity, and we add resource allocation as additional management dimension to our conceptual framework (table 2).

Table 4. Summary of findings

Management dimension	Balancing dilemma	SA	TA	CA
Degree of innovation	Exploit vs. explore	●	-	-
Organizational configuration	Central vs. decentral	●	-	-
Target setting	Hard KPIs vs. soft targets	-	-	-
Decision making policies	Hierarchical vs. flat	-	●	-
Intellectual property	Protecting vs. revealing	●	-	-
Motivation and incentives	Monetary vs. personal gains	●	-	-
Resource allocation	Routine vs. non-routine task	-	-	●

SA = Structural ambidexterity; TA = Temporal ambidexterity; CA = Contextual ambidexterity

6 Discussion

Open innovation with its many different formats (inbound and outbound, internal and external, processes and sub-processes, entire ecosystems, etc.) is a wide field for investigation. Many companies have implemented one or more open innovation processes and thereby have defined their particular open innovation environment. The paper at hand contributes to the general discussion of how companies *manage their open innovation environments* – a question which has been widely neglected in academic research so far [5], [6].

Before discussing implications for research and practice, some limitations have to be considered: Our research is based on a single case study, a setting which we have explained and justified by our assumption that InnoMaster can be seen as representative for many large enterprises that practice open innovation. Investigating a representative case is seen as key rationale for using a single case design [43]. However we cannot be certain if other large enterprises have similar or maybe very different processes and environments. Future research could investigate additional cases and thereby improve the robustness of findings and interpretations in this direction. A multiple case design [43] would allow for comparison of management dimensions, different dilemmas, and different modes of ambidexterity. A second limitation of this study is related to the contribution to theory building. Based on our review of the literature and supported by the case analysis, this study contributes to academic research in terms of analyzing, describing, and explaining the phenomenon of managing open innovation [45]. From our case findings we can suggest a causal relationship between well organized and successful open innovation environments and the application of ambidexterity for managerial and organizational practice. Future research could provide further insights by conducting additional case studies, developing testable propositions, and aiming to explain the general nature of the relationship between ambidexterity and open innovation performance.

Notwithstanding these limitations, we hope that our study adds significant value to the research stream of open innovation and in particular the management of open innovation. Our distinction between open innovation *processes* and *environments* has not yet been made explicitly by other authors, but from our point of view is important for future theoretical discussions, especially as open innovation practices mature and become multi-faceted. Building upon various studies which cover single management dimensions, we have developed a conceptual management framework for open innovation and identified critical dilemmas in each of these dimensions. All management dimensions which we included in our conceptual framework have shown to be relevant in the open innovation environment of our case study. Because we derived the management dimensions from the extant literature, our study provides renewed support for the relevance of each dimension. Future research could further substantiate the presented framework by analyzing other relevant cases and thereby confirming, extending, and challenging the different management dimensions.

Another contribution of this study is the systematic analysis of the concept of ambidexterity as an approach to managing various challenges and dilemmas. To the best of our knowledge, no prior research has applied this concept to *open innovation* man-

agement. Our case findings could confirm our initial assumption that ambidexterity can be applied to a variety of different management dimensions in an open innovation environment. Our findings also suggest that different modes of ambidexterity can be applied [12]: The most prevalent mode is structural ambidexterity, applied for balancing incremental and radical innovations, central and decentral sharing of responsibilities, protecting and revealing IP, and monetary and non-monetary incentive schemes. We could also find temporal ambidexterity with regards to decision making policies (in particular in internal and external web-based idea contests), and contextual ambidexterity which allows employees to participate in internal open innovation processes in parallel to their routine jobs.

This study also adds to research on organizational ambidexterity. In line with studies which do not limit this concept to exploitation and exploration (e.g., [8] and [11]) we propose that the need for balancing diverse and even opposing approaches can occur in manifold dimensions. We encourage ambidexterity researchers to consider this line of thinking and dissociate from solely considering a single dimension.

Besides implications for theory, our study also offers meaningful insights for practice. We see that more and more companies consider open innovation for their innovation strategy. In the European Union, in 2010, more than 84,000 companies reported collaboration with external partners in product or process innovation, thereof more than 45,000 companies collaborated with suppliers or customers [46]. All these companies need to manage their open innovation environment. Although our study is focused on the specific open innovation environment at InnoMaster, we strongly suggest that many of the other 45,000 companies follow similar approaches because the open innovation processes (idea contests, collaboration with knowledge brokering intermediaries, and open expert networks) are certainly not unique.

We can present two major insights for these managers: The first insight is that, when planning, implementing, and executing open innovation processes, managers should consider the presented management dimensions as shown in table 4: They need to define the degree of innovation they expect to achieve in their processes, set up the appropriate organizational configuration, think about target and measurement systems, decision making policies, handling of intellectual property, motivation and incentives, and appropriate settings which enable different actors to participate. In addition, after they have defined the processes and underlying governance mechanisms, managers should consider these elements also for the IT systems which support the open innovation processes. Our second insight is that we would encourage managers to consider the theory of ambidexterity for each of the mentioned dimensions: In any open innovation setting there is often no straightforward solution, hence conflicting goals and interests can occur and will have to be balanced. The theory of ambidexterity, and especially the different forms of ambidexterity, offers managers an alternative solution approach compared to linear thinking in unidirectional trade-off decisions. Although we assume that balancing conflicting goals and interests is often done *implicitly* without considering the theory of ambidexterity, managers might run their open innovation environment more effectively and successfully by taking *explicit choices* in defining the right approach.

References

1. Teece, D., Pisano, G.P.: The dynamic capabilities of firms: An introduction. *Industrial and Corporate Change* 3 (3) pp. 537-556 (1994)
2. H. Chesbrough: *Open innovation - the new imperative for creating and profiting from technology*. Harvard Business School Press, Cambridge, MA (2003)
3. Pisano, G.P.: The R&D boundaries of the firm: an empirical analysis. *Administrative Science Quarterly* 35 (1) pp. 153-176 (1990)
4. Dodgson, M.: The strategic management of R&D collaboration. *Technology Analysis and Strategic Management* 4 (3) pp. 227-244 (1992)
5. Gassmann, O., Enkel, E., Chesbrough, H.W.: The future of open innovation. *R&D Management* 40 (3) pp. 213-221 (2010)
6. Lichtenthaler, U.: Open innovation: Past research, current debates, and future directions. *The Academy of Management Perspectives* 25 (1) pp. 75-93 (2011)
7. March, J.G.: Exploration and exploitation in organizational learning. *Organization Science* 2 (1) pp. 71-87 (1991)
8. Rothaermel, F.T., Alexandre M.T.: Ambidexterity in technology sourcing: The moderating role of absorptive capacity. *Organization Science* 20 (4) pp. 759-780 (2009)
9. Argyres, N.S., Silverman, B.S.: R&D, organization structure, and the development of corporate technological knowledge. *Strategic Management J.* 25 (8-9) pp. 929-958 (2004)
10. Henkel, J.: Selective revealing in open innovation processes: The case of embedded Linux. *Research Policy* 35 (7) pp. 953-969 (2006)
11. Gibson, C. B., Birkinshaw, J.: The antecedents, consequences and mediating role of organizational ambidexterity. *The Academy of Management Journal* 47 (2) pp. 209-226 (2004)
12. Raisch, S., Birkinshaw, J.: Organizational ambidexterity: Antecedents, outcomes, and moderators. *Journal of Management* 34 (3) pp. 375-409 (2008)
13. Tidd, J., Bessant, J.: *Managing innovation*, 4th ed. John Wiley & Sons Ltd., West Sussex, England (2009)
14. Neyer, A.-K., Bullinger, A.C., Moeslein, K.M.: Integrating inside and outside innovators: A sociotechnical systems perspective. *R&D Management* 39 (4) pp. 410-419 (2009)
15. Burns, T., Stalker, G.M.: *The management of innovation* (1961)
16. Volberda, H.W.: Toward the flexible form: How to remain vital in hypercompetitive environments. *Organization Science* 7 (4) pp. 359-374 (1996)
17. Duncan, R.B.: The ambidextrous organization: Designing dual structures for innovation. *The Management of Organization Design* 1 pp. 167-188 (1976)
18. Tushman, M.L., O'Reilly, C.A. III: Ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Review* 38 (1) pp. 8-30 (1996)
19. Atuahene-Gima, K.: Resolving the capability-rigidity paradox in new product innovation. *Journal of Marketing* 69 (4) 61-83 (2005)
20. Gupta, A.K., Smith, K.G., Shalley, C.E.: The interplay between exploration and exploitation. *The Academy of Management Journal* 49 (4) 693-706 (2006)
21. Adler, P.S., Goldoftas, B., Levine, D.I.: Flexibility versus efficiency? A case study of model changeovers in the Toyota production system. *Org. Science* 10 (1) pp. 43-68 (1999)
22. Siggelkow, N., Levinthal D.A.: Temporarily divide to conquer: Centralized, decentralized, and reintegrated organizational approaches to exploration and adaptation. *Org. Science* 14 (6) pp. 650-669 (2003)
23. von Hippel, E.: *Democratizing Innovation*. MIT Press, Boston, MA (2005)
24. Reichwald, R., Piller, F.T.: *Interaktive Wertschöpfung: Open innovation, Individualisierung und neue Formen der Arbeitsteilung* (2nd ed.). Gabler (2009)

25. Dahlander, L., Gann, D.M.: How open is innovation? *Research Policy* 39 (6) pp. 699-709 (2010)
26. Huizingh, E.K.: Open innovation: State of the art and future perspectives. *Technovation* 31 (1), pp. 2-9 (2011)
27. Benner, M.J., Tushman, M.L.: Exploitation, exploration, and process management: The productivity dilemma revisited. *The Academy of Mgt. Review* 28 (2) pp. 238-256 (2003)
28. Dewar, R.D., Dutton, J.E.: The adoption of radical and incremental innovations: An empirical analysis. *Management Science* 32 (11) pp. 1422-1433 (1986)
29. Tidd, J.: Innovation management in context: environment, organization and performance. *International Journal of Management Reviews* 3 (3) pp. 169-183 (2001)
30. Cordero, R.: The measurement of innovation performance in the firm: An overview. *Research Policy* 19 (2) pp. 185-192 (1990)
31. Hagedoorn, J., Cloudt, M.: Measuring innovative performance: Is there an advantage in using multiple indicators? *Research Policy* 32 (8) pp. 1365-1379 (2003)
32. Huston, L., Sakkab, N.: Connect and Develop: Inside Procter and Gamble's new model for innovation. *Harvard Business Review* 84 (3) pp. 58-66 (2006)
33. Chesbrough, H., Crowther, A.K.: Beyond high tech: Early adopters of open innovation in other industries. *R&D Management* 36 (3) pp. 229-236 (2006)
34. Sawhney, M., Prandelli, E.: Communities of creation: Managing distributed innovation in turbulent markets. *California Management Review* 42 (2) pp. 24-54 (2000)
35. Pisano, G.P., Verganti, R.: Which kind of collaboration is right for you? *Harvard Business Review* 86 (12) pp. 79-86 (2008)
36. von Zedtwitz, M., Gassmann, O., Boutellier, R.: Organizing global R&D: Challenges and dilemmas. *Journal of International Management* 10 (1) pp. 21-49 (2004)
37. von Hippel, E., von Krogh, G.: Open source software and the 'private-collective' innovation model: Issues for organization science. *Org. Science* 14 (2) pp. 209-223 (2003)
38. Amabile, T.M.: Creativity and innovation in organizations. *Harvard Business School* 5 (9) pp. 396-239 (1996)
39. De Jong, J.P.J., Den Hartog, D.N.: How leaders influence employees' innovative behaviour. *European Journal of Innovation Management* 10 (1) pp. 41-64 (2007)
40. Antikainen, M.J., Vaataja, H.K.: Rewarding in open innovation communities--how to motivate members. *Int. J. of Entrepreneurship and Innovation Mgt.* 11 (4) pp. 440-456 (2010)
41. Boudreau, K., Lakhani, K.: How to manage outside innovation. *MIT Sloan Management Review*, 50 (4), 68-76. 50 (4) pp. 68-76 (2009)
42. Eisenhardt, K.: Building theories from case study research. *The Academy of Management Review* 14 (4) pp. 532-550 (1989)
43. Yin, R.K.: *Case study research: Design and methods* (4th ed.). Sage Publications (2009)
44. Madill, A., Jordan, A., Shirley C.: Objectivity and reliability in qualitative analysis: Realist, contextualist and radical constructionist epistemologies. *British Journal of Psychology* 91 (1) pp. 1-20 (2000)
45. Gregor, S.: The nature of theory in information systems. *MIS Quarterly* 30 (3) pp. 611-642 (2006)
46. Eurostat: *Community Innovation Survey (CIS) #7 of the European Union: Collaboration in Product and Process Innovation.* (2010)