Justyna Dąbrowska

ORGANIZING FOR OPEN INNOVATION:
ADDING THE HUMAN ELEMENT

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Thesis for the degree of Doctor of Science (Technology) to be presented with due permission for public examination and criticism in the Auditorium 2310 at Lappeenranta University of Technology, Lappeenranta, Finland on the 27th of July, 2018, at noon.

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Abstract

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Firms across industries are radically changing the way they innovate. Instead of developing new products and technologies on their own, they are increasingly embracing open innovation (OI) as a new way to create and capture value from different sources of knowledge that reside both within and across their organizational boundaries. This is evidenced by the increasing adoption of strategic OI units and specific OI professionals in firms, which supports the notion that OI is not only a buzzword but an actual phenomenon in the contemporary corporate world. However, while OI has received significant academic attention, the concept remains relatively ambiguous, and there is a limited understanding of how companies actually organize and manage OI. Furthermore, while it is individuals who enact OI strategies, studies focusing on the specific roles, responsibilities, practices and competencies of formal OI specialists remain scarce.

The purpose of this study is to explore how companies organize and formally manage OI. It combines qualitative and quantitative research designs and several research methods, including multiple case studies, content analysis and a survey. Overall, the empirical data includes interviews with 18 senior innovation managers at 10 companies, 454 survey responses and 100 job advertisements for OI positions.

The findings of this study demonstrate how companies strategically understand, adopt and organize for OI. They also identify specific, formalized OI roles and responsibilities that individuals tend to adopt and suggest organizational practices and mechanisms that can empower employees to facilitate OI within intra- and inter-firm boundaries. In addition, the findings reveal challenges in OI that are associated with cultural differences and highlight possible solutions to overcome them. Collectively, the findings contribute to OI and knowledge management research and provide new insights for practitioners on how to organize and manage OI.

Keywords: open innovation, open innovation professionals, individuals, human resource, organizational culture, national culture, capabilities

Acknowledgements

I can describe completing this doctoral thesis as a long research journey – long in terms of years and long in terms of learning, self-development, moments of enlightenment and frustration. I now realize how true the classic quote 'the more you learn, the more you realize how little you know' is. That can be frustrating at times, but it also motivates you not to be afraid of further research discoveries, especially, when you realize that you are not alone and that the people who surround you – with their support, encouragement, long discussions or even arguments – have had an enormous positive impact on the overall learning and self-development process. Here, I would like to thank each and every person who contributed to this journey and helped me along the way – I am deeply grateful you were part of it!

First, I would like to thank my supervisors, Marko Torkkeli and Joona Keränen. Marko's patience, flexibility, constant encouragement to 'keep pushing' and empowering attitude towards PhD research and project management have been invaluable. Joona's guidance on research design, research methods, constant reminders to focus on the core essence and 'the beef' and to 'delete, delete, delete redundant sentences' have greatly improved my writing skills. I know that I have a lot more to learn from you and I would be happy for further tips, even though, I may disagree with some.

I would like to thank my thorough reviewers, Tor Helge Aas and Marina Dabić, for investing their time and providing comments and suggestions to improve the thesis. I also thank Irina and Antero for commenting and providing valuable advice on the *n*-versions of this thesis.

Special thanks go to the co-authors of publications that are included in this thesis. It was an honour and great pleasure to work with you, and I genuinely hope we will have a chance to work together in the future.

I would not be even in academia and the 'innovation world' if not for Irina Fiegenbaum and Martin Ihrig, who first got me to work on the OISIM project. I still remember the interview you held with me in the GDSS room that changed my career path; thanks so much for believing in me! Irina, you will always have a special place in my heart. You were truly my mentor and you taught me a great deal about academic world and life in general.

I would like to thank my LUT colleagues for making my PhD journey not only less lonely but also fun and enjoyable. Special thanks go to Antero Kutvonen for long and insightful discussions (especially during carpooling from my first years at LUT Kouvola). Ekaterina Albats, Daria Podmetina and Roman Teplov: thank you so much for your support in day-to-day academic life, inspiring discussions and investing your time, expertise and knowledge in the OI-Net project – I will always be in debt to you for that. I would also like to thank the other LUT colleagues by whom I was so lucky to be surrounded (in no particular order): Samuli Kortelainen, Paavo Ritala, Juha Väätänen, Sanna-Katriina Asikainen, Samira Ranaei, Arash Hajikhani, Shqipe Buzuku, Argyro Almpanopoulou, Päivi Karhu, Henna Järvi, Sina Mortazavi, Igor Laine, Niko Lipiäinen and Matylda Jablońska-Sabuka. In addition, I would like to thank the administrative and support staff at the LUT for their always reliable and professional assistance – Petri Hautaniemi, Tarja Nikkinen, Pirkko Kangasmäki, Eva Kekki, Terttu Hynynen, Sanna Tomperi and Jenni Partinen.

Last but of course not least, a special word of gratitude to my family and friends for their support and encouragement. Joona, there are no words to describe how grateful I am that you are part of my life. Thank you for being so understanding and encouraging and for challenging me intellectually along the way. To my children Jasper and Julia – the main sources of my motivation, inspiration and happiness – my mom, brother and sister-in-law and their kids, and my grandparents – thank you for your support and knowing I can always count on you regardless of distance, time zone or situation.

Thank you all for being part of this journey! Now it is time to close this first chapter of my research journey, turn the page and start writing the next chapter full of new discoveries. I hope that you will be part of it too!

Justyna Dąbrowska

July 2018
Lappeenranta, Finland

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LIST OF PUBLICATIONS

This thesis is based on the following five individual papers that are included in Part II. This section also highlights contribution of the author in each publication. The rights have been granted by publishers to include the papers in the thesis.

I. Dąbrowska, J., Fiegenbaum, I., and Kutvonen, A. (2013). Mapping the perception and reality of open innovation. *International Journal of Innovation Management,* 17(6), pp. 1340016.

The author drew up a research plan and conducted the research interviews with the second co-author. Overall, the paper was written in cooperation with the co-authors and the main author coordinated the research and writing of the paper. The main author was responsible for the literature review, study design, and implementation The working version of the paper was presented at the XXIV ISPIM Innovation Conference, Helsinki, Finland, 2013 where it was invited for the Special Issue in the *International Journal of Innovation Management.* The paper has been accepted for publication in the journal based on double-blinded review of the full paper.

II. Dąbrowska, J., Teplov, R., Podmetina, D., Albats, A., and Lopez-Vega, H. (2017). Where lies the difference between open innovation adopters and non-adopters? 77th Academy of Management Annual Meeting, Atlanta, USA

The publication was a joint work with equally distributed contribution. The first author participated in publication's idea development, research plan and data collection activities, and took primary responsibility for constructing literature review, discussion and conclusions. The paper was presented at the conference and its acceptance was based on a double-blinded review of the full paper.

III. Dąbrowska, J., and Savitskaya, I. (2014). When culture matters: exploring open innovation paradigm. International Journal of Business Innovation and Research, 8(1), pp. 94-118.

The author was responsible for the research plan, design of the framework and implementation. Overall, the paper was written in cooperation with the co-author and the main author coordinated the research and writing of the paper. The paper has been accepted for publication in the journal based on double-blinded review of the full paper.

IV. Dąbrowska, J., and Podmetina, D. (2017). Roles and responsibilities of open innovation specialists based on analysis of job advertisements. Journal of Innovation Management, 5(4), pp.103-129.

The author was responsible for the research plan and implementation. Overall, the paper was written in cooperation with the co-author and the main author coordinated the research and writing of the paper. The paper has been accepted for publication in the journal based on double-blinded review of the full paper. The earlier version of this paper was presented at the XXVII ISPIM Innovation Conference, Porto, Portugal, 2016.

V.   Dąbrowska, J., Keränen, J., Mention, A-L. (2017). Organizing for opening up. Responsibilities of open innovation professionals. The ISPIM Innovation Summit – Building the Innovation Century, Melbourne, Australia.

The principal author drew up research plan and primarily conducted the interviews and data analysis. Overall, the paper was written in cooperation with the co-authors and the main author was responsible for the literature review, designing the framework for analysis and interpretation of the results. The publication was accepted based on the double blind review of the extended abstract and presented at the conference.

LIST OF ABBREVIATIONS

AC	Absorptive Capacity
CBV	Capability-based view of the firm
HR	Human Resource
IND	Individualism
IPR	Intellectual Property Rights
KBV	Knowledge-based view of the firm
MAS	Masculinity
NIH	Not-Invented-Here
NSH	Not-Sold-Here
OI	Open Innovation
PDI	Power Distance Index
P	Publication
RBV	Resource-based view of the firm
RQ	Research Question
R&D	Research and Development
SHRM	Strategic Human Resource Management
SME	Small and Medium-Sized Enterprise
UAI	Uncertainty Avoidance Index
VRIN	Valuable, Rare, Imperfectly Imitable, Non-substitutable

PART I: OVERVIEW OF THE DISSERTATION

1. INTRODUCTION

In today's global knowledge- and innovation-intensive economy, where ideas and new industry players can spur from any corner of the world, the term *open innovation* has become a matter of survival for many firms (Chesbrough, 2003). Paraphrasing Drucker's 'innovate or die', firms are acknowledging the need to open up their innovation process to survive, and 'open up and co-innovate or stay closed and die'[1] has become a new industry motto. Many companies differing in size, industry, age and resource allocation have embraced OI in their innovation processes and innovation strategy (Bogers, Chesbrough and Moedas, 2018).

Treating OI as 'the new imperative for creating and profiting from technology' (Chesbrough, 2003, p.1) refers to purposively managed knowledge inflows and outflows within the innovation process (Chesbrough and Bogers, 2014). In recent years, it has become recognized as one of the most central trends both in the innovation management literature and in practice. This soaring interest is attested by the number of scientific articles on OI (nearly 3,000 in Web of Science over 15 years), the nearly 14,000 citations of Henry Chesbrough's 2006 book (Google Scholar), various themed conferences (e.g., the World Open Innovation Conference), special interest groups and special issues in high-level journals (*R&D Management, California Management Review, Research Policy, Technovation*, etc.). Even policy-makers recognize OI as a crucial factor for competitiveness and growth, which has led to the formation of the Open Innovation Strategy and Policy Group that is part of a strategic action of the European Commission (*Open Innovation 2.0 Yearbook*, 2018).

Scholars have also noted that OI is in fact an 'organizational innovation' itself (Christensen, 2006; Di Minin et al., 2009; Huston and Sakkab, 2006), because it involves many organizational changes and coordination between various departments and levels; they have urged that it should be treated more broadly as corporate strategy. Some of the best-known examples of companies that have incorporated OI are Procter & Gamble (Huston and Sakkab, 2006), Fiat (Di Minin, 2010), GM and GE (Chesbrough, 2012), IBM and Intel (Chesbrough, 2003), Unilever and Philips (Mortara and Minshall, 2011a), Whirlpool (Muller and Hutchins, 2012) and Roche (Nakagaki, Aber and Fetterhoff, 2012). After adopting OI, companies have reported benefits such as increased innovation performance, improved access to new competences and resources, shared innovation costs and risks, improved time to market, and value capture from market opportunities (Chesbrough and Bogers, 2014; Tidd, 2014; Drechsler and Natter, 2012; Mortara and Minshall, 2011).

However, even as OI's profile has increased in academia and practice, the phenomenon has come in for criticism for its conceptual ambiguity (Trott and Hartmann, 2009; 2013; Mowery, 2009) and the different perceptions of the concept, which make OI literature relatively incoherent and disconnected (Bogers et al., 2017). Despite this, companies do report increased levels of OI adoption (Brunswicker and Chesbrough, 2018), but there is a growing concern that the understanding of the OI paradigm by practitioners can differ greatly.

Despite the growing managerial importance of OI, academic research has reported challenges associated with managing the OI process (e.g van de Vrande et al., 2009; Lichtenthaler, 2011; Mortara and Minshall, 2014) and pointed out the negative consequences of opening up to

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[1] An expression used by a representative of a large corporation during the 2nd World Open Innovation Conference, Barcelona, Spain, 2016.

innovation (Laursen and Salter, 2006; Faems et al., 2010; Knudsen and Mortensen, 2011; Salter et al., 2015; Olsen, Sofka and Grimpe, 2017; Stefan and Bengtsson, 2017). Indeed, the more firms source external ideas and technologies and engage in value co-creation with various actors, the more complex the process becomes. The implementation of OI requires the development of new systems and processes, leading to cultural transformation and fundamental changes in employee thinking, which comes with resistance (Witzeman et al., 2006). Thus, it is crucial for companies that plan to implement (or already have implemented) an OI approach to focus on organizational culture and on people, both their own employees involved in the process and those responsible for making the change happen (Mortara and Minshall, 2011b).

Many innovation scholars acknowledge the need to create an open and collaborative innovation culture to facilitate the transition towards an OI strategy (Chesbrough, 2003; Dodgson, Gann and Salter, 2006; Herzog and Leker, 2010). Recent research indicates that companies have changed the way they hire new research and development (R&D) staff, as the competence profile and required skillset of employees has changed with this paradigm shift (Di Minin et al., 2010; Mortara and Minshall, 2011; 2014; Salter et al., 2014). Moreover, new job positions related to managing OI are constantly being created worldwide (e.g., Open Innovation Manager at Tesco, Fujifilm, L'Oréal and Unilever). However, there are only a few empirical studies in this domain. Research on the formal roles of OI professionals would contribute not only to research on OI but also to its practice by helping managers to better understand the profiles of OI professionals and thus leading to more likely selection of the best people for the job.

In addition, many scholars have called for more research on the human side of OI (e.g., Dodgson et al., 2006; Podmetina et al., 2013; Vanhaverbeke et al., 2014; Bogers et al., 2018;). This includes aspects such as individual characteristics, new competencies and human resource (HR) and organizational development practices. Indeed, the HR management literature can be beneficial, because it tackles the issues of HR practices vis-à-vis innovation performance and employee attitudes towards organizational change (Choi, 2011), both of which are closely related to an organization's shift from a closed perspective to an OI approach. Furthermore, as OI involves collaboration with various and often culturally heterogeneous partners, understanding cultural barriers to the implementation of OI activities is crucial for both OI scholars and practitioners.

Therefore, in an increasingly globalizing and interconnected business environment and scholarly debate, there remains an acute need for studies that use multiple lenses to focus on how firms organize and implement OI. This includes adding the individual-level (intra-organizational) view by exploring the roles, responsibilities and competencies of individuals enacting OI, as well as organizational-level (e.g., firm-internal and firm-external practices and activities) and cultural-level perspectives. Such studies can contribute greatly to the conceptualization of the OI paradigm and its better understanding within practitioners' communities.

The overall goal of this study is to provide insights for firms that want to successfully operate and innovate in this rapidly changing business environment by capturing and creating value from different sources and taking into account the multiple lenses with which to view external knowledge collaborative initiatives. In brief, these firms are transforming their innovation strategy from closed and non-porous towards OI, where knowledge flows go inside and outside organizational boundaries and involve various types of network partners. This transformation requires many organizational, cultural and individual changes.

The introductory section introduces the research gaps addressed in this dissertation, followed by the research objectives and research questions. Next, it describes the positioning and scope of the research, which is followed by listing the key definitions and a concluding sub-section presenting an overview and outline of the thesis.

1.1.   Research gap

The term *open innovation* was introduced in 2003 by Professor Henry Chesbrough and quickly drew interest among innovation scholars and practitioners. With the growing breadth of academic research in this domain and its first relatively broad definition, OI soon became an umbrella term that links and incorporates several research streams and innovation activities (Huizingh, 2011), which has led to difficulties in building a coherent body of knowledge (Di Benedetto, 2010; Huizingh, 2011). In addition, the emerging classification of OI and OI activities and mechanisms can be observed. Thus, many scholars have called for a proper definition and conceptualization of this paradigm (e.g., Dahlander and Gann, 2010; Huizingh, 2011; Trott and Hartmann, 2013). Interestingly, given the growing confusion about the concept within the academic community, there are no studies investigating the understanding of the concept by the practitioner community, even though studies confirm that a majority of companies have adopted OI practices (Brunswicker and Chesbrough, 2018). Exploring the differences among practitioners' perceptions of OI adoption could shed light on the understanding and definition of this paradigm. Therefore, the first research gap this dissertation aims to address is (1) *the lack of research on how firms understand and adopt OI*. In order to establish how firms can organize for OI and how to distinguish it conceptually, it is essential to focus on the differences between companies who claim to adopt OI and those who do not. Focusing on this aspect and conducting research that highlights its implications meaningfully improves our current understanding of this phenomenon and assists companies in successful OI implementation.

Second, prior research has focused on analysing OI at the organizational rather than the individual level (Lichtenthaler and Ernst, 2008a; Foss, Laursen and Pedersen, 2011; Lichtenthaler, 2011; Bogers, Chesbrough and Moedas, 2018). However, many scholars have pointed out the need to study the human side of OI (e.g., Podmetina et al., 2013; Salampasis and Mention, 2017; Bogers et al., 2018). For example, while it has been observed that companies create new formalized OI job positions (Mortara and Minshall, 2014), there have not yet been studies that analyse these emerging formal OI job functions and OI professionals, their responsibilities and roles within the companies and their required skillsets, even though, from an ontological perspective, it is people – not organizations – that stand behind idea generation and implementation (Foss and Fellin, 2005). One recent study by Ollila and Yström (2017) conceptualizes the role of OI collaboration managers. In addition, Du Chatenier et al. (2010) focus on competencies for OI teams, but they do not investigate the formal OI units launched in companies. However, there are over 52,000 jobs related to *open innovation* in job titles or job descriptions on LinkedIn, with over 700 job advertisements linked to *open innovation* recently posted. Studies focusing on analysing the role of individuals in OI, especially those who enact OI activities in organizations, will provide valuable insights for companies into the emerging job designs and set of skills and competencies necessary for successful implementation of OI. In addition, they will advance the understanding of OI, its conceptualization and how it can be formally and strategically managed. Thus, the second research gap that this study addresses is: (2) *the lack of research on the human side and the roles, responsibilities and skills of OI professionals*.

Third, in response to calls from several scholars (Paul, Roijakkers and Mortara, 2016; Petroni, Venturini and Verbano, 2012; Mortara and Minshall, 2014), the next identified research gap is: (3) *the lack of studies on the role of HR practices (e.g., job design, recruitment, selection, training, rewarding) in OI*. Many authors acknowledge that, with the paradigm shift, companies have changed the way the recruit staff (e.g., Di Minin, 2010) and the skills they require from employees dealing with OI (Mortara and Minshall, 2014). Overall, HR practices can assist in management of OI as properly designed and positively influencing individuals, leading to direct effects on firm-level results (Wright and McMahan, 2011). The present study tackles the HR aspect by integrating previous findings from HR research streams. For example, two decades ago, Jick (1990) was already arguing that, due to the rapid increase in new forms of network organizations, joint ventures and other forms of collaboration to develop innovations, significant changes in intra-organizational and inter-organizational practices and attitudes were taking place. He stressed that HR plays a crucial role in these changes to help 'fashion boundaryless thinking' and be a 'bridge builder' (Jick, 1990, p. 451).

Fourth, in 2003 Henry Chesbrough made the argument that one of the driving forces of the paradigm shift was the increased mobility of skilled workers. Lichtenthaler (2011) and Muethel and Hoegl (2010) raised the issue of exploring the international aspect of OI from the cultural perspective, as OI involves a variety of international partners in the process. As noted by Vanhaverbeke and colleagues (2014), the impact of differences in national culture upon OI needs further research, because it could assist in identifying the moderators and limits of OI. They also called for a cross-disciplinary approach and incorporating other research streams, including cultural studies. Indeed, through the prism of cross-cultural management literature, there is empirical evidence that national culture has an impact on knowledge sharing (Dąbrowska and Fiegenbaum, 2017; Savitskaya, 2011; Michailova and Hutchings; 2006), selection of external collaboration partners, employment models, incentive systems, understanding the attitudes in regard to ideas sharing and risks, all of which are strongly linked with adoption of OI. However, research in this domain remains scarce. This leads to the fourth research gap addressed in this study: (4) *the lack of research on the impact of culture for management of the OI process*.

1.2.   The purpose of the study and research questions

In order to address the research gaps noted above, the overall purpose of this study is to explore *how firms organize and implement OI*. This purpose is divided into the following research questions:

> *RQ1: How do firms understand and adopt OI?*
> *RQ2: What is the role of HR practices in OI implementation?*
> *RQ3: What are the main roles, responsibilities and skills of OI professionals?*
> *RQ4: How do different cultural contexts influence OI implementation?*

Each research question adopts a perspective that provides different viewpoints on the topic. The answers are incorporated in the five publications presented in Part II. The connection between the research questions, the identified research gaps and the publications that explore these issues are presented in Figure 1.

RQ1 is the starting point of this study; it establishes the premises for empirical investigation into how companies perceive OI adoption within their firms. Publication I explores the OI

activities in companies at different stages of transition to shed light on the understanding of the OI paradigm and the practices employed. It aids the theoretical conceptualization of the term and reveals certain ambiguities, thus contributing to answering research gap 1. Publication I serves as an input for Publication II, which provides further empirical evidence on the factors distinguishing companies that do from those that do not adopt the OI paradigm. Overall, the objective of this research question is to explore different perceptions of OI adoption within companies and identify the factors distinguishing companies claiming to adopt OI from those who do not.

The answers to *RQ2* are presented within Publications II, III IV and V, which respond to research gap 4, on the use of supporting HR practices in companies' OI approaches. The conclusions compiled on its role are presented in the conclusion section of Part I. *RQ3* explores the novel job functions of the OI professionals that companies have begun to employ for better OI facilitation. This is also one of the outcomes of the HR practices employed (*RQ2*); thus the link from input to output is presented in Figure 1. This research question also helps fill research gaps related to OI at the people-centric level and the emerging roles of OI professionals by identifying the necessary competencies, skills and responsibilities. The results are presented in Publications IV and V. Finally, the objective of *RQ4* is to investigate the potential enabling factors for successful OI adoption by linking it with findings from cultural studies. It also explores the potential barriers and proposes solutions to overcome them from the cultural-level perspective presented in Publication III.
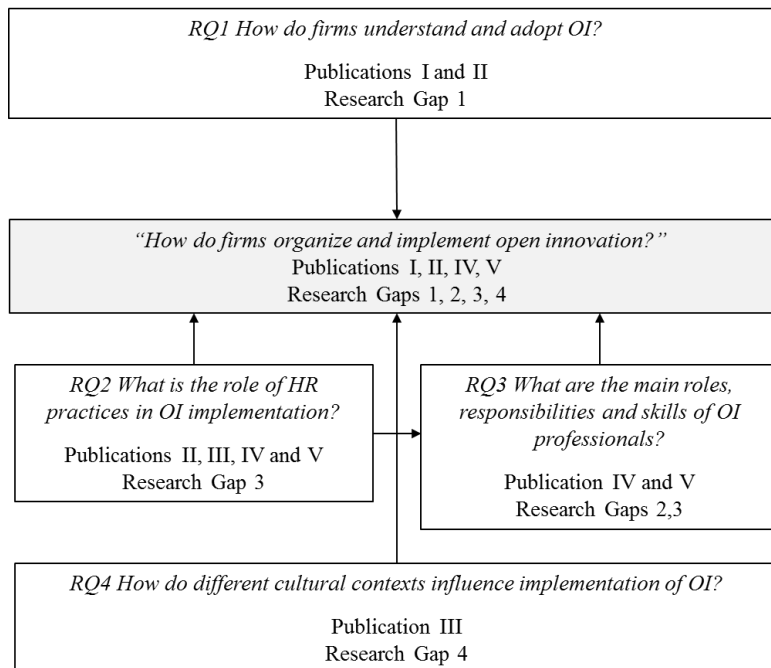
Figure 1 Research questions and their link with research gaps and publications

By answering these research questions, this study addresses existing gaps in research at both theoretical and empirical levels. It contributes to the current literature on OI, human resources management and cultural studies. It addition, it aims to stimulate further research and to contribute to management practice through consideration of specific cultural requirements, job responsibilities and challenges associated with OI, along with the practices employed in it.

Overall, the five publications in this dissertation address the main objective from different perspectives: the organizational level by exploring firm-internal and firm-external practices and mechanisms, the cultural level by exploring the impact of cultural characteristics on OI implementation and the individual level by exploring the roles, responsibilities, competencies and employed practices of individuals enacting OI.

While this study acknowledges other levels of analysis (e.g., extra- and inter-organizational, industrial, regional) and various perspectives found in the OI literature (Bogers et al., 2017), they are not within the scope of this dissertation, as it focuses primarily on intra-organizational factors that influence OI implementation. There is one exception – the cultural dimension – that could be considered an external influencing factor on OI adoption (Savitskaya, 2011). As it reflects the 'collective programming of the mind' (Hofstede, 1991) of certain groups of individuals, it is considered in the context of the present study to affect intra-organizational and individual-level choices in terms of elements like knowledge transfer and knowledge sharing, thus playing an important role in contributing to the main aim of the present study.

Given that empirical evidence concerning the cultural and human aspects of OI is scarce, this thesis is exploratory in nature. Due to the complexity of OI, this study combines different standpoints to better understand the phenomenon under investigation (Vanhaverbeke and Cloodt, 2014).

1.3.   Positioning and scope of the research

This dissertation is primarily embedded within the seminal research stream of OI (Chesbrough, 2003) and the literature on HR management, cultural studies and knowledge management (see Figure 2). In order to build upon a solid theoretical foundation, it incorporates well-grounded influential theories of management and organization, such as the resource-based view (RBV) (Penrose, 1959; Barney, 1991) and the knowledge-based view (KBV) of the firm (Grant, 1996), which have been widely explored in the strategic management literature, along with the research streams noted above.

The innovation management literature focuses on the management of the complex innovation process defined as 'turning ideas into reality and capturing value from them' (Tidd and Bessant, 2013, p. 21). It seeks to answer several questions related to creating and capturing value from ideas or opportunities, supporting organizational constructs and making strategic choices in selecting the best innovation options and commercializing innovation (Tidd and Bessant, 2013). Managing innovations is usually perceived to be embedded within an organization's structure and culture; it can thus be a source of competitive advantage for the firm, as it is harder to imitate (Barney, 1991; Barney, Wright and Ketchen, 2001; Foss et al., 2012). Therefore, the RBV of the firm that considers a company's intangible assets like employees and culture to be one source of competitive advantage is incorporated into the present study, as is its later theoretical derivation, the KBV of the firm (Grant, 1996). The KBV defines knowledge as a primary resource to achieve competitive advantage and value creation. It focuses also on individuals who generate knowledge that is captured and integrated through various

mechanisms (Grant, 1996). In addition, this thesis builds upon the broadly defined *capability-based view (CBV) of the firm* that refers 'to the firm's capacity to deploy resources' (Amit and Schoemaker, 1993, p. 35). Some scholars tend to regard capabilities as part of a company's resources (e.g., Barney, 1991), while others make an explicit distinction (e.g., Amit and Schoemaker, 1993, p. 35; Grant, 1996). Nevertheless, capabilities and more specifically organizational capabilities are intertwined in both KBV and RBV theories; in the context of the present study, they contribute to answering the main research question.

The OI literature is derived from the technology and innovation management literature. Within that corpus, this thesis will seek connections with the seminal works on certain organizational roles, such as boundary spanners (Tushman, 1977) and innovation champions and their link with newly emerging OI roles. In addition, the cultural aspect and cultural dimensions are explored in this thesis to identify potential barriers in opening up an organization, as well as to find solutions to overcome them. As the organizational shift from a closed towards a more open approach to innovation management requires managing change and associated strategic changes to organizational design, reward systems, job design, selection process and the like, the strategic HR management (SHRM) literature is employed in this study to better answer the main research question.

Based on the definition of OI that considers the 'use of purposive inflows and outflows of knowledge' (Chesbrough, 2006, p. 1) or overall 'purposively managed knowledge flows' (Chesbrough and Bogers, 2014, p. 27), this paradigm indirectly implies consideration of knowledge sharing and knowledge transfer on both the inter- and intra-organizational level as well as its tacit and explicit components (Nonaka and von Krogh, 2009). Therefore, it can be linked with the knowledge management literature and cross-cultural management literature, which widely explore knowledge creation, transfer and sharing across organizational and geographical boundaries
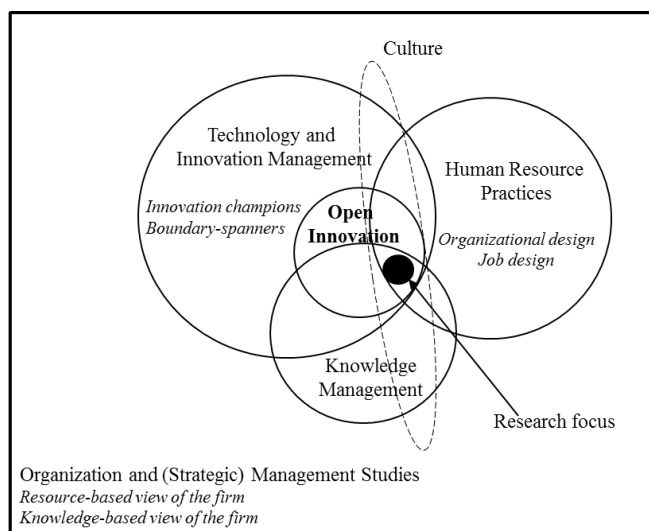
Figure 2 Positioning of the research

This study acknowledges the importance of other aspects like open business models (Chesbrough, 2007) and issues related to intellectual property rights protection (Alexy, Criscuolo and Salter, 2009) in managing OI; however, they are not within the scope of this research. The same is true of the dyadic, innovation network and ecosystem perspectives (Rohrbeck, Hoelzle and Gemuenden, 2009; Bogers et al., 2017). In addition, the scope of this research does not explicitly focus on the development of the measurement of comprehensive instruments for OI.

1.4.   Key definitions

This section highlights the definitions used in this thesis. They are structured in alphabetical order with the overall goal of providing the reader with a glossary. Thus, the terms presented in this section do not explain the concepts comprehensively, instead, they briefly highlight the central terms discussed in this thesis. Table 1 provides a summary of definitions and key concepts.

Table 1 Summary of definitions

Concept	Definition	Source
Capabilities	'firm's capacity to deploy resources, usually in combination, using organizational processes to effect a desired end.'	Amit and Schoemaker, (1993, p. 35)
Competences	'…the ability to sustain coordinated deployments of resources and capabilities in ways that help a firm achieve its goals in its competitive context'	Sanchez (2007, p. 47)
Culture	'collective programming of the mind that distinguishes members of one group or category of people from another' 'a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems'	Hofstede (1991, 5) Schein (1992, p. 12)
Dynamic capability	'The firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments'	Teece, et al. (1997, p. 516)
Human resources	'knowledge, expertise, skills, commitment of employees and their relationship with people inside and outside of organizational boundaries'	Barney and Wright (1998, p. 10)
Innovation	'The process of turning ideas into reality and capturing value from them'	Tidd and Bessant (2013, p. 21)
Not-Invented-Here (NIH) syndrome	'a bias triggered by the negatively- shaped attitude of an individual towards knowledge that has to cross a contextual (disciplinary), spatial or organizational (functional) boundary, resulting in either its sub-optimal utilization or its rejection as behavioural consequences of this attitude bias'	Antons and Piller (2015, p. 10)
Open innovation	'Distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model'	Chesbrough and Bogers (2014, p. 17)

Organizational capabilities	'firm's ability to perform repeatedly a productive task which relates either directly or indirectly to a firm's capacity for creating value through effecting the transformation of inputs into outputs'	Grant (1996, p. 377)
Organizational routines	'repetitive, recognizable patterns of interdependent actions, carried out by multiple actors'	Feldman and Penrland (2003, p. 95)
Organizational structure	'the way an institution is organized to carry out its objectives and pursue its projects. It allows relations within the organization to be formalized by describing the tasks, jobs and positions of its personnel, as well as the limits and responsibilities of the work unit. It also indicates the kind of hierarchy within the organization, the levels of authority and power as well as the formal lines of communication between employees'	Browayes and Price (2008, p. 134)
Strategic human resource management	'the pattern of planned human resource deployments and activities intended to enable an organization to achieve its goals'	Wright and McMahan, (1992, p. 298)
Strategy	'..strategy is concerned with planning how an organization or an individual will achieve its goals'	Grant (2005, p. 288)

In terms of OI as an innovation management phenomenon that is still in its relatively early stages and is continuously evolving, this research has also adapted and changed its approach as more findings and data emerged along the author's research journey. Thus, some papers presented in the dissertation that were developed in the early stage of the research (Publications I and II) incorporate Chesbrough's 2003 definition of OI and classify OI activities as per Chesbrough and Brunswicker (2013). Others that were developed later use the refined definition and classifications proposed by Chesbrough and Bogers (2014). Thus, this glossary provides only the most recent definition of OI. More details on the evolution of the term and its classifications are presented in Chapter 2.

1.5.   Overview and organization of the thesis

This thesis has two main parts. Part I offers an overview of the study. It starts with an introduction (Chapter 1) that provides the background and motivation of the study, identifies research gaps, the purpose of the study, the research questions, the positioning and scope of the research and key definitions. Chapter 2 presents an overview of the literature on OI, which is intertwined with theoretical considerations from other research streams. Chapter 3 justifies the methodological choices, research methods employed and the empirical data. Chapter 4 provides an overview of the individual publications, while Chapter 5 focuses on the conclusion of the study as a whole. It consists of answering the research questions, describing theoretical and managerial implications and noting limitations and suggestions for further research. The thesis concludes with Part II, which presents the five individual publications (see Figure 3).
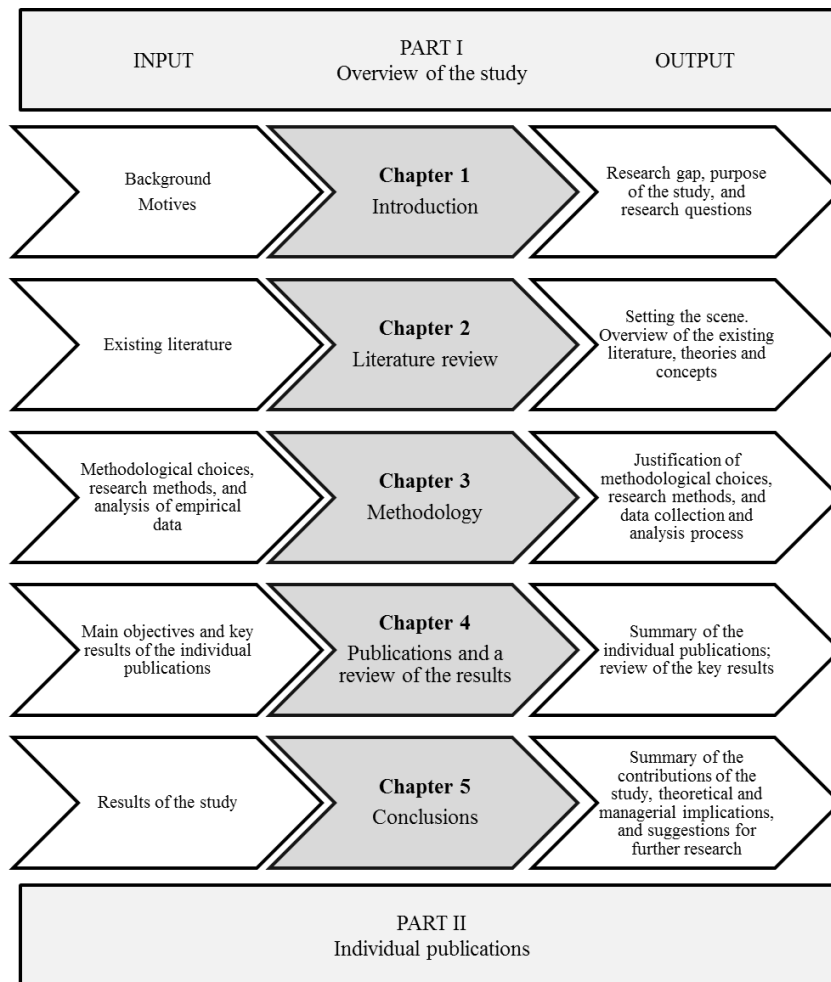
Figure 3 Outline of the study

2. LITERATURE REVIEW

This chapter opens by introducing the concept of OI in the innovation management literature. A special emphasis is placed on reviewing the various efforts by scholars to elevate OI literature into a coherent body of work. Thus, it describes the origins of the term and the different classifications, degrees and determinants of OI. It is followed by a review of organizational and management theories incorporated into the OI literature. The next sections highlight insights into managing OI by incorporating a multilevel lens that adopts firm-, cultural- and individual-level perspectives. Each sub-section is intertwined with the previous complementary literature from other research streams. For example, sub-section 2.3 on the firm-level perspective includes insights from HR management that can help shed light on the supporting organizational practices needed for the successful management of OI. Sub-section 2.4 (the cultural-level perspective) builds upon insights from cross-cultural management and other cultural studies. Finally, sub-section 2.5 (the individual-level perspective), borrows from research on various organizational roles (e.g., innovation champions and boundary spanners) to shed light on the emerging roles of OI professionals, their responsibilities and the skillset they need.

2.1. Emergence of open innovation

The concept of OI has received growing interest since 2003, when Henry Chesbrough published *Open Innovation: The New Imperative for Creating and Profiting from Technology*. In that book, he argued that firms, especially in the high-technology industry, had changed the way they innovate, moving from closed, in-house development to the OI mode by opening up organizational boundaries to external knowledge flows. According to Chesbrough, the OI paradigm assumes that 'companies should use both internal and external ideas and knowledge as well as internal and external paths to market to improve their technology' and secure long-term economic gains (Chesbrough, Vanhaverbeke and West, 2006, p. 1). The primary logic in closed innovation is that 'successful innovation requires control' (Chesbrough, 2003, p. xx), which is associated with in-house development and moves throughout the whole innovation process.

Chesbrough (2003) originally identified four main erosion factors that were the foundation of the explanation for why companies shifted from a closed to an OI model:

1. The increasing availability and mobility of skilled workers, resulting in increased inter-firm knowledge flows
2. The growth of the venture capital market
3. An increase in options to further develop promising technologies beyond organizational boundaries, as in the form of entrepreneurial firms or spin-offs, resulting from the combination of the previous factors
4. Technological advancements and the increasing capabilities competences of external stakeholders.

These four erosion factors were later extended to include the rise of the internet and the accompanying boom in social media as an important tool to access, share and leverage knowledge (Chesbrough and Bogers, 2014).

The organizational shift to OI implies a change in the organizational mind-set, realizing that 'not all the smart people work for you' (Chesbrough, 2003) and that a company should

collaborate on and source external ideas. Taken to the extreme, Chesbrough (2003) distinguished open from closed innovation by comparing the principles in Table 2, which presents the main ideas of both closed innovation and OI and clearly shows the changing mind-set of how to generate, develop and disseminate new ideas and technologies. Here, organizations operating under a closed innovation approach have a protective, controlling and 'I-can-do-it-myself' mentality regarding external ideas, collaboration and sharing knowledge with others. On the contrary, firms operating under the OI approach acknowledge that, thanks to collaboration and combining their ideas and technologies with the outside world, a company can create and benefit from the 2+2=5 synergy effect.

Table 2 Principles of closed and open innovation

Closed Innovation	Open Innovation
Smart people in our field work for us	Not ALL smart people work for us. We need to work with smart people inside AND outside the company
To profit from R&D, we must discover it, develop it and ship it ourselves	External R&D can create significant value. Internal R&D is needed to claim some portion of that value
The company that gets innovation to market first will win	Building a better business model is more important than getting to market first
If we create the most and the best ideas in the industry, we will win	If we make the best use of internal AND external ideas, we will win
We should control our IP, so that our competitors cannot profit from it	We should profit from other's use of our IP(license out) and we should license in other's IP whenever it advances our business model
We will OWN ALL our results from contract research with universities	We will partner with universities to create knowledge and encourage use outside our field

Source: Chesbrough (2003)

Despite the unquestionably significant attention from the scholars that OI has received, it has also faced criticism. For example, as noted above, some scholars have criticised it for creating an illusory dichotomy between open vs. closed innovation modes (Dahlander and Gann, 2010), despite the strong research evidence that innovation processes have never been fully closed or fully open (Tidd, 1993; Mowery, 2009; Trott and Hartmann, 2013). Others have suggested that the concept is simply 'an old wine in new bottle' (Trott and Hartmann, 2009; 2013, p. 715) and incorporates several research streams and innovation activities, including user co-creation, strategic alliances, outsourcing R&D, IP out-licensing and revealing internal resources to external community under an overarching OI theme (Dahlander and Gann, 2010; Huizingh, 2011).

However, it is important to note that OI in not a new theory *per se* but a paradigm shift (Bogers et al., 2017). As with other paradigms, Chesbrough (2003) provided a framework consisting of basic assumptions and ways of thinking (Table 2) that have largely been accepted by the innovation management community. The novelty of OI lays in suggesting a new perspective on innovation processes and offering a unique value proposition to innovation models. Since its introduction, there have been growing attempts among scholars to conceptualize the term (Bogers et al., 2017), as more frameworks, classifications, definitions and innovation practices associated with OI encourage further research.

According to Gianiodis and colleagues (2010), the conceptualization of OI is derived from incorporating the logics of the 1) in- and out-flows of knowledge, 2) permeability of organizational boundaries, 3) purposive adaptation of practices and 4) success factors of OI. It is also captured in the definitions presented below (see Table 3), as they tackle issues of knowledge flows, organizational boundaries, adoption of pecuniary and non-pecuniary mechanisms and the most recent conceptualization (e.g., Chesbrough and Bogers, 2014), along with the notion of the organization's business model.

Furthermore, even Henry Chesbrough redefined his original definition twice to capture the lessons learned from emerging research findings (West et al., 2014a). In the latest expanded definition, Chesbrough and Bogers (2014, p. 17) state that OI is a 'distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model'. Here, the innovation process is extended to development and commercialization of products and services, along with processes. Openness is understood as knowledge flows across permeable organizational boundaries, while the business model reflects the organizational construct of how value is created and captured (Chesbrough and Bogers, 2014).

Table 3 Definitions of open innovation

Author	Definition
Diener and Luettgens, (2016, p. 27)	'Open innovation describes collaboration that is characterized by low proximity on the level of the entire cooperation and low formalization in terms of distributed control. This allows organizing knowledge flow as a distributed innovation process to cross organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model'
Chesbrough and Bogers (2014, p. 17)	'Distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model'
Gianiodis, et al. (2014, p. 41)	'We define open-innovation strategy as a business model that is designed to purposefully allow and facilitate knowledge and technology transfers across organizational boundaries'
Lichtenthaler (2011, p. 111)	'Open innovation is defined as systematically performing knowledge exploration, retention, and exploitation inside and outside an organization's boundaries throughout the innovation process'
Lichtenthaler (2008, p. 148)	'An open innovation approach refers to systematically relying on a firm's dynamic capabilities of internally and externally carrying out the major technology management tasks, i.e., technology acquisition and technology exploitation, along the innovation process'
Terwiesch and Xu (2008, p. 1529)	'There exist a rapidly growing number of innovation processes that rely on the outside world to create opportunities and then select the best from among these alternatives for further development. This approach is often referred to as open innovation'
Perkmann and Walsh (2007, p. 259)	'This means that innovation can be regarded as resulting from distributed inter-organizational networks, rather than from single firms'
Dittrich and Duysters (2007, p. 512)	'The system is referred to as open because the boundaries of the product development funnel are permeable. Some ideas from innovation projects are initiated by other parties before entering the internal funnel; other projects leave the funnel and are further developed by other parties'
Chesbrough et al. (2006, p. 1)	'use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively'
West and Gallagher (2006, p. 320)	'We define open innovation as systematically encouraging and exploring a wide range of internal and external sources for innovation opportunities, consciously

	integrating that exploration with firm capabilities and resources, and broadly exploiting those opportunities through multiple channels'
Gassmann and Enkel (2004, p. 2)	'Open innovation means that the company needs to open up its solid boundaries to let valuable knowledge flow in from the outside in order to create opportunities for cooperative innovation processes with partners, customers and/or suppliers. It also includes the exploitation of ideas and IP in order to bring them to market faster than competitors can'
Chesbrough (2003, p. XXIV)	'a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as firms look to advance their technology'

This section, with below sub-sections, provides the background and the overview of open innovation research that aims to guide the reader into the topic of this dissertation. In addition, by presenting the multitude of existing approaches to study OI, various types of classifications and contexts, it draws attention to the problem of OI conceptualization within academic community. This leads to the ambiguity and difficulty in capturing the true essence of OI within the practitioners' community, which is further elaborated in Publication I.

2.1.1. Classifications of open innovation

Considering the inflows and outflows of knowledge, some authors refer to OI in terms of knowledge flow (Gassmann and Enkel, 2004) and distinguish between the two (i.e. *inbound* and *outbound* OI) (Chesbrough et al., 2006). Gassmann and Enkel (2004) identified three core archetypes of OI processes: *outside-in, inside-out* and *coupled*. This classification was incorporated into several further studies (e.g., Enkel, Gassmann and Chesbrough, 2009; Rohrbeck, Hoelzle and Gemuenden, 2009; van de Vrande et al., 2009; Natalicchio et al., 2017). The outside-in process refers to external knowledge exploitation by which a company can profit by selling IP or otherwise transferring ideas and technologies to parties in the external environment. The coupled one combines these two processes by distinguishing co-creation and cooperation with partners with complementary assets through strategic alliances and strategic networks. The inside-out and outside-in processes correspond to outbound and inbound types of OI, respectively; these terms are very often used interchangeably by scholars (e.g., Dahlander and Gann, 2010; West and Bogers, 2017).

In 2010, based on an analysis of 150 articles on OI, Dahlander and Gann enriched inbound and outbound innovation by adding the *pecuniary* and *non-pecuniary* dimensions. The former relates to the immediate financial rewards associated with implementation of a particular mode, whereas the latter refers to indirect financial benefits. Thus, their conceptual framework included two forms of inbound innovation (*acquiring* and *sourcing*) and two types of outbound innovation (*selling* and *revealing*) (Dahlander and Gann, 2010); however, these scholars disregarded the coupled mode promoted by Gassmann and Enkel (2004), including instead strategic partnership and other forms of leveraging complementarities with partners within the inbound-acquiring types of OI. In 2014, Chesbrough and Bogers incorporated the pecuniary and non-pecuniary dimensions into the refined definition of OI while acknowledging the three types of knowledge flows and their supporting mechanisms. Table 4 provides a summary of types of OI and OI activities.

Table 4 Types of open innovation and its mechanisms

Type of open innovation		Chesbrough and Bogers (2014)	Brunswicker and Chesbrough (2013); Dahlander and Gann (2010)
Outside-in /inbound Acquiring and Sourcing	Opening up company's innovation process to various types of external inputs and contributors. *Acquiring* – pecuniary and direct monetary benefits from acquiring external inputs *Sourcing* – non-pecuniary and indirect benefits related to sourcing external ideas and knowledge	- In-licensing of IP, - Using intermediaries, - University research programs, - Funding start-up companies in one's industry, - Collaborating with suppliers and customers, - Utilizing non-disclosure agreements, - Organizing competitions and tournaments, crowdsourcing - Communities, - Spin-ins or spin-backs	*Acquiring (pecuniary)* - IP in-licensing - Purchasing R&D work form others - Contracted R&D services - Supplier innovation awards - Idea & start-up competitions - Specialized OI intermediaries *Sourcing (non-pecuniary)* - Customer & consumer co-creation - Crowdsourcing - Informal networking - Scanning for external technologies Collaboration with suppliers, competitors, lead users, universities and research institutes
Inside-out/ outbound Selling and Revealing	Allowing unused and underutilized ideas and assets to be used by other parties in line with their business models *Selling* – pecuniary and direct monetary benefits from out-licensing or selling *Revealing* – non-pecuniary benefits from revealing internal assets and resources to external parties	- Out-licensing IP and technology; - Donating IP and technology - Spin-outs - Corporate venture capital - Corporate incubators;	*Selling (pecuniary)* - IP out-licensing - Spin-offs - Selling patents, know-how, market-ready products *Revealing (non-pecuniary)* - Participation in standardization (public standards) - Donations to commons or nonprofits
Coupled	Combination of mechanisms for outside-in and inside-out. Involves at least two partners who mutually and purposively manage knowledge flows across organizational boundaries to collaboratively develop and/or commercialize innovation. Mainly includes partners with complementary assets.	- Strategic alliances - Joint ventures - Consortia - Networks - Ecosystems and platforms	

Source: Adopted from Gassmann and Gann (2004); Dahlander and Gann (2010); Brunswicker and Chesbrough (2013); Chesbrough and Bogers (2014)

It can also be observed that the concepts of *OI practices* (e.g., van de Vrande et al., 2009; Huizingh, 2011; Mazzola, Bruccoleri and Perrone, 2012; Chesbrough and Brunswicker, 2014a),

OI activities (e.g., Schroll and Mild, 2011; Parida, Westerberg and Frishammar, 2012; Pullen et al., 2012) and *mechanisms to manage knowledge flows* in OI (e.g., Chesbrough and Bogers, 2014) are used interchangeably by scholars.

Using the construct of inbound and outbound OI, many researchers observe that companies implement more inbound than outbound modes (e.g., Van Der Meer, 2007; van de Vrande et al., 2009; Schroll and Mild, 2011; West and Bogers, 2014). This is not surprising, as prior research suggests that opening up to the external environment and integrating knowledge from suppliers, customers, competitors and the like can improve a firm's innovation performance (Laursen and Salter, 2006; Parida, Westerberg and Frishammar, 2012; Wang, Chang and Shen, 2015) and financial performance (e.g., Sisodiya, Johnson and Gregoire, 2013; Belderbos et al., 2010; Inaunen and Schenker-Wicki, 2011). Likewise, OI scholars pay more attention to investigating solely inbound OI activities, neglecting both the outbound and coupled modes (West and Bogers, 2014a). For example Parida, Westerberg and Frishammar (2012) examine four types of inbound OI activities and their impact on innovation performance. Inaunen and Schenker-Wicki (2011) found a positive effect of opening up to customers, suppliers and universities on innovation performance measures. On the other hand, some studies point out negative consequences like increased costs, time and labour caused by over-search (Laursen and Salter, 2006) and increased coordination costs and the complexity of managing relationships with external parties (Enkel, Gassmann and Chesbrough, 2009).

The few studies exploring the outbound OI phenomenon focus mainly on strategic consideration of numerous contractual forms (e.g., out-licensing agreements, spin-offs) that enable a company to profit from external technology commercialization (Lichtenthaler and Ernst, 2007; Hu, McNamara and McLoughlin, 2015; Lichtenthaler, 2015). In this domain, Kutvonen (2011) identified strategic objectives for externally exploiting knowledge, linking those objectives with business and technology strategies. Lichtenthaler (2009) analysed 136 industrial firms, finding a positive relation between outbound OI strategies and firm performance and identifying the underlying environmental conditions. Apart from positive effects on innovation performance, Lichtenthaler (2015) also suggests that this type of OI may have a negative effect, as the direction (positive or negative) and degree of the effect depends on a firm's internal and external factors. Other scholars have also pointed out certain risks and negative effects (e.g., Arora and Fosfuri, 2003, Fosfuri, 2006), especially from the long-term performance, as it may weaken internal R&D capabilities (Lichtenthaler, 2005). Only a handful of studies have thus far examined all three types of OI activities. For example, based on 105 Nasdaq-listed companies, Mazzola, Bruccoleri and Perrone (2012) found that different types of activities associated with inbound, outbound and coupled OI processes have different effects (both positive and negative) on innovation and financial performance.

2.1.2.   Levels of analysis and different contexts of open innovation.

Apart from investigating the OI paradigm in terms of inbound and/or outbound constructs, majority of studies on OI investigate separate components related to OI activities in different contexts, such as open source (Henkel, 2006; West and Gallagher, 2006), R&D collaboration (Perkmann and Walsh, 2007), outsourcing of R&D (Andries and Thorwarth, 2014), selling and licensing IP (Chesbrough, 2006; Lichtenthaler, 2007), creating new ventures (Eftekhari and Bogers, 2015), user-centred innovation and customer integration (Franke and Piller, 2004; von Krogh and von Hippel, 2006), crowdsourcing (Leimeister et al., 2009), soliciting external

insights (Alexy, Criscuolo, and Salter, 2012) supplier integration (Schiele, 2010) and joint-development projects (Muller et al., 2012). In addition, it can be observed that the notion of OI has been applied to various company's settings. For example, in high-technology industries (Chesbrough, 2003) and low-tech (Chesbrough and Crowther, 2006; Chiaroni, Chiesa and Frattini, 2011a); large-sized (Mortara and Minshall, 2011a) small-sized (van de Vrande, Vanhaverbeke and Gassmann, 2010); mature (Chiaroni, Chiesa and Frattini, 2010) and start-up (Usman and Vanhaverbeke, 2017) companies operating in a wide range of geographical landscapes.

In addition, various themes and levels of analysis pursued by OI scholars have been identified (See Table 5). For example, *individuals and groups, firm-centric, inter-organizational value networks, industry and sector and national institutions and innovation systems* identified by West, Vanhaverbeke and Chesbrough (2006) *or intra-organizational, organizational, extra-organizational, inter-organizational, industry, regional innovation systems and society* proposed by Bogers et al (2017). Randhawa et al.'s (2016) bibliometric review of 321 articles identified three main themes among OI researchers that include *firm-centric aspects of OI, management of OI networks* and *the role of users and communities in OI*. In their paper, they acknowledge the shift from dyadic collaboration between two companies towards collaboration with external networks, communities and ecosystems (e.g., West and Gallagher, 2006; West and Lakhani, 2008; Fichter, 2009). Nevertheless, the majority of research explores the firm-level approach (West, Vanhaverbeke and Chesbrough, 2006; van de Vrande, Vanhaverbeke and Gassmann, 2010; West and Bogers, 2014a).

Table 5 Compiled list of different themes and levels of analysis in the open innovation literature

Source	Themes found in existing literature / level of analysis/ typologies	Method	Additional comments
West, Vanhaverbeke and Chesbrough (2006)	Levels of analysis of OI researchers: - individuals and groups, - firm-centric, - inter-organizational value networks, - industry and sector, - national institutions and innovation systems		
Elmquist, Fredberg and Ollila (2009)	Themes within OI literature: - the notion of open innovation, - business models, - organizational design and boundaries of the firm, - leadership and culture, - tools and technologies, - IP, patenting and appropriation, - Industrial dynamics and manufacturing.	Systematic literature review of 49 publications with "open innovation" in title, keywords or abstract published between 2003 and November 2007.	Identified two dimensions – the locus of the innovation process and the extend of collaboration. Human and organizational side as important fields for further studies
Dahlander and Gann (2010)	Typology: - Outbound Revealing innovation - Outbound Selling innovation - Inbound Sourcing innovation - Inbound Acquiring innovation	Bibliographic analysis of 150 papers with "open innovation" in title, keywords or abstract published until August 2009	Discussed advantages and disadvantages of each modes
van de Vrande, Vanhaverbeke and Gassmann, (2010)	Level of analysis: - Firm-level, - individual, - dyad, - innovation projects, - industry, - geographical.	Meta-analysis of 88 articles with "open innovation" in title, keywords or abstract published until 2008	Fruitful research opportunities to link OI to HRM as well as marketing to deal with organizational and individual tensions and as

			opportunity for co-branding and co-distribution, respectively
Giannopoulou et al. (2010)	Themes within OI literature: - Development of the concept, - organizational design and boundaries of the firm, - open strategy, - human factor in OI, culture and leadership, - communities for distributed co-creation with customers and other collaborating actors, - IP, patenting and appropriation, - innovation intermediaries, - triple helix: industry, academia and government policy.	Review of 134 papers published until June 2009	
Duarte and Sarkar (2011)	Themes within OI literature: - market, - organizations, - human phase, - collaboration strategy, - type of integration, - knowledge origin, - newness (incremental, new, radical) , - orientation, - formality, - embeddedness, - IP.	Numerical taxonomy based on 20 published case studies on open innovation	
Randhawa et al., (2016)	Themes within OI literature: - firm-centric aspects of OI, - management of OI networks, - the role of users and communities in OI	Bibliometric review of 321 articles	
Bogers et al. (2017)	Level of analysis: - intra-organizational (individual, team, project, functional area, business unit), - Organizational (firm, strategy, business model) - Extra-organizational (external stakeholders, individual, community, organization), - Inter-organizational (alliances, network, ecosystem), - Industry, regional innovation systems and society (industry development, inter-industry differences, local region, nation, supra-national institution, citizens, public policy).	Based on insights gained during two Professional Development Workshops at the Academy of Management in 2014 and 2015	

2.1.3. Types and degrees of openness

Many scholars have long argued that instead of creating a false dichotomy between open vs. closed innovation, studies should explore different types and degrees of openness along a continuum (Dahlander and Gann, 2010). In line with this approach, many OI frameworks, taxonomies and typologies have been developed. For example, in addition to the classification of Dahlander and Gann (2010) noted above, Gianiodis and colleagues (2010) distinguish four OI strategies rooted in inter-firm interactions within an industry's value chain: *innovation seeker*, *innovation provider*, *intermediary* and *open innovator*. By focusing on two variables – different types of partners and operating in different phases of the innovation funnel – Lazzarotti and Manzini (2009) identify four modes: *closed innovator, open innovator, specialized innovator* and *integrated innovator*. Huizingh (2011) classifies OI practices based on innovation process (closed vs. open) and outcome (closed vs. open), leading to a 2x2 matrix

with the categories of *closed innovation, private OI, public innovation* and *open source innovation*. Barge-Gil (2013) proposes three strategies for a firm: *open, semi-open* and *closed innovators*. Pisano and Verganti (2008) develop four typologies of collaborative modes based on two dimensions - openness to enter collaboration and hierarchy of decision-making. Ahn, Minshall and Mortara (2015) propose re-defining OI modes by considering three types of dominant changes involved in the implementation of OI. The taxonomy they develop consists of *technology-oriented OI*, *market-oriented OI* and *organization-oriented OI*.

Still, these various approaches to investigate OI, its separate components or particular OI modes, level of analysis and myriad contexts, apart from contributing to the richness and breath of the OI phenomenon, can also greatly inhibit finding the true essence of the concept. This problem is portrayed in Publication I.

In addition, Laursen and Salter (2006) propose measuring openness in terms of the breadth and depth of searches of external sources, but they neglect the quality and value of the different external sources that a company incorporates in its innovation process. Nevertheless, they provide evidence that there exists certain optimal degree of innovation openness and being too open is not necessarily beneficial for firm's innovation performance. Hence, it is crucial to identify antecedents to understand the nature of OI and the underlying degree of openness of a firm (Enkel, Gassmann and Chesbrough, 2009; Drechsler and Natter, 2012). The most common determinants for OI adoption are:
- the external environmental characteristics such as appropriability regime, industry traits like industry speed, and the nature of the industry (Gassmann and Enkel, 2004; van de Vrande et al., 2006; Chesbrough and Crowther, 2006; Perkmann and Walsh, 2007 Drechsler and Natter, 2012);
- the firm's characteristics (Henkel, 2006; Dahlander and Gann, 2010)
- the technology itself (Dodgson, Gann and Salter, 2006; Piller and Walcher, 2006).

In terms of firm-level antecedents of OI (Lichtenthaler and Ernst, 2008a; Foss, Laursen and Pedersen, 2011; Lichtenthaler, 2011; Bogers, Chesbrough and Moedas, 2018) scholars highlight the importance of the organizational design and boundaries of the firm (Dahlander and Wallin, 2006), culture (Chesbrough, 2003; de Araújo Burcharth et al., 2014; Dodgson et al., 2006; Herzog and Leker, 2010) and links with strategy and absorptive capacity (Spithoven, Clarysse and Knockaert, 2011; West and Bogers, 2014; Lichtenthaler, 2016). Others also acknowledge the role of individuals as the main drivers of knowledge and technology creation, thus highlighting the importance of the human aspect within the OI process (e.g., Bogers et al., 2018; Dodgson et al., 2006).

For the purpose of this thesis, these issues will be described in detail in following sub-sections, as firm-level and individual-level factors are the main focus of this study. In addition, a cultural lens is applied, because external (national culture) and internal (organizational culture) factors influence the implementation of OI. Overall, in this context, OI is considered holistically as an umbrella term and management practice that includes various types of inbound and outbound OI activities, without an explicit focus on one particular OI mode.

However, it is first important to briefly acknowledge the various theoretical lenses that have been applied by scholars to understand the notion of OI, because they are intertwined with the organizational motives and challenges faced while organizing and managing internal changes and thus contribute to this dissertation research.

2.2.   Organizational and management theories in open innovation research

Scholars have applied many theoretical lenses to explore and understand the nature of OI. For example, they have used an RBV(Cheng and Huizingh, 2014; Foege, Piening and Salge, 2017, Alexy et al., 2018), and a KBV of the firm (Elmqvist et al., 2009; Vanhaverbeke and Cloodt, 2014), a relational view of the firm (Gesing et al., 2015), absorptive capacity (Spithoven, Clarysse and Knockaert, 2011; West and Bogers, 2014b; Lichtenthaler, 2016), dynamic capabilities (Lichtenthaler and Lichtenthaler, 2009), resource dependency theory (Alexy, Henkel and Wallin, 2013), transaction cost economics (Bogers, 2011), among many others.

Open innovation has a strong link to the *RBV of the firm*, which states that a firm needs a unique set of resources, capabilities and competencies that 'are valuable, rare, imperfectly imitable, and non-substitutable' (or VRIN attributes) (Barney, 2001, p. 625) in order to create a competitive advantage (Penrose, 1959; Barney, 1991; 2001; Grant, 1996). These resources and capabilities consist of tangible and intangible assets that range from raw materials, firm-level competences including organizational processes and routines to management skills and internal knowledge (Barney, 2001). Thus, these resources can be grouped into physical capital, human capital and organizational capital (Wright and McMahan, 1992). The RBV also emphasizes that these resources and capabilities need to be owned and strictly controlled within the boundaries of a firm (Dyer and Singh, 1998). In OI settings, however, companies rely on both internal and external resources and internal and external paths to market (Vanhaverbeke and Cloodt, 2014). Thus, internal resources and capabilities are combined with external ones, leading to the increased permeability of a firm's boundaries (Elmqvist et al., 2009; Vanhaverbeke and Cloodt, 2014). The common underlying factor between OI and the RBV is the importance of resources and competencies to create and capture value in order to generate a sustainable competitive advantage (Vanhaverbeke and Cloodt, 2014). Alexy et al. (2018) use this lens to illustrate how openness and exploiting selected VRIN and common-pool resources can still generate a competitive advantage.

In terms of combining critical resources with external ones, OI scholars have emphasized the *relational view of the firm* (e.g., Gesing et al., 2015). The relational view (Dyer and Singh, 1998) assumes that strategic resources can and should be created beyond a firm's boundaries. It emphasizes inter-organizational collaboration as a source of competitive advantage and relational rents generated in dyadic or network settings that could not be achieved individually (Dyer and Singh, 1998). Drawing on insights from the relational view of the firm, Gesing et al. (2015, p. 426) propose a contingency view of OI and advocate for the importance of understanding of the 'role of complementary resources, relationship-specific assets, knowledge-sharing routines and governance mechanisms' on successful inter-firm collaboration.

When discussing the RBV and its latter conceptualizations, including other theories that are derived from it, it is important to emphasize the CBV theories, as they are closely interconnected. The origins of the CBV of the firm, as with the RBV, can be traced back to Penrose's (1959) seminal work. The CBV focuses on how organizations change and develop (Helfat and Peteraf, 2003) and assumes that capabilities consisting of the knowledge, skills and experience of a firm are sources of competitive advantage (Penrose, 1959) because they are intangible, invisible and socially complex and thus hard to imitate (Alexy et al., 2017). In addition, the simple fact of possessing VRIN resources by a firm, would not work unless the firm possesses the ability to manage them. Overall, many scholars tend to define resources very

broadly and include capabilities as well as 'all assets, organizational processes, information, knowledge, etc.' (Barney, 1991, p. 101) as part of the RBV (Ethiraj et al., 2005). Others make a distinction between resources and capabilities by treating capabilities as a 'firm's capacity to deploy resources' (Amit and Schoemaker, 1993, p. 35). Consistent with the latter approach, the present study also makes a distinction between resources and capabilities; however, it treats capabilities in general and organizational capabilities as a literature stream, not a theory *per se*.

Extending the RBV and the CBV to include market dynamism, Teece, Pisano and Shuen (1990) proposed *dynamic capabilities*, which are the abilities 'to integrate, build, and reconfigure internal and external competences to address rapidly changing environments' (Teece et al., 1997, p. 516); these allow firms to sense, seize and reconfigure opportunities. Following this line of thought, sustainable competitive advantage requires difficult-to-replicate dynamic capabilities rather than owning the difficult-to-imitate resources that are found in the RBV (Teece, 2007; Vanhaverbeke and Cloodt, 2014). Overall, OI scholars point out the importance of dynamic capabilities. They adopt it to, for example, investigate the relationship between openness and firm performance during an economic crisis (Ahn, Mortara and Minshall, 2018), among small- and medium-sized enterprises (SMEs) (Grimaldi et al., 2013) and its role and OI activities in breakthrough innovation (Cheng and Chen, 2013). Others, propose analysing the micro-foundations of dynamic or second-order capabilities that would guide management in sensing and seizing opportunities and defining the best configuration to pursue new avenues (Foss and Saebi, 2018).

Originating from the RBV, the *KBV of the firm* (Grant, 1996; Kogut and Zander, 1992; vog Krogh et al., 1994) considers knowledge to be the most important determinant of competitive advantage. It includes certain strategic approaches to managing knowledge assets and knowledge creation (e.g., Boisot, 1998; Nonaka and von Krogh, 2009). As knowledge is difficult to imitate, companies can take advantage of its knowledge assets by building capabilities to protect, transfer and integrate knowledge (Denford and Chan, 2011) that resides within and beyond the organizational boundaries of the firm. Thus, they can leverage purposeful knowledge inflows and outflows for their innovation outcomes (Cassiman and Valentini, 2009). Therefore, the firm's ability to manage, maintain and create knowledge becomes important (Nonaka and Takeuchi, 1995). The KBV also emphasizes the importance of learning at the individual and organizational levels. First, individuals are important because they are intrinsically involved in knowledge sharing. However, at the organizational level, routines, procedures, histories and know-how are important, as they create a shared understanding of the knowledge within a company (Grant, 1996; Volberda, Foss and Lyles, 2009).

Absorptive capacity (Cohen and Levinthal, 1990, p. 128) refers to a firm's ability 'to recognize the value of new, external knowledge, assimilate it, and apply it to commercial ends'. They also introduce *inward-looking* and *outward-looking* types of AC. The former is associated with a company's internal communication and the latter with its links to external knowledge sources. Cohen and Levinthal (1990) argue that AC is the critical tacit component of innovative capabilities and will depend on the AC of an organization's individual members. Researchers across numerous disciplines (strategic management, international business, technology management, organizational economics, etc.) have analysed it to explain a variety of organizational phenomena (Zahra and George, 2002). For example, in the HR management literature, AC is found to have a positive impact on organizational and individual ability to learn from external sources of knowledge. Lane and Lubatkin (1998) extend AC to include '*relative*' AC within the dyadic learning construct. They argue that inter-organizational learning ability

is determined by the knowledge base, the organizational structure and the dominant logic within dyad settings. Based on a review of the literature on absorptive capacity, Zahra and George (2002, p. 198) add a dynamic view and propose another definition: 'a set of knowledge-based capabilities embedded within the firm's routines and strategic process'. They distinguish between *potential* (i.e., acquisition and assimilation) and *realized* (i.e., transformation and exploitation) AC.

In the OI literature, researchers use this lens to explore how companies seek out and exploit external knowledge, how AC effects internal R&D capabilities (West and Bogers, 2014a) and how it affects certain individual attitudes in terms of external knowledge acquisition (e.g., NIH syndrome, described in section 2.4.3). As OI implies leveraging external sources of knowledge, it is closely linked with absorptive capacity (Vanhaverbeke, van de Vrande and Cloodt, 2008). Thus, it is acknowledged to be an important component of and precondition for the success of OI (Newey, 2010; Spithoven, Clarysse and Knockaert, 2011; Lichtenthaler, 2016). The ability to assimilate external knowledge depends on the firm's internal competences to manage OI (Dahlander and Gann, 2010), and a certain amount of internal knowledge remains a precondition (Diaz-Diaz and De Saa-Perez, 2014; Arvanitis et al., 2015). Thus, it may be determined by internal organizational factors, by how a firm develops routines and changes its organizational structure and culture (Dahlander and Gann, 2010). However, some authors demonstrate how firms that lack absorptive capacity can use innovation intermediaries to search for alternative ways to engage with the external environment (e.g., Spithoven, Clarysse and Knockaert, 2011; Kokshagina, Le Masson and Bories, 2017). In terms of inbound and outbound OI, Newey (2010) suggests that companies may require different absorptive capacities to manage these two modes, such as customer absorptive capacity in the case of inbound OI and supplier absorptive capacity for outbound OI mode. Nevertheless, the central notion of absorptive capacity, although important in OI, focuses mainly on inbound OI modes and largely disregards the outbound ones; thus, it does not fully capture the holistic OI paradigm.

Overall, OI scholars try to build on various existing theories on resources and capabilities and extend their conceptualizations (Peris-Ortiz, 2018; Lichtenthaler and Lichtenthaler, 2009). For example, Gassmann and Enkel (2004) argue that each OI mode – inside-out, outside-in and coupled – should be connected with absorptive capacity, multiplicative capability and relational capacity, respectively. Lichtenthaler and Lichtenthaler (2009) complement the conceptualization of absorptive capacity by integrating it with dynamic capabilities and the knowledge management literature, leading to the development of a capability-based framework for OI. They distinguish between knowledge processes of exploration, retention and exploitation, each of which can be performed internally or externally (see Figure 4); they thus identify six knowledge capacities.

	Knowledge exploration	Knowledge retention	Knowledge exploitation
Internal (Intrafirm)	Inventive capacity	Transformative capacity	Innovative capacity
External (Interfirm)	Absorptive capacity	Connective capacity	Desorptive capacity

Figure 4 Capability-based framework for open innovation (Lichtenthaler and Lichtenthaler, 2009)

What all these theories have in common is the insistence that companies must possess certain crucial resources and/or capabilities to maintain a sustainable advantage. However, apart from conceptual studies, no prior studies provide empirical evidence to support raised arguments.

To ensure that it is built on a solid theoretical foundation, this dissertation departs from some of the above approaches by incorporating multiple theoretical lenses. In particular, it incorporates the RBV and its later sub-branch, KBV with interlinked CBV concept. The main rationale in choosing these concepts is the focus on understanding of the motivation behind the strategic consideration of firm's resources and capabilities as well as firm's internal organizational factors (Dahlander and Gann, 2010) when organizing for OI.

2.3. Firm-level perspective: Organizing and managing OI

The extant research on firm-centric aspects of how companies organize for OI largely builds on rich case studies such as Procter & Gamble (Dodgson, Gann and Salter, 2006a; Huston and Sakkab, 2007), DSM (Kirschbaum, 2005), Fiat (Di Minin, Frattini and Piccaluga, 2010) and GE (Henry Chesbrough, 2012).

It is widely acknowledged that a successful transition to OI requires organizational changes (Huston and Sakkab, 2007; Di Minin, Frattini and Piccaluga, 2010). As a starting point, it demands a certain organizational flexibility and willingness to restructure existing business models (Chesbrough and Schwartz, 2007; Van Der Meer, 2007; Saebi and Foss, 2015). Second, it requires changes in the organizational design and boundaries of the firm (Dahlander and Wallin, 2006; Dodgson, Gann and Salter, 2006b; Bröring and Herzog, 2008; Foss, Laursen and Pedersen, 2011; Nisar, Palacios and Grijalvo, 2016), its culture (de Araújo Burcharth et al., 2014; Herzog and Leker, 2010), proper links with corporate strategy and the development of certain organizational capabilities (Lichtenthaler and Lichtenthaler, 2009) or organizational competences (Hafkesbrink and Schroll, 2010).

For example, when exploring OI implementation at Fiat, Di Minin et al. (2010) noted that it included crucial changes in other organizational areas such as HR management, project management and organizational design. Some researchers emphasize the need to develop an OI capability framework consisting of *strategic alignment, governance, methods and tools, information technology, people and culture* (Hosseini et al., 2017). Others, in line with dynamic capabilities, refer to 'higher-order management capabilities' to internally align the inflows and outflows of knowledge (Brunswicker and Vanhaverbeke, 2015a) employed at both the strategic and operational levels. Hafkesbrink and Schroll (2010) argue that firms need to develop certain organizational competences that also capture the dynamic status of the organization for successful management of OI. They are grouped into *organizational readiness*, *collaborative capability* and *absorptive capacity* (Hafkesbrink and Schroll, 2010). On the other hand, Enkel, Bell and Hogenkamp (2011) suggest an OI maturity framework that consists of five maturity levels measured against the three main elements of *climate for innovation*, *partnership capacity* and *internal processes*. In a similar manner, Habicht, Möslein and Reichwald (2012) develop a multidimensional OI maturity framework. Mortara and Minshall (2011) suggest that large multinationals incorporate different approaches to implement OI and, based on their taxonomy, group them into *OI conscious adopters*, *OI ad-hoc adopters*, *OI precursors* and *OI communities of practice*.

The evidence also suggests that these organizational changes may follow Lewin's (1947) change management approach of *unfreezing, moving* and *institutionalizing* (Chiaroni, Chiesa and Frattini, 2011b). However, managing OI and the organizational transition implies a set of managerial challenges and a certain resistance to change (Christensen et al., 2005; Chesbrough et al., 2006; Dodgson et al., 2006; Gassmann, 2006; Vanhaverbeke, 2006; West and Gallagher, 2006; van de Vrande et al., 2009; Lichtenthaler and Ernst, 2009a; Lichtenthaler, 2011). For example, they can correspond to organizational changes while incorporating corporate-wide OI strategy (e.g., Gassmann and Enkel, 2004; Di Minin, Frattini and Piccaluga, 2010), higher coordination costs and greater complexity of managing inter-firm relationships (Enkel, Gassmann and Chesbrough, 2009), dealing with organizational inertia and structural rigidities (Lane, Koka and Pathak, 2006; Chiaroni, Chiesa and Frattini, 2010, 2011b; Mortara and Minshall, 2011b) and implementing measurement and monitoring mechanisms (Chesbrough and Crowther, 2006; Huston and Sakkab, 2007; Chiaroni, Chiesa and Frattini, 2010). Second, they can be associated with cultural changes (Chesbrough and Crowther, 2006; Mark Dodgson, Gann and Salter, 2006b; Herzog and Leker, 2010) and difficulties with incorporating proper business model innovations and the associated governance changes, management of internal assets and resources and so on. (Chesbrough and Appleyard, 2007; Chesbrough and Bogers, 2014). Finally, there are the issues of IP management and undesired knowledge leakage (Henkel, 2006; Alexy, Criscuolo and Salter, 2009; Chesbrough and Brunswicker, 2014; Rangus, Drnovsek and Di Minin, 2016).

In terms of the organizational design and boundaries of the firm, Bröring and Herzog (2008) suggest that firms should create unique organizational designs to balance the explorative vs. exploitative dilemma and degrees of openness. Thus, the key role is devoted to organizational ambidexterity, a concept promoted by Tushman and O'Reilly (1996, p. 24) and defined as 'the ability to simultaneously pursue both incremental and discontinuous innovation... from hosting multiple contradictory structures, processes, and cultures within the same firm'. Consistent with this concept, Bröring and Herzog (2008) suggest the formation of separate units to foster radical innovations and incremental innovation. The former usually follows the OI approach, while the latter opts instead for the closed innovation approach. Nisar, Palacios and Grijalvo (2016) have developed an open-organization framework linking exogenous (i.e., institutional and social context) and endogenous (i.e., open and closed structure) factors.

The evidence also suggests that organizational structures within companies adopting OI vary from launching complementary internal networks (Hansen and Nohria, 2004) or dedicated cross-functional teams (e.g., at Procter & Gamble (Huston and Sakkab, 2006)) to independent OI business units (as at DSM (Kirschbaum, 2005; Chiaroni, Chiesa and Frattini, 2011b). Thus, they are linked with organizational factors like formalized and informal organizational structures (Teece, 1996). The decentralization of OI activities may also evolve over time into centrally controlled OI approaches (Mortara and Minshall, 2011b). The influence of OI on organizational structure also depends on the locus of the R&D function and may lead to setting up either a matrix or a network structure (Petroni, Venturini and Verbano, 2012). In the context of firm-external managerial challenges, Wallin and von Krogh (2010) argue that when inviting external users to innovate on a voluntary basis, the traditional organizational structure, hierarchy and leadership authority are challenged. The delegation of decision rights has also been studied in this context (Buganza et al., 2011). Overall, scholars warn against organizational structures that are incorrectly designed and managed, as they may inhibit the knowledge sharing within and across organizational boundaries (Gold, Malthora and Segars,

2001; Chiaroni, Chiesa and Frattini, 2010) or even encourage hoarding and otherwise guarding information (Mcdermott and O'Dell, 2001).

2.3.1. Organizational and managerial practices to support OI implementation

The evidence indicates that companies need to employ different organizational and managerial practices and routines for the successful facilitation of OI. Prior research in organizational studies, strategic management and technology management has focused mainly on intra-organizational antecedents to innovation with respect to how firms can best leverage in-house knowledge and resources for innovation purposes (e.g., Dougherty, 2001). However, the question of how organizational practices can assist in sourcing knowledge from external parties has rarely been explored (Foss, Laursen and Pedersen, 2011), even though these practices play a facilitating role in effectively organizing, mobilizing and integrating both internal and external assets (Huizingh, 2011; Robertson, Casali and Jacobson, 2012; Brunswicker and Vanhaverbeke, 2015a). They may include extensive communication (vertical and lateral), the development of reward and incentive systems, delegating decision rights (Foss, Laursen and Pedersen, 2011, Buganza et al., 2011), the development of internal research capacity (Berchicci, 2013) or OI capabilities (Lichtenthaler and Ernst, 2009a), cross-functional collaboration between different departments in the innovation processes (Salge et al., 2012) and knowledge management systems (Dodgson et al., 2006; Chiaroni, Chiesa and Frattini, 2011b).

The reward and incentive systems and delegating decision rights all have a strong link with the HR management practices employed by organizations, so they are discussed in the next section. Knowledge management systems enable diffusion and transfer of knowledge within and across firm boundaries (e.g., Dodgson et al., 2006; Chiaroni, Chiesa and Frattini, 2011b, Santoro et al., 2016). These systems can be incorporated in two ways, either by internal development of the knowledge management infrastructure or by leveraging external intermediary platforms. Terwiesch and Xu (2008) focused on exploring the incentive structure within innovation contests, demonstrating how changing the awards structure from fixed-price to performance-based can increase the efficiency of the contests. In the SME context, Brunswicker and Vanhaverbeke (2015) suggested four internal organizational practices that aid in sourcing and aligning external knowledge (i.e. long-term investment activities, innovation strategy processes, innovation development processes and innovation project control).

Academic research has also investigated how managers could facilitate OI and new types of collaborators (e.g., (van de Vrande et al. 2009; Bogers, 2011; Bogers and West, 2012) and proposed the use of supportive tools such as the revised Stage-Gate model (Grönlund, Sjödin and Frishammar, 2010), the Want, Find, Get, Manage model (Slowinski and Sagal, 2010) and watch lists (Mortara et al., 2010).

Still, despite acknowledging the organizational and managerial issues in OI implementation (i.e., the need for supportive top management, the creation of an OI culture, the development of organizational-level capabilities), the human aspect of OI and activities related to HR management remain unexplored (e.g., West et al., 2014; Bogers, Foss and Lyngsie, 2018).

2.3.2. Human resource practices in open innovation literature

The main HR characteristics of a firm include 'knowledge, expertise, skills, commitment of employees and their relationship with people inside and outside of organizational' (Barney and

Wright, 1998, p.10). HR practices can be a source of a company's competitive advantage (Barney and Wright, 1998) and they are associated with KM practices as they reflect company's intellectual and human capital (Ferraris, Erhardt, and Bresciani, 2017). Overall, for over three decades researchers have agreed on the importance of HR for innovation (e.g. Schuler and MacMillan, 1984). However, the link (with supported empirical evidence) between HRM practices and organizational-level innovation has started receiving attention around 2000s (e.g. Laursen and Foss, 2003; Shane and Ulrich, 2004; Zhou, Hong and Liu, 2013). For example, study by Zhou and colleagues (2013) grouped HR practices into commitment-oriented (directed towards building internal commitment and cohesiveness) and collaboration-oriented (intended to build external collaboration). They found that both types have positive effect on the firm innovation.

Consistent with the work by Paul, Roijakkers and Mortara (2016), the present study considers OI to be part of business strategy; thus, it focuses on SHRM. In this context, HR practices consist of different tools to manage the skills, abilities and behaviours of employees, i.e. human capital pool (Wright and McMahan, 1992; Wright, Dunford and Snell, 2001; Podmetina et al., 2013; Paul, Roijakkers and Mortara, 2016). Skills and abilities affect behaviours that have a direct link with firm-level outcomes (Wright and McMahan, 1992; Paul, Roijakkers and Mortara, 2016). The main differentiating factors between SHRM and HRM are twofold. First, SHRM links HR practices with the strategic management process (Dyer, 1985; Wright and McMahan, 1992). Second, while HRM focused on various HR practices performed in relative isolation, SHMR emphasizes aligning them through planned coordinated actions towards the same strategic goal (Wright and McMahan, 1992). Many HR scholars find evidence that HR practices facilitate knowledge sharing and creation at the firm level (e.g. Foss et al., 2009) and identify various knowledge sharing and learning processes grounded in RBV and KBV (e.g. Wright, Dunford and Snell, 2001). These HR practices include for example staffing, training, performance appraisals, job design, and compensation (Soo et al., 2017). Taking job design as an example, Foss et al (2009) found evidence that it affects employee motivation to share knowledge.

In the OI context, only a few scholars have empirically explored the link with HR practices. For example, Podmetina and colleagues (2013) found that internal motivation systems and training programs have a positive effect on employees' openness to knowledge sharing (both externally and internally) in OI implementation. Their results also emphasize the importance of human capital. Other studies also emphasize the strategic role of HR practices in OI implementation in general (Salampasis, Mention and Torkkeli, 2015; Corral de Zubielqui, Fryges and Jones, 2017) and especially for training personnel involved in OI activities like research collaboration and R&D outsourcing (Teirlinck and Spithoven, 2013; Paul, Roijakkers and Mortara, 2016), recruitment and selection (Clausen, 2013; Steiber and Alänge, 2013), reward systems (Bianchi et al., 2011; Foss, Laursen and Pedersen, 2011, Buganza et al., 2011) and performance appraisal (Chen, Huang and Huang, 2009). Thus, the adoption of OI also requires changes in career paths, rewarding systems, training courses and recruitment (Petroni, Venturini and Verbano, 2012), keeping in mind that different cultural modes may lead to different kinds of responses. While analysing intra-organizational challenges in the implementation of OI, de Araújo Burcharth, Knudsen and Søndergaard (2014) proposed a set of practices to reduce NIH and NSH syndromes (defined in section 2.4.3), mainly through competence-building training programs for employees and nurturing top talents. Another study by de Araújo Burcharth, Knudsen and Søndergaard (2017) found that giving employees more autonomy (i.e., time, freedom, independence) positively affects openness and innovation sales.

Bianchi and colleagues (2011) emphasize the role of powerful rewards to enable the capacities of licensing managers. Clausen (2013) found that internal R&D recruiting and training skilled workers is needed when firms wish to pursue the OI path. A thought-provoking study by Paul, Roijakkers and Mortara (2016) provides insights in terms of selection, training, rewarding and organizational climate and how these HR practices strengthen OI implementation. They offer a set of propositions and identify ten challenges that HR managers involved in OI implementation will face, such as finding the right employees, determining the level of knowledge that can and cannot be shared while stimulating people to share ideas and aligning incentives to the various people involved in the collaborative or spin-out project.

While these aspects have been addressed to some extent within the OI literature, a job design for OI professionals has not. This issue, as well as rewarding systems, training programs and the like are all treated in Publications II, III, IV and V.

2.4.   Cultural-level perspective: Organizing and managing OI

There is no consensus on the definition of *culture* among scholars. However, virtually all of them acknowledge that it operates on different levels in terms of visibility to the observer (Browaeys and Price, 2008). These levels include, first, *artefacts* and *attitudes* (or so-called practices when combined with behaviour patterns (Hofstede et al., 1990)). These are the most noticeable elements and include rituals, dress codes, language, eating, making contracts and so on. The second level involves *norms* (or *beliefs*) and *values* that explain expectations about the behaviour of individuals in certain groups and determine what is good or bad and right or wrong. The third and deepest level consists of *basic assumptions*, which are difficult to explore (Browaeys and Price, 2008, p. 4). Based on these levels, culture has been defined as the 'collective programming of mind that distinguishes members of one group or category of people from another' (Hofstede, 1991, p. 35); it begins to emerge and then develops when a group of individuals have a shared experience (Schein, 1984). Even though culture is not an aspect of individual, it is expressed within a way of thinking that is shared by individuals (Hofstede, 1998; Browaeys and Price, 2008). Because people belong to many groups, they carry numerous layers of cultures inside themselves, ranging from national, regional/ethic, religious, generational, gender, organizational, corporate and departmental to any form of grouping including profession (Hofstede, 1991; Browaeys and Price, 2008).

In the scope of the present study, only organizational and national cultures are considered. In the context of OI, national culture is often neglected, with only a few exceptions (e.g., Savitskaya, Salmi and Torkkeli, 2010 and publication III in this dissertation). However, this aspect is important to consider when exploring how firms implement OI, as different cultural contexts may influence the adoption of OI and the need for different organizational approaches in terms of partner selection, employee incentive systems and dealing with employees' negative attitudes towards acquiring external knowledge or exploiting external knowledge. For example, Savitskaya, Salmi and Torkkeli (2010) found evidence that certain national cultural peculiarities impose barriers to outbound OI. Cultural differences may also influence collaboration, leading to conflicts and misunderstandings that may hinder information and knowledge flow. Thus, this section incorporates the prior literature on national culture from various domains that can shed light on understanding the cultural issues involved when organizing for OI. Publication III explores the cultural challenges in OI implementation in detail.

2.4.1. National culture

National culture reflects the common characteristics, norms and values of people within a country's borders (Hofstede, 1991). The evidence from the cross-cultural management and knowledge sharing literature suggests that national culture can be a main driver or inhibitor of knowledge sharing (Michailova and Hutchings, 2006); it affects innovation performance (Shane, 1995) and the diffusion of innovations (Dwyer et al., 2005). In addition, the literature suggests that firms that are embedded in different national cultural contexts may deal with knowledge sharing differently than those embedded in other external contexts (Foss, Hudset and Michailova, 2010). As national culture is linked with norms and values, it drives individuals' way of thinking, affects business practices and problem-solving efforts and the manner of looking for and sharing new ideas (Hofstede, 2001).

Usually, the national culture and cross-cultural issues are investigated in terms of knowledge sharing and knowledge/technology transfer between multinational corporations and their local subsidiaries (e.g., Cui et al., 2006), in mergers and acquisitions (Weber, Shenkar and Raveh, 1996; Sarala and Vaara, 2010) or strategic alliances (Mowery, Oxley and Silverman, 1996) but rarely in the OI context.

The conceptualization of the national culture and cultural differences in the business context has largely been explored in terms of its dimensions. The most cited framework, which has proven to be a powerful source of inspiration for many scholars, is Hofstede's (1980) cultural dimensions model. Originally, Hofstede developed four dimensions based on his analysis of responses from 64 countries to a survey at IBM Corporation (Hofstede, 1980):

- *Power Distance* (low vs. high) is defined as 'the extent to which the less powerful members of organizations and institutions expect and accept that power is distributed unequally' (Hofstede, 1991, p. 28). It corresponds to attitudes towards authority and a certain distance between individuals in a hierarchy. For example, low PD cultures prefer decentralized hierarchical structures, while high PD cultures prefer centralized hierarchical structures. In addition, in low PD cultures, managers are more oriented towards involving other employees in decision-making processes and employee initiatives and ideas are encouraged, in contrast to high PD cultures (Hofstede, 2001). In addition, in high PD cultures, proposing new ideas and being innovative may be restricted in an effort to protect the *status quo* (Rinne, Steel and Fairweather, 2012).
- *Individualism vs. Collectivism* is 'the extent to which individuals are integrated into groups' (Hofstede, 1991, p. 51). It corresponds with the importance that is placed on personal relationships versus the tasks to be performed and individual achievements.
- *Masculinity vs. Femininity* is 'assertiveness and competitiveness versus modesty and caring' (Hofstede, 1991, pp. 82–83). Highly masculine cultures perceive work as a challenge and expect monetary rewards and recognition (Browaeys and Price, 2008). On the contrary, feminine cultures place a greater value on relationships with others in the workplace and pay more attention to seeking consensus (Hofstede, Jonker and Verwaart, 2012)
- *Uncertainty Avoidance* (low vs high) is 'intolerance for uncertainty and ambiguity' (Hofstede, 1991, p. 113). In high uncertainty-avoiding cultures, people prefer not to take their own initiatives without approval from a supervisor and generally dislike matrix organizational structures or any other arrangement that enforces a high level of

ambiguity (Hofstede, 1980). They are willing to accept familiar risks, but not the danger of the unknown and uncertain.

Later, a fifth dimension, *short-term vs. long-term orientation* (or so-called Confucian dynamism), was included. It refers to focusing the efforts of individuals towards past, present or future outcomes (Hofstede, 2001). Even more recently, Hofstede's cultural dimensions have also been extended to a sixth dimension, *indulgence vs. restraint,* which refers to gratification as opposed to control of human needs as each relates to life happiness (Hofstede and Minkov, 2010). However, this latest dimension has been acknowledged by only a few scholars and has not been empirically validated by other researchers. Therefore, the present study does not consider this dimension.

In terms of management of innovations, earlier studies by Shane (1992; 1993) showed that innovative activities are influenced by national culture. For example, he argued that the cultural dimensions of individualism, PDI, UAI can explain differences in national innovativeness rates (Shane, 1993). This was later confirmed by Rinne, Steel and Fairweather (2012), who compiled their results using the Global Innovation Index dataset. Other studies found that cultures that score low on PDI and high in masculinity have higher research and development productivity (e.g., Kedia et al., 1992). Some studies also found that cultural dimensions of individualism could be applied as an individual aspect of personality, thus treating it at the individual level, not only at the societal level (see review by Oyserman, Coon and Kemmelmeier, 2002). In a similar manner, Shane (1995) identified the negative influence of the UAI dimension on innovation champions.

As with all new paradigms, Hofstede's cultural dimensions faced criticism (see e.g., McSweeney, 2002), mainly for being based on a sample from a single company with Western origins (Ailon, 2008), the small number of respondents in some countries and the fact that the study was conducted over 30 years ago and thus does not reflect current reality. Nevertheless, it is still acknowledged to be the most comprehensive such effort (Chudzikowski et al., 2011) as long as it is treated in relative rather than absolute terms. Trompenaars and Hampden-Turner (1997), House et al. (1999) in the GLOBE project and Hall and Hall (1990) developed other cultural dimensions, all of which are presented in Publication III.

For the purpose of this thesis, national culture is considered to be an external factor that influences OI implementation. In addition, in line with Hofstede (2001), the present study applies cultural dimensions at the organizational level and argues that, in order to successfully manage OI across geographical borders, both national and organizational cultures need to be acknowledged and understood (Publication III).

2.4.2. Organizational culture

Organizational culture has been defined as 'a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems' (Schein, 1992, p. 374). Consistent with the RBV (Barney, 1991) and the KBV (Grant, 1996), it can be a source of competitive advantage because it is tacit and hard to imitate. It can also be perceived as determinative of innovation because it can either boost or hinder the tendency to innovate (Ahmed, 1998). Many innovation management scholars focus their attention on innovation culture and,

unsurprisingly, emphasize that a strong innovation culture increases innovation performance (e.g., Cooper and Kleinschmidt, 1995).

Consistent with the OI literature, knowledge management scholars argue that organizational culture can be an enabler of successful knowledge transfer. Knowledge transfer will not occur unless groups or individuals have a willingness to share it and demonstrate high levels of co-operative behaviours (Goh, 2002). As organizational culture represents a soft category that is harder and more time consuming to develop than hard factors like IT systems, it is often neglected by organizations (Goh, 2002). In the context of OI implementation, this involves a shift from a previously closed approach to a more open strategy that relies on external contributions to innovation processes; it imposes certain cultural shifts towards greater openness. Thus, the management of cultural change and understanding cultural barriers both become important.

In this study, the terms *organizational cultures* and *corporate cultures* are used interchangeably, following the practice in most studies, although it is acknowledged that there are certain differences between them.

2.4.3. Cultural challenges in open innovation

The role of organizational culture in OI is acknowledged in numerous examples in the OI literature (e.g., Chesbrough, 2003; Dodgson et al., 2006; West and Gallaher, 2006; Herzog and Leker, 2010; Chiaroni, Chiesa and Frattini, 2011b; Mortara and Minshall, 2011; de Araújo Burcharth et al., 2014). Scholars emphasize the need to create an organizational culture that favours openness to external ideas, promotes knowledge sharing and features entrepreneurial characteristics (Witzeman et al., 2006).

However, in addition to being a potential enabler for OI adoption, culture can also be a barrier to successful OI (Witzeman et al., 2006; van de Vrande et al., 2009; Mortara and Minshall, 2011; 2014). Mortara and Minshall (2011) found evidence that cultural background may hinder the implementation of OI, even though a company has a strong desire to implement it. Researchers have pointed out several culturally rooted challenges to successful OI adoption.

First, the Not-Invented-Here (NIH) syndrome (Katz and Allen, 1982; Schein, 1992) is the most cited and widely acknowledged challenge among OI researchers (Mortara and Minshall, 2011b). It refers to employees' unwillingness to adopt external ideas and thus corresponds to inbound OI activities. In searching for reasons for the existence of the NIH syndrome, Chesbrough (2006) found a fear among employees of failing to find the right external technology and the fear of losing a job when more R&D activities are performed outside company's boundaries.

On the other hand, the Not-Sold-Here syndrome or Not-Shared-Here (NSH) syndrome reflects a protective attitude towards the external exploitation of knowledge (Lichtenthaler, Hoegl and Muethel, 2011) and hence is associated with outbound OI. In general, these challenges are described in the context of cultural (group)-level phenomena, although they address the individual-level perspective. The empirical evidence indicates that the NIH and NSH syndromes prevent the adoption of inbound and outbound OI, respectively (de Araujo Burcharth, Knudsen and Søndergaard, 2014).

Additional challenges include a lack of trust in external technologies and partnerships (Remneland-Wikhamn and Wikhamn, 2011) and fear of knowledge leakage, cultures that favour risk aversion rather than risk-taking attitudes (Herzog and Leker, 2010), a lack of motivation, power sharing and differences in communication context and styles (Dabrowska and Savitskaya, 2014). However and with just a few exceptions, OI scholars only tackle these issues marginally. For example, Herzog and Leker (2010) analysed the cultural dimensions of NIH, risk-taking and management support and found the existence of contrasting cultures and beliefs between units that follow closed innovation vs. an OI approach. These cultural challenges and proposed solutions to overcome them are explored in detail in Publication III.

2.5.   Individual-level perspective: Organizing and managing OI

From the ontological point of view, 'individuals are the ones that act, not firms'. Felin and Foss (2005) argue that 'to fully explicate organizational anything – whether identity, learning, knowledge or capabilities – one must fundamentally begin with and understand the individuals that compose the whole' (Felin and Foss, 2005, p. 441).

Within the OI literature, the people-centric perspective has received very little attention. However, due to calls from several scholars to explore this promising but underexplored research area (e.g., Bogers et al., 2018; Dodgson et al., 2006; Podmetina et al., 2013; Vanhaverbeke and Roijakkers, 2012; Vanhaverbeke et al., 2014), more studies have started to appear.

Some studies focus on leadership aspects and analyse leaders' characteristics (e.g., Ahn, Minshall and Mortara, 2017), leadership tactics regarding employee openness (Rangus and Černe, 2017), managerial roles from a collaboration-centric perspective (Ollila and Ystrom, 2017), the role of informal *champions* to promote outbound OI activities (Lichtenthaler and Ernst, 2009b) and individual-level openness to external knowledge and its effect on ideation performance (Salter et al., 2015); some have indirectly acknowledged the crucial role of top management in OI implementation (Fredberg, Elmquist and Ollila, 2008; Giannopoulou et al., 2010). For example, Ahn, Minshall and Mortara (2017) analysed personal traits among Korean SME CEOs and their role in OI adoption. They found that a CEO's positive attitude, entrepreneurial orientation, patience and education influence the adoption of OI, although the effect varies depending on the OI mode. Witzeman and colleagues (2006) emphasize the importance of visionary leaders, who should encourage and reward employees for using external sources of knowledge effectively and facilitate changes in employee thinking from 'Not-Invented-Here' towards 'Invented Anywhere'. Likewise, Lifshitz-Assaf et al. (2017) stress the crucial role of managers in refocusing the professional identity of engineering staff in NASA from 'problem solvers' to 'solution seekers'.

Di Minin et al. (2010) suggest that to make the shift towards OI, which usually requires challenging existing routines and practices, the use of top management with experience from outside the industry or coming from a different culture could be of great help. Rangus and Černe (2017) analysed the role of top management and employees' openness to innovation performance at the individual and team level and emphasize the crucial role of leaders who build OI coalitions.

The internal changes and reorganization that come with OI also indicate the use of organizational roles, whether formal or informal, to enable employees to function in new and

more open settings. These new roles can be created at the corporate, business unit or project management level (Petroni, Venturini and Verbano, 2012). Here, the literature suggests assigning *innovation champions* to serve as drivers of organizational transition (Chiaroni, Chiesa and Frattini, 2010). This proposal follows the central work of Schon (1963) on champions who act informally and voluntarily. Other identified roles in OI settings include two types of *innovation brokers*: *idea scouts* and *idea connectors* (Whelan et al., 2011). Aquilani and colleagues (2017) highlight the role of external *OI intermediaries* for successfully implementing OI and aiding in overcoming certain organizational barriers. *Integration experts* are mentioned in the context of Procter and Gamble's top management. These new professional figures enable the selection and integration of external knowledge, are able to communicate and interact with managers and researchers coming from different industries and disciplines and, at the same time, are able to manage complex structures (Dodgson et al., 2006, Huston and Sakkab, 2006). Ollila and Yström (2017) identify the informal roles of *facilitator, tactician* and *sensegiver* when analysing managerial roles in OI settings from a collaboration-centric perspective. Moreover, they note that many OI scholars provide implications for managers but do not explore managerial roles when engaging in OI (Ollila and Yström, 2017).

Boundary spanners are also explored in an OI context (Fleming and Waguespack, 2007; Kislov, Hyde and McDonald, 2017). They originate from the boundary-spanning literature that has a long history of profiling individuals who build and manage linkages within and across organizational boundaries (Tushman, 1977), mainly in the engineering sector. They are guardians of information who have good reputations and managerial authority (Tushman, 1977) and act as an interface between a unit or organization and its external environment (Cross and Prusak, 2002). These roles are also widely acknowledged in the organizational theory and strategic management literature (Kislov, Hyde and McDonald, 2017). In the OI literature, Fleming and Waguespack (2007) investigate the differences between boundary spanners and brokers in OI communities as voluntary roles, while Kislov and colleagues (2017) focus on the mechanism and consequences of the legitimation of boundary-spanning roles and practices in university-industry collaborations. Others focus on their effect on trust and performance in governance networks (van Meerkerk and Edelenbos, 2014), their role in cross-sector partnerships (Ryan and O'Malley, 2016) and their importance in Triple Helix as people who scan and identify promising ideas, link them with relevant projects, build networks and bring various cultures together by translating domain-specific knowledge (Lundberg, 2013). The common feature of boundary-spanning roles is their authority and ability to communicate and translate highly technical knowledge with multiple types of stakeholders. Dahlander and colleagues (2016) investigated the search behaviour of *elite boundary spanners* at IBM and found that the effects of external search breadth on innovation outcomes are determined by the individual attention to personal relationships with external knowledge sources. This means that employees who allocated attention to internal people ('locals') were highly innovative; however, people with high external breadth ('cosmopolitans) outperformed them when they devoted attention to cultivating personal relationships with those external sources. Their results also suggest the importance of individuals' self-awareness of their own weaknesses and strengths for an effective search strategy.

Apart from boundary-spanning roles, the literature acknowledges the importance of *gatekeepers* and *knowledge brokers* for successful knowledge transfer in OI settings (Haas, 2015). Table 6, adopted from Haas (2015), provides a comparison between these three concepts. The distinction between boundary spanners, gatekeepers and knowledge brokers depends on context; in all cases, these roles can be allocated to individuals or organizations. However, only

the literature from the individual-level perspective is highlighted in the context of this thesis. In addition, gatekeepers are sometimes a sub-category of boundary-spanners, whose main role is 'to monitor the environment and acquire, transfer and, sometimes, diffuse information inside the organization or group.' (Haas, 2015, p. 1036). Knowledge brokers are individuals who can belong to overlapping groups and have the primary role of enabling knowledge sharing between communities.

Table 6 Comparison of boundary spanners, gatekeepers and knowledge brokers

	Boundary spanner	Gatekeeper	Knowledge broker
Origins of the concept	Boundary spanning behavior described in the 1920s; March and Simon (1958), Katz and Kahn (1966); Brown (1966) describe boundary spanning behaviors "Boundary spanner" phrase introduced by Tushman (1977)–research on innovation	Lewin (1947) introduced the concept: analysis of decision processes–sociology. Concept used in law, communication, management, information systems and political science. In management: "technical gatekeeper" introduced by Allen (1967), in research on innovation in R&D settings	Foundational work on brokerage by Simmel (1908). Notion of knowledge broker emerged in the 1990s, related to specialized roles in healthcare, education and consulting sectors
Definition	Multiplicity of definitions. Interface between areas (within or outside the organization), permits information exchanges and access to markets and resources	Multiplicity of definitions, depending on the scientific discipline using the concept In management: Controller/guard of information or individual who collects and diffuses information. Can apply to an individual, an organization or a technology	Two main definitions (one of them–Brown and Duguid, 1998 corresponds to gatekeeper). Mainstream definition: Individual who facilitates knowledge transfer between groups to which he does not belong. More precise definitions apply in education and healthcare contexts
Key characteristic	Well-connected internally and externally External, internal and linking roles Facilitate communication of other group members Contribute to reducing the level of organizational uncertainty Collect, interpret and translate knowledge		Collects, interprets and translates knowledge
	Also: organization/group representative	In more restricted definitions of gatekeepers, controls quality of internal knowledge	Liaison function (does not belong to any group spanned)
Reference	Adams (1976), Barner-Rasmussen *et al.* (2010), Cross and Prusak (2007), Friedman and Podolny (1992), Jemison (1984), Kostova and Roth (2003), Leifer and Delbecq (1978), Levina and Vaast (2005), Tushman (1977), Tushman and Scanlan (1981)	Barzilai-Nahon (2008b), Cohen and Levinthal (1990), Ettlie and Elsenbach (2007), Katz and Tushman (1980), Macdonald and Williams (1993, 1994), Nochur and Allen (1992), Paul and Whittam (2010), Utterback (1971)	Brown and Duguid (1998), Hargadon (2002), Pawlowski and Robey (2004), Lomas (2007), Meyer (2010)

Source: Haas (2015, p. 1039)

Researchers have also tackled individual level-attributes and analysed how human capital is involved in OI. For example, Salter et al. (2015) found that individual-level openness to external knowledge is positively correlated with the ability of individuals to generate new and valuable ideas for their organizations as they gain access to richer, broader and more diverse knowledge that they can recombine. However, there are external search coordination costs related to efforts and time. On the other hand, Zhang, Baden-Fuller and Mangematin (2007) point out that while OI creates interesting opportunities for scientific personnel to gain valuable experiences while engaging with the outside environment, it is appreciated by young personnel but not necessarily by the older scientific generation. Bogers, Foss and Lyngsie (2018) analysed human capital and found that educational diversity among staff is positively connected with firm-level openness. Lazzarotti, Manzini, Nosell and Pellegrini (2017) investigated the mediating role of internal social capital in the connection between OI practices and innovation ambidexterity. Salter and colleagues (2014) focus on R&D professionals, their challenges in pursuing OI and their coping strategies.

Overall, the evidence suggests that, with OI, different points of contact need to be created with inter- and intra-firm functions like manufacturing, suppliers and marketing. Thus, managerial skills, in addition to scientific knowledge and expertise, are expected from R&D staff (Huston and Sakkab, 2007; Bredin, 2008). This indicates that a shift of knowledge, skills and expertise is required from personnel working under an OI approach, along with changes in the tasks they perform (Alexy, Henkel and Wallin, 2013). The evidence suggests that some companies have started to emphasize *entrepreneurial attitudes* when hiring new R&D personnel (Di Minin, Frattini and Piccaluga, 2010). In building a competence profile for professionals in OI teams, Du Chatenier et al. (2010) report that they should possess *combinatory*, *social astuteness* and *sociability skills.* Additional OI skill sets include 'introspective, extrospective, interactive and technical' elements (Mortara and Minshall, 2009, p. 42), and other soft skills like *intrapreneurial skills, communication skills, relationship building, fast learning, uncertainty tolerance*, *passion* and *optimism* (Martino and Bartolone, 2011) and *creativity* and *pro-activeness* (Herzog, 2011). However, it is unrealistic to expect one person to possess all the necessary skills at the same time as he or she has the different sets of skills that may be needed, depending on the OI activities performed and the different stages of OI adoption (Mortara and Minshall, 2009).

The existing research says relatively little about the formalized OI units and OI job positions that companies around the world are now establishing. Some studies only acknowledge its emergence (e.g., VP for Open Innovation at Unilever (Mortara and Minshall, 2014)) or briefly explore LinkedIn profiles of OI managers (e.g., Vanhaverbeke, Chesbrough and Cheng, 2017). In the context of the present study, the individual-level perspective is applied to shed light on the role of individuals, especially OI professionals as per job title or job description, and their skills and competencies in OI settings. This aspect is presented in detail in Publications IV and V.

3. RESEARCH DESIGN

This chapter outlines the overall research design of the study and is constructed as follows. First, it presents the research approach and explains the philosophical assumptions within the research paradigms that offer a foundation for the present study. Second, it describes the methodological choices in the research, which is followed by a section on the quality of the research.

3.1. Research approach

When deciding on the appropriate research approach for a study, it is important to understand the philosophical assumptions that shape its methodological choices and research questions (Creswell, 2013). These are the foundation of the philosophy of science, which describes the 'use of abstract ideas and beliefs that inform our research' (Creswell, 2013, p. 16). These assumptions involve the conceptualization and comparison of research paradigms in four categories: *ontology, epistemology, axiology* and *methodology* (Creswell, 2013).

Ontology (*the nature of reality*) refers to the explicit or implicit assumptions related to the core nature of the phenomena under investigation. It is associated with the concept of reality – whether 'reality' is seen in an 'objective' or 'subjective' manner; the latter view holds that reality is multiple, because it is seen through many different individual lenses and depends on social context (Creswell, 2013; Burrell and Morgan, 2017).

Epistemology (*what counts as knowledge and how knowledge claims are justified*) refers to the beliefs associated with the foundations of knowledge and its dichotomy of 'true' and 'false'. These assumptions should determine whether knowledge is something that can be learned or has to be experienced (Creswell, 2013; Burrell and Morgan, 2017). In qualitative research, it is usually subjective and based on the personal experiences of individuals (Creswell, 2013, p. 20).

Axiology (*the role of values*) refers to the beliefs associated with how the researcher positions his or her values and goals in a study and acknowledges the presence of biases (Creswell, 2013, p. 20). *Methodology* (*the process of research*) refers to the assumptions made in terms of research process, such as the choice of research methods that are most appropriate for generating valid evidence (Creswell, 2013, p. 21).

Overall, the literature suggests using these four assumptions to understand the underlying research paradigms that guide the research and the researcher's beliefs. There are many research paradigms and interpretative frameworks, such as positivism, postpositivism, interpretivism, constructivism, hermeneutics and feminism, along with the transformative perspective, postmodernism and disability approaches, among others (Creswell, 2013, p. 23). This thesis follows the philosophical tradition of *postpositivism*, as it is the closest to the researcher's overall philosophical standpoint.

Postpositivism relies on the belief that there is an independent reality; however, our observations of it are imperfect, and all theories can be modified. This leads to the assumption that there exists only an approximate truth of reality, which cannot be perfectly or completely explained; however, we should aim to be as close to universal truth as possible. Thus, postpositivists believe in perspectives from multiple individuals and using multiple levels of data analysis. They also acknowledge that a researcher has at least partial bias in 'objectively' perceiving reality, as the results are built upon the cultural experiences and worldviews of the

researcher (Onwuegbuzie, Johnson and Collins, 2009; Creswell, 2013, p. 23). Overall, from the ontological perspective, postpositivism is close to *critical realism* (Guba and Lincoln, 2005; Järvensivu and Törnroos, 2010), which recognises the existence of objective reality but regards perception of it as restricted by human cognition (Guba and Lincoln, 2005). In line with the critical realism approach, the present study tries to find 'local, community-bounded, interacting forms of truth that are created and validated through dialog in different communities' *(*Järvensivu and Törnroos, 2010, p. 101).

In the present study, reality is represented by finding common truths regarding the notion of OI in diverse practitioner and academic communities. From the epistemological perspective, it strives to move closer to the truth by undertaking empirical investigation (Järvensivu and Törnroos, 2010, p. 102) of companies implementing OI and individuals working in OI settings, who have subjective perceptions on the topic. These notions are primarily visible in Publication I, where the goal was to find the common truth between perceptions of adoption of OI in companies when compared with the common classification of OI activities and knowledge assets in the scholarly community.

In terms of methodological assumptions, postpositivists and critical realists use similar approaches and acknowledge the possibility of applying different research methods: quantitative, qualitative or mixed. However, postpositivism can be found in the more systematic and rigorous approaches that are associated with quantitative studies involving data analysis and different data analysis strategies that use case comparisons (Creswell, 2013, p. 24; Onwuegbuzie, Johnson and Collins, 2009). In terms of qualitative data gathering, critical realism considers interviewing as a search-and-discovery mission with limited interference, as opposed to the active form of interviewing in which knowledge is jointly built both interviewer(s) and informant(s) (Järvensivu and Törnroos, 2010, p. 102).

However, from the perspective of ontological, epistemological and methodological assumptions, different philosophical positions can be adopted along the way (Järvensivu and Törnroos, 2010; Creswell, 2013, p. 24). In this regard, the present study also partially adopts a *pragmatic* perspective, especially in terms of the range of methods used. The pragmatic research paradigm focuses more on the central problem and the questions asked, rather than the methods employed (Creswell, 2013, p. 28). Thus, pragmatics are not committed to any one philosophy and call for 'freedom of choice' in selecting 'the methods, techniques and procedures of research that best meet their needs and purposes' (Creswell, 2013, p. 28). In practice, they can use multiple methods – qualitative, quantitative and mixed – of data collection to best answer the research questions, including analyses, descriptive and inferential statistics and so on. (Onwuegbuzie, Johnson and Collins, 2009). In terms of methodological assumptions, this approach is suitable for the present study because OI is a complex phenomenon that requires employing different lenses. For example, to best answer *RQ2*, a qualitative content analysis of job advertisements was incorporated in Publication IV, but stressed by in-depth semi-structured interviews in Publication V.

3.2. Methodological choices of the research

Given that the current literature on OI is broad and fragmented and that the research on the human and cultural sides of OI is scarce, this thesis is explorative in nature. Explorative research aims to extend existing theory (Eisenhardt and Greabner, 2007; Yin, 2014) and seeks to find new insights into the phenomenon under investigation (Robson, 2002). Overall, the primary research approach is qualitative, but it is complemented with a quantitative approach in Publication II. Qualitative research was chosen because it assists in gaining a more holistic understanding into complex phenomena like OI and its rationales (Eisenhardt. 1989; Creswell, 2013; Yin, 2014). Following the pragmatic research paradigm, the present study focuses on the central problem and uses multiple research methods. It employs three empirical research methods: a *multiple case study* in Publications I and V (Eisenhardt and Graebner, 2007; Yin, 2014), *content analysis* in Publication IV (Krippendorff, 2013) and a *survey* in Publication II. In addition, it uses a *conceptual research* approach in Publication III and uses findings from the existing literature on cross-cultural management, knowledge transfer and OI. Table 7 outlines the methodological choices in the individual publications, which are further described in the following sub-sections.

Table 7 Overview of the methodological choices in individual publications

	Publication I	Publication II	Publication III	Publication IV	Publication V
Title	*Mapping the perception and reality of open innovation*	*Where does the difference between OI adopters and non-adopters lie?*	*When culture matters: Exploring the open innovation paradigm*	*Roles and responsibilities of open innovation specialists based on analysis of job advertisements*	*Organizing for opening up: Responsibilities of Open Innovation Professionals*
Research objective	To explore OI practices within the practitioners' community, particularly in the context of understanding the OI paradigm and OI practices employed.	To identify differences and similarities between companies that claim to be at different stages of OI adoption and between adopters and non-adopters.	To identify key challenges in managing OI and ways to overcome them by incorporating findings from cultural studies.	To identify the common skills and competencies of OI specialists and their responsibilities and roles within their companies.	To explore 1) how firms organize OI units, 2) what kind of responsibilities and practices OI professionals employ and 3) how their roles and responsibilities change over time.
Research approach	Qualitative	Quantitative	Conceptual	Qualitative	Qualitative
Research purpose	Exploratory	Descriptive	Exploratory	Exploratory	Exploratory
Research strategy	Abductive	Deductive	N/A	Inductive	Inductive
Research method	Multiple case study	Survey	Literature review	Content analysis	Multiple case study
Sampling strategy	Purposeful contrasting, convenience	Stratified	N/A	Purposeful	Purposeful/theoretical
Data collection	Three interviews at three B2B companies: Manager of Technology at Alpha, Director of Technology at Beta, Director of Technology Portfolio at Gamma; follow-up survey; supporting secondary data.	454 responses from European companies; data collected between September 2014 and June 2015.	N/A	100 job announcements available in the public domain with *open innovation* in job title or job description; data collected over two periods 2014 and 2016.	Fifteen in-depth interviews with senior managers (Head of Open Innovation, Open Innovation Managers/Directors) at seven large organizations; supporting secondary data including companies' internal documentation.
Data analysis	Qualitative data analysis	Quantitative, ANOVA	N/A	Qualitative and quantitative data analysis	Qualitative data analysis

3.2.1. Multiple case study

The case study is a qualitative research approach that enables studying an organization, unit, individual, industry, process, program or even an event in a holistic and real-life setting (Yin, 2014). By incorporating this approach, researchers are able to gain rich insights on the focal phenomenon, its characteristics and the mechanisms affecting it (Eisenhardt and Graebner, 2007; Yin, 2014; Cresswell, 2013). More broadly, case studies are recommended when the researcher is asking 'how' and 'why' in unexplored domains; that is, when there is scant prior knowledge about the phenomenon (Eisenhardt and Graebner, 2007). Multiple case study research offers insights from cross-case analysis and thus increases transferability and theory building (Eisenhardt and Graebner, 2007) over the single case study approach. It is also chosen for theoretical reasons that include 'replication, extension of theory, contrary replication, and elimination of alternative explanations' (Eisenhardt and Graebner, 2007, p. 27) and allows for exploring individuals (or organizations) through multifaceted relationships and interventions (Yin, 2014). One vital procedure in conducting a multiple case study is to identify the cases appropriately. The selection is usually based on *purposeful/purposive* sampling, which means deliberately choosing cases that can offer new insights (Eisenhardt and Graebner, 2007; Creswell, 2013, p. 100; Patton, 2015), as by selecting contrasting or comparable cases. In addition, a convenience sampling strategy can be employed.

In the present study, Publications I and V employ an explorative multi-case research methodology (Eisenhardt and Graebner, 2007). This approach was chosen because it enables in-depth exploration of the OI phenomenon. The main objective in Publication I was to explore OI practices within companies in real-life settings, with an emphasis on their approach and understanding of the OI paradigm and the OI practices employed. Thus, a cross-case analysis was the most appropriate approach. In addition, that technique assisted in understanding the ambiguity of the OI concept by analysing contrasting cases. The research applied an abductive process (Dubois and Gadde, 2002), as it focused on comparing existing theories and research to empirical observations and included a dynamic frame. In Publication V, given that the objective was to explore how firms organize formalized OI units and what responsibilities and practices OI professionals apply over time, undertaking a cross-case analysis of several companies with formalized OI units ensured that the researcher could obtain empirically rich insights into this relatively unexplored management practice (Mortara and Minshall, 2014). Here, the research followed an inductive (empirically based) approach that is common in qualitative social science research (Creswell, 2013). In addition, a multiple-level analysis was employed (Yin, 2014) to explore the individual characteristics and responsibilities of OI professionals and OI units.

Data collection and analysis

In Publication I, a purposeful and contrasting sampling strategy (also called 'purposeful maximal sampling' (Creswell, 2013, p. 100)) was applied, which means that the case companies were deliberately selected based on different industry contexts and stages of transition to OI implementation. As a result, three case companies operating in B2B markets were selected, each at a different stage of OI adoption – adopting OI, in transition towards OI and closed innovator. All three case companies have their headquarters in Finland and operate globally. A brief description of the case companies is presented in Table 8.

Table 8 Information about the case companies in Publication I (Dabrowska, Fiegenbaum, Kutvonen, 2013)

Firm pseudonym	Areas of activities	Annual turnover (approx. EUR in mln)	R&D percentage of turnover (approx. in %)
Alpha	power and automation technologies	30,000	3.7%
Beta	process industries	7,000	3%
Gamma	minerals and metals processing technology	2,000	2%

The data includes three semi-structured and in-depth interviews with the Manager of Technology at company Alpha, the Director of Technology at company Beta and the Director of Technology Portfolio at company Gamma, supported by secondary data sources. To avoid individual researcher's bias, investigator triangulation in the data collection was applied by ensuring that at least two researchers were involved in interviews and data analysis (Mathison, 1988). The duration of the interviews was between 67 and 153 minutes. All interviews were recorded and transcribed, and the NVivo 10 software program was used to code and analyse the materials. In addition, to cross-check and buttress the validity of the results, an online self-completed questionnaire was designed and filled out by interviewees. The questionnaire included Likert-scale and multiple-choice questions related to current and future OI activities and other questions related to knowledge components; these were developed by Savitskaya and Dabrowska (2012) as part of the larger research project.

Publication V followed a theoretical and purposive sampling logic (Patton, 2015) in which the main criterion was to identify and select companies who either have formalized OI units or employ OI professionals per job title. Subsequently, semi-structured interviews with senior-level managers who held positions of OI Manager or Director or Head of OI unit at seven different firms were conducted (using virtual communication software due to geographical distance). The selected companies were different in size and operated in several industries (see Table 9). In addition, to obtain greater insight, in-depth interviews were conducted with experienced OI consultants equipped with OI tools who closely collaborate with large firms implementing OI.

Table 9 Overview of companies in the study (Publication V; Dabrowska, Keränen, Mention, 2017)

Firm	Industry	Employees (Global)	Country (launch of open innovation unit)	Year (launch of open innovation unit)	Participants
Alpha	Diary	19,000+	Denmark	2013	Head of Open Innovation
Beta	Food & Beverages	5,000+	Croatia	2014	Open Innovation Manager
Gamma	Financial services	165,000+	Switzerland	2015	Open Innovation Developer
Delta	Pharmaceutical	5,000+	Denmark	2013	Head of Open Innovation in Research
Epsilon	Luxury Goods & Jewelry	10,000+	Austria	2013	Director Open Innovation Networks; Innovation Ventures and Infrastructure

Zeta	Utilities, Chemicals, Medical devices	*50,000*	France	2013	Customer innovation support
Eta	Consumer Goods	*55,000*	Italy	2011	Open Innovation Director
Theta	*Consulting*	*2*	Australia	(consulting on OI)	Consultant
Iota	Management Consulting	*10,000*	Australia	(consulting on OI)	Chief Edge Officer
Kappa	Consulting	*2*	Netherlands	(consulting on OI)	Consultant
Lambda	Consulting	*2*	Australia	(consulting on OI)	Consultant

The interview guide was focused on thematic questions. The interviews ranged from 50 to 105 minutes and followed the same protocol as in Publication I (i.e., recorded, transcribed verbatim and analysed using NVivo software). In both publications (Publication I and V), the use of open-ended questions gave the interviewees the flexibility to freely express their viewpoints and facilitated the emergence of naturally occurring data (Creswell, 2013). The interview data was enriched with secondary data (internal company documents on OI strategy and external announcements related to OI, company websites, press releases and other publicly available information on companies' OI-related activities). Following established exploratory and discovery-oriented study protocols, the coding used an inductive grounded theory approach with open, axial and selective coding (Corbin and Strauss, 2015).

3.2.2. Content analysis

Publication IV employed content analysis as a primary research method. Content analysis has been defined as 'a research technique for making replicable and valid interfaces from texts (or other meaningful matter) to the contexts of their use' (Krippendorff, 2013, p. 24). This inductive approach allows generating in-depth knowledge and rich new insights as well as strengthening the understanding of particular phenomena by analysing relatively unstructured data derived from various sources without interference from the researcher(s) (Krippendorff, 2013). The purpose of Publication IV was to identify the common skills and competencies of OI specialists and their responsibilities and roles within their companies. In addition, it aimed to explore certain patterns, trends and differences within OI job profiles. Given that employing OI specialists is an emerging phenomenon, there are no prior studies that analyse these specific OI job positions, and empirical research on competencies for OI specialists and their roles is limited. Thus, a content analysis approach was chosen to analyse the rich dataset of publicly available job advertisements for OI-related positions. This approach, which is novel from an OI research perspective, has been widely adopted in other disciplines. For example, content analysis of job advertisements has been employed in the HR management field to analyse HR manager positions and their IT competencies (Poba-Nzaou, Uwizeyemungu and Clarke, 2018), certified HR professionals (Aguinis et al., 2005) and the competencies of project managers (Ahsan, Ho and Khan, 2013). In communications research it has been used to analyse, for example, the skills requirements of information systems positions (Todd, McKeen and Gallupe, 1995) and in Big Data (Gardiner et al., 2017).

Data collection and analysis

A purposive sampling strategy was employed in Publication IV (Krippendorff, 2013; Patton, 2015): job advertisements with the term *open innovation* in the job title or job description and posted in English, regardless of location, were selected for the sample. Data collection occurred over two periods in 2014 and 2016 to investigate certain patterns and changes in OI profiles between the two periods. To select the job advertisements, the Career Jet (www.careerjet.com) search engine was used, as it compiles job advertisements posted in a variety of online recruitment channels. Overall, 100 job advertisements were selected for analysis. As there is no specific protocol for content analysis of job advertisements, a pragmatic approach to data methodology and analysis was employed, with an emphasis on selecting the techniques that would best assist in answering the research question (Krippendorff, 2013). Thus, the primary approach to data analysis was qualitative, complemented with quantitative data analysis. First, all the data was collected into an MS Excel dataset that was later exported into the NVivo10 software for further qualitative analysis that included open, axial and selective coding (Corbin and Strauss, 2015). In addition, a quantitative approach focused on analysing the occurrence and frequency of words used to describe the required skills was used; Wordle (www.wordle.net). In addition, the OI activities that were mentioned as part of the responsibilities of OI specialists were grouped into inbound, outbound and coupled according to Chesbrough and Boger's (2014) classification and then counted to determine the intensity of employee responsibilities from the sample.

3.2.3. Survey

Publication II used a quantitative research approach and employed a survey as a research method to identify differences and similarities between companies at different OI transition stages, including non-adopters of OI. The main advantage of using this method is the ability to analyse larger datasets and 'provide statistical estimates of the characteristics of a target population' (Fowler, 2013, p. 8).

Data collection and analysis

For data collection, an interactive method in the form of an online-based questionnaire was used (Creswell, 2013), which is very common in innovation management research domains. The questionnaire itself was developed as part of a larger-scale research project – the European Academic Network for Open Innovation (OI-Net) – with the main goal of analysing industrial needs for OI education in Europe (see www.oi-net.eu for further details). The project included many academic partners who contributed to the development of the questionnaire. However, the questionnaire was also based on the findings from Publication I; it included questions on the intensity of the adoption of OI activities and on the stage of OI implementation. In addition, it used well-established and validated questionnaires such as the Community Innovation Survey and other questions that were based on a thorough analysis of the academic- and practitioner-oriented literature on OI and its requisite skills. The proposed measures were later revised by experts' feedback, and a pilot study was performed. Apart from English, the revised and validated questionnaire was later translated into 12 other European languages to increase the response rate and applied to the large-scale self-administered online questionnaire using Webropol (See Appendix 1). The targeted respondents were innovation, R&D personnel, top management and HR representatives (some questions were related to HR functions). Data collection took place between September 2014 and June 2015 and was conducted in 38

European countries from all regions of the continent. A stratified sampling strategy was employed (Lee and Lings, 2008) based on a selection of companies in the five to ten top industries contributing to a country's GDP. This resulted in a sample size of 525 companies (response rate: 10%); however, for the purpose of the present study, 454 responses were analysed after the removal of incomplete responses and responses provided by representatives of public organizations (e.g., universities and public research institutes) that were not focus of the present study.

In Publication II, three groups of questions were analysed (see Publication II for a detailed description of the operationalization of variables):

1) Single-choice response format: company's stage of OI implementation: Stage 1 'We are not adopting and not planning to adopt open innovation'; Stage 2 'We are not currently adopting open innovation, but plan to implement OI in the nearest future'; Stage 3 'We are in the early stages of implementing OI activities'; Stage 4 'We are in the process of refining OI activities and shaping programmes to help establish best practices in OI' and Stage 5 'We are experienced adopters of OI (processes, procedures and best practices are in place)'.
2) Eight-point Likert scale: intensity of adoption of OI activities – 13 variables representing OI activities based on the classification offered by Chesbrough and Brunswicker (2013).
3) Seven-point Likert scale: fifteen statements indicating various organizational capabilities related to organizational practices in terms of fostering OI within the organization and knowledge transfer.

Data was analysed using ANOVA with post-hoc tests, including Welch's ANOVA to limit the risk of errors due to non-homogenous variances.

3.3. Quality of the research

In order to evaluate the quality of the research, the present study incorporates postpositivist trustworthiness criteria (Guba and Lincoln, 2005) consisting of *credibility, transferability, confirmability* and *dependability*. Given that the majority of the publications presented in this thesis use a qualitative approach, these criteria are a better fit with the overall research approach. These criteria, also known as 'parallel criteria' (Guba and Lincoln, 2005), are derived from quantitative studies that use the categories of *validity, generalizability, objectivity and reliability*, to verify the rigor of the research (Miles and Huberman, 1994).

The *credibility* of qualitative research corresponds to internal validity and relates to the extent to which the findings reflect the real-life settings being studied (Lee and Lings, 2008). In this thesis, credibility was achieved in numerous ways. First, the research was conducted within three larger-scale projects that involved multiple partners (OISIM, OI-Net and Overcome; see Appendix 2). The ongoing research results were presented during project meetings that included several project researchers, partnering firms and independent experts. Peer debriefing was also achieved by co-analysis with co-authors. Peer scrutiny of this research by others, including academics, was realized by presenting the findings at a total of seven academic conferences with peer review processes. Three publications were published in academic journals with double-blind review processes. Second, the research employed data triangulation. For example, multiple data types were used in Publications I and V, including interviews with different

people from different firms and industries, but stressed by multiple sources of secondary data (e.g., annual reports, press releases, internal documentation on OI strategy and processes).

The *transferability* of qualitative research relates to external validity and should answer the question of whether the findings can be generalized and applied to other situations (Yin, 2014). However, given that qualitative research is usually based on small sample sizes and does not include statistical analysis, the findings cannot be transferred in a straightforward sense (Morrow, 2005). Instead, the study should provide proper information on the context, particular characteristics and geographical coverage in which the fieldwork was carried out in order to assess whether the findings are relevant and useful for people in other settings (Shenton, 2004). In the present study, transferability is controlled by the limitations of the study. However, analysing companies operating globally in different industries and having headquarters in different countries increases the transferability of the findings. Moreover, the individual publications provide in-depth information on the theoretical or convenience sampling, which will assist readers in determining whether the findings are applicable and useful in their contexts.

Confirmability relates to objectivity in the interpretation of the results against the biases, beliefs of the researcher(s) (Shenton, 2004). To ensure the confirmability of the present study, triangulation played a role. In addition, direct quotations from interviews were used, and the findings were compared with the findings of other researchers in the field.

Dependability refers to the extent to which the findings are explicit and repeatable. In the present study, dependability was achieved by providing in-depth information on the research design, including the sampling protocol and its implementation in both individual publications and the thesis as a whole. In addition, the interviews were recorded, transcribed and stored. In terms of Publication II, which uses a quantitative method, proper reference to the website with further information on the study and questionnaire has been provided in the acknowledgement section. Finally, the questionnaire itself has been appended to this thesis (see Appendix 1).

4. PUBLICATIONS AND REVIEW OF THE RESULTS

Chapter 4 outlines the main objectives, findings and contributions of the individual publications, followed by a summary of the thesis as a whole.

4.1. Publication I: Mapping the perception and reality of open innovation

Main objective

The objective of Publication I was to explore OI practices within the practitioner community, particularly in the context of understanding the OI paradigm and the practices employed. This publication analysed the distinct innovation process in three case companies, each representing a different stage of OI adoption (implementing OI, in transition to implementing OI, closed innovator). It examined OI activities based on the developed *framework of perceived, targeted and actual openness*.

This publication was the foundation for further investigation into what distinguishes OI adopters from non-adopters, thus contributing to answering *RQ1* of the thesis.

Main findings

The main research findings build upon an in-depth case analysis of three R&D-intensive large companies operating in the B2B markets. They indicate the existence of a discrepancy between firms' perception of the adoption of OI activities (Chesbrough and Brunswicker, 2013) and those companies' actual stage of transition. This means that, the case companies perceived themselves as being at different stages of (open) innovation adoption (implementing OI, in transition to implementing OI, closed innovator), but in fact, they all fell into a comparable level of actual openness when compared to one another (see Figure 5). For example, company Gamma perceived itself as an OI adopter and associated this term with opening up to internal idea generation, but it remained within its existing organizational boundaries. Beta, on the other hand, perceived itself as a closed innovator, but it had adopted inbound OI and, unlike the others, had been actively involved in finding new markets for unutilized patents and technologies (outbound OI). This indicates the sometimes profound ambiguity in companies' understanding of OI.
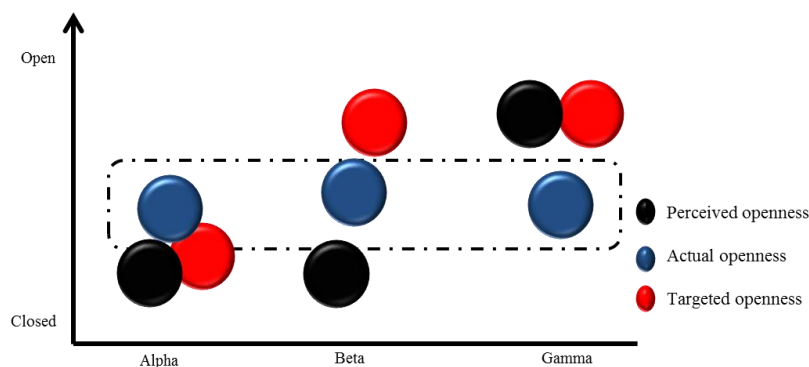

Figure 5 Perceived, actual and targeted openness of three case companies

Main contribution

Publication I sheds light on the understanding of OI by companies and highlights the problems resulting from the various existing overlapping OI classifications, definitions and terminologies. Thus, it contributes to the ongoing debate in the innovation management literature on the false dichotomy between closed versus open innovation (Trott and Hartmann, 2009; 2013; Dahlander and Gann, 2010). In line with the studies by Dahlander and Gann (2010 and Trott and Hartmann (2013), it emphasizes the need to explore the various types and degrees of openness that can benefit companies. It also stresses the need to distinguish between openness to external ideas as a company philosophy and implementing OI as an approach to manage the innovation process, considering all three types of OI (inbound, outbound and coupled). Furthermore, this publication proposes a framework of actual, perceived and targeted openness that could be used by both practitioners and research scholars to map OI activities.

4.2. Publication II: Where lies the difference between open innovation adopters and non-adopters?

Main objective

Publication II follows up on the research from Publication I and analyses the differences and similarities between companies representing different stages of self-proclaimed OI adoption, including OI non-adopters. The main objectives were to compare companies according to their *self-assessed* stage of OI adoption and to identify the differentiating factors in terms of intensity of adoption OI activities and organizational-level capabilities.

Main findings

Based on a survey of 454 European companies, the findings suggest that the main difference between the intensity of adoption of OI activities is portrayed only at the extremes (e.g., experienced adopters vs. non-adopters). Moreover, significant differences can be observed when analysing organizational-level capabilities. Thus, the findings uncover the crucial role of organizational-level capabilities, establishing purposive organizational practices and deploying supporting mechanisms to foster the successful implementation of OI. Efforts like *providing education and training, reward systems, developing knowledge management systems, having the support of top management* and *nurturing collaborative and risk-taking attitudes* are the main differentiating factors between experienced OI adopters and non-adopters of OI.

Main contribution

The findings contribute to the OI literature by advancing the understanding of how OI is managed and organized within a variety of companies. They contribute to the conceptual development of OI strategy (Chesbrough and Appleyard, 2007) by suggesting that companies that intend to implement OI need to adopt a more holistic approach at the organizational level by establishing proper organizational practices and supporting mechanisms to foster knowledge flows within and beyond companies' organizational boundaries. By identifying these organizational practices and supporting mechanisms, Publication II also makes a practical contribution.

4.3.   Publication III: When culture matters: Exploring the open innovation paradigm

Main objective

The main objective of Publication III was to examine how cultural studies can help overcome the challenges related to managing OI, especially in terms of collaboration outside a company's boundaries in the broader geographical landscape.

Main findings

This conceptual paper identifies the key challenges in managing OI that have cultural roots. Examples include the *NIH syndrome* (Chesbrough, 2003; Katz and Allen, 1982), the *NSH syndrome* (Lichtenthaler et al., 2010), *resistance to change, trust, readiness to take risks, failure tolerance, participants' motivation and differences in communication contexts*; these can all be at least partly explained through the lenses of national and organizational culture studies. Thus, Publication III provides insights into how issues related to the implementation of OI in different cultural settings can be overcome by incorporating findings from cultural studies. It also suggests that human factors shape patterns in dealing with knowledge transfer, openness to external ideas and technologies; they therefore should not be ignored in managing OI.

Main contribution

Although the extant literature on OI emphasizes the need to consider the impact of differences in national culture upon OI (e.g., Lichtenthaler, 2011; Muethel and Hoegl, 2010; Vanhaverbeke et al., 2014), scant work of this sort has actually been carried out. Thus, Publication III helps fill this research gap and contributes to cross-cultural studies by combining these two research lenses. It develops a framework of reference that links the main issues in implementing OI across cultural borders and their effects from the cultural perspective. The findings advance the understanding of why the implementation of OI may succeed in some cultures and fail in others. The conceptual framework developed can greatly assist mangers who are trying to identify potential barriers in opening up to the external environment across geographical borders and find solutions to overcome them. Lastly, Publication III defines a research agenda for OI scholars that is built on cross-cultural studies.

4.4.   Publication IV: Roles and responsibilities of open innovation specialists based on analysis of job advertisements

Main objective

The main objective of Publication IV was to identify the common skills and competencies of OI specialists and their responsibilities and roles within companies.

Main findings

By analysing 100 global job advertisements with *open innovation* in the job title or job description, the findings identify the most desired set of skills needed to fulfil OI position requirements (e.g. *communication and interpersonal skills*, *strategic thinking*, *problem-solving skills, leadership and project management skills, ability to influence others)*. They also suggest

that large companies have started to expect *previous work experience in start-up* environments from OI candidates. In addition, *the ability to influence other*s, especially in ecosystem engagement activities, has become increasingly important. This indicates the growing role of OI specialists as the main drivers of innovation ecosystem building and engaging with the start-up community.

In addition, Publication IV identifies the key areas of responsibility of OI specialists, which are primarily related to managing inbound OI activities (*scouting for new ideas and technologies, use of OI with intermediaries, cooperation with universities and start-ups*), along with coupled OI activities (e.g., *building and managing strategic partnerships, ecosystems and networks*). Other key areas include the development of an OI strategy, OI project management including cross-functional management, development and management of OI platforms, managing OI events and IP management. The results reveal the truly multidisciplinary nature of the tasks and responsibilities expected from OI specialists, including those like talent management, recruitment and selection or training that are derived from HR management practices.

Lastly, in terms of organizational structure, the findings in Publication IV show the rapid extension of OI functions beyond R&D departments, as originally observed by Henry Chesbrough (2003). Other identified organizational functions that companies seek to employ OI professionals include for example, marketing and sales, corporate communications or information technology.

Main contribution

While many scholars acknowledge that companies have established OI units and created new job positions for OI specialists (e.g., Mortara and Minshall, 2011; 2014), no prior studies have focused on analysing what these OI specialists are expected to do at their firms or the skills and competencies they need to possess. Thus, Publication IV contributes to the OI literature by focusing explicitly on the emerging job positions of OI specialists and highlighting their key responsibilities and desired set of skills. Moreover, it addresses the call issued by a large number of OI scholars (e.g., Dodgson, Gann and Salter, 2006; West, Vanhaverbeke and Chesbrough, 2006; Dahlander and Gann, 2010; Randhawa, Wilden and Hohberger, 2016; Bogers, Foss and Lyngsie, 2018) to investigate the human side of OI. Accordingly, Publication IV builds on the human capital and human resources literature and emphasizes the importance of investigating the role of emerging OI positions in the successful implementation of an OI strategy. It calls for new multidisciplinary research building upon the HR management and OI streams of research.

Publication IV also provides insights for innovation and HR managers in terms of designing job descriptions of OI specialists, recruitment and selection, as well as creating training programs focused on harnessing the desired skills and attitudes. It opens new perspectives for OI education by emphasizing the need to foster multidisciplinary skills and to include OI topics in higher education disciplines beyond innovation management programs.

4.5. Publication V: Organizing for Opening up: Responsibilities of Open Innovation Professionals

Main objective

Publication V follows up on the research from Publication IV and analyses the responsibilities and practices employed in OI units and/or by OI professionals. The objective of Publication V was to explore 1) how firms organize OI units, 2) what kind of responsibilities and practices OI professionals employ and 3) how their roles and responsibilities change over time.

Main findings

The findings built upon in-depth interviews with senior-level managers holding positions like Open Innovation Director (or Manager) or Head of OI unit at seven large companies. First, the findings suggest that companies employ new and dedicated organizational functions of OI units or single OI professionals to emphasize and communicate a corporate shift towards OI. The findings suggest that, in order to succeed, these units and/or OI professionals need to be empowered within organizational structures by having own accountability rules and budgets. Second, the findings identify four categories of responsibilities for OI professionals that correspond to two dimensions: a focus on internal and external stakeholders and a focus on technical and social matters. Third, they indicate the changing role and focus of responsibilities as organizational OI capabilities mature. Thus, the results indicate that factors like the type of industry, firm size and the maturity level of OI implementation impact on the type of responsibilities that OI professionals have. This leads to an increased focus on the development and influencing of innovation ecosystems in the later stages of OI adoption or, once the OI has been embedded in corporate innovation philosophy as the new innovation DNA, formal OI units may be discontinued.

Main contribution

The findings contribute to the existing OI literature in three ways. First, they show how the responsibilities of OI professionals and units range within the two-dimensional model, as well as how they change over time. Thus, they shed light on an underexplored aspect of employing specific innovation units or professionals to manage OI (e.g., Mortara and Minshall, 2011; 2014; Manzini, Lazzarotti and Pellegrini, 2017). Second, while previous research has focused on OI practices that were often conducted by different organizational units and teams (Chesbrough and Crowther, 2006; Salter, Criscuolo and Ter Wal, 2014), this publication advances existing research by framing OI as an organizational function and identifying a set of practices that are strategically and formally assigned to OI professionals. Third, the findings propose a set of moderating factors influencing the responsibilities of OI professionals as organizational OI capabilities mature over time.

In addition, the findings contribute to the organization management literature and HR management by highlighting the creation of new organizational functions and professions that simply did not exist even 15 years ago. Apart from this, this publication offers several important insights for practitioners that may assist in understanding how OI can be managed and organized. It offers managers dealing with OI an analytical framework to evaluate and design new practices for harnessing OI or to use as a base for the recruitment and training of OI professionals.

4.6.   Summary of the publications

Publication I was the starting point of the research presented in this thesis. Applying a multiple case study approach permitted interesting findings to emerge regarding the perceptions of OI implementation. Thus, the main role of Publication I in the overall dissertation process was to identify the problem of the misunderstanding and misinterpretation of OI in the practitioner community, to find solutions to assist companies in organizing and managing OI and to contribute to the theoretical conceptualization of OI. It led to a further exploration of the factors distinguishing companies at different stages of OI adoption, including companies who have not adopted this paradigm (Publication II). As a result, it provided insights on how companies organize and implement OI. Table 10 provides an overview of the individual publications and their main findings.

PUBLICATIONS AND REVIEW OF THE RESULTS

Table 10 Overview of the individual publications

	Publication I	Publication II	Publication III	Publication IV	Publication V
Title	*Mapping the perception and reality of open innovation.*	*Where lies the difference between open innovation adopters and non-adopters?*	*When culture matters: Exploring the open innovation paradigm.*	*Roles and responsibilities of open innovation specialists based on analysis of job advertisements*	*Organizing for opening up. Responsibilities of Open Innovation Professionals*
Objective	To explore the OI practices within the practitioners' community, particularly in the context of understanding OI paradigm and employed OI practices.	To identify differences and similarities between companies who claim to be at the different stage of OI adoption (also non-adopters).	To identify key challenges in managing OI and ways to overcome them by incorporating findings from cultural studies.	To identify common skills and competencies of OI specialists as well as their responsibilities and roles within the companies.	To explore 1) how firms organize OI units; 2) what kind of responsibilities and practices OI professionals employ and 3) how their roles and responsibilities change over time
Main findings	The findings suggest that companies understand OI differently. They emphasize the need to differentiate between openness to external ideas as a corporate philosophy and OI as a holistic approach to managing the innovation process, which consists of both inbound and outbound innovation activities.	Out of five identified stages of OI adoption in companies, the findings recognize differences in the intensity of adoption of OI activities only at the extremes. Significant differences are portrayed at the organizational level in terms of establishing purposive organizational practices and supporting mechanisms.	The findings identify key culturally rooted challenges in managing OI and suggest that the human factor should not be neglected in managing OI. They suggest incorporating the findings from cultural studies into the OI research agenda.	The findings identify the desired set of skills for OI professionals, emphasizing the ability to influence others and prior start-up experience as important requirements. The findings identify key areas of responsibility of OI professionals with an emphasis on managing inbound and coupled OI.	The findings identify four categories of responsibilities for OI professionals and emphasize the importance of dedicated OI units at the early stages of OI implementation.
Main contribution	The study develops a framework of actual, perceived and targeted openness to map the OI activities employed by real-world companies.	Advancing the understanding of how OI is managed and adopted within various companies. Identifying the supporting practices employed by companies to manage OI.	The study proposes a framework of reference: the effect of cultural dimensions on OI implementation.	The study sheds light on the underexplored aspect of employing OI professionals.	The study sheds light on the formal organizational units and OI professionals and their role in a company's transition to OI implementation.

5. DISCUSSION AND CONCLUSIONS

The main objective of this thesis was to explore *how firms organize and implement OI*. The research topic was approached both conceptually and empirically by applying a primarily qualitative research approach. This study built upon prior research from several literature streams to contribute first and foremost to the OI literature.

Overall, this thesis examined the phenomenon of the implementation of OI, which is highly relevant to both academia and practitioners. The first chapter focused on describing research gaps, research questions, positioning and the scope of the research while providing key definitions. The second chapter described the concept of OI and how companies organize for it, taking into account different perspectives and various supporting streams of literature. The third chapter highlighted the overall research design and was followed by Chapter 4, which summarized the main findings from five individual papers. Chapter 5 discussed the main contributions of the overall research study presented in the dissertation. Thus, in this section, the main objective and four research questions are reviewed. This is followed by theoretical and managerial implications and, finally, limitations and possible avenues for future research.

The objective of *how firms organize and implement OI* was narrowed to four research questions. Overall, the answers to these questions were intertwined in different publications that at the end combine the related elements into a holistic approach.

RQ1: How do firms understand and adopt OI?

The first question deals with the problem of the conceptualization of OI by companies and the way OI is adopted by various companies. First, the answer to this question was presented in Publication I, where it was shown that the degree of understanding of OI varies substantially between companies, from associating OI with only internal openness to employing both inbound and outbound modes as a more conscious, strategic approach. Second, Publication II distinguished between companies at different stages of OI adoption, including those perceiving themselves as OI non-adopters. The results indicate that the implementation of OI activities takes place even in companies that do not acknowledge their adoption of OI. They demonstrate that, regardless of the OI modes (inbound or outbound) employed and the OI activities associated with them (Chesbrough and Brunswicker, 2013), the crucial differentiating factor for understanding OI for companies and reaching a certain maturity level of OI adoption (Enkel, Bell and Hogenkamp, 2011) lies in considering its strategic importance and the development of organizational-level capabilities, purposive organizational practices and supporting mechanisms to facilitate OI implementation (Ketchen et al., 2007). The examples include providing *education and training* on OI*, rewards* for engaging in OI activities*,* development of the *knowledge management systems,* having the *support of top management* and nurturing *collaborative and risk-taking attitudes* of employees*.*

Publication V explored how companies employ formalized OI units and/or formal OI job positions within their organizational structures to drive the organizational shift to OI and bring it to the strategic level.

RQ2: What is the role of HR practices in OI implementation?

The role of HR practices are addressed primarily in Publication IV and V and implicitly in Publications II and III.

Overall, this thesis suggests that HR practices play a crucial role in the successful implementation of OI, as they help to facilitate organizational changes, shape a collaborative organizational culture and as a result affect (open) innovation outcomes. The present study emphasizes the need to recognize the strategic importance of HR practices (performed not in isolation but treated as bundle of activities (Wright and Mcmahan, 2011)) to facilitate OI implementation. HR practices should focus on supporting more open attitudes on the part of employees regarding knowledge inflows and outflows across organizational boundaries. The study provides empirical evidence that some companies have already recognized the importance of this point, as they involve HR management in the implementation of OI. The changes needed in HR practices presented in this study include those that correspond to the management of skills, abilities and behaviours of employees involved in OI activities, such as creating reward systems, education programs and training courses on OI. In addition, the study sheds light on the organizational design and creation of new organizational functions dealing directly with OI implementation while identifying the key responsibilities of the emerging role of formal OI professionals. Thus, this study provides insights into the job design and recruitment practices employed by companies.

RQ3: What are the main roles, responsibilities and skills of OI professionals?

This study shows that companies who adopted OI formed OI units or teams and created new job positions related to OI management. In this particular case, the responsibility of the OI professional is manifold and incorporates the different roles of *boundary spanner, innovation champion, change agent* and *gatekeeper* into one holistic and formalized job position. In addition, the results show that, to drive further organizational change in the direction of OI and create an OI culture, some formal OI professionals create informal OI ambassador roles across organizational structures (Publication V). The findings also indicate that the roles and focus of responsibilities of OI professionals will change as an organization's OI capabilities mature.

While publication IV identifies the key areas of responsibility for OI specialists that are part of the official job description, Publication V extends this insight by identifying tasks and responsibilities that are not necessarily written down but are nevertheless part of everyday routines. It identifies tasks based on two dimensions – a focus on internal and external stakeholders and a focus technical and social elements. In addition, both publications found evidence for the growing importance of OI professionals in developing and managing the innovation ecosystem and engaging in collaborations with start-ups.

In terms of required skills, the study found support for the arguments of other scholars (e.g., Mortara and Minshall, 2009) on the multiple skills that OI professionals should possess, with an emphasis on strong *interpersonal, communication, leadership, problem-solving, team-working* and *project management skills*, in addition to *strategic thinking*. The ability to influence others is becoming a basic requirement of the OI job position, as is *prior start-up work experience* (Publication IV).

RQ4: How do different cultural contexts influence OI implementation?

This research question reflects the contribution from Publication III. Thus, to avoid repetition, a summary of the findings is presented in section 4.4, while detailed results can be found in the next part, which presents the full publication. However, the theoretical and managerial contributions are discussed below.

5.1. Contribution to theoretical discussion

The findings of the present study provide important contributions that advance the scholarly understanding in OI research and other research streams (in line with Corley and Goia (2011) on what constitutes a theoretical contribution). These contributions are first discussed in terms of an integrated framework that summarizes the main contributions of this study, which is followed by shedding light on and filling in the research gaps that were identified in the first chapter. Finally, further theoretical contributions are presented. The reason for describing the sometimes-overlapping contributions in this way is that the contributions to the identified research gaps were intertwined in different publications. Likewise, the answers to the research questions, except for *RQ4* in Publication III, were not addressed in individual publications. This approach should better acquaint the reader with the overall contribution of this thesis to OI, which is such a complex and rapidly evolving phenomenon.

Organizing for open innovation: Summarizing the main contributions of this study.

Overall, based on the research findings obtained through the dissertation research process, a conceptual framework for organizing OI has been developed that weaves the related elements from the five publications into a holistic picture. Figure 6 highlights the most important components analysed in this dissertation. First, it is obvious that there is no generic rulebook on how companies should organize and manage OI. Many scholars have already emphasized that one size does not fit all and that the implementation of OI is highly context-specific (Huizingh, 2011; Tidd, 2014: Bogers et al., 2017). Nonetheless, following a critical realism approach, the present study aims to move closer to describing the common understanding of the notion of the OI paradigm that can be found in different practitioners' communities. It acknowledges that choices to adopt certain OI activities can be determined by external environment characteristics (Chesbrough and Crowther, 2006), firm size, technology and other factors (Dodgson, Gann and Salter, 2006). However, this thesis indicates that implementing OI should be treated more holistically as an innovation management strategy; it should include the development of supporting organizational-level mechanisms to manage knowledge inflows and outflows. It should not necessarily focus solely on specifically OI activity (e.g. crowdsourcing, collaboration with universities) but should emphasize the conscious and deliberate commitment of a company to pursue an OI path.

From *the firm-level perspective*, Publication I suggests identifying the intensity of adoption of OI activities with a focus on the current and desired stages. Publication II extends the understanding of OI by identifying five stages of OI adoption that represent a company's perceptions of its OI maturity. Here, apart from analysing intensity of adoption of OI activities, the findings suggest that implementation of OI requires a certain level of organizational readiness. Moreover, the adoption of OI and reaching a particular level of maturity (Enkel, Bell and Hogenkamp, 2011) is determined by organizational-level capabilities, supporting mechanisms and organizational practices. The findings also highlight the importance of strategically aligning OI with the business strategy, thus supporting calls of other scholars to further investigate the links between OI and firm's business strategy (e.g. Vanhaverbeke and Cloodt, 2014; Appleyard and Chesbrough, 2017).

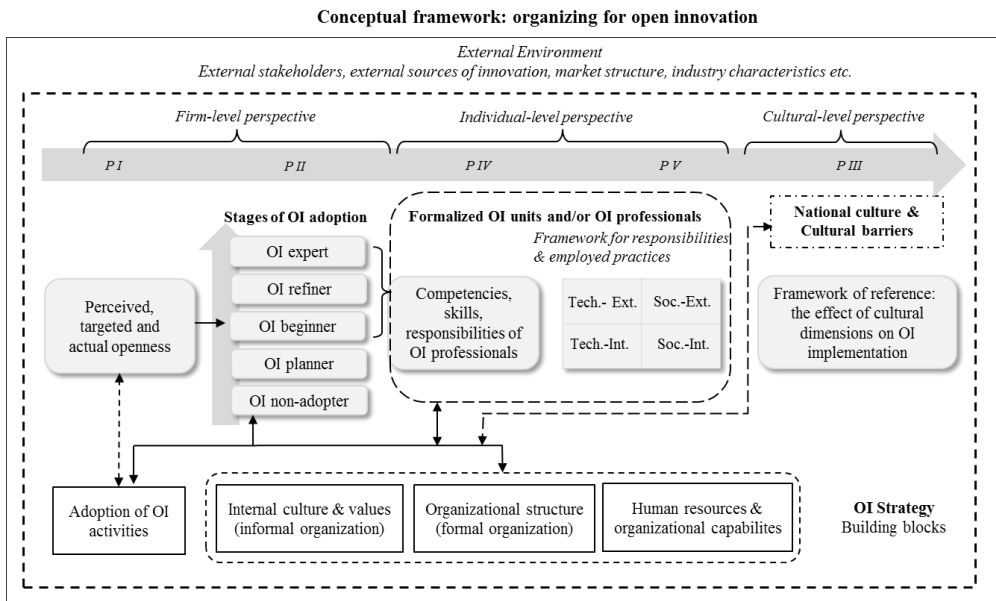**Conceptual framework: organizing for open innovation**

Figure 6 Framework of organizing for open innovation, summarizing the main contributions of this study

The bottom row of Figure 6 highlights the four main building blocks that should be considered when strategically organizing for OI. They are directly or indirectly intertwined in all five publications that make up this thesis. First, the *adoption of OI activities* represents *which* OI activities and *how* intensively the company is adopting or planning to adopt them. The successful adoption of OI activities also depends on internal processes, internal culture and values, organizational structure and human resources and organizational capabilities. The latter three blocks build on Teece's (1996, p. 208) seminal work, which identified them as key 'determinants of the rate and direction of firm level innovation'. The work in this dissertation extends Teece's insights by applying them further in the OI field.

Internal culture and values represents the informal organizational construct. In line with other scholars, the present study argues that organizational culture can greatly aid OI implementation. However, it may also prevent OI adoption (Mortara and Minshall, 2014). The cultural challenges are addressed in Publications II and III. They highlight, for example, the NIH syndrome (Chesbrough, 2003; Katz and Allen, 1982), the NSH syndrome (Lichtenthaler, 2011), resistance to change, trust, readiness to take risks and failure tolerance (Publication III) as barriers. The findings presented in Publication II suggest that the more experienced companies become in OI adoption, the less negative attitudes such as NIH and NSH will be observed among employees. One way to foster an OI culture (Gassmann, Enkel and Chesbrough, 2010) that welcomes external ideas, promotes knowledge sharing and shared values and features entrepreneurial characteristics is by employing education and training programs, redesigning incentive systems and fostering OI skills (Publication II). In addition, employing formal OI units that are the drivers of organizational change in the early stages of OI implementation can be a fruitful approach (Publication V).

This leads to the *organizational structure* as the next component. Publication II found evidence that it is an important component to facilitate knowledge in both inflows and outflows, thus

supporting the findings of Chiaroni, Chiesa and Frattini (2010) and Nisar, Palacios and Grijalvo (2016). In addition, the findings indicate that both organizational structure and organizational boundaries become more open as OI capabilities mature (Publication V). The novel contribution to OI literature that this thesis provides is identifying emerging formalized OI units or individual OI professionals per their job titles in organizational structures. Within these organizational structures, they are empowered by having their own accountability rules and budgets (Publication V). The findings presented in Publication IV also emphasize that companies has recognized the importance of employing OI professionals beyond R&D departments.

Human resources and organizational capabilities. Even though the main postulate of OI is that 'not all the smart people work for you' (Chesbrough, 2003) and companies should seek external knowledge and external paths to market, it is still the employees who capture and integrate external knowledge and engage with external environment. Thus, having the right people equipped with the right knowledge, expertise and skills to capture the full potential that OI offers is still the source of competitive advantage (*the individual-level perspective*). Publications IV and V explore these issues and contribute to the OI literature by 1) identifying the desired set of competencies and skills for OI professionals and 2) developing a framework for the responsibilities of OI professionals and the practices employed. Moreover, Publication II found evidence that organizational capabilities play a fundamental role in the implementation of OI. Therefore, this study argues that focus on HR (Barney and Wright, 1998) and organizational capabilities are still highly relevant in OI setting.

Theoretical contribution

As indicated in Chapter 1, this thesis acknowledges that OI is a phenomenon, not a stand-alone theory (Bogers, Afuah and Bastian, 2010; Bogers et al., 2017). However, as there have been many calls for better theorisation of OI, this section highlights contributions to the OI literature by shedding light on the identified research gaps.

First, while there is an ongoing discussion in the academic community on what constitutes OI, its mechanisms and how to better conceptualize the OI paradigm (e.g., Trott and Hartmann, 2014; Huizingh, 2011, Bogers et al., 2017), little research has been conducted that examines how its actual practitioners conceptualize it. Indeed, there are many single case studies that provide insights into OI implementation at various companies (see Kirschbaum, 2005; Mark Dodgson, Gann and Salter, 2006a; Minin, Frattini and Piccaluga, 2010; Chesbrough, 2012), and numerous efforts to investigate OI from various perspectives or focusing on a particular OI activity (see Bogers et al., 2017). Yet, these different efforts only increase the probability of making the OI paradigm incoherent and considered an umbrella term (Huizingh, 2011) associated with increasing amounts of disconnected innovation activities and business practices and leading to further confusion among both scholars and practitioners. Thus, this study contributes to the scholarly discussion on conceptualizing the term by providing important insights into the perceptions of the OI paradigm within companies and, ultimately, contributing to the ongoing discussion of how OI is managed and organized. The results reveal that the adoption of OI activities even occurs in firms that do not acknowledge the use of OI. As a consequence, this thesis suggests that adopting OI *is a complex innovation process that involves purposive management of both inflows and outflows of knowledge and that OI should be treated more holistically as innovation strategy. It also involves the purposive management of various*

internal (re)sources of knowledge, including employees, and the development of organizational-level capabilities that should be aligned with long-term strategic objectives.

Second, this thesis contributes to the understudied and often even neglected human element in OI literature (Bogers et al., 2018; Salampasis and Mention, 2017; Vanhaverbeke et al., 2014). There are a few recent studies that have built a generic competence profile of professionals working in OI teams (Chatenier et al., 2010) and conceptualize the roles of OI collaboration managers (Ollila and Yström, 2017). However, little, if nothing, is known about the emerging formalized OI units and OI professionals per job titles and their roles, responsibilities and needed skillset, apart from acknowledging their existence (Mortara and Minshall, 2014, Manzini, Lazzarotti and Pellegrini, 2017). This thesis places these issues under examination and provides empirical evidence that innovative companies have started to employ dedicated OI professionals to manage the OI process. The findings highlight a set of practices that OI professionals use to facilitate OI both within and beyond organizational boundaries. While previous research has focused mainly on those OI practices that are conducted more informally, often by different functions (e.g., Salter, Criscuolo, and Ter Wal, 2014), the present study complements existing research by emphasizing practices that are conducted formally by strategically organized and specialized OI professionals (see Publication V). Thus, it advances the understanding of how OI can be managed and organized by adding the human element to the equation. The main contributions also include 1) the identification of the key areas of responsibility of OI professionals that are part of the official job description; 2) the identification of formal and informal tasks within a two-dimensional framework of an internal and external stakeholder focus and a technical and social focus (see Publication V); 3) the identification of competencies (skills, abilities, knowledge) of OI professionals (Publication IV).

The cumulative outcomes of this dissertation also highlight the changing role of dedicated OI professionals as companies become more experienced in OI adoption. The research findings indicate that many companies at the early stage of OI implementation struggle with developing internal processes and procedures, so the efforts of dedicated OI professionals are directed towards internal changes. In addition, they suggest the growing importance of OI professionals in developing and managing the innovation ecosystem and engaging in collaborations with start-ups at the later stages of the OI transition. These research findings on OI professionals provide important contributions, as they may help answer questions as to *why* some companies fail to adopt OI or are less successful in OI implementation than others (Tucci et al., 2016; Brunswicker and Chesbrough, 2018). The answer(s) may lie in underestimating the value of the human element and the importance of developing internal organizational practices and supporting mechanisms to empower employees to engage with the external environment. In the present study, the findings suggest that individuals play a crucial role and that formalized OI professionals can help drive successful OI adoption and the creation of an OI mind-set.

Third*,* while it is acknowledged that OI requires changes in career paths, reward systems, training courses and even recruitment (Paul, Roijakkers and Mortara, 2016; Petroni, Venturini and Verbano, 2012), there are only a handful of research studies on the role of HR practices (including job design) in OI implementation. This thesis advances the existing research by framing OI as an organizational function and shedding light on the understanding of OI job designs. In addition, it enhances our knowledge of the recruitment process, how companies frame OI job descriptions and, within that frame, what skills and basic requirements should be fulfilled by the ideal candidates (Publication IV). Thus, the results suggest a growing need for

trained OI professionals in the job market. The results indicate that companies that are more experienced in OI adoption have aligned their HR practices (e.g., reward systems for OI initiatives, education and training on OI, fostering OI skills) with their OI strategy (Publication II). In addition, this thesis advances the OI literature by highlighting various practices that companies have employed to embrace OI as a new cultural mind-set (Publication V). Despite these many important advances, this research highlights the need for further studies on the role of HR practices in OI; properly designed, they will have a positive influence on the skills, abilities and behaviour of individuals who in turn will have a direct effect on firm-level outcomes (Wright and McMahan, 2011).

Fourth, the understudied and often neglected cultural perspective is brought into the picture (Bogers et al., 2017; West and Bogers, 2013) because this thesis makes a contribution by developing a conceptual framework on the effect of cultural dimensions on OI implementation. The results provide insights into the OI challenges that are associated with cultural differences and offer possible solutions to overcome them (Publication III). They incorporate findings from cross-cultural literature (e.g. Hall and Hall, 1990; Trompenaars and Hampden-Turner, 1997, Hofstede, 2001) and by exploring the cultural dimensions they offer insights to issues like selection of external partners, employment models, rewarding mechanisms etc.

Fifth, the cumulative results of this research journey provide a multi-level perspective into the OI phenomenon (Bogers et al., 2017) by analysing *how companies organize and implement OI* from the perspective of focal companies and their firm-internal and firm-external practices and business units and by integrating the cultural-dimension perspective. Finally yet crucially, as the title of this dissertation indicates, it adds the human element to the OI process and suggests aligning strategies, internal processes and organizational practices to empower employees to engage in OI activities, as they are the ones who make the OI work.

In addition, the findings contribute to the organization management literature and to HR management by highlighting the creation of new organizational functions and OI professions that did not exist until 2003, when the OI term was introduced.

This thesis follows the classical RBV of the firm (Barney, 1991) as the theoretical umbrella and its derivative KBV (Grant, 1996) and CBV and suggests that companies that want to successfully implement OI must nurture and possess certain capabilities and resources (Lichtenthaler and Lichtenthaler, 2009; Enkel, Bell and Hogenkamp, 2011) including its tacit components (i.e., human resource, culture, processes, routines, know-how etc.). In this context, even though some scholars (e.g., Spithoven, Clarysse and Knockaert, 2011; Kokshagina, Le Masson and Bories, 2017) suggest that the lack of certain capabilities and resources can be overcome by the use of specific intermediaries, the research findings still reveal their importance. Even though intermediaries may assist in identifying external knowledge, its internal integration can happen only when a firm develops specific practices to facilitate OI and has the right and employees with the right skills and cultural mind-set in place. Likewise, external knowledge exploitation and collaboration with various stakeholders for value co-creation can only take place when specific practices and routines are developed and certain resources, employees and capabilities are in place.

5.2. Managerial implications

Overall, as emphasized in the title of the dissertation, this thesis aspires to provide insights that are relevant for companies who wish to pursue an OI pathway and capture its full potential. Thus, a set of practical implications is proposed that can serve as guidelines for managers, regardless of the industry in which their company operates. It should be kept in mind that there is no golden rule for managing OI – as it is context-specific – and that companies should use trial and error to develop the processes and capabilities that best fit their own strategic objectives, industry and business models while acknowledging the need for constant adaptation to rapid changes in the environment. Moreover, it is highly likely that firms will face different costs, challenges and benefits from OI implementation, given the interdependencies of different organizational choices.

The main goal of OI is the creation of long-term economic growth through purposive management of inflows and outflows of knowledge and exploiting the external paths to market via permeable organizational boundaries (Chesbrough and Bogers, 2014). First, companies should *understand that implementing OI is a complex longitudinal process that requires coordinated action with various departments*. The findings indicate that OI is not a stand-alone and one-time-only innovation activity (crowdsourcing, use of intermediary, etc.); rather, it is a conscious strategy, and pecuniary outcomes may not be immediately realized. It requires commitment and support from top management and the development of organizational capabilities and supporting internal practices. Indeed, building such capabilities and implementing an OI strategy requires a significant and irreversible commitment of real resources, both managerial and financial.

For many employees, the shift towards OI can be too complex and frustrating. The findings of this research journey reveal many reasons for such resistance to change (e.g., NIH, NSH, fear of failure, uncertainty avoidance, lack of trust, lack of motivation). On the other hand, the reasons may be simply a lack of knowledge and education about OI and how the company envisions its implementation. Another reason may be the fear of knowledge leakage or not knowing with certainty what information can be shared with the outside environment. It should be obvious that the implementation of OI does not mean being fully transparent or that a company should open its research labs to everyone – far from it. The management of the knowledge flows should be done *purposively*, and certain proprietary technologies and know-how should remain secret. However, employees should have a clear understanding of what can and cannot be shared with the outside environment.

The challenges above can be overcome by developing an OI strategy, rulebooks for innovation, internal processes and education and training programs for employees. The research findings indicate that at the early stage of OI implementation, companies find developing internal processes, procedures, and ways of doing things to be the greatest OI-related challenge. Thus, the findings show the need to design supporting mechanisms, internal practices and organizational-level capabilities, including education programs that will improve the understanding of OI mechanisms and practices. Managers should first *assess the underlying current stage of OI adoption and then set expectations for OI management effort*.

Once the strategy has been defined, managers should *communicate the OI strategy within and beyond organizational boundaries*. Proper communication of the strategy can be of enormous

value in encouraging a common understanding among employees regarding the company's approach to OI. Communicating the strategy externally increases the 'market-pull' effect. Of course, as easy as it sounds, managers should also *understand the dynamic changes and need for constant adaptation of OI practices.* The findings emphasize the need for experimenting with various business models and OI practices.

In addition, nurturing a new set of competencies and skills and building an OI culture is a central part of the foundation for a successful OI implementation. Managers should *realize the importance of the human element* and having their employees stand behind idea integration; they should *not underestimate the value of HR practices* in supporting OI implementation. Apart from education and training programs, designing incentive and reward systems and recruiting and selecting staff with the needed set of skills and competencies are of utmost importance. The analytical framework that was developed and presented in Publication IV can offer managers a tool to evaluate and design new practices or serve as a baseline for the recruitment and training of staff.

The novel, interesting findings on how companies organize and implement OI are presented in Publication V and indicate that companies that successfully brought OI to the strategic level had launched formalized OI units and/or employed OI professionals. The findings offer managers a two-dimensional framework (a focus on internal and external stakeholders and an focus on technical and social issues) of the responsibilities of OI professionals dealing directly with OI implementation and management. The framework developed is supported with a set of practices employed as outcomes of the changes that were implemented. They can be used as a set of tools or serve as inspiration for managers planning to implement OI.

In addition, the findings indicate that managers should *be aware of cultural challenges related to the involvement of international stakeholders with different cultural backgrounds.* The identified cultural barriers and proposed framework of reference (Publication III) provide considerable insights for managers when implementing OI activities and co-innovating with various stakeholders from other cultural backgrounds. If awareness of cultural differences is deliberately raised, the ability to incorporate proper employment models, reward mechanisms and incentive systems is considerably improved. The findings highlight the need to better understand the international stakeholders involved within various OI activities, which will ultimately improve the success rate of OI initiatives.

Lastly, further implications can be drawn for decision makers at higher education institutions. As more and more companies focus on recruiting new (graduate) staff that possess multidisciplinary skills, including both entrepreneurial and influencing skills and an overall OI mind-set, there is a pressing need to include overarching OI courses in curricula. For example, universities could allow students from various disciplines to take part in specially designed OI courses which, apart from providing theoretical knowledge on OI, nurture the development of future OI skills and the ability to work in a cross-disciplinary environment.

5.2. Limitations and suggestions for further research

The main contributions of this thesis aimed at shedding light on how companies organize for OI and contributing to the 'theory' of OI. However, as this is an exploratory study that has a

limited numbers of firms and uses a qualitative research approach, the findings provide a preliminary understanding on the studied phenomenon. In addition, even though this study analysed OI implementation through the prism of different perspectives, it still focused mainly on the organizational and intra-organizational dimensions. Thus, it did not emphasize the inter-organisational levels of analysis, the roles of external stakeholders or how firms practice OI in ecosystems (Bogers et al., 2017). These limitations, however, provide fruitful avenues for further research.

Moreover, this thesis has focused mainly on large companies from different industries, so the key contributions and implications cannot be fully transferred or generalized to SMEs or start-ups engaging in OI activities. Again, this provides an interesting avenue for future studies. In addition, the present study was conducted from the perspective of individuals involved in innovation management activities. Other research avenue could complement the findings by seeking the perspectives of other employees and external stakeholders.

A further research agenda can be built by drawing on the findings of this dissertation. First, from the perspective of theory development, a future research could enrich the findings by extending empirical evidence. While the research results do appear to extend the emerging theories in OI literature, statistical generalization would suggest the value of future quantitative and cross-sectional studies to confirm and validate the findings. Future research could also explore a broader set of industries or cultural contexts to reveal additional responsibilities and practices or focus on specific industries to widen the findings.

Still, the findings indicate different perceptions regarding OI at different companies. Further studies focused on the understanding and conceptualization of OI within practitioners' communities would significantly improve the current theoretical and practical knowledge. Research focused on developing tools to evaluate the current and desired levels of OI maturity within companies would further assist companies in managing OI. In addition, studies that explore more deeply the differences between companies, especially in terms of the micro-foundations of such differences, hold the promise of enhancing the understanding of *how* and *why* some companies perform better than others at implementing OI.

In addition, a longitudinal study analysing the role of formalized OI units and/or OI professionals over time and their impact on companies' innovation performance would enrich the current theoretical understanding. While the findings here reveal that the nature and focus of professional OI units evolves over time, they offer only limited insight into *why* and *when* this happens. Future research could explore the drivers, barriers and other contingency factors that influence the choice of development trajectories for establishing, developing and managing professional OI units.

Another interesting research avenue was identified during the analysis of job requirements for positions related to OI. The findings indicate an increase in companies' interest in OI professionals who have prior entrepreneurial experience and the ability to influence others. This opens a fruitful research avenue on the future role of OI professionals in ecosystem development or in engaging with collaboration with start-ups. In addition, studies that focus on individual skill endowment (Bianchi et al., 2011; Bogers et al., 2017) and social capital could greatly advance the understanding of OI phenomenon from the human-centric perspective. In regard to the cultural context, Publication III develops a set of propositions that call for empirical validation.

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Appendix A: OI-Net Questionnaire

Lifelong Learning Programme
Co-funded by the European Union

OI net — The European Academic Network for Open Innovation
Ref. number: 542203-LLP-1-2013-1-FI-ERASMUS-ENW

Survey: Identification of Industrial Needs for Open Innovation Education in Europe

Part of deliverable of WP 2: Identification of Industrial Needs for Open Innovation Education in Europe

Survey "Identification of Industrial Needs for Open innovation Education in Europe" 2014

Dear Survey Participant,

*Thank you very much for helping us with the research on **Industrial Needs for Open Innovation Education** conducted within ERASMUS Academic networks project, OI-Net. We aim to interview companies in 35 European countries in order to collect the information on real companies' needs for specialists working under open innovation approach.*

Open Innovation concept was introduced by Henry Chesbrough in 2003 and it "assumes that firms <u>can and should</u> use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology. Open Innovation combines internal and external ideas into architectures and systems whose requirements are defined by a business model" (Chesbrough, 2003: p. 43).

In order to enable teaching open innovation on the basis of actual industry needs, we, first, study the level of open innovation adoption in companies in Europe, then, the level of open innovation knowledge and skills of employees in the companies. We try to develop open innovation manager profiles and specify the skills and knowledge that these specialists need in different EU countries and different industries. This research will help us to give recommendation to higher education in Europe on the development of open innovation curricula.

Thank you very much for your time and insights!

Yours sincerely,

OI-Net Team

Identification of Industrial Needs for Open innovation Education in Europe, 2014

1. COMPANY PROFILE

Name of the company*_____Web address*_____

Country_____ Region in the country, if relevant_____

Company was established in _____Number of employees_____

The main markets for our goods and services are Industrial (B2B)_____% Consumer (B2C)____%

Industry. Please, select the Industry. Tick the one which provides the main source of revenue.

☐ Energy	☐ Media	☐ Diversified Financials
☐ Materials	☐ Retailing	☐ Insurance
☐ Capital Goods	☐ Food & Staples Retailing	☐ Real Estate
☐ Commercial & Professional Services	☐ Food, Beverage & Tobacco	☐ Software & Services
☐ Transportation	☐ Household & Personal Products	☐ Technology Hardware & Equipment
☐ Automobiles & Components	☐ Health Care Equipment & Services	☐ Semiconductors & Semiconductor Equipment
☐ Consumer Durables & Apparel	☐ Pharmaceuticals & Biotechnology	☐ Telecommunication Services
☐ Hotels Restaurants & Leisure	☐ Banks	☐ Utilities
☐ Other, what?	Specify:	

Size of the firm

☐ Large, >250	☐ Medium-sized, 50 - 249	☐ Small, 10 - 49	☐ Micro, 1- 9

* Optional questions, due to social data collection ethics and requirement for anonymous data collection

2. OPEN INNOVATION ACTIVITIES

Current State of Open Innovation Adoption

		Do you adopt the following activities in your company?		Which of the following should be used more often and which should be used less in your company?
		No	Yes, we adopt OI. Please evaluate 1 to 7; 1 Very seldom; 4 Regularly; 7 Very intensively 9 I don't know	-2 decrease significantly, -1 slightly decrease, 0 keep as it is, 1 slightly increase, 2 increase significantly, 9 - I don't know
1	Customer and consumer co-creation in R&D projects	☐		
2	Crowdsourcing	☐		
3	Scanning for external ideas	☐		
4	Collaborative innovation with external partners (i.e. suppliers, universities, competitors)	☐		
5	Subcontracting R&D	☐		
6	Idea & start up competitions	☐		
7	Using external networks (e.g. associations, intermediaries, knowledge brokers)	☐		
8	Participation in standardization (public standards) / influencing industry standards	☐		
9	Free Revealing (e.g. Ideas, IP) to external parties	☐		
10	IP in-licensing	☐		
11	IP out-licensing	☐		
12	External technologies acquisition	☐		
13	Selling unutilized / unused technologies	☐		

Open Innovation Competences

	Please indicate the degree to which you agree with the following statements	1 strongly disagree; 7 strongly agree 9 - I don't know
1	We provide education and training on open innovation for our employees	
2	Open innovation skills and awareness are fostered within our organization	
3	The borders of our company are open for knowledge flow from outside-in and from inside-out	
4	New external ideas are easily accepted and disseminated in our organization	
5	Relevant departments are actively participating in knowledge sourcing and knowledge exchange	
6	We accept the possibility of mistakes in external knowledge sourcing	
7	Our employees have positive attitudes for applying ideas and technologies from outside the company	
8	Our employees have positive attitudes to having other companies receiving and using our knowledge and technologies	
9	Open innovation activities of our employees are rewarded	
10	Organizational structure in our company is designed according to our needs to be open	
11	We apply interactive collaboration tools and methods to facilitate open innovation	
12	Externally obtained knowledge is integrated into our products, processes and services	
13	Our competitive advantage lies in collaborating with external partners	
14	We have sufficient knowledge in our organization to compete in our marketplace	
15	(Top) management strongly supports open innovation activities (by allocating enough resources)	

3. SET OF SKILLS AND COMPETENCES IN OPEN INNOVATION CONTEXT

	What skills should open innovation specialist have? Please, evaluate the importance of following items	1 not important, 7 strongly important 9 - I don't know
1	IP management skills	
2	Negotiation skills	
3	Entrepreneurial skills	
4	Leadership skills	
5	Teamworking skills	
6	Multi-tasking skills	
7	Problem solving skills	
8	Virtual collaboration skills	
9	Internal collaboration skills	
10	External collaboration skills	
11	Trust skills	
12	Communication skills	
13	Networking skills	
14	Other:	

	What abilities should open innovation specialist have? Please, evaluate the importance of following items	1 not important, 7 strongly important 9 - I don't know
1	Technology and business mindset	
2	Project management	
3	Adaptability and flexibility	
4	Managing inter-organizational collaboration process)	
5	Ability to work in interdisciplinary environment	
6	Ability to work in internal cross-functional teams	
7	Strategic thinking	
8	Creativity	
9	New media literacy	
10	Cultural awareness	
11	Ability to work with different professional communities	
12	Ability to share knowledge and ideas internally / within organization	
13	Ability to share knowledge and ideas externally	
14	Risk awareness	
15	Failure tolerance	
16	Other:	

4. OPEN INNOVATION PERFORMANCE

	Please evaluate the innovation performance of your company over the last 3 years	-2 decrease significantly, -1 slightly decrease, 0 keep as it is, 1 slightly increase, 2 increase significantly, 9 - I don't know
1	Success of radically new or significantly improved products and services development	
2	Risks of innovation activities (financial, technological and market based risks)	
3	New product and service development time	
4	Market acceptance of innovative products and services	
5	Return on investment rate (ROI) of innovation activities	

	Please, evaluate your current open innovation status. Choose one option.	
1	We are not adopting and not planning to adopt open innovation	☐
2	We are not currently adopting open innovation, but plan to implement OI in the nearest future	☐
3	Early stages of implementing OI activities	☐
4	In the process of refining OI activities and shaping programs to help establish best practices of OI	☐
5	Experienced adopters of OI (processes, procedures and best practices are in place)	☐
6	We had OI activities, but decided to discontinue	☐

How do you define open innovation? Please provide your own definition (optional)

5. RESPONDENT INFO AND FEEDBACK

What is your opinion about the survey?	
This survey is of current importance	☐
We lack the information on the topic of the survey	☐
We consider the research on this topic to be pointless	☐

Are you interested in the results of the survey? If yes, in what form:	
No	☐
Yes, Brief report	☐
Yes, Full report	☐

Are you interested to participate in in-depth interview on Industrial Needs for Open Innovation Education?	
Yes	☐
No	☐

Are you interested in the future cooperation on the topics covered in the survey? If yes, in what form:	
Writing business cases	☐
Participation in round tables, workshops and conferences	☐
Participation in research seminars	☐
Individual consultations	☐
Other, please specify _____	☐

If you are interested in receiving the report or be contacted in the future, please, provide your details*	
Name, Surname*	
How long do you work in the company?	
Position in Company	
Email	
Phone number (optional)	

* Optional question, due to social data collection ethics and requirement for anonymous data collection

Other Feedback you wish to provide?

Lifelong Learning Programme

Co-funded by the European Union

OI Net The European Academic Network for Open Innovation

Ref. number: 542203-LLP-1-2013-1-FI-ERASMUS-ENW

OI-Net
52 partners from 35 countries

Leader: Finland	Lappeenranta University of Technology
Albania	"Marin Barleti" University
Austria	WIFI Institute for Economic Promotion of the Austrian Federal Economic Chamber; FH Wien University of Applied Sciences
Bosnia and Herzegovina	University of East Sarajevo
Belgium	University of Namur; MAC-Team aisbl; European Foundation for Management Development (EFMD)
Bulgaria	New Bulgarian University
Croatia	University of Zagreb
Cyprus	University of Cyprus; European Association of Erasmus Coordinators
Czech Republic	University of Economics
Denmark	Aarhus University
Estonia	University of Tartu; Tallinn University of Technology
France	France Business School; Actif-Europe
Germany	University of Erlangen-Nuremberg; iNNOWiSE; RWTH Aachen University
Greece	Athens University of Economics and Business-Research Center
Hungary	IMCRC University of Miskolc; University of West Hungary
Ireland	Whitaker Institute for Innovation and Societal Change, National University of Ireland
Italy	Scuola Superiore Sant'Anna; TTP Lab, Technology Transfer Program & Laboratory/ Studio ing. Giordani; Politecnico di Milano
Latvia	Riga International School of Economics and Business Adminsitration
Lithuania	Kaunas University of Technology
Luxembourg	Public Research Centre Henri Tudor
Macedonia	Ss. Cyril and Methodius University in Skopje
Malta	University of Malta
Netherlands	Strategie en Organisatie; Fontys University of Applied Sciences
Norway	Norwegian School of Economics; NTNU Social Research AS
Poland	Technology Partners; University of Economics in Katowice
Portugal	University of Porto, Faculty of Engineering
Romania	Transilvania University of Brasov
Serbia	University of Novi Sad
Slovakia	Technical University of Košice
Slovenia	University of Ljubljana; University of Primorska
Spain	EADA Business School; IE Business School
Sweden	Linköping University
Switzerland	Geneva School of Business Administration
Turkey	Middle East Technical University
United Kingdom	ISPIM; University of Exeter

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Appendix B: Other research contributions during PhD studies

During my PhD studies, I had privilege to work and be involved in number of research projects. They were built upon different funding schemes and involved number of national and international partners coming from both academia and business.

1. Overcome, Open innoVation Raw Materials, 2017 – 2018. Co-funded by EIT Raw Materials
2. INSPIRE, INtegrated Support of oPen Innovation pRofessionalization initiatives (http://inspire-smes.eu/), 2016 – 2018, Co-funded by H2020.
3. C3PO, Collaborative City Co-design Platform (https://itea3.org/project/c3po.html), 2015 – 2018. Co-funded by Tekes, ITEA labelled.
4. Accelerate, A Platform for the Acceleration of go-to market in the ICT Industry (http://www.accelerateproject.eu/), 2013 – 2016. Co-funded by Tekes, ITEA labelled.
5. OI-Net, The European Academic Network for Open Innovation (http://oi-net.eu/), 2013 – 2016. Co-funded by the European Commission under the Erasmus Programme.
6. OISIM, Open Innovation Simulation: A Strategic Management of Knowledge, 2011 – 2013. Funded by Tekes.

This dissertation consists of five publications which are the research outcomes of three research projects: OISIM, OI-Net and Overcome. In addition to these publications, I have been involved in number of research papers that have enhanced my research skills and understanding of the innovation management field. Some of the related publications are:

1. Dąbrowska J and Fiegenbaum I (2017) Open Innovation and Culture: A System Dynamics Model (p. 29-55). In Salampasis, D. and Mention, A.L (2017). *Open Innovation: Unveiling the Power of the Human Element*. World Scientific Publishing Co. Pte. Ltd.
2. Dąbrowska J, Lopez-Vega H and Ritala P (2017) How to Implement Open Innovation in Practice? A Case Study of a Cultural Transition, *R&D Management Conference,* Leuven.
3. Mention A-L, Nagel A, Hafkesbrink J and Dąbrowska J (2016) *Innovation Education Reloaded: Nurturing Skills for the Future. The Open Innovation Teaching Handbook*, LUT Scientific Publication.
4. Dąbrowska J, Teplov R, Podmetina D, Albats A, and Lopez-Vega H (2016) Organizational capabilities: the truth about adopters and non-adopters, *2nd World Open Innovation Conference, Barcelona, Spain*
5. Albats A, Dąbrowska J, Podmetina D and Teplov R (2016) The role of human capital in open innovation: evidence from the European companies, *2nd World Open Innovation conference, Barcelona, Spain*

6. Teplov R, Podmetina D, Albats A and Dąbrowska J (2016) Inbound or outbound? Or both? Adoption patterns and concept perception, *2nd World Open Innovation conference, Barcelona, Spain*

7. Podmetina D, Teplov R, Albats E and Dąbrowska J (2016) Perception vs Reality: the Adoption of Open Innovation in European Companies. In *Academy of Management Proceedings* (Vol. 2016, No. 1, p. 17799).

8. Dąbrowska J and Podmetina D (2014) Identification of Competences for Open Innovation, *ISPIM Conference - Challenges for Sustainable Growth Innovation for Sustainable Economy & Society*, Dublin, Ireland

9. Savitskaya I, Dąbrowska J and Torkkeli M (2013) Filling the gap: knowledge foundations of open innovation, *73rd Annual Meeting of the Academy of Management*, Orlando, USA, 9-13 August 2013

10. Podmetina D, Volchek D, Dąbrowska J and Fiegenbaum I (2013) Human Resource practices and open innovation, *International Journal of Innovation Management*, Vol. 17, No. 6

11. Savitskaya I, Dąbrowska J (2012) Knowledge-Based Open Innovation Strategies: an Illustrative Taxonomy, *Proceedings of The 5th ISPIM Innovation Symposium - Stimulating Innovation: Challenges for Management, Science & Technology,* Seoul, South Korea on 9-12 December 2012 ("Best Technology Paper Award 2012" by Nokia Siemens Networks "in recognition of the scientific study and its relevance for being applied in industry")

PART II: INDIVIDUAL PUBLICATIONS

Publication I

Dąbrowska, J., Fiegenbaum, I., and Kutvonen, A. (2013)

MAPPING THE PERCEPTION AND REALITY OF OPEN INNOVATION

International Journal of Innovation Management, 17(6), pp. 1340016.

Imperial College Press
www.icpress.co.uk

MAPPING THE PERCEPTION AND REALITY OF OPEN INNOVATION

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Open innovation holds great potential for improving the efficiency of companies' innovation processes, but also presents substantial risks. A key issue in innovation management is finding the right balance of openness, i.e., determining how open companies should be in their innovation activities. However, academics and business practitioners hold conflicting notions of what constitutes open innovation practice and of how "open innovation companies" are defined. In this paper, we present three in-depth case studies of global R&D-intensive companies, where we find that the firms' perception of their openness differs from their actual situation (as determined by the innovation practices that they apply), and that each company has a different view as to what constitutes open innovation. We claim that resolving conceptual ambiguity and differentiating between openness (as a philosophical aspect) and open innovation (as a way of structuring the innovation process) in research is critical in order to clarify the current state of open innovation research and enable the communication of results to practitioners.

Keywords: Open innovation; outbound innovation; inbound innovation; innovation process; case study; openness.

Introduction

The literature on open innovation (OI) observes that many firms have opened up their boundaries (Chesbrough *et al.*, 2006; Gassmann *et al.*, 2010; Laursen and Salter, 2006; Ritala *et al.*, 2009; West and Bogers, 2013). Companies strive for a

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variety of open innovation activities and seek to improve their innovation processes through an exchange with the external environment. The research has found that open innovation increases product development, innovative performance, and chances of market success (Cassiman and Veugelers, 2006; Chesbrough *et al.*, 2006; Laursen and Salter, 2006; Leiponen and Helfat, 2010). Not surprisingly, the open innovation paradigm is widely supported by academia (Chesbrough's first book on Open Innovation has been cited over 6,000 times to date, according to Google Scholar) and has numerous industry followers (e.g., IBM, BMW, P&G, Natura, GE, General Mills, Philips, DSM, AkzoNobel, Siemens and more).

While academic research on open innovation is on the rise, the discussion on innovation management is deepened by studies that critically uncover the weakness and limitations of the open innovation concept (Dahlander and Gann, 2010; Knudsen and Mortensen, 2011; Ozman, 2008; Piller and Walcher, 2006; Trott and Hartmann, 2009). As stated by Elmquist *et al.* (2009) after an extensive review of the field of open innovation, "There is an increased acknowledgement of the negative sides of open innovation and the identification of situations and circumstances where the model is more or less beneficial." Hence, several researchers (e.g., Enkel *et al.*, 2009; Laursen and Salter, 2006; Salge *et al.*, 2011) have concluded that efficient management of open innovation requires determining the correct degree of openness, i.e., the appropriate balance between open and closed innovation. Another related challenge (both for academia and practitioners) is the growing number of terminologies, typologies and classifications of open versus closed innovation practices that have emerged within open innovation research (di Benedetto, 2010; Huizingh, 2011). This conceptual ambiguity concerning what open innovation actually is, and which practices can be considered as open and which ones as closed, engenders the question of how companies themselves define open innovation and what open/closed innovation practices can be identified in their innovation processes.

We propose that in-depth overviews of companies' innovation activities are needed in order to distinguish and examine differences in understanding and implementing open innovation. For example, the differences between managerial perceptions versus actual openness, as determined by a generalised set of open innovation practices (Chesbrough, 2003; Dahlander and Gann, 2010; Gassmann and Enkel, 2004) deserve special attention. Likewise, the innovation activities of companies operating under different levels of openness should be analysed in order to bring some clarity to defining what open innovation actually is and what the activities distinguishing open from closed innovation practices are.

We address these issues by analysing and comparing the innovation process in three case companies and by identifying open (closed) innovation practices. Each of the three case companies has extensive R&D activities and a patent portfolio but

claims to be at a different position on the open innovation landscape (open, in transition, or closed). Based on an in-depth case analysis, we mapped open innovation activities in those companies based on their perceived, targeted, and actual levels of openness. This paper aims to answer the question: What differences do exist in actual and perceived openness? In order to answer this question, we analyse what the open innovation practices are in the case companies with respect to (1) perceived openness, (2) actual openness, and (3) targeted openness.

Our findings indicate that even though all three companies perceive themselves as having different degrees of openness (open innovator, in transition, or closed), they all fall into a similar level of actual openness when compared to each other. Based on the results of our study, we claim that internal openness to idea generation should be differentiated from open innovation as a practice (e.g., collaborating with external partners in knowledge co-creation and external knowledge exploitation).

The rest of the paper is organised as follows. First, we briefly introduce the theoretical framework of open innovation used by different authors as well as the most cited examples of companies who have implemented open innovation. Second, we present our methodology and data collection. Third, we present our results. Finally, based on these results, we draw conclusions and discuss theoretical and practical implications.

Theoretical Background

The rapid expansion of open innovation research has brought about the scattered use of the term and the difficulty of identifying the essence of the concept. Still, firms collaborate with different scopes and intensities with external parties, and the degree of company openness varies in the corporate landscape (Dahlander and Gann, 2010; Lazzarotti and Manzini, 2009).

The myriad types of openness

As stated by Dahlander and Gann (2010) openness is partially defined by different forms of relationship with external parties and is thus tied to company's boundaries. The most popular definition comes from Chesbrough (2006), where open innovation is "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively." In spite of the increased interest in using the openness construct, studies of openness remain troublesome due to conceptual ambiguity. For example, several authors (e.g., Trott and Hartmann, 2009) claim that the concept is

not particularly new, since already for decades there has been a strong research tradition on the topic of opening up a company's boundaries to the external environment (Freeman, 1974; Pavitt, 1984; von Hippel, 1986; Chandler, 1990). After "the period of fascination" (Elmquist *et al.*, 2009), the benefits of unconditionally opening up are questioned widely. Knudsen and Mortensen (2011) found that on immediate new product development (NPD) performance, the single-firm strategy performs better than does the collaborative strategy, and with an increasing degree of openness, product development projects are slower than the norm in industry and more expensive. Enkel *et al.* (2009) argue that too much openness can negatively impact companies' long-term innovation performance because it could lead to loss of control and core competences. Likewise, de Wit *et al.* (2007) discovered a limited use of open innovation practices and concluded that there is a rationale behind it. Additionally, the open innovation concept has been criticised for constructing an artificial dichotomy between closed and open approaches (Dahlander and Gann, 2007). Table 1 presents the main classifications and concepts of open innovation that have emerged within open innovation research.

Of these main classifications and concepts of open innovation, Laursen and Salter (2006) associate openness with the number of external sources of innovation, whereas Henkel (2006) focuses on openness as revealing ideas previously hidden inside organisations. Also, the concept of closed innovation is defined differently. A study by Lazzarotti and Manzini (2009) identifies four basic ways to collaborate by considering two variables: (1) the number of partners and (2) the number of phases of the innovation process where a company opens up to external contributions. Based on these variables, they distinguish four degrees of openness: open innovator, closed innovator, specialised collaborator and integrated collaborator. Here, an open innovator is described as having high partner variety, which impacts the whole innovation funnel. A closed innovator, on the other hand, accesses external sources of knowledge only for a specific reason, in a single phase of the innovation funnel, and usually in a dyadic collaboration. In contrast, Pisano and Verganti (2008) refer to closed networks as an open perspective whereby the company selects the partner or the input type they need. In their work, closed networks are like private clubs, and the company shares the problem with the few parties (e.g., suppliers or customers) it trusts and considers as having crucial capabilities to provide innovative solutions. This perspective on closed innovation is clearly different from that of Chesbrough (2003), and the two should not be confused with each other. Furthermore, another research study of Barge-Gil (2010) distinguishes the three company strategies: open, semi-open, and closed. The grouping is made by analysing two degrees of openness, one narrow and one very broad. Based on the analysis, a closed innovator is a

company for whom the most important external source is less important than company's internal knowledge and whose innovations have been developed mainly through their own efforts.

Dahlander and Gann (2007) relate openness to characteristics of interaction modes and identify the three types of openness according to (1) the different degrees of formal and informal protection, (2) the number of sources of external innovation, and (3) the degree to which firms rely on informal and formal relationships with other actors. Lichtenthaler (2011) seeks to define openness *via* a capability-centric perspective, defining open innovation as "systematically performing knowledge exploration, retention and exploitation inside and outside an organisation's boundaries throughout the innovation process." A variant perspective is offered by Kortelainen and Kutvonen (2012), who connect open innovation to a dynamic resource-based view of strategy and argue that the novelty of the concept is limited to cases in which knowledge exchange is directed to inbound and outbound *flows* of knowledge as opposed to static knowledge *stocks*, which are sufficiently informed by transaction cost economics (TCE) theory.

When discussing company's open innovation activities, a study by Gassmann and Enkel (2004) deserves more attention. They identified three core open innovation processes: (1) the outside–in process (when the company enriches the knowledge base through the integration of suppliers, customers and external knowledge sourcing in order to increase its innovativeness); (2) the inside–out process (profit by bringing ideas to market, selling intellectual property (IP), and transferring ideas to the outside environment); and (3) the coupled process (a combination of the outside–in and inside–out processes by working in alliances with complementary partners). Sandulli and Chesbrough (2009) present another classification defining the two sides of open business models: the Buying and the Selling sides corresponding to the outside–in and the inside–out technology transaction. According to these two sides which the firm is adopting, there are four relevant business models: open business models, partially open business models — the buying side, partially open business model (the selling side), and the closed business model.

The later work of Dahlander and Gann (2010) enriches the inbound and outbound framework by adding non-pecuniary and pecuniary dimensions, thus connecting openness to aspects of firm technology strategy. They distinguish between inbound modes — acquiring and sourcing; and outbound ones — selling and revealing. This classification allows for differentiating between monetary or indirect benefits of outbound and inbound activities that the company can pursue and thus one may notice the difference between sourcing and revealing ideas and knowledge versus out-licensing, selling technologies, and acquiring technologies. For the purposes of this paper, when analysing a firm's innovation process and

level of collaboration with the external environment, we will follow Chesbrough's definition of open innovation from his 2006 book (Chesbrough, 2006) (see Table 1) as well as the classifications of Gassmann and Enkel (2006) and Dahlander and Gann (2010). However, before we proceed with presenting our three cases, we need to briefly mention the best known examples of companies operating under an open innovation approach in order to shed light on how differently "open innovation companies" are defined in the literature.

Table 1. Main classifications/concepts of open innovation.

Study	Classification/concept	Key points of differentiation
Laursen and Salter (2006)	External search breadth and external search depth — two components of the openness of individual firms' external search strategies. Number of different types (suppliers, users, universities etc.) of external sources of innovation and the extent to which each is used.	Complete focus on inbound; provides the most commonly accepted measures of open innovation thus far. Later extended to account for firm-specific context by adding "constraints on the application of firm resources" and the "abundance of external knowledge" (Garriga *et al.*, 2013).
Chesbrough (2006)	The use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively.	Equally represents both in- and outbound modes; accounts only for intended knowledge flows; builds on organisational (legal) boundaries and the business model concept. Implicit emphasis on IPR-related knowledge exchange and B2B cooperation.
Henkel (2006)	"Open innovation is similar to the phenomenon of 'collective invention', a particular instance of user innovation."	Focuses on inbound; open innovation is understood as a part of a user innovation research stream. Focuses on value creation and neglects outbound and potential synergies between in bound and outbound.
Gassmann and Enkel (2006)	Three core processes of open innovation: outside–in process, inside–out process, and coupled process:	Explains openness through the *locus* of knowledge generation, *locus* of innovation, and *locus* of exploitation: only closed when all are inside company boundaries; open if one *locus* or more *loci* are outside. Complementary to Chesbrough.

Table 1. (*Continued*)

Study	Classification/concept	Key points of differentiation
Pisano and Verganti (2008)	Typology of four collaboration modes: open hierarchical, open flat, closed hierarchical, and closed flat.	Two dimension matrix: openness (can anyone participate or just select players?) and hierarchy (who makes decisions — all players or "kingpin" participants?). Inbound-oriented. Notably influenced by user, community, and open source innovation. Focus on using choice of governance to cope with disadvantages and advantages of opening up of the innovation process.
Sandulli and Chesbrough (2009)	Four relevant business models: open business models, partially open business models — the buying side, partially open business model — the selling side and the closed business model.	Considers in- and outbound equally. Rooted in the business model concept and resource-based logic. Resource excludability and rivalry as two main factors for business model choice.
Lazzarotti and Manzini (2009)	Four types of openness: closed innovator, open innovator, specialized collaborator, and integrated collaborator.	Two-dimensional typology: (1) the number of partners and (2) number of phases of the innovation process, where the company opens up to external contributions.
Barge-Gil (2010)	Three firm strategies: open, semi-open, and closed. Open innovators are defined as using open sources as a primary basis for innovation, while semi-open firms utilise external knowledge in non-critical phases of innovation. Openness depends on absorptive capacity and the need for external knowledge (inversely proportional to R&D intensity).	Analyses two degrees of openness: one narrow (targeted and formalised cooperation agreements) and one very broad (encompassing also freely available knowledge). Seeks to reconcile conflicting logics regarding the effect of R&D intensity and the size of firm to usefulness or utilisation of open innovation. Implies that middle-sized companies are benefiting most from (inbound) openness, while it is not core to either the smallest or biggest firms. Small firms, however, utilise freely available assets more. Posits that low-tech industries are dependent on high-tech industries supplying knowledge assets.

Table 1. (*Continued*)

Study	Classification/concept	Key points of differentiation
Dahlander and Gann (2010)	Framework by direction of openness and involvement of pecuniary motives: Inbound — acquiring and sourcing; and outbound — selling and revealing	Equal account of both in- and outbound modes as well as inclusive of non-pecuniary forms of openness. Able to reconcile the open source and user innovation streams with open innovation.
Lichtenthaler (2011)	Open innovation is defined as systematically performing knowledge exploration, retention, and exploitation inside and outside an organisation's boundaries throughout the innovation process.	Capability-centred viewpoint. Directs focus to balancing between different capabilities as well as in- and outbound modes; uniquely includes knowledge retention; builds on technology marketing theory (Tschirky, 1998; Escher, 2005). Emphasis on finding synergies and balance between in- and outbound knowledge flows.
Lakhani *et al.* (2013)	Firms pursue a range of organisational boundary options decided atthe problem (task) level. Openness is defined so that "problem solving needs and knowledge flow both inside and outside the firm via interaction with multitudes of external actors who could be embedded in communities or participating in innovation platforms." Openness is favoured when task decomposition (modularity) is high and required knowledge is distributed broadly.	Emphasis is on setting organisational boundaries on the level of innovative problems to be solved. Rooted strongly in user innovation and open source disciplines. Directs attention to the relation between closed and open innovation forms and to managing contrasting and paradoxical innovation logics; equates open innovation broadly to community or distributed innovation. Understands that community innovation is one of the main anomalies that cannot be accounted for by traditional management theories.

The myriad types of open innovation in practice

The literature on open innovation is rich with examples of companies who benefit from implementation of an open innovation approach. Probably the most cited and famous example is Procter & Gamble's Connect and Develop case. According to Google Scholar, Huston and Sakkab's (2006) as well as Dodgso *et al.*'s (2006) articles concerning P&G's open innovation approach have been cited over 600 and 300 times to date, respectfully. Here, open innovation is presented throughout the whole

organisation as the company's new model for improving its innovation outcomes. In using Dahlander and Gann's (2010) classification, it can be noticed that P&G use an outbound mode — a selling (pecuniary) approach, as well as an inbound one — sourcing and acquiring. The company connects with a wide range of external sources of new ideas and technologies: universities, government-based labs, web-based open networks (e.g., InnoCentives, NineSigma, YourEncore, Yet2.com, and own pgconnectdevelop.com platform), suppliers and even competitors; and then develops those ideas and/or technologies further into new products. At the same time, the company has realised its monetary potential from its extensive but highly unutilised patent portfolio and introduced a new patent strategy that allows licensing of unused technologies as well as all patents three years after market introduction at the latest, or five years after market approval (Sakkab, 2002). Another example is DSM (Kirschbaum, 2005), who combines internal and external competencies and knowledge in R&D and marketing in all stages of the innovation process. The case describes building an appropriate open "intrapreneurial" culture and an outside–in approach for identifying new opportunities, as well as a pecuniary inside–out approach by licensing-out. As described by Chesbrough (2007), IBM also uses both inward and outward knowledge flows. In addition to collaborating with different parties to acquire new ideas and technologies, IBM also generates revenues from its offensive approach to IP (by licensing IP to outside parties instead of preventing the leakage of IP). Fully committed to open innovation, it also donates (an outbound non-pecuniary approach) a certain amount of its software patents to the open source community.

While P&G, DSM, and IBM are examples of open innovation with both outbound and inbound knowledge flows, the literature on open innovation is replete with examples of companies using only one knowledge direction and/or one form of collaboration. For example, LEGO focuses on an outside–in (or inbound non-pecuniary) approach. Here, open innovation is presented as involving customers in the company's innovation process and letting them co-design (Chesbrough, 2011). Adidas, as described by Piller and Walcher (2006), uses the internet-based toolkits for idea competitions as a way to access innovative ideas and solutions from users. Henkel (2006), with over 300 citations (Google Scholar, 2013), presents the Linux case focused on patterns of free revealing of firm-developed innovations within embedded Linux, a type of open-source software.

Methodology and Data Collection

Methodology

Given the explorative nature of this study, a multiple-case research approach was chosen (e.g., Eisenhardt and Graebner, 2007; Yin, 2009). The three selected case

companies operate as global suppliers of power, technology, automation, and services in business-to-business (b2b) markets. Multiple-case study research allows the researchers to explore individuals or organisations simply through complex interventions, relationships, and communities (Yin, 2009). This qualitative approach facilitates the exploration of open innovation phenomena using a variety of data sources and ensures that the issue is explored through a variety of lenses. Furthermore, thanks to this approach, one can achieve a higher level of abstraction, boost accuracy and allow for a more generalisable theory by collecting and analysing multiple cases (Eisenhardt and Graebner, 2007).

The research followed an abductive process (Dubois and Gadde, 2002). We sought out insights from the literature on open innovation which would be particularly relevant in the context of the innovation process and practices. The data collection and analysis were tentatively structured on the basis of existing insights into open innovation, specifically focusing on identifying outbound and inbound open innovation practices within each company's innovation process. However, as the research progressed, it became evident from the conducted interviews that there are differences in the companies' perceptions of the open innovation paradigm. In light of the insights gained from the interviews, we refined and adjusted our theory in a parallel and iterative process with the field observations, in order to develop a deeper understanding of the possible (open) innovation strategies adopted by case companies and possible internal and external barriers associated with their targeted openness.

Data collection

The three case companies were selected according to their interest towards open innovation, demonstrated by their attendance of open innovation-related events. They claimed to be at different stages in their open innovation approach (i.e., open, in transition, or closed). However, some of them are dissatisfied with their position on the openness map and are planning a set of actions to "relocate" towards increased openness. The selected three case companies (Table 2) are briefly described below. All three companies are operating in b2b markets.

The main method of data collection was semi-structured, in-depth interviews with the Manager of Technology, Director of Technology, and Director of Technology Portfolio in Alpha, Beta, and Gamma companies, respectively. In order to avoid features of personal interviews often criticised as biased due to personal interpretations, impressions, and retrospective views, we adopted investigator triangulation in the data collection and ensured that there would be more than one researcher involved in the interview and data analysis (Mathison, 1988). Therefore, we strongly rely on this type of data source, as it can deliver rich data

Table 2. Information about the case companies (2012).

Firm pseudonym	Areas of activities	Annual turnover (approx. EUR in mln)	R&D percentage of turnover (approx. in %)
Alpha	Power and automation technologies	30,000	3.7%
Beta	Process industries	7,000	3%
Gamma	Minerals and metals processing technology	2,000	2%

on periodic matters (Eisenhardt and Graebner, 2007). The interviews lasted between 67 and 153 min and were conducted face-to-face, except for the interview with Alpha's representative, which was conducted *via* telephone. Each interview was audiotaped and transcribed *verbatim*. Nvivo10 software was used to analyse the interview data.

In addition, internal documents, annual reports, companies' presentations, press releases, news feeds, companies' websites, and other publicly available information were used as secondary data sources. Furthermore, in order to verify and establish the validity of the research results gained from interviews, a self-completion questionnaire was designed and distributed to interviewees in the form of an online survey. The questionnaire was designed with the aim to cross-check and to validate the results gained from interviews and to be used on a wider scale for further research. It was based on multiple-choice and Likert-scale questions regarding present and planned innovation activities as well as knowledge components used by Savitskaya and Dabrowska (2012) to develop an integrated taxonomy of open innovation strategies. By means of this broad data collection, validity was enhanced, and the results could be adequately assessed (Yin, 2009).

Case Companies

Case company Alpha is a provider of power and automation technologies. It offers products, systems, solutions, and services to improve power grid reliability, enhance energy efficiency and increase industrial productivity. The company operates in approximately 100 countries across Europe, Asia, the Americas, the Middle East, and Africa.

Alpha's R&D is not globally centralised, but each division has its own R&D business units. Alpha has almost 19,000 patents in its portfolio. The R&D investments were approximately 3.7% of revenues in 2012, and are targeted to increase up to 4% by 2015. The company's R&D focuses on developing and commercialising the technologies that are of strategic importance to future growth. Since 2010, the company has spent more than USD 10 billion on acquisitions as

part of its strategy to grow and develop in-house capabilities. Alpha considers itself as a rather closed innovator, with continuous investments in developing in-house capabilities.

Case company Beta is a supplier of technology and services to customers in five process industries, including mining, recycling, pulp and paper, power, and oil and gas, and it operates in 50 countries worldwide.

New technologies, processes, and service solutions are actively developed and protected. Beta holds over 7,400 patents and it has been making over 600 invention disclosures each year, which in 2012 alone led to over 200 priority patent applications. The R&D expenses in 2012 represented 1.7% of net sales. In addition, expenses related to IP rights equalled approximately EUR 13 million in 2012. Beta is now in the process of transition towards a more open approach and claimed to be a closed company at the stage when the interview was conducted.

Case company Gamma operates in minerals and metals processing technology areas as well as in energy, chemical industries, industrial water treatment; in addition, it provides environmental solutions and services. From an R&D perspective, it has two in-house research centres and over 600 patent families, with almost 6,000 national patents and applications, and over 70 trademarks. The research and technology development expenses totalled 2% of sales in 2012. It continuously develops technologies and complements its in-house R&D with acquisitions of other companies. Gamma has recently introduced an "open innovation" approach in its research centres. But what do they mean by "open innovation", really? This is revealed in the next section.

Findings

Based on the in-depth case analysis of the three companies, Alpha, Beta, and Gamma, we identified certain interesting differences in the companies' perception of open innovation activities. The results can be illustrated using the preliminary framework (Fig. 1). It presents a company's degree of openness based on three components: (1) perceived openness, (2) actual openness, and (3) targeted openness. This framework is derived from the empirical comparison of case companies' (open) innovation processes and is used as a tool to capture a general overview and an approximate understanding of a company's open innovation activities in comparison with those of others. Perceived openness represents a company's subjective opinion about its degree of openness and the involvement of external parties in the innovation process. Actual openness represents the level of the inbound and/or outbound innovation activities of the case companies compared to each other and to the major open innovation theory. Targeted openness is related
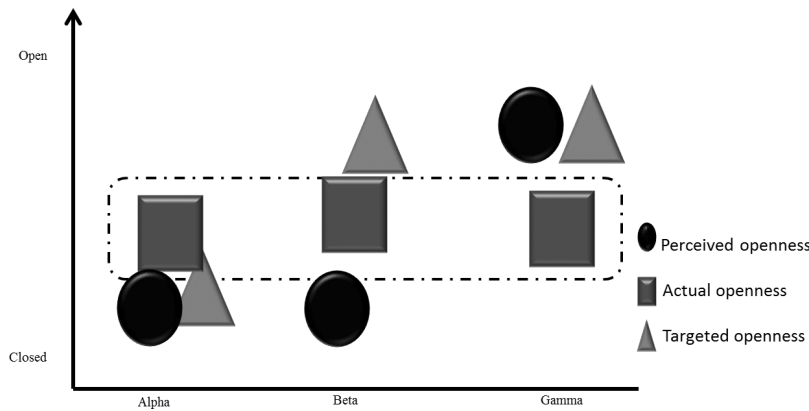
Fig. 1. Preliminary framework — perceived, actual, and targeted opennes.

to perceived openness and is mapped according to the company's future goals and actions to "relocate" its innovation activities towards being more open or closed.

Perceived openness

As illustrated in Fig. 1, the results indicate that company Alpha perceives itself as a closed innovator who strictly controls its internal innovation process, outward knowledge transfer, and proprietary IP. The level of company innovativeness is also perceived as "being innovative in a traditional way," which means generating new ideas and innovations by "activating internal people for these innovative activities" (Interviewee, company Alpha). Furthermore, as part of the strategy to grow and develop in-house capabilities, the company invests heavily in acquisitions.

To justify the controlling, closed innovation perspective and importance of strong in-house capabilities, the interviewee representing company Alpha said: "...If we have some cooperation with customers or suppliers, then our requirement is to have all IP rights... Practically, we really like to have the full ownership and cover the costs for all kind of technology development by our own."

This indicates that the company does indeed collaborate with customers and suppliers, but only to a certain extent. Usually the collaboration with customers occurs during the piloting stage, when the company invites key customers to test the products and provide feedback before the product launch. However, the knowledge flow is still inward:

> We strictly control that, what is the level of sharing the data. It's mandatory to collaborate with key customer and get the feedback from them and you share a little bit more with them. We also have the pilot program for the Alpha pilots and Beta pilots during the

> R&D process before we launch the product. With key customers we start very early by giving them prototype for testing. And then, typically, 3–6 months before the sales release we have the Beta piloting which is kind of zero series products which are fully performing before the sales starts. We get the limited quantity of key customers that we collect the feedback. This is the important area with the customer. But of course, we like to limit the access for confidential data. Even with suppliers, we share only which is mandatory for them to do their work.

Close collaboration with suppliers is also of importance for company Alpha, so that it will obtain new techniques and technologies of how to utilise these in their products. However, again, the information is strictly controlled. Also, a common practice for Alpha is not to rely on one supplier, and since it has the financial capabilities, it would rather buy the technologies developed by suppliers, safeguarding Alpha from competition and at the same time strengthening its position and competitiveness. "In our case we don't like to rely on any of the supplier practically. So if there is something which is crucial and core for us we negotiate so that we can buy the IPR for us."

In regard to outbound open innovation practices, Alpha does not (nor does it plan to) share their knowledge with the outside world (be it for monetary or non-monetary benefits). Unutilised technologies and unused patents are simply "put in the pocket": "...We just put it in the pocket. They are 'under the table' so all the IP rights what we have no matter if we use them or not, we are not selling any (...) Typically, what we have created we keep it for our own use so we are not doing such way that if we innovate on something and then we find out that we won't use it and then try to sell it out ... No, it's not our business."

Company Beta (similar to Alpha) perceives itself as a rather closed company, but is "in the process of transition towards greater openness." Since the company operates in five different segments and employs professionals in 50 countries, the level of openness varies according to the business division and the given project. Some projects, especially in the automation or power division areas are more "open" to external sources of knowledge and require collaboration with different parties in knowledge co-creation. However, those collaborative projects are still not common practice and overall, taking into consideration the whole Beta Group, the company claimed to be closed at the time the interview took place. To support that claim, in general, Beta develops technologies internally and prefers to own all IPR. It does collaborate with research institutes and universities, but only on basic research. Moreover, when presented the fundamental Chesbrough principles distinguishing open innovation from closed (Chesbrough, 2003), Beta, with no

hesitation, placed itself as having a closed innovation mindset. "(. . .) Right now, if you would have these two columns [principles of closed versus open innovation], so Beta is only in entrance to area of closed, we do everything ourselves. There is a bit of the cooperation with research institutes and universities, but basically, at the end of the day we want to own IPR, we want to own patents, we fill hundreds of patent applications every year."

Company Gamma, in contrast to Alpha and Beta, considers itself as an open innovator. Before the official semi-structured, face-to-face interview had begun, the Director of Technology Portfolio of Gamma gave a brief presentation of the company's structure and areas it operates in, following this with a presentation of their recently introduced Open Innovation Strategy. According to Gamma, open innovation is opening up to internal ideas. It considers open innovation as a concept of opening up the knowledge and idea flows inside the company boundaries, without any increased level of cooperation with the outside world. "Open innovation it is sharing the ideas internally within different groups and departments (. . .) inside open innovation."

Hence, the company puts effort into internal collaboration between the different units and departments in order to create an "open innovation culture" where ideas and knowledge are shared among employees.

Actual openness

Based on these different perceptions of open innovation held by our case companies, we developed a second level of openness — actual openness — and compared their open innovation activities. Interestingly, when we identified the inbound and outbound innovation practices with their pecuniary and non-pecuniary sides (Table 3), our case companies all fell into a virtually similar level of open innovation activities, with Beta expressing slightly greater openness due to its involvement in selling size of open innovation.

Alpha, as mentioned before, collaborates with customers and suppliers. Suppliers play an important role in the innovation process and are the biggest sources of external knowledge and ideas. Nevertheless, outward knowledge flow is limited to mandatory information the customer and supplier need to know. Also, in its organisational structure, the company has established Alpha Technology Ventures, which invests in high potential firms of strategic interest. It systematically scouts for new technologies and screens nearly 1,000 opportunities per year, investing from USD 1 million to USD 20 million in new ventures. Alpha has a special department called the Technology Department (TD), which is responsible for scanning for new knowledge (inbound non-pecuniary innovation). This responsibility is partly shared among all R&D employees. Even though the centralised

Table 3. Actual openness — open innovation activities in three case companies.

Focus	Open innovation activities	Alpha	Beta	Gamma
Inbound non-pecuniary (sourcing) (sourcing for external ideas)	Customer & consumer co-creation	Low	Low	Low
	Crowdsourcing	No	No	No
	Informal networking	Medium	High	High
	Scanning for external technologies	High (systematic)	Medium	Medium
	Collaboration with suppliers, competitors, lead users, universities, and research institutes	Inward collaboration with suppliers, customers, universities, and research institutes	Inward collaboration with suppliers, customers, universities, and research institutes	Inward collaboration with suppliers, customers, universities, and research institutes
Inbound pecuniary (acquiring) (acquisition of external knowledge)	IP in-licensing	No	Low	Low
	Purchasing R&D work form others	High(mainly suppliers)	High	High
	Contracted R&D services	Medium	Medium	Medium
	Supplier innovation awards	No	No	No
	Idea and start-up competitions	Low (i.e., Demola)	Low	No
	Specialised open innovations intermediaries	No	No	No

Table 3. (*Continued*)

Focus	Open innovation activities	Alpha	Beta	Gamma
Outbound non-pecuniary (revealing) (making own technologies and innovations available to others free of charge (free revealing)	Participation in standardization (public standards)	No	No	No
	Donations to commons or non-profits	No	No	No
Outbound pecuniary (selling) (commercialisation of company's technologies, inventions through selling or licensing-out to other organisations)	IP out-licensing	Yes	No	No
	Spin-offs	No	No	No
	Selling patents, know-how, market-ready products	Yes	No	No

Source: Adapted from Dahlander and Gann (2010), Chesbrough and Brunswicker (2013) and interpreted by authors.

TD is in charge overall, employees are also encouraged to scan the external environment, and if they find something of interest, they contact the TD and make a request to study a specific area of technology. Alpha collaborates with nearly 70 universities around the world. Even though the majority of the university research is at a basic level and the knowledge flow is inward, some of the business units participate in the fuzzy front end in an industry-academia collaboration called Demola (see Kutvonen and Havukainen (2011) for more details about the Demola project). Therefore, even though the company positions itself as closed, it is involved in certain inbound pecuniary and non-pecuniary activities — placing the level of actual openness higher than the perceived one. However, since it strictly controls the outbound activities (revealing or selling), it does score lower than company Beta.

Beta has similar identified inbound open innovation activities: it collaborates with customers, universities, and suppliers and considers them as important sources of ideas and knowledge, but the intensity of the collaboration is low. Usually, Beta includes key clients and suppliers in pilot and demo stages, but also strictly controls the information shared with them. However, it has already taken certain steps towards greater openness on their outbound innovation side by opening up and profiting from external knowledge exploitation. Beta noticed that IP-related expenses are high (over 13 million EUR in 2012), and that over 20% of patents in their portfolio are unused. Therefore, it joined a special program through which companies open up their unused IPR for other companies or SMEs who might be interested in making use of them.

Actual openness for Gamma, as illustrated in Fig. 1, is lower than that for Beta, due to Gamma's lack of outbound innovation activities. According to one of the interviewees, unused technologies are "put on the shelf" and the firm is not involved in any outbound open innovation practices (pecuniary or non-pecuniary). From the inbound perspective, it collaborates with small companies who have specialised knowledge that the company does not possess; it also collaborates with suppliers and customers. Customers are usually involved in the ideation and piloting stages. The company is also involved in university collaboration at the basic research level. Nonetheless, it mostly relies on in-house development and internal ideas, and uses mergers and acquisitions to strengthen its core business area.

Targeted openness

Targeted openness reflects future actions towards greater openness as subjectively self-reported by the companies. Case company Alpha does not see a great need to be fully open. It systematically scouts and observes the external environment and

has specialised departments and standardised procedures for that purpose. It absorbs all needed information from the market without needing to reveal its own knowledge. Privileged to be a large company with extensive R&D capabilities, it can afford to build an extensive patent portfolio and does not even consider any side business from sharing or selling their unused patents: "It's not our business and we don't consider much more of a business. The dollar values are so small that we have not resourced this kind of secondary business for patents."

However, Alpha is taking steps in boosting the innovativeness of its own employees and making them more open towards sharing ideas through an internal platform where they can post their ideas and initiatives, creating an "internal open culture." Gamma is also focusing on an internal openness towards sharing ideas rather than opening up more to the external environment. Company Beta, on the other hand, does consider increasing the level of collaboration with the external environment at different stages of the innovation process. It is considering using innovation intermediaries as well as opening up its unutilised patent portfolio to the external world. However, as a first step towards openness to the external environment, it needs to open up internally. As stated by previous interviewees of the other two case companies, the biggest challenge is to create an open organisational culture where ideas are shared internally. An interviewee from case company Beta made the following comment:

> At the end of the day, it's a cultural thing, so Beta is a very introvert and risk avoiding company... I would say that this internal culture that people are encouraged to put their ideas, that why we are starting with that and also it's ok to fail. As long as you are successful as well, your only fail that might happen with that is a business model. But, who was the guy, was it Edison, who said: how many times did it take to make a light bulb? I've tried a 100 times before it. Wasn't it frustrating to fail 99 times? I didn't fail; I just proved 99 wrong ways of making a light bulb . . . That's what our internal culture is missing at the moment.

Surprisingly, the targeted openness resulted in bringing up issues related to internal cultural changes and changing of the mindset rather than in opening up the innovation process to an inward and outward flow of knowledge, technologies and, ideas. Therefore, Alpha and Gamma's targeted openness is on an almost similar level of actual openness, and only Beta is planning to take more steps to open up to the external environment by incorporating both inbound and outbound innovation activities in tandem with changing the internal culture to being more open.

Conclusions

In this paper, we have aimed to direct the reader's attention towards differences in the understanding of open innovation by companies. We have analysed distinct (open) innovation strategies by three industry leaders and highlighted the problems resulting from numerous existing overlapping classifications and activities. We discovered that two companies who claimed to operate within two different approaches (perceived openness — open and closed), have in fact a similar degree of openness in their innovation activities (the actual openness is on a similar level). Furthermore, based on the perceived level of openness, the results indicate some confusion in the defining of open innovation by practitioners, which is an inevitable result of ambiguous definitions of the concepts in academia as well.

We discovered that even though our case companies perceive their openness differently, all are indeed at a similar level of actual openness. They all collaborate with external partners. The most important role in their collaboration activities is fulfilled by suppliers, and secondly by customers; however, the ideas gained from these are minor and incremental. Furthermore, they all engage in collaboration with universities and research institutes, but usually for purposes of basic research. All of the case companies are taking the necessary steps to increase the level of internal collaboration and to motivate employees to share ideas internally. Nevertheless, Gamma, who claims to have implemented open innovation, associates this approach with internal openness of the sharing and exchanging of ideas. Gamma takes neither outbound open innovation activities nor pecuniary inbound types under consideration. On the other hand, case company Beta, even though it perceives itself as "closed," has already engaged in finding the markets for its unutilised patents and technologies. All of the companies perceive open innovation differently, whether they possess a general openness towards ideas sharing, or profit from external knowledge exploitation or from crowdsourcing and use of innovation intermediaries.

As our research demonstrates, the gap between the three companies' own perception of their openness and their actual openness does exist. There might be multiple potential reasons for that. First of all, given the conceptual ambiguity of open innovation, due to poor operationalisation and interpretative definition, both practitioners are liable to make highly divergent assessments about the level of openness. In other words, the level of openness is seen differently, as openness itself is understood differently. Another potential reason, especially for reporting exaggerated perceptions of openness, is rooted in the positive hype factor still surrounding open innovation as a distinctly modern and progressive principle (trend) on innovation management. Managers may deceitfully report high levels of openness in order to polish the company's brand image towards potential

collaborators, employees, and shareholders. On the other hand, they can be cautious and claim that they are not open (whereas still maintaining the similar to other levels of collaborative operations). The decision of putting themselves on either end of openness is probably merely defined by the level of cautiousness the companies are demonstrating towards its brand and public image and their trust into open innovation paradigm. Yet, a further case could be made for the notion that the concept of open innovation has "watered down" as being perceived as a general principle or philosophy as opposed to representing any specific and concrete set of actions or activities, much like TQM, Six Sigma, or lean-management. Lastly, since there exist only few absolute indicators for measuring open innovation and even those are generally not known by managers, their perceptions are usually subjective assessments, which are by nature relative (i.e., relative to the familiar context, in this case, the direct competition and the industry).

The paper deals with the problem of misunderstanding between academic and practitioner communities, and emphasises the need to recall where open innovation research has originated. We suggest to the academic community that it is necessary to differentiate between openness as a corporate philosophy and the implementation of open innovation as an approach to managing the innovation process. Based on the results of our study, we claim that internal openness to idea generation and open innovation practices (e.g., collaborating with external partners in knowledge co-creation and external knowledge exploitation) should be conceptually differentiated. Open innovation as a concept should refer to a process related to a company's research and development activities rather than to a general (culture of) openness to external ideas (and, for example, crowdsourcing). We support the explicit classification of open innovation practices by the direction of knowledge flows and the motivation behind them into outbound (revealing and selling) and inbound (sourcing and acquiring) modes. Nonetheless, the real essence and novelty of open innovation is in coupled modes of open innovation, that is, in collaboration in knowledge co-creation, where the knowledge flows in both directions.

Clarification of the open innovation concept and activities is useful not only for academia, which carries out research of the phenomenon, but also for managers planning the innovation strategies. Our findings raise the awareness of business people regarding the many faces of open innovation and the existence of three different levels of it (perceived, actual and targeted). It helps them to be better informed about their levels of open innovation activities and to pay attention to the difference between their own perception and reality of open innovation in their companies.

Shedding light on the problem of defining open innovation and openness *per se* aids companies in finally defining where they are located on the open innovation

map. The results may raise critical doubt on self-reported questionnaire answers on open innovation surveys due to a misperception of open innovation practices by managers. Surveys with simplified questions like "Is your company engaged in open innovation activities?" are destined to fail and yield false results due to the responders' subjective perceptions of what actually constitutes open innovation.

The present paper is subjected to a number of limitations. The results do not reflect the innovation process of a whole company. Furthermore, each group division within the case companies has its own innovation process, and the integration of external ideas and technologies is project/division specific. Hence, the company may be more open for one project and closed for another, which we cannot distinguish, so we have only focused on the average of operation activities compared with the other companies. Results are generalised at the whole group-level, are based on interviews with centralised heads of TDs who are based in Finland, and are supported by an analysis of external sources of information. The next step of the research is to increase the amount of interviews within the case companies as well as to include more companies into our sample. Quantitative data collection is also a viable option.

The insights gained from this research allow the following questions to be added to the open innovation research agenda: When can a company be perceived as closed, and when can it be perceived to be open? Do truly closed companies even exist nowadays? Considering how companies utilise highly divergent innovation approaches in their various business units and projects, should openness be discussed on a company level at all?

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Publication II

Dąbrowska, J., Teplov, R., Podmetina, D., Albats, A., and Lopez-Vega, H. (2017)

WHERE LIES THE DIFFERENCE BETWEEN OPEN INNOVATION ADOPTERS AND NON-ADOPTERS?

Conference article. In: the 77th Academy of Management Annual Meeting, Atlanta, USA, 4-8 August 2017

Where lies the difference between open innovation adopters and non-adopters?

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ABSTRACT

Based on a survey of 454 Europe-based companies, we explore the differences in implementation of open innovation (OI) activities and organizational level capabilities of companies representing five stages of self-assessed adoption of OI including non-adopters. Our results indicate that difference between the intensity of OI activities' adoption can be clearly recognized in case of extreme groups' comparison (e.g. experienced adopters vs. non-adopters) only. Moreover, our results show that the true difference between companies lay in establishment of particular organizational practices and supporting mechanisms to foster knowledge inflows and outflows, discovering external and unlocking internal paths to markets. Thus, this study contributes to the ongoing research on the process of open innovation implementation and its supporting mechanisms.

Keywords:

open innovation, organization capabilities, open innovation activities, survey

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Where lies the difference between open innovation adopters and non-adopters?
Introduction

Nowadays more and more companies recognise the benefits, that open innovation (OI) can bring to their innovation strategy (Appleyard and Chesbrough, 2016; Whittington, et al. 2011). Numerous examples of companies show how firms use OI to respond to innovation challenges (Chesbrough and Brunswicker 2014; Di Minin, et al. 2010; Dodgson, et al. 2006; Mortara and Minshall, 2014). However, some conceptual ambiguity on the definition of open innovation (and how to define companies adopting OI from those who do not) can still be observed (Dahlander and Gann 2010, Huizingh, 2011). We suspect the benefits of knowledge inflows and outflows only prevail when open innovation is embedded in a firm's innovation strategy or (and) internal corporate activities and organizational practices. Many studies indicate that implementation of open innovation needs to be in line with the changes in the entire organizational processes, for example by establishing structures and coping mechanisms (Chiaroni et al, 2010, Dahlander and Gann 2010; Gassmann, et al. 2010; Enkel et al, 2011, Lakhani, et al. 2013, Mortara and Minchal, 2011). Chiaroni and colleagues (2010) explains the open innovation implementation as a dynamic process linking it with change management literature, that includes three phases: unfreezing (establishing a logic and sense of urgency for change towards OI), moving (change implementation) and institutionalizing (establishing the new order).

By defining open innovation as a strategic process, we make assumptions on organisational resources and capabilities required for implementing open innovation. First, according to Lichtenthaler and Lichtenthaler (2009) firms use their organizational capabilities to manage open innovation environment. Next, following the capability based-view (Eisenhardt and Martin, 2000) and organizational learning theory (Grant, 1996), we assume that the organizational capabilities play a fundamental role in creating a sustainable competitive advantage, which results in superior performance and aid in successful implementation of open innovation. In support of this assumption, Mengus and Auh (2010) argue that unless companies build organizational capabilities, their innovation performance may be at risk. Thus, firms intending to implement an open innovation strategy require specific organizational capabilities being developed (Ketchen, Hult and Slater, 2007). We assume that the organizational capabilities existing in the firms can contribute to enhancing innovation performance at the different stages of open innovation implementation (Enkel, et al. 2011). As organisational capabilities are assumed important for innovation, this study explores the specific innovation capabilities that foster open innovation in parallel with studying practices perceived as open innovation activities in the academic literature (Chesbrough and Brunswicker, 2013). In this paper, we aim to compare the companies according to their self-assessed stage of open innovation adoption and to study the differences in (open) innovation activities and organisational capabilities between companies at the different stages of OI adoption. Hence, our research question is: *What are the differences and similarities between companies who claim to be on different stage of open innovation adoption (also non-adopting OI)?* To answer this question, we compare the companies based on: 1) intensity of adoption of activities associated with OI: 2) organizational-level capabilities.

The following section presents the literature on open innovation and organizational-level capabilities with associated organizational practices. Next, we describe the research design, followed by an overview of the survey results. Finally, the last section discusses the contribution of this paper, limitations and suggestion for future research.

Literature review

In the recent years, there can be observed a rapid increase of companies adopting open innovation. Following the definition of open innovation as "*a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with each organization's business model*" (Chesbrough and Bogers, 2014, p.27), companies may adopt various inbound and outbound open innovation activities. For example, searching for external ideas and collaborating with external partners supplements company' internal R&D (Baglieri and Zamboni, 2005), creates added-value from relationship with partners (Chesbrough et al, 2014; Walter et al., 2001; Smith and Blanck, 2002). According to many scholars (e.g. Chesbrough and Brunswicker 2013; Chiaroni, et al. 2010; Di Minin, et al. 2010,) implementation of open innovation is a strategic process that should include establishing certain processes to manage these external collaborations and to collect ideas from external sources (for example, P&G's Connect and Development, Fiat's research center, GE's ecomagination and Open NASA). These mechanisms could also be physical infrastructures such as the Eindhoven Science Park, Xerox PARC, and Techshops (Chesbrough, 2003). Also, some companies prefer hiring innovation intermediaries such as NineSigma or InnoCentive (Jeppesen and Lakhani 2010; Lopez-Vega, et al. 2016), using virtual platforms for crowdsourcing i.e. TopCoder or a mix of the two such as co-creation or hackatons (Lakhani, et al. 2013). They are all associated with inbound open innovation.

While these activities facilitate the connection of internal technology needs with external innovation opportunities, companies also need internal managerial processes to cope with the identification of internal innovation needs, search and select for external partners and integrate solutions (Enkel, et al. 2011; Salter, et al. 2014). Searching for co-creation of innovation externally, companies cooperate with different partners: customers (von Hippel, 1988), suppliers (Schiele, 2010), research organizations (Gemünden et al., 1996) and even competitors (Clark and Fujimoto, 1991). Thus, lead users, suppliers, or universities can be identified as the key sources for external innovation (von Hippel, 1988). Companies, adopting open innovation, use different channels (technology providers, suppliers, customers, research organisations, universities), while searching for external knowledge and innovation opportunities (Laursen and Salter, 2006).

The selection of a preferable partner depends on the objective of the collaboration, i.e. problem driven or strategic projects. For example, when an organization seeks to solve a specific technical problem, it uses its own open innovation platform to crowdsource its need. However, when it seeks to create a radical innovation, it decides to use a hackathon or co-creation method. As suggested by Malhotra and Majchrzak (2014), problem formulation is a key success factor of knowledge integration in crowdsourcing. Miotti and Sachwald (2003) proposed a framework

for predicting the efficiency of innovation cooperation with different partners, addressing also the partner selection problem.

As identified earlier, for establishing open innovation processes, companies need internal mechanisms and tools, powered by the abilities of organisation to search for knowledge externally, and to integrate and disseminate it internally. In other words, companies need established organisational capabilities to handle these processes. Regardless the level of openness, companies need to possess certain organizational capabilities to manage knowledge in- and outflows and to develop skills to support internal infrastructure and cross-functional coordination, assisting the innovation integration and dissemination (Cohen and Levinthal, 1990; Grant, 1996).

Organizational capabilities and managerial levers

There exist several theories on capabilities that scholars link with open innovation. One of the most cited (e.g. Lichtenthaler and Lichtenthaler, 2009; Cheng and Chen, 2013) is dynamic capability, defined by Teece et al (1997, p. 516) as "*the ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments*. Lichtenthaler and Lichtenthaler (2009) investigate knowledge capabilities that are required for internal and external knowledge exploration, exploitation and retention as well as interactions among them. Drawing on the capability maturity framework, Habicht and colleagues (2012) propose OI-specific competence management framework that focuses on project- and individual-level capabilities. Absorptive capacity (Cohen and Levinthal, 1990) allows scanning, judging and incorporating external knowledge. In open innovation literature, this capacity is considered as critical for recognizing the opportunities and constrains of external knowledge in respect to company's own resources (e.g. Chesbrough, 2003; Dodgson et al, 2006; Spithoven et al., 2011; West and Gallaher, 2006).

Innovation capabilities, as defined by Lawson and Samson (2001, p. 384), are the abilities "to continuously transform knowledge and ideas into new products, processes and systems for the benefit of the firm and its stakeholders". According to Ritala and colleagues (2009) the research on organizational level capabilities takes its roots from evolutionary economics and the resource-based theory. Organizational capabilities, as defined by Grant (1996, p.377) are firm's abilities "to perform repeatedly a productive task which relates either directly or indirectly to a firm's capacity for creating value through effecting the transformation of inputs into outputs" and require integration of specialized knowledge across different employees. Hafkesbrink and Schroll (2010) gave another insight on capabilities or competences. They combine different competences and technological capabilities to capture the dynamic status of the organization and group them into three dimensions: *organizational readiness, collaborative capability and absorptive capacity*. These three dimensions describe organizational antecedents to enhance the successful open innovation process and are defined by authors as "organizational competences for open innovation" (Hafkesbrink and Schroll, 2010, p.32).

In this paper, we will link different streams of literature with respect to organizational level capabilities and organizational practices, which are considered important for companies

deciding to implement open innovation (Chiaroni et al 2011; Ketchen at al., 2007). We describe them below as they form a foundation for the survey questionnaire on open innovation capabilities, which has been used in this study.

Organizational-level capabilities called to support open innovation

According to Gold and colleagues (2001), *organization structure* plays an important role as unfavorable structure may inhibit knowledge sharing and collaboration across organization. For example, O-Dell and Grayson (1998) argues that structures that encourage individualistic behaviour by providing rewards for 'hoarding' information prevent effective organizational knowledge sharing and management. Likewise, the study of Nisar and colleagues (2016) and Chiaroni et al (2010) emphasize that special organizational structures and organizational boundaries are needed to successfully facilitate the knowledge in and out flows.

Companies should also include the use of proper *rewarding systems* to support the knowledge transfer and introduction of the new paradigm (Chesbrough 2003, Huizingh 2011; West and Gallagher, 2006). Findings of Fu (2012) suggest that incentives (short-term and long-term) have positive effects on the innovation efficiency. Moreover, by properly incentivising employees' efforts and utilising external talents and their ideas, the innovation efficiency can be further increased. Apart from motivating employees to engage in open innovation activities, a company needs to properly set incentives, promote strategic decisions, greater collaboration and team working. At the same time, such activities may easily jeopardise the cooperative creativity, learning and internal technology transfer, if they are wrongly focused (Teece and Pisano, 1994).

In addition, many authors (e.g. Sakkab, 2002; Gassmann and von Zedtwitz, 2003; Dodgson et al., 2006) emphasize the adoption of *knowledge management systems* aiming at fostering the diffusion, sharing and knowledge transfer. Furthermore, authors stress the *role of top management to promote* open innovation (Chesbrough and Brunswicker, 2014; Chiaroni et al 2011; Mortara et al 2011; van de Meer, 2007). The high level of commitment from managers, especially from the top management team, is also acknowledged from the perspective of dynamic capability theory scholars (e.g. Harreld et al., 2007; Teece, 2007; Zahra et al., 2006).

The research has shown that organizational inertia and structural rigidities inhibit the transfer and use of outside knowledge at the organizational level (Lane et al., 2006). However, according to many scholars knowledge, is in fact, transferred, absorbed, and put into practice at the individual level (Lichtenthaler, 2011; Reagans and McEvily, 2003; Rogan and Mors, 2014). Hence, as pointed out by Chesbrough et al (2006) attitudes can constitute an important micro-foundation of major obstacles to the development of organizational capabilities at the firm level. For example, the so-called the Not-Invented-Here (NIH) syndrome (Katz and Allen, 1982) is one of the most cited concepts in the literature on knowledge transfer (Antons and Piller, 2015) and stresses that generally, individuals have negative attitude toward knowledge, ideas and technologies which originates from the outside of the company (de Araujo Burcharth et al., 2014; Laursen and Salter, 2006). Antos and Piller (2015) in their recent study, analysed 647 publications referring to NIH, and found that scholars list many different antecedents. They

include e.g. established routines (Kathoefer and Leker, 2012; Katz and Allen, 1982), the human tendency to strive for security and stability (Kathoefer and Leker, 2012), wrongly balanced incentive systems, culture (Dabrowska and Savitskaya, 2014), resistance to change (Antos and Piller, 2015). Consequently, NIH may lead to project failures (Herzog and Leker, 2010; Kathoefer and Leker, 2012), decrease firm's performance (Katz and Allen, 1982), wrong evaluation of external ideas and technologies (Antos and Piller, 2015; de Araujo Burcharth et al., 2014; Kathoeferand and Leker, 2012) and organizational failure in implementation of open innovation. On the other hand, individuals may be affected by the Not-Sold-Here (NSH) syndrome that relates to protectionisms and reluctance towards external knowledge exploitation (Lichtenthaler et al., 2010). The empirical study of de Araujo Burcharth and colleagues (2014) finds that the level of Not-Invented-Here and Not-Sold-Here attitudes, negatively effects the extent of use of inbound and outbound open innovation practices, respectively. Moreover, they emphasize the need of specific type of professional training programs to ease the effect of these syndromes.

In addition, the recent study of Lazarotti and colleagues (2017) mentions the importance of internal social context to facilitate open innovation. Burcharth, Knudsen, and Søndergaard (2013) identifies a set of internal management mechanisms related to providing autonomy, empowerment, and freedom to employees that are important links between open innovation practices and company's innovation performance.

Research Design

The data

This submission uses the data of the survey conducted in 38 countries in 2014-2015 among managers representing companies operating in Europe. The survey was based on the self-administered online questionnaire. The original questionnaire was created in English. In order to increase the response rate, the respondents were offered an option to fill the questionnaire in 12 other European languages. The survey was distributed though Webropol. The targeted survey respondents were innovation, R&D, HR or generally top managers. The primary objective of the survey accomplished as the part of the large-scale European project was identification of skills required for open innovation specialists. Therefore, there was a need to include HR managers in the targeted group of respondents. However, in this paper we focus on firm-level data and do not discuss individual skills and abilities of OI specialists.

To collect the data we applied stratified sampling strategy selecting 5-10 top industries contributing to country GDP. The overall sample size is 525 companies. After removing incomplete questionnaires and questionnaires filled by universities and public organizations, which do not belong to the focus of this study the sample size decreased to 454 firms. The sample contains firms of different sizes from 38 countries representing all European regions (Northern, Southern, Eastern and Westen Europe).

Measures

In order to address the research objectives the following measures have been used. First, we captured the company self-perception about their stage in open innovation implementation process. Thus, we offered 6 alternatives consisting of Stage 1 "We are not adopting and not planning to adopt open innovation" (23% of total sample); Stage 2 "We are not currently adopting open innovation, but plan to implement OI in the nearest future" (16%). Stage 3 "We are in the early stages of implementing OI activities" (29%); Stage 4 "We are in the process of refining OI activities and shaping programmes to help establish best practices in OI" (19%) and Stage 5 "We are experienced adopters of OI (processes, procedures, and best practices are in place)" (13%). Stage 6 indicated those firms "who had OI activities, but decided to discontinue them". As for the Stage 6 only one company chose this alternative, therefore we excluded it from the further analysis (the anonymity of the respondents does not allow for further investigation of this interesting case). The respondents were asked to select the one stage, which best describe their company . In order to ensure the common understanding of "open innovation" term, the respondents were offered the "classical" definition of the concept as written in Chesbrough (2003, p.43).

Second, to analyse the intensity of open innovation activities adoption we developed the list consisting of 13 various activities traditionally considered in academia as open. The list is based on Chesbrough and Brunswicker (2013) but was further elaborated and validated during several experts workshops organized during the project activities. The respondents were asked to evaluate the degree of each activity adoption with 8-point scale where 1 corresponds to "no, we don't (adopt)", 2 to "very seldom" and 8 therefore denotes the very intensive adoption.

Third, we developed the list consisting of 15 statements indicating the specific organizational capabilities. The capabilities we used originate from Hafkesbrink et al. (2010), but were sufficiently elaborated and validated during several experts' sessions and small-scale pilot survey. The respondents were asked to report their degree of agreement with each specific statement using 7-point scale (from 1-"strongly disagree" to 7-"strongly agree). Next, the capabilities were grouped into two sections where one group captures practices to foster open innovation on the organization level and the second addresses rather the general corporate culture of openness and knowledge transfer.

To proceed with the analysis we implemented ANOVA with post-hoc tests. Specifically, we adopted Welch's ANOVA to decrease the risk of getting incorrect results due to issues with the non-homogenous variances (Levene's test was significant for certain variables) for post-hoc comparisons Games-Howell test was used.

Results

Based on the five stages of self-assessed adoption of OI, we grouped the companies accordingly: OI non-adopters (Stage 1); OI planners (Stage 2); OI beginners (Stage 3); OI refiners (Stage 4); OI experts (Stage 5). These groups were then analyzed based on the intensity of adoption of activities associated with OI and organizational-level capabilities.

Open Innovation activities

Figure 1 presents the results of the intensity of adoption of various activities between five groups. In order to better illustrate the results, the inbound and outbound dimension was used (see e.g. Gassman and Enkel, 2010, Brunswicker and Chesbrough, 2013 for details). Not surprisingly, it can be noticed, that companies who identified themselves as experienced OI adopters (aka OI experts) demonstrate the highest intensity of adoption of OI activities compared to other stages and especially to OI non-adopters and OI planners. The results are confirmed by Welch's ANOVA where all activities demonstrate significant (p< .01) difference between the groups (Table 1). However, the results also indicate that firms neglecting to adopt open innovation in fact, do adopt the majority of open innovation activities, only less intensively. Moreover, OI planners followed by OI non-adopters, also adopt activities like *scanning for external ideas/technologies, collaboration with external partners*, relatively high. Interestingly, for *customer co-creation in R&D projects* and *IP in-licensing* OI non-adopters demonstrate even slightly higher intensity of adoption than OI planners, although the difference is not significant. At the same time, post-hoc tests revealed that for majority of OI activities OI planners demonstrate similar level of adoption as OI non-adopters (Games-Howel test for differences between OI adopters and OI planners is not significant for 8 out of 13 activities, see Table 1).

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Overall, post-hoc comparisons revealed that although OI activities (either inbound or outbound) can differentiate between OI adopters and those who do not adopt OI (non-adopters and planners), the difference between various stages of OI adopters (e.g. experienced adopters vs. beginners) is not significant. The only exceptions are such activities as *using external networks* and *scanning for external ideas,* for which the difference between OI beginners and OI refiners is significant (Table 1).

Organizational-level capabilities

The most noticeable differences between OI adopters, non-adopters and planners can be observed when analysing the organizational capabilities. Welch's ANOVA demonstrates significant difference (p< .01) between groups for all capabilities (see Table 2).

One group of organizational capabilities focuses more on the *corporate culture and knowledge transfer* (Figure 2). The patterns revealed from post-hoc comparison clearly differ from the second group of capabilities (Table 2) aiming at organisational practices fostering open

innovation. Thus, although the differences between experienced OI adopters and non-adopters are still significant for all the capabilities, the differences between other stages of OI adoption (OI refiners and OI beginners) and OI planners are not significant. Therefore, we can observe two groups consisting of non-adopters on one side and various stages adopters on the other. Noticeably, the group of adopters (including OI planners) is relatively homogenous as the differences between the most of capabilities are not significant for all pairs.

On average, the level of development of the first group of capabilities is higher than in the second group of capabilities. The results indicate that neither OI adopters, nor OI planners are affected by Non-Invented-Here syndrome (average scores for statement "*Our employees have positive attitudes towards applying ideas and technologies from outside the company*" are positive), including OI non-adopters.

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In addition, all OI adopters report that their employees have positive attitudes towards sharing ideas / technologies outside the companies (in other words, they are not affected by Not-sold-here syndrome). On the contrary, non-adopters have negative *attitudes towards having others receiving and using their knowledge and technologies* (the difference between groups is significant at p< .01). The results show the clear difference between OI adopters and OI non-adopters when referring to the *opening borders to facilitate knowledge in- and outflows* as well as *the cross-functional collaboration in knowledge sourcing and exchange* (see Figure 2).

The second group of capabilities, representing *what companies do to foster open innovation* on the organization level (Figure 3) consists of *fostering OI skills and bringing awareness on OI within the organization, providing education and training on OI*, *applying interactive collaborative tools and methods*, *receiving support from top management*, *designing rewarding system*, *having appropriate organizational structure to facilitate OI. This set of organisational procedures* revealed the most significant differences between the analysed five groups of companies. OI experts have implemented corporate practices to foster OI more intensively than companies have at earlier stages of OI adoption (OI refiners and especially OI beginners). Multiple post-hoc comparisons revealed that differences between OI experts and other groups (except of OI refiners) are significant (p<.01) for most of the cases, whereas difference between OI experts and OI refiners is significant (p< .05) only for two capabilities: *fostering OI skills and bringing awareness on OI within the organization* and *designing rewarding system (for OI activities performed by employees).* We can also differentiate between earlier stages of OI adoption (OI beginners and OI refiners) and OI non-adopters,

whereas comparison with OI planners gives mixed results (Table 2). Differences between OI refiners and OI beginners are not significant. Therefore, OI experts can be clearly distinguished from other groups by (higher) level of capabilities fostering OI (Figure 2).

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Discussion and Conclusions

The objective of this paper was twofold. First, it compared how companies at the different stage of OI adoption implement various OI-related activities. Second, it disentangled the organizational capabilities that help to unlock the knowledge inflows and outflows, as well as internal and external market paths. Results indicate that the intensity of adoption of OI activities between companies at various stages of OI adoption follow the straightforward logic for most of the activities: in general, OI experts adopt OI activities more intensively. However, in some cases, different paths are observed. For example, the OI experts do not differ from OI refiners and OI beginners, in adoption of outbound OI activities (e.g. *no significant difference in participation in industry standards; free revealing)*. Not surprisingly, the OI non-adopters and OI planners demonstrate lower level of adoption, in general. However, there are certain activities that OI planners and OI beginners adopt on similar level (e.g*., scanning for external ideas and selling unutilized technologies*). Interestingly, for *customer co-creation in R&D projects* and *IP in-licensing* OI non-adopters demonstrate even slightly higher intensity of adoption than OI planners, although the difference is not significant.

Furthermore, results indicate that the real difference between the groups can be observed while analysing the organizational capabilities and practices fostering OI (e.g. providing education and training, developing organizational structure and knowledge management systems, support of top management). Furthermore, some variation is also captured when analysing the capabilities related to corporate culture and knowledge transfer (e.g. attitudes related to NIH and NSH, easy acceptance of new external ideas; failure-tolerance mentality). Hence, it may be argued, that the real difference between OI adopters of the different stage, OI planners and non-adopters lay in the establishing purposive organizational practices, processes and supporting mechanisms to foster knowledge in and out flows, within and outside of the company boundaries. For example, the results indicate that OI planners, aiming at starting the adopting OI, have reached a certain level of organizational readiness when referred to knowledge transfer and organizational culture (Figure 2), and the level of some capabilities is higher than in case of OI beginners. However, OI planers still have not developed supporting mechanisms like rewarding systems, education and training programs to foster OI (Enkel, et al. 2011) .

We expect that this research will contribute to further understanding of how open innovation is managed and organized. This paper contributes to the current conceptual developments related to open innovation strategy (Chesbrough and Appleyard 2007; Whittington, et al.

2011). Our results reveal that implementation of open innovation activities also occurs in firms that do not acknowledge the use of open innovation. Following the findings of this paper, we suggest that firms intending to implement an open innovation strategy also need specific organizational capabilities. These should align them to a firm's innovation strategy and other internal organisational practices (Ketchen, et al., 2007).

While numerous authors discussed the effect of the NIH syndrome in the implementation of open innovation (van de Vrande, et al. 2009), our findings revealed that it does not play a crucial role for either of the groups. This contradicts with the previous findings confirming the negative effect of NIH in the implementation of open innovation. On the other hand, the clear difference is seen with regard towards NSH syndrome. We suppose that it may be linked with the need to establish proper organizational practices, procedures and supporting mechanisms (e.g. knowledge management systems) – forming organizational capabilities as emphasized by other scholars (Dahlander and Gann 2010; Gassmann, et al. 2010; Lakhani, et al. 2013).

We also see that further studies are needed to explore relationships between OI adoption, organizational capabilities development and actual organizational performance.

This paper directs attention towards the importance of developing proper organizational practices and supporting mechanisms to foster OI and calls for further research in this domain. However, already now, one can raise the question on the importance of implementing such mechanisms at the organizational level (e.g. rewarding systems, knowledge management systems) for knowledge transfer within and outside company's borders. Further research on open innovation' implementation calls for analysis at the different levels (Bogers et al., 2016) - the exploration of skills and competences of managers implementing open innovation (as suggested by Whittington et al., 2011); the influence of understudied NSH syndrome on company's innovation strategy; establishment of dynamic capabilities for open innovation (Helfat, et al. 2007) or capabilities to build and orchestrate an ecosystem (Adner and Kapoor, 2010).

Acknowledgement

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FIGURE 1

Intensity of adoption of Open Innovation activities
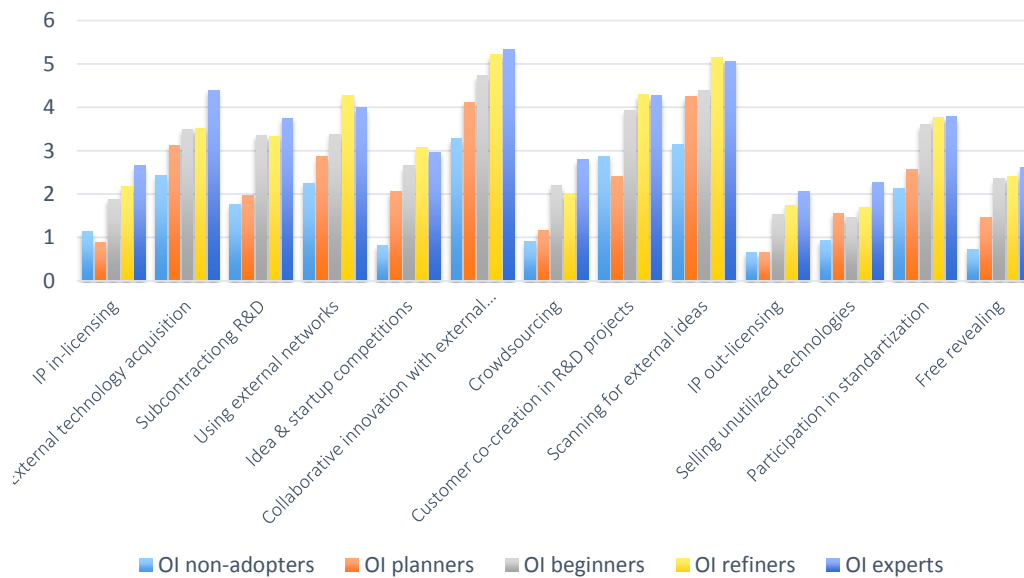
FIGURE 2

Organizational capabilities 1: corporate culture and knowledge transfer
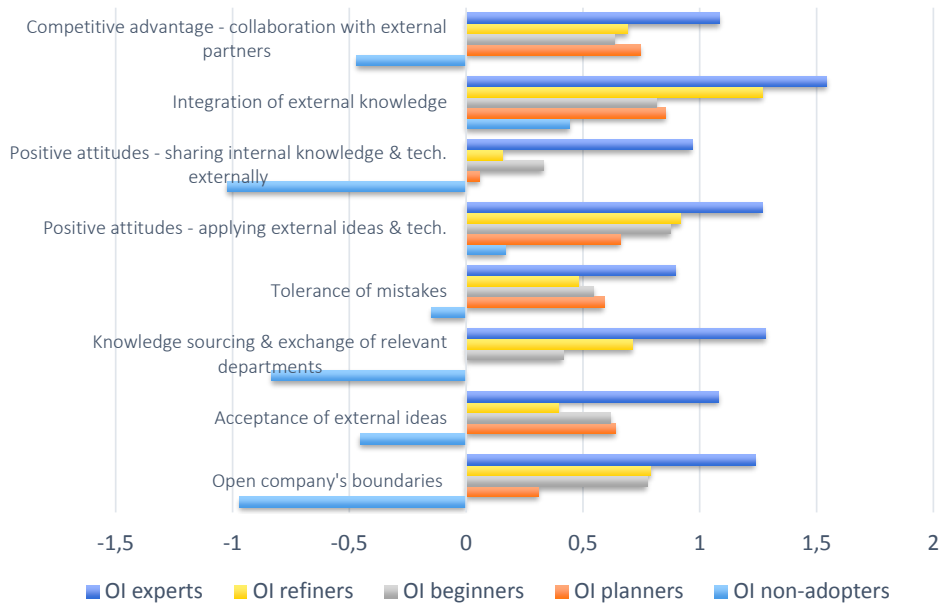
FIGURE 3.

Organizational Capabilities 2: what companies do to foster open innovation

TABLE 1

Open innovation activities
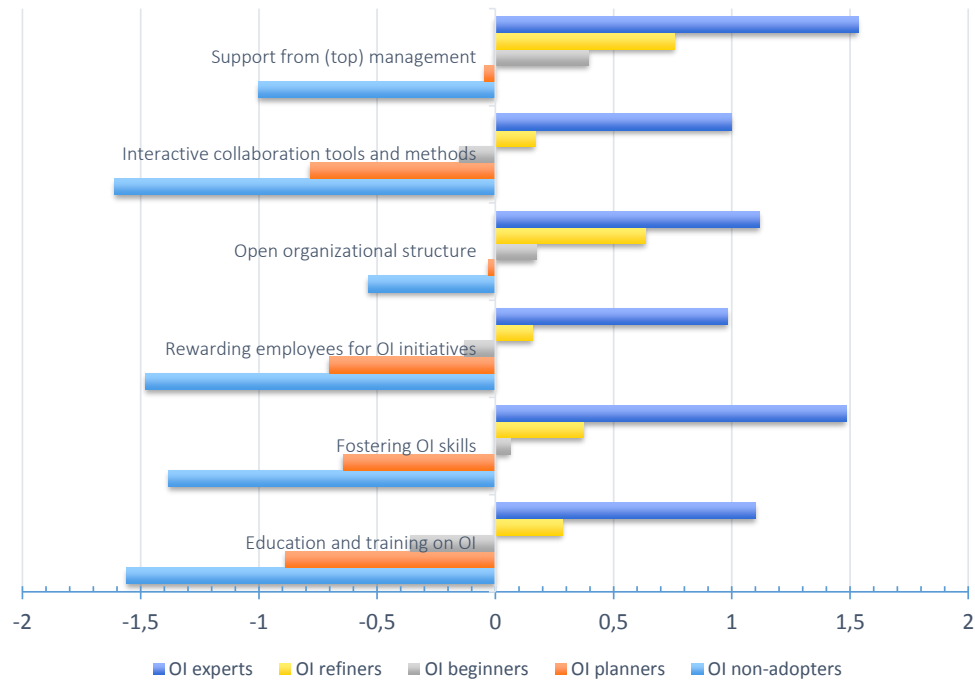
Open Innovation activities	Welch's ANOVA		Post-hoc multiple comparison (Games-Howell)									
	Statistics	Sig.	OI experts vs OI non-adopters	OI experts vs OI planners	OI experts vs OI beginners	OI experts vs OI refiners	OI refiners vs OI non-adopters	OI refiners vs OI planners	OI refiners vs OI beginners	OI beginners vs OI non-adopters	OI beginners vs OI planners	OI planners vs OI non-adopters
IP in-licensing	9,009	0,000	0,001	0,000	0,258	0,787	0,014	0,001	0,891	0,062	0,004	0,865
External technology acquisition	6,778	0,000	0,000	0,025	0,127	0,203	0,017	0,828	1,000	0,007	0,808	0,316
Subcontractiong R&D	14,014	0,000	0,000	0,000	0,788	0,775	0,000	0,001	1,000	0,000	0,000	0,975
Using external networks	12,217	0,000	0,000	0,033	0,394	0,945	0,000	0,001	0,023	0,001	0,488	0,372
Idea & startup competitions	23,167	0,000	0,000	0,212	0,942	0,999	0,000	0,059	0,747	0,000	0,365	0,001
Collaborative innovation with external partners	12,924	0,000	0,000	0,006	0,246	0,995	0,000	0,009	0,377	0,000	0,270	0,121
Crowdsourcing	11,771	0,000	0,000	0,001	0,545	0,292	0,002	0,084	0,965	0,000	0,006	0,891
Customer co-creation in R&D	10,257	0,000	0,005	0,000	0,891	1,000	0,001	0,000	0,823	0,015	0,000	0,731
Scanning for external ideas	12,442	0,000	0,000	0,152	0,169	0,999	0,000	0,058	0,044	0,000	0,991	0,017
IP out-licensing	10,091	0,000	0,001	0,001	0,555	0,924	0,001	0,001	0,928	0,002	0,003	1,000
Selling unutilized technologies	4,464	0,002	0,002	0,374	0,142	0,548	0,055	0,993	0,907	0,236	0,998	0,280
Participation in standartization	9,171	0,000	0,001	0,046	0,989	1,000	0,000	0,026	0,988	0,000	0,030	0,751
Free revealing	19,582	0,000	0,000	0,019	0,948	0,985	0,000	0,047	1,000	0,000	0,032	0,075

TABLE 2

Organizational capabilities

Open Innovation activities	Statistics	Sig.	OI non-adopters	OI experts vs OI planners	OI experts vs OI beginners	OI experts vs OI refiners	vs OI non-adopters	vs OI planners	vs OI beginners	vs OI non-adopters	vs OI non-adopters	vs OI planners	vs OI non-adopters
Group 2 Organizational capabilities fostering Open Innovation													
We provide education and training on open innovation for our employees	14,629	0,000	0,000	0,000	0,001	0,408	0,000	0,000	0,034	0,092	0,006	0,829	0,486
Open innovation skills and awareness are fostered within our organisation	26,427	0,000	0,000	0,000	0,000	0,002	0,000	0,009	0,751	0,000	0,000	0,093	0,308
Open innovation activities by our employees are rewarded	13,924	0,000	0,000	0,000	0,024	0,047	0,000	0,246	1,000	0,000	0,000	0,277	0,230
The organisational structure in our company is designed to be open according to our needs	6,922	0,000	0,000	0,022	0,074	0,602	0,003	0,369	0,800	0,878	0,036	0,878	0,511
We apply interactive collaboration tools and methods to facilitate open innovation	17,385	0,000	0,000	0,000	0,003	0,090	0,000	0,012	0,873	0,000	0,000	0,072	0,377
(Top) management strongly supports open innovation activities (by allocating enough resources)	14,679	0,000	0,000	0,000	0,002	0,083	0,000	0,090	0,780	0,001	0,001	0,480	0,284
Group 1 Organizational capabilities representing corporate culture and knowledge transfer													
The borders of our company are open for knowledge flow from outside-in and from inside-out	17,531	0,000	0,000	0,138	0,788	0,743	0,000	0,709	1,000	0,000	0,000	0,546	0,001
New external ideas are easily accepted and disseminated in our organisation	7,104	0,000	0,000	0,778	0,495	0,234	0,013	0,968	0,974	0,001	0,001	1,000	0,008
Relevant departments are actively participating in knowledge sourcing and knowledge exchange	12,338	0,000	0,000	0,001	0,083	0,425	0,000	0,026	0,874	0,000	0,000	0,149	0,479
We accept the possibility of mistakes in external knowledge sourcing	3,523	0,009	0,004	0,644	0,666	0,730	0,077	0,999	1,000	0,040	0,040	0,998	0,219
Our employees have positive attitudes towards applying ideas and technologies from outside the company	3,873	0,005	0,008	0,443	0,964	0,937	0,027	0,784	1,000	0,010	0,010	0,672	0,617
Our employees have positive attitudes towards having other companies receiving and using our knowledge and technologies	9,637	0,000	0,000	0,555	0,549	0,140	0,002	0,991	0,854	0,000	0,000	0,997	0,005
Externally obtained knowledge is integrated into our products, processes, and services	3,372	0,011	0,030	0,167	0,118	0,964	0,085	0,375	0,314	0,830	0,830	0,998	0,977
Our competitive advantage lies in collaborating with external partners	5,114	0,001	0,000	0,824	0,782	0,484	0,047	0,996	0,958	0,002	0,002	1,000	0,049

Publication III

WHEN CULTURE MATTERS: EXPLORING OPEN INNOVATION PARADIGM

When culture matters: exploring the open innovation paradigm

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Abstract: Despite the increasing attention of researchers to the phenomenon of open innovation and the popularity of cultural studies in management, the link between the two has not been properly examined so far. Therefore, the lack of literature regarding the impact of culture on open innovation creates a certain knowledge gap. This conceptual paper aims to increase the understanding of how cultural studies can aid in overcoming the challenges of open innovation. The paper argues that culture is an important explanatory variable of human and corporate behaviour under open innovation settings (e.g., it shapes the patterns in dealing with novelty and knowledge transfer, and shapes the preferences, expectations, and behaviours in regard to risks, trust, etc.). We analyse the challenges and attitudes towards collaboration through the lens of culture and cultural dimensions, and introduce a framework of reference for understanding these challenges. Moreover, we offer initial insights and propositions, and discuss the need for incorporating cross-cultural management and organisational studies into the research agenda of open innovation.

Keywords: open innovation; culture; collaboration; not invented here; NIH; not sold here; NSH; national culture; cultural dimensions; review; innovation.

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1 Introduction

In today's highly globalised world, it is widely observed that companies no longer conduct their R&D in strictly guarded research labs (Chesbrough, 2006; Duarte and Sarkar, 2011; Laursen and Salter, 2006; Ritala et al., 2009; Huizigh, 2011). In order to maximise returns on innovation, companies need to seek beyond their in-house resources and capabilities and not hide innovations which they cannot commercialise themselves on dusty shelves inside the company (Giannopoulou et al., 2010). Various internal and external stakeholders get systematically involved in different levels of the innovation process (von Hippel, 2005; Prahalad and Ramaswamy, 2003). The research has proved the effectiveness of collaboration in knowledge acquisition, which allows companies to profit from outside innovators in addition to their internal sources of knowledge (Franke et al., 2006; Lilien et al., 2002; Tipu, 2012), resulting in the possibility to include all the people around the world who have access to the internet and are interested in the company's innovation activities.

While open innovation is rewarding, many firms experience severe challenges in actively managing the processes (Lichtenthaler, 2008, 2011; van de Vrande et al., 2009). In a Management Tools & Trends survey conducted by Bain & Company in 2011 (Rigby and Bilodeau, 2011), only 21% of executives acknowledged using open innovation as a management tool in 2010, compared to 56% of respondents in 2006. The numbers may suggest that in 2006 companies rushed to incorporate the newly introduced open innovation trend without taking the necessary time to understand it properly and to create a preliminary framework tailored for their business and culture, and/or were too impatient to wait for future long-term results. In addition, the results of the same survey showed that among all participating executives, the broadest agreement was in the statement that

1   culture is as important as strategy for business success, followed by

2   the ability to change as being a significant advantage (Rigby and Bilodeau, 2011).

As the main goal of open innovation is new knowledge creation through collaboration of different professionals from different organisations (and very often, different countries), it can be argued that one of the reasons for the failure of the implementation of open innovation is neglecting the impact of national and organisational cultures of the participants involved in open collaboration. People stand behind strategy formulation and implementation, they shape the organisational structures, generate ideas, and invent and use technology. Therefore, open innovation is to a great extent about how individuals and groups communicate, exchange ideas and learn from each other. As those individuals, as well as organisations, are part of societies, one can expect them to reflect their national culture in their thinking processes, practices and values (Javidan et al., 2005). At the same time, while culture unifies people's behaviour, it may create barriers and conflicts between people when cultural differences occur (Tidd et al., 2001).

As noted by Ritter and Gemuenden (2002), the diversity of organisational backgrounds is considered a critical success factor for innovation projects and a source of creativity. Despite the positive impact on innovation, this factor can be a source of social and communication difficulties, which may lead to conflicts and project failures (Tidd et al., 2001), but surprisingly, scholars tend to disregard the human side of open innovation, except mentioning the importance of culture in facilitating a transition towards an open innovation strategy (Chesbrough, 2003; Herzog and Leker, 2010;

Dodgson et al., 2006). Indeed, the implementation of open innovation requires a change in employees' practices in dealing with ideas, knowledge and technology which can appear from any corner of the world. To our best knowledge, only a few scholars have raised the issue that the international dimension of open innovation from the cultural perspective needs further analysis due to the involvement of foreign partners in companies' open innovation activities (Lichtenthaler, 2011; Muethel and Hoegl, 2010). However, several studies have found that the impact of collaboration on new product development is mediated by the geographic location of the collaborative networks, with a strong impact on collaboration across national boundaries (Chesbrough et al., 2006). From the international perspective, open innovation offers various advantages to different industrial sectors and has different appearance in corporations around the world. Hence, the employment models, selection of external collaboration partners, patterns of knowledge transfer, distribution of power and trust, and the way the innovation is carried out vary in different countries, and these divergences should be taken into account in the open innovation process. Moreover, from the internal organisational perspective, it is observed that while some people tend to value knowledge coming from external stakeholders excessively (Menon et al., 2006), others tend to demonstrate a persistent negative attitude toward ideas and technologies not developed in-house (Lichtenthaler et al., 2010; van de Vrande et al., 2009). The latter tendency is usually referred to as the not invented here (NIH) syndrome (Katz and Allen, 1982), which deserves special attention in open innovation settings.

In order to fill the identified research gap, this paper takes culture as its main focus, and in doing so argues that culture is an important explanatory variable of human and corporate behaviour under open innovation settings (e.g., it shapes the patterns in dealing with novelty, individual initiatives and collective actions, preferences, expectations, incentives, motivation, understandings and behaviours in regard to risks, and trust as well as taking opportunities). Accordingly, this conceptual paper aims to increase the understanding of how cultural studies can aid in overcoming the challenges related to collaboration in open innovation, and targets to answer the question of what is the relationship between national and organisational cultures and open innovation. The paper discusses the need for considering cultural dimensions, strategic cross-cultural communication and cultural roots explaining the NIH and not sold here (NSH) syndromes, and the need for incorporating cross-cultural management and organisational studies into the open innovation research agenda. It contributes to the stream of open innovation research by defining a research agenda for studies on culture.

The rest of the article is organised as follows. First, different forms of collaboration in open innovation are described, leading to the introduction of challenges of open innovation challenges that have cultural roots, followed by presenting the concepts of national and organisational culture. We proceed by reviewing different cultural dimensions and identify six of them to be used as a framework of reference in explaining the challenges which may occur from cultural differences, followed by discussion and presentation of managerial implications. We conclude with a research agenda to stimulate the debate of successful open innovation management in diverse cultural contexts.

2 Different forms of collaboration in open innovation

It is almost a cliché to say that there has been an explosion in the amount of research on the concept of open innovation in the last decade. Since Henry Chesbrough first coined the term open innovation (Chesbrough, 2003), his book has gathered more than 5,500 citations in nine years, according to Google Scholar. The concept suggests opening up companies' boundaries in innovation activities, with the aim to make the most of the opportunities coming from collaboration with external and internal parties (Chesbrough, 2003). Collaboration can be described as the development of knowledge through relationships with specific partner organisations, involving mutual exchange of knowledge. Industrial companies may collaborate with:

1 customers (users) (Lettl et al., 2006; von Hippel, 1988; West and Lakhani, 2008)

2 suppliers (Song and Di Benedetto, 2008; van Echtelt et al., 2008)

3 universities or research institutes (Coccia, 2008; Czuchry et al., 2009; Doodley and Kirk, 2007; Elmuti et al., 2005; Laursen and Salter, 2006)

4 they can form alliances or joint ventures with other industrial companies holding complementary knowledge (Gassmann and Enkel, 2004; Hagedoorn, 2006).

Let us take a brief look at the pros and cons of these forms of collaboration. Today, the consumer is no longer a passive recipient of the company's decisions, but can participate upstream in the idea generation, design, or production process. The research on user innovation in the past decades has identified certain benefits and challenges which may arise in this type of cooperation (Table 1). In is also worth mentioning that in order to activate and exploit the "wisdom of the crowd" successfully (Surowiecki, 2004), companies have to motivate and manage external stakeholders (Wallin and von Krogh, 2010) who may be located in any corner of the world, which adds to the set of potential culture-related challenges of this approach. Moreover, companies should take into consideration the different incentives, preferences and expectations of participants with regard to their cultural values, as well as be aware of the fact that managing user innovation communities varies from country to country (Talukder and Joham, 2009), and thus the role of culture should not be disregarded.

Another stream of research (Table 1) indicates that collaboration with academic or industrial partners has a positive effect on a company's performance (e.g., Abramo et al., 2009; Coccia, 2008; Salmi and Torkkeli, 2009). From the organisational perspective, it has been pointed out that trust, commitment, and integration contribute to successful university-industry collaboration (Plewa and Quester, 2007). However, it may be argued that universities themselves have specific subcultures deriving from the national culture. Therefore, for the purposes of this paper, the university-industry collaboration is not examined from the cross-national point of view.

Table 1   Main characteristic of different forms of collaboration in open innovation

Name (also known as)	Essence	Recent research	Benefits	Challenges
Collaboration with customers; user innovation; user-dominated innovation	User innovation studies investigate how companies collaborate with users in the external exploration of new knowledge and ideas (von Hippel, 1988).	Lakhani and Panetta (2007), Chakravorti (2007), and Cook (2008) User communities and user innovation in open innovation (Bogers et al., 2010; West and Lakhani, 2008) The role of toolkits for idea competition (Pillar and Walcher, 2006)	Receiving insight from stakeholders, promoting brand loyalty; (potentially) innovating at greater speed and lower risk. May enhance the creativity and efficiency of processes (Hargadon and Bechky, 2006)	Rewarding mechanisms (international customisation) West and Gallagher (2006) Incentives, preferences and expectations of participants with regard to their cultural values
Collaboration with universities and research institutes		Elmuti, et al. (2005), Doodley and Kirk (2007), Coccia (2008), Czuchry et al. (2009)	Access to both codified and tacit knowledge that has been developed within the research centre through decades of publicly funded research; access to world-class academics and their academic network; acquiring competitive advantage by gaining access to better leads and feedbacks (Dooley and Kirk, 2007), as well as receiving government subsidiaries	Significant differences in organisational cultures between universities and industries: different timescales, different objectives to fulfil and often different value systems Possible need to collaborate with other actors (even competitors) in order to implement the technology

Table 1 Main characteristic of different forms of collaboration in open innovation (continued)

Name (also known as)	Essence	Recent research	Benefits	Challenges
Collaboration with suppliers		Song and Di Benedetto (2008), van Echtelt et al. (2008), Hagedoorn (2006), Hilletofth and Eriksson (2011), Wynstra and Weggemann (2001)	Input on quality improvement and cost reductions through process innovation (Hagedoorn, 2006), also beneficial for product innovation due to combination of complementary capabilities and common goals between the firm and suppliers. Firms gain new competencies, share risks, move faster into new markets, and conserve resources (Wynstra and Weggemann, 2001)	Limited and narrowed new knowledge offered by suppliers. Requires great deal of commitment. Trust associated with revealing confidential information to suppliers
Strategic alliances	Collaborative strategies formulated and implemented to meet shared objectives and develop superior resources cooperatively	Hagedoorn, (2006), Dyer and Singh (1998)	Gaining market power (Hagedoorn, 2006). Access to complementary resources (Dyer and Singh, 1998), accumulating relational capital (Dyer and Singh, 1998; Kale et al., 2000), overcoming uncertainty and optimising risks and costs (Eisenhardt and Schoonhoven, 1996)	Conflict, distrust and may ultimately jeopardise the cooperation. Loss of competitive knowledge Conflicts resulting from incompatible cultures and objectives, reduced management control (Chan and Heide, 1993)

Last but not least, strategic alliances are widely considered as collaborative strategies formulated and implemented to meet shared objectives and develop superior resources cooperatively. Bianchi et al. (2011) have found that alliances are the most frequently applied ones among the various inbound and outbound activities.

The complexity and dynamic nature of a strategic alliance offers powerful opportunities for value creation that a company would not achieve on its own. According to a recent study of Jiang et al. (2010), social and cultural differences increase the difficulty of information sharing across alliances. Cultural differences have been found to be an important obstacle for inter-firm learning by reducing a firm's ability to absorb its partner's knowledge (Simonin, 1999). Research in the area of the failure of alliance identifies reasons for this, such as

1   failure to understand and adapt to the new style of management required for the alliance

2   failure to learn and understand the cultural differences between the partners

3   insufficient trust (Duysters et al., 1999).

3   Open innovation challenges with cultural roots

A key idea of open innovation is the notion that not all the smart people work for you (Chesbrough, 2003). Instead, beneficial technologies can be found anywhere in the world within companies of any size. In the distributed environment, where organisations of every size have valuable technologies, firms benefit more from trade in technology. However, the change is rapid and companies meet certain challenges on the way to a higher level of openness (Chesbrough, 2006).

3.1   Not invented here (NIH) syndrome

Besides the challenges of finding, evaluating, negotiating, transferring and incorporating external technology into their own product, companies face internal resistance to external innovations, known as the NIH syndrome (Chesbrough, 2003; Katz and Allen, 1982; van de Vrande et al., 2009), which refers to a negative attitude towards knowledge that originates from a source outside the own institution. The NIH syndrome is partly based on an attitude of xenophobia (Chesbrough, 2006) – fear and rejection of something different from us, something coming from outside.

To explain the shift toward the open innovation paradigm, Chesbrough (2006) offers the following reasons for the NIH syndrome:

1   fear of failure in selecting the right external technology, especially when the time for the project is limited

2   fear of succeeding with integrating external technology, as it may lead, in the long term, to a reduction of the R&D personnel in the company.

Resistance towards external ideas may be a result of the company's business model, but also each and every employee's values and beliefs, which may be a result of their national culture. But why do beliefs matter? People have formed them over time, and thus they are mentally validated and slow to shift substantially. Beliefs must be taken into

account in order to find out the potential for conflict, hidden resistance and improving organisational awareness and development potential. Bennett (1993) explains the tendency to filter external information by ethnocentrism – the assumption that your own culture is central to all reality – hence the unwillingness to accept anything created outside the culture. In the open innovation context, the situation where this could happen is in international collaboration projects for technology acquisition from a foreign country. Certain cultural values common for one whole nation may be reflected in their attitude towards using the results of somebody else's intellectual activity. Therefore, the NIH attitude will be higher in countries with high level of individualism than in collectivistic countries (see the subsection Individualism vs. collectivism in Chapter 5 for more information).

3.2 Not sold here (NIH) syndrome

Leveraging external technologies is only one part of open innovation practices. Another crucial issue is letting others use one's ideas. Here we encounter the not sold here syndrome, in which the main reasoning is that if we are not selling it in our own sales channels, we will not let anyone else sell it, either. NSH can be defined as a protective attitude towards external knowledge exploitation (Lichtenthaler et al., 2010). The sales and marketing people are affected most and insist on exclusive use of own technology for own product (Chesbrough, 2003).

The experience of external knowledge exploitation is relatively limited (Teece, 1998; Lichthenthaler et al., 2010). Among possible barriers have been mentioned market failures and risks (Gans and Stern, 2003), intellectual property protection (Teece, 2006), and others. The NSH syndrome has been seldom mentioned in the literature, which has mainly focused on analysing organisation- and market-dependent challenges. However, the human factor should not be ignored, and in favourable conditions, the NSH can still restrain the exploitation of external knowledge.

3.3 Other cultural challenges in open innovation

People may express resistance to change in general. Change is associated with uncertainty and may affect the working style and status quo, and that is a risk that some people are not willing to take.

Furthermore, in addition to the fact that collaboration involves dense interaction and exposure of own knowledge, it also requires trust (Remneland-Wikhamn, 2011) and risk taking (Herzog and Leker, 2010). When there is a lack of trust, people may be afraid of being exploited and robbed of their own ideas, as also companies, when collaborating in the open forum, may be afraid that their ideas will leak to their competitors. Therefore, developing new technology or product collaboratively brings greater risk than a closed innovation approach. Trust and readiness to take risk are partly results of an individual's personality and experience, but can also be influenced by the organisational culture and national values.

Some authors also stress the importance of general openness in regard to communication and discussion among employees (Hunter et al., 2007). Furthermore, novelty seeking is the desire to seek out 'new and different', and is a key component in innovativeness (Tellis et al., 2009b). Other challenges the company may face in international collaboration in open innovation settings are: participants' motivation,

failure tolerance, power sharing, different communication contexts and styles. All these challenges can be explained through the lens of national and organisational culture.

4   National and organisational culture

A precise definition of culture is elusive and remains the subject of intense debate among scholars. Hofstede (2001) refers to culture as the collective programming of mind which distinguishes the members of one group or category from another. This paper employs Hofstede's definition of culture and focuses on differences in values (Maznevski and DiStephano, 2000) and differences in communication styles (Hall and Hall, 1990).

As almost everyone belongs to a set of different groups at the same time, people carry several layers of mental programming within themselves, corresponding to different levels of culture (Hofstede, 2001). Culture can be associated with a nation, region, gender, corporation, department, function, or any form of grouping (e.g., a profession or an occupation). Although culture is reflected in individual behaviour, it is the way of thinking shared by individuals in a particular society that makes culture what it is. This paper explores the national and organisational levels of culture. The terms 'corporate' and 'organisational' culture are used interchangeably in this paper.

As with national culture, recent research indicates that corporate culture may play a role in radical innovation (Tellis et al., 2009a). Corporate culture refers to a core set of attitudes and practices that are shared by the members of the firm (Detert et al., 2000; Schultz and Hatch, 1996). A culture that fosters relentless innovation may help ensure that the firm stays constantly at the leading edge of innovation (Tellis et al., 2009a). Culture is often viewed as a determinant of innovation (Ahmed, 1998), as culture has different elements which can serve to enhance or inhibit the propensity to innovate.

National culture is a common characteristic of people within the borders of one country, and it should be differentiated from the culture of societies or ethnic groups. Within nations which have existed for some time, there are strong tendencies towards integration: they share a national language, education system, political system, etc. Organisational culture is different from national culture in many aspects: an organisation is a social system of a different nature than a nation (Hofstede, 2001). Organisational culture can be characterised by orientation towards risk, collaborative management style, maturity, corporate arrogance, level of centralisation and market focus, among others; while national culture is associated with cultural norms and values that drive thinking, communication styles, attitude towards hierarchy, gender roles, and other aspects of individual and group behaviour.

From the national perspective, any decision in a company will be influenced by the national culture, as it is embedded in business practices, strategies, processes, and the style of communication among individuals, as well as organisations. It will affect the way of solving problems, looking for new ideas (internal and external) and innovative activities.

5   Cultural dimensions

The most widely recognised cultural dimensions are the ones described by Hofstede (2001). Hofstede introduced originally four cultural dimensions (individualism-

collectivism; masculinity-femininity; uncertainty avoidance; and power distance), adding a fifth dimension (long term-short term orientation) later. Although Hofstede's model has been subject to criticism (e.g., Erez and Early, 1993; McSweeney, 2002; Williamson, 2002), particularly due to the data set on which it is based, it is the most often cited cultural framework and acknowledged to be the most comprehensive (Kogut and Singh, 1988) one.

Other cultural dimensions (Table 2) include those presented by Trompenaars and Hampden-Turner (1997) and Kluckhohn and Strodtbeck (1961), those developed in the GLOBE study (e.g., House et al., 1997; House et al., 1999), as well as the more linear ones by Hall and Hall (1990).

Table 2   Models of (national) culture

Source	*Cultural dimensions*	*Method*	*Sample/context*
Trompenaars and Hampden-Turner (1997)	Universalism – particularism, analysing – integrating, individualism – communitarianism, inner-directed – outer-directed, time as sequence – time as synchronisation, achieved status – ascribed status, equality – hierarchy	Quantitative questionnaire with scales	30,000 managers from 55 countries
Hofstede (2001)	Power distance, uncertainty avoidance, individualism – collectivism, masculinity – femininity, long-term orientation – short-term orientation	Quantitative questionnaire	Approx. 116,000 IBM employees from over 40 countries
Kluckhohn and Strodtbeck (1961)	Free will – determinism, accumulation of wealth – 'just enough'	Quantitative questionnaire and qualitative report	106 persons including: Navaho, Indians, Pueblo Indians, Spanish American village, Texan and Oklahoman, farming village, and a Mormon village
House et al. (1997), House et al. (1999) (GLOBE project)	Power distance, in-group collectivism, institutional collectivism, uncertainty avoidance, future orientation, gender egalitarianism, assertiveness, humane orientation, performance orientation	Quantitative questionnaire with scales and analysis of quantitative data with content analysis	More than 18,000 middle managers from 62 countries
Hall and Hall (1990)	Monochromic – polychromic, high context – low context, space	Open qualitative interviews	180 employees and managers from the economy field

In this paper we incorporate Hofstede's dimensions (as they have been studied the most extensively to date) and Hall's differences in communication styles (since his ideas have proved to be especially relevant in collaborative activities across cultures). Based on this, six dimensions of national culture have been selected that can be related to collaboration in open innovation. The dimensions are intended to be used as a framework of reference in understanding the challenges which may occur from cultural differences while collaborating in open innovation settings. Examples of countries representing certain groups are based on the dimension data matrix which is available both online and in the book *Culture's Consequences* by Hofstede (2001).

5.1   Power distance (low vs. high)

Power distance (low vs. high) refers to what extent power and hierarchical relations are considered essential in the given culture. A high power distance reflects a hierarchical orientation in the society (Hofstede et al., 2012). The members (e.g., Russia, Mexico, China, France, and Poland) show great respect for the status and life experience of superiors, and can be reluctant to show initiative and prefer to be given instructions instead, which they accept without question. In contrast, low power distance societies (e.g., Austria, the Nordic countries, Great Britain) see a superior to be more as a first among equals, and hence consider that person's decisions and judgments to be subject to further discussion or challenge.

In high power distance cultures the members are more reluctant to challenge their supervisors and are more fearful in expressing disagreement with them (Hofstede, 2001). The sharing of information in a high power difference culture can be constrained by the hierarchy (van Evergingen and Waarts, 2003). Moreover, the threat of bringing external knowledge may affect the authority and status power, and therefore there is no particular interest in external collaboration, and most of R&D activities are performed in-house.

Furthermore, power distance is an important factor in regard to trust. Shane (1992) argues that a high power distance inhibits innovativeness and creativity through control systems based on rules and trust. In the same line, Oldham and Cummings (1996) have identified a 'supportive and non-controlling' leadership style, which indicates that a low power distant leader enhances creativity.

P.1   Cultures with low power distance more emphasise trust and openness between different hierarchical levels and external environment.

P.2   There is a negative correlation between power distance and innovation, as well as openness to new ideas and the NIH syndrome.

5.2   Uncertainty avoidance (low vs. high)

Uncertainty avoidance (low vs. high) measures the extent to which people in a certain culture avoid uncertainty, feel threatened by unknown situations, and take steps to avoid them (Hofstede et al., 2012), e.g., apply laws, rules, structure. This dimension is related to the acceptance of vague or uncomfortable situations and regarded by Hofstede (2001) as 'what is different, is dangerous' vs. 'what is different, is curious'.

People in cultures that score high in uncertainty avoidance (e.g., Greece, Portugal, Russia, and France) prefer predictability in their lives and may be willing to accept

familiar risks rather than the danger of the unknown. They tend to resist innovation (Shane, 1993; Waarts and van Everdingen, 2005) and prefer imposing rules and structure in their activities. They appreciate authorities who have always the 'right' answers and give exact instructions. The people are less open to change and innovation than the people of low uncertainty avoidance cultures. This dimension also explains differences in the adoption of innovations (Tellis et al., 2003).

Cultures with low uncertainty avoidance (e.g., Sweden, Great Britain, China, Germany, the USA) accept uncertainty and deviation. They understand that answers to problems cannot always be found, they are ready to take risks, and ambiguous situations are regarded as natural and interesting. They are motivated and inspired by working in a challenging atmosphere and look forward to new ideas and collaboration with other organisations or countries.

Uncertainty has been found to influence the diffusion of innovations (Rogers, 1983). For example, Hofstede (2001) notes that cultures of low uncertainty avoidance make greater use of recent technological innovations than high uncertainty avoidance societies. Low uncertainty avoidance cultures tolerate uncertainty more readily (Kale, 1995) and have a "willingness to take unknown risks" [Hofstede, (2001), p.161], whereas high uncertainty avoidance cultures, in their desire for predictability and uncertainty, are less likely to adopt innovations and absorb external ideas. These attitudes also mean that there is less incentive to come up with a novel idea which will most likely be rejected. In regard to collaboration with external partners, high uncertainty avoidance cultures may be reluctant to knowledge exchange.

P.3   Uncertainty avoidance is negatively associated with the NIH syndrome and openness to new ideas, risk taking, and external collaboration.

5.3   *Individualism vs. collectivism*

Individualism vs. collectivism presents whether the interests of an individual or a group are more important. This division is seen to be the major distinguishing characteristic of how various societies process and deal with information (Bhagat et al., 2002; Earley and Gibson, 1998; Hofstede, 2001; Hofstede et al., 2012).

According to Hofstede (2001), individualistic societies (e.g., the USA, Great Britain, Germany, and Finland) are characterised by weak relations between individuals, and thus the flow of information is low. On the other hand, collectivistic societies (e.g., China, Russia, Japan, and South Korea) are connected to each other through strong and cohesive groups, and thus the flow of information sharing is higher. Collectivism is also associated with loyalty towards the group one belongs to.

Individualism is also expected to lead to greater emphasis on outcomes and rewards (Smith and Bond, 1999). In individualistic societies, people expect to be rewarded in line with their individual contribution; individual performance appraisals are common, competition is important, and organisations assume that employees are motivated by economic and material incentives (Hofstede, 2001). However, as with rewards for individual performance, there comes risk of individual responsibility in case of project failure.

The common understanding of group responsibility in collectivistic cultures decreases the fear of project failure in the case of sourcing external technology. Moreover, at the organisational level, a culture that rewards collective work will help create a climate of

trust, whereas a culture which is based on social status and individual performance will hinder knowledge sharing and favour the "I can do it myself" attitude. Hence:

P.4   High level of individualism is associated with the NIH syndrome and low level of collaboration.

5.4   Masculinity vs. femininity

Masculinity vs. femininity refers to the distribution of emotional roles between the genders and is one of the more complex variables introduced by Hofstede (2001). Masculinity as a model of behaviour of the average citizen is more prevalent in societies with strictly defined roles for men and women (Hofstede et al., 2012; Naumov and Puffer, 2000). Masculine cultures (e.g., Japan, Italy, Mexico) show a strong preference for outputs and results, emphasise performance, assertiveness, and competitiveness. Feminine cultures (e.g., the Scandinavian countries, the Netherlands) show preference for processes, aesthetics, cooperation and job security, and emphasise relationships and social interactions, as well as feelings and equal opportunities (Haiss, 1990; Hofstede, 2001). Masculinity applies to societies where social gender roles are certainly distinct (toughness as characteristic for men and tenderness for women). In short, Hofstede (2001) notes that people in masculine cultures believe that a person 'lives to work', whereas people in a feminine society have a 'work to live' – approach.

It can be argued that masculine cultures have better grounds for innovation due to the dominant urge for outperformance. On the other hand, feminine cultures would show more openness towards external ideas and collaboration, which also may result in innovation performance. However, from the reward perspective, there is agreement in the literature that masculine societies value monetary rewards for individual accomplishments and material goods, whereas feminine societies stress modesty and concern for the quality of life, environment and job security rather than material 'things' (Tellis et al., 2003).

This dimension is also associated with intolerance of failure and need for help, which may discourage transfer of knowledge (Davenport and Prusak, 1998). Due to the high level of competitiveness in masculine cultures, people will be unwilling to exploit knowledge externally, hence expressing the NSH attitude.

P.5   High level of masculinity is associated with intolerance for mistakes, limited idea sharing and the NSH syndrome.

5.5   Short-term vs. long-term orientation

Short-term vs. long-term orientation is a society's 'time horizon', or the importance attached to the future versus the past and present. In long-term -oriented societies (e.g., South Korea, Japan, China, Germany, and Russia) people value actions and attitudes that affect the future: persistence/perseverance, thrift and shame. They have virtues oriented towards future rewards, in particular saving, persistence, and adapting to changing circumstances. Short-term-oriented societies (e.g., the USA, Finland, and Portugal) foster virtues related to the past and present, such as immediate stability, respect to traditions, national pride, respect for tradition, preservation of 'face', and fulfilling social obligations (Hofstede et al., 2012).

This orientation may be useful in explaining the difference of Japanese vs. Western behaviours. The Japanese are more influenced by long-term market share than immediate short-term factors (e.g., dividends). They are keen to build long-term relationships with partners and are not willing to attempt takeovers. Moreover, they are eager to explore new opportunities, ready for challenges, and open for collaboration with companies and individuals from other countries. By looking into future, they may be willing to cannibalise their current technology and products if they believe that a newly created innovation will be of greater importance. At the same time, with their emphasis on savings, they are financially prepared to exploit new initiatives. This dimension may also explain the attitudes in the US company Kodak Eastman and its focus on past revenues from traditional film products and reliance on existing knowledge, resulting in missing the digital era, and more recently filing for Chapter 11 bankruptcy (Reuters, 2012).

Moreover, as noticed by Lichtenthaler (2008), firms often do not benefit immediately from establishing particular management mechanisms (e.g., incentive systems) in order to strengthen open innovation. This is a long-term process, and thus short-term societies may not be satisfied with the open innovation approach when they do not see immediate revenue results, leading to cancellation (or even non-implementation) of open innovation. This dimension may also explain why 35% of executives abandoned open innovation as a management tool in less than four years after its introduction (referring to the Bain & Company survey, 2011, mentioned in the Introduction).

P.6   Short-term orientation is negatively associated with searching for external ideas.

5.6   *Context (low vs. high)*

Context (low vs. high) refers to the amount of information surrounding an event (Hall and Hall, 1990). In high-context cultures (e.g., China, Japan), a limited amount of information is coded and explicit. The information is 'hidden' in the text and therefore indirect. In low-context cultures (e.g., Scandinavia, Germany, Switzerland), the information is explicit and the focus is on words and precision (Trompenaars and Hampden-Turner, 1997). High-context cultures emphasise organised, formal and structured forms of communication in contrast to the informal, unplanned and unstructured approach used by low-context cultures.

This dimension is also associated with relationship management. According to Trompenaars and Hampden-Turner (1997), people from low-context cultures believe that the relationships with others should be explicit and regulated in the form of a contract. Therefore, before any knowledge co-creation initiative, formal regulation in the form of a contract would be of importance, describing each party's responsibility and contribution explicitly. On the other hand, high context cultures will prefer establishing relationships first without any formal obligation.

6   Discussion and managerial implications

Understanding cultural challenges has the potential to greatly increase the success of organisational collaboration and effectiveness in open innovation. When a company collaborates across borders or tries to involve different users across the world, there are bound to be communication challenges. In open innovation activities, particularly in

knowledge sharing and collaboration, companies should take account of the cultural characteristics of the countries or organisations in/with which the open innovation activities are to be deployed.

Table 3 highlights the main issues which may arise while implementing open innovation activities across borders, and their effect from the cultural perspective. For scholars and practitioners, it may be a useful framework of reference in understanding the importance of cultural awareness.

Table 3　　Framework of reference: the effect of cultural dimensions on issues in open innovation

Issues	*Measured dimensions (explanatory variable)*		*Low*		*High*	
Employment models – career paths	a	Uncertainty avoidance, Individualism vs. collectivism	a	Weak loyalty to employer – short average duration of contracts	a	Strong loyalty to employer – long average duration of contracts
	b	Power distance	b	Flat organisation pyramid. Faster promotion	b	Career starts from the bottom of the organisation and enables promotion to higher levels in hierarchy over time. Importance of job title
Rewarding mechanisms	a	Individualism vs. collectivism	a	In individualistic cultures differential reward systems for individual performance and achievement are appreciated	a	In collectivistic cultures in-group – based rewards are of greater value
	b	Masculinity vs. femininity	b	Rewards based on performance, material goods valued to show success	b	Rewards to improve quality of life and environmental awareness
	c	Power distance	c	Narrow salary range between the top and bottom in the organisation	c	Wide salary range between the top and bottom in the organisation
	d	Long-term vs. short term orientation	d	Short-term, immediate benefits	d	Long-term benefits, company's stock options
Selection of external partners	a	Power distance	a	Negotiations based on the knowledge and experience of the participants	a	Negotiations held only between people high in the hierarchy

Source:　Adapted from Hall and Hall (1990), Hofstede (2001), and Trompenaars and Hampden-Turner (1997)

Table 3 Framework of reference: the effect of cultural dimensions on issues in open innovation (continued)

Issues	*Measured dimensions (explanatory variable)*	*Low*	*High*
Selection of external partners	b Context, uncertainty avoidance	b Contract agreement at the beginning of negotiations	b Importance of establishing relationship and trust before any written agreement
Communication context	a Context	a Detailed, explicit plans, information-based	a Plans are more implicit and less detailed
	b Individualism vs. collectivism	b Impersonal communication based on written rules	b Importance of face-to-face communication and informal communication
Distribution of power	Power distance	a Two-way communication systems	a Top-down communication system
		b Authority is decentralised	b Authority and responsibility are centralised
		c Employees like working with bosses to develop and implement objectives	c Employees prefer personal control over impersonal control systems
		d The manager should be a benevolent autocrat	d The manager should be a resourceful democrat
Motivation in online communities	Individualism vs. collectivism	a Individualistic cultures do not mind being anonymous but they give their opinion in the online community if they know that it will not be subject to criticism	a Collectivistic cultures would prefer a more personalised form of communication and participation rather than being anonymous
Innovation leadership	Power distance	a Innovations need good champions	a Innovations need good support from hierarchy

Source: Adapted from Hall and Hall (1990), Hofstede (2001), and Trompenaars and Hampden-Turner (1997)

Table 3   Framework of reference: the effect of cultural dimensions on issues in open innovation (continued)

Issues	Measured dimensions (explanatory variable)		Low		High
Uncertainty	Uncertainty avoidance	a	Hope for success	a	Fear of failure
		b	Information less codified, formal, flexible, risk taking	b	Use of codified information to eliminate the risk – formal rules, regulations and extensive written agreements
		c	Willingness to take unknown risk	c	Resistance to take any risks
Resistance to change	Uncertainty avoidance	a	No interest in change	a	Willingness to change
Attitudes towards external ideas – NIH syndrome	a Individualism vs. collectivism	a	Individualistic cultures are reluctant towards external ideas which may influence their individual performance	a	Collectivistic countries show openness towards external ideas
	b Uncertainty avoidance	b	Eagerness to exploit new ideas	b	Avoidance of new, unknown ideas
	c Power distance	c	Openness towards new ideas	c	Bringing new ideas may affect authority – no interest in external collaboration
Attitudes toward knowledge sharing	a Power distance	a	Openness with information	a	Information constrained by hierarchy
	b Individualism vs. collectivism	b	Individualists: organisational success attributed to withholding information, avoiding alliances	b	Collectivists – organisational success attributed to sharing knowledge, political alliances
	c Uncertainty avoidance	c	Competition and knowledge exchange seen as advantageous	c	Competition and knowledge exchange seen as damaging

Source: Adapted from Hall and Hall (1990), Hofstede (2001), and Trompenaars and Hampden-Turner (1997)

Table 3 Framework of reference: the effect of cultural dimensions on issues in open innovation (continued)

Issues	*Measured dimensions (explanatory variable)*	*Low*	*High*
Attitudes toward novelty	Uncertainty avoidance	Scepticism toward technology solutions	Strong appeal of technological solutions
Willingness to cannibalise	Long term vs. short term orientation	Focus on present sales result and no interest in cannibalising products	Willingness to cannibalise present technology if there is an opportunity to achieve better results with new innovation in the future

Source: Adapted from Hall and Hall (1990), Hofstede (2001), and Trompenaars and Hampden-Turner (1997)

The line of reasoning presented above may naturally turn into over-simplification. Presented issues describe general tendencies adopted by a majority of members of certain cultural groups and should be considered in relative terms rather than absolute. Nationality or corporate culture may be influential, but at the same time it is important to realise that even within the same organisation wider cultural gaps can exist between occupational cultures. For example, administrative functions in a large company are generally more rule-oriented and bureaucratic, whereas the marketing and sales departments in the same company would be more goal-oriented.

The framework of reference can be applied by managers to mitigate potential challenges. Below we give some examples of how managers can turn cultural challenges to their benefit.

If the culture scores high on the power distance dimension, the solution to overcome the resistance of personnel is to introduce a stronger hierarchy, assigning a certain leader empowered by strong authority. Employees in high power distance countries (e.g., Russia, Mexico, China, France, and Poland) do not usually question the managerial decisions from higher authority. In low power distance countries (e.g., Austria, Nordic countries, Great Britain), the employees might be motivated to do what management wishes after it has been explained to them that the company is a team with common goals and they all work equally to reach them.

In order to avoid barriers to certain practices, those practices should be codified and turned to rules, procedures and internal regulations. An uncertainty avoiding culture (e.g., Greece, Portugal, Russia, and France), will rather follow rules than face the unexpected. The new approach toward open innovation should be communicated throughout an organisation. The communication programs should ensure that all employees know their role in the open innovation process. If the uncertainty avoidance is low (e.g., Sweden, Great Britain, China, Germany, the USA), the situation is already favourable for risk taking.

Individualists (e.g., the USA, Great Britain, Germany, and Finland) have to feel that they have control over what they are doing. Hence, the roles and responsibilities of each and every employee should be defined. They will gladly fulfil the task when having individual responsibility for it. Collectivists (e.g., China, Russia, Japan, and South Korea), on the other hand, need to be assigned into teams with shared responsibility – identification of oneself as part of a group will allow sharing the

responsibility and increase the willingness to take risks. In case of overcoming mental models through education and training, individualists should be taught separately, for collectivists the informal leader should be aware of the need/benefit of the actions taken.

Long-term oriented cultures (e.g., South Korea, Japan, China, Germany, and Russia) are motivated by goals which will bring them peace in future (e.g., working for one company for one's whole life to get a high position by retirement). Short-term oriented cultures (e.g., the USA, Finland, and Portugal) like to have benefits from the society immediately when they start to work. Hence, the motivation and reward system for the employees should also follow their short or long term orientation.

7   Further research

This paper has presented six research propositions which call for empirical validation and are potentially promising themes to take the topic of open innovation and culture to the next level.

1   cultures with low power distance emphasise trust between different hierarchical levels and the external environment

2   there is a negative correlation between power distance and innovation, as well as openness to new ideas and the NIH syndrome

3   uncertainty avoidance is negatively associated with the NIH syndrome and openness to new ideas, risk taking, and external collaboration

4   high level of individualism is associated with the NIH syndrome and low level of collaboration

5   high level of masculinity is associated with intolerance for mistakes, limited idea sharing and the NSH syndrome

6   short-term orientation is negatively associated with searching for external ideas.

The research proposition should be further explored and tested on the national and organisational level. The examples of companies that have failed to incorporate the open innovation approach should be analysed from the cultural perspective. Case studies describing adopting open innovation in different countries through the lens of cultural dimensions would bring new insights into the field. Furthermore, from the national perspective, it would be important to further identify the relevant processes and tools for building and managing an open innovative culture. Empirical surveys could address the main barriers and practices in different countries in overcoming cultural challenges in open innovation. Such an international scope would advance our understanding of the phenomenon substantially. The effects of national culture on open innovation and functional strategies (incentives, motivation factors) should be examined empirically, as well.

Moreover, the findings and research results in the current literature on open innovation should be interpreted on the basis of the country of origin of the sample data, as most open innovation research comprises samples of one country only [e.g., the Laursen and Salter (2006) data collection in the UK]. The research results might have different outcomes (and no impact) when conducted in another country, and therefore

scholars and practitioners should be cautious when introducing domestic research results on the international scale.

Finally, a particular type of culture that deserves more attention in the open innovation literature is the occupational culture. Different occupational cultures are expected to both interact and conflict. Future research should focus on defining the occupational cultures and their impact on communication and knowledge sharing within the company. It would be useful to investigate cross-occupational collaboration in new product development empirically. How do the marketing and R&D departments communicate with each other and exchange ideas? How are the cultural dimensions described between those cultures and does the national culture have any influence on their collaboration?

8 Conclusions

This paper aimed at demonstrating the importance of culture as an explanatory variable of human and corporate behaviour in open innovation activities. It contributes to the research on open innovation and cross-cultural studies by combining the lenses of these theories and creating a conceptual framework that describes the challenges of open innovation. The challenges and attitudes towards collaboration were presented through the lens of culture and cultural dimensions, and a Framework of Reference in understanding the effect of those dimensions was introduced. The paper offers initial insights into these issues and provides concrete directions for future research via six propositions, as well as managerial guidelines to apply the Framework of Reference. Considering cultural dimension is necessary for companies wishing to operate successfully in the world where ideas can appear from any corner of the world. Incorporation of cross-cultural management and organisational studies to the open innovation agenda is crucial to explaining the motives and actions of individuals (and organisations) involved in open collaboration and may shed light on understanding why the implementation of open innovation principles fails in some cultures and succeeds in others. The human factor shapes the patterns in dealing with novelty, knowledge transfer, understanding and behaviour in regard to risks, trust as well as opportunity-taking, and it should therefore not be neglected. We believe this paper is a starting point to bolster interpersonal and cultural acumen in open innovation scholars and practitioners.

Acknowledgements

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Publication IV

**ROLES AND RESPONSIBILITIES OF OPEN INNOVATION SPECIALISTS BASED
ON ANALYSIS OF JOB ADVERTISEMENTS**

Roles and responsibilities of open innovation specialists based on analysis of job advertisements

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Abstract. Innovative companies are increasingly creating new open innovation
functions and employing open innovation specialists to facilitate innovation
processes. However, research that explores these emerging jobs remains scarce.
This study examines the worldwide job market for 'open innovation' specialists
as per job title and/or job description, and analyzes 100 job advertisements
related to 'open innovation' specialists published during two periods in 2014 and
2016. The findings identify the key responsibilities of dedicated open innovation
specialists and associated skills, and the competencies that companies seek in
candidates. In addition, the findings indicate that companies need open
innovation specialists to not only work in R&D departments. In addition, the
ability to influence others and prior start-up experience have become basic
requirements to apply for open innovation specialist positions.

Keywords. Open innovation, job skills, competencies, job description, open
innovation specialist, job advertisement, roles.

1   Introduction

Since 2003, when Henry Chesbrough introduced the term 'open innovation' (OI), it has
become very popular among scholars and practitioners. Many firms have opened up
their companies' boundaries and embraced open innovation as a business strategy
(Chesbrough and Bogers, 2014; Dahlander and Gann, 2010; Gassmann et al., 2010;
Mortara and Minshall, 2014). Open innovation adoption requires changes in the
organizational structure and work practices of R&D professionals (Salter et al., 2014),
and the redefinition of tasks, tools, processes and reward systems (e.g. Alexy et al.,
2014; Mortata et al., 2014). Considering the intensity of necessary changes related to
the personnel involved in open innovation, academic research has paid little attention
to the human side of open innovation (Bianchi et al., 2011; Bogers et al., 2018;
Podmetina et al., 2013; Mortara et al., 2014; Salter et al., 2014; Vanhaverbeke et al.,
2014; West et al., 2006; Wynarczyk et. al., 2013).

According to the report of the Word Economic Forum on the Future of Jobs (WEF, 2016), disruptive changes to the business models, together with the other major drivers of global transitions, are expected to have a significant impact on creating new jobs that did not exist a few years ago. Indeed, this rapid change is also observed in companies as open innovation functions and new roles are formalized (Alexy et al., 2014; Dabrowska and Podmetina, 2014; Mortara and Minshall, 2014). In addition, new open innovation job titles have emerged, and a LinkedIn search reveals over 52,000 job titles related to "open innovation", only 15 years after the introduction of the term (LinkedIn, 2018).

Apart from creating new jobs, the adoption of open innovation practices also changed the way companies recruit new staff, and what skills and competencies they are seeking (Di Minin et al., 2010). Once a company decides to open up its innovation process, employees are expected to possess certain competencies and skills in addition to technical/scientific or managerial expertise (Bredin and Söderlund, 2006; Huston and Sakkab, 2006). However, the description of these required competencies and skills remains vague.

At the same time, the confusion about the nature of the open innovation term (Trott and Hartmann, 2009) and the different processes and practices associated with it, leads to asking what the roles and responsibilities are of open innovation specialists. To the best of our knowledge, before this study, there was no prior attempt to analyze the job advertisements related to open innovation that aimed to identify the skills, roles and responsibilities of open innovation specialists in companies. Thus, by analyzing the job market, this paper focuses on identifying common skills and competencies of open innovation specialists, as well as their roles and responsibilities. Moreover, it analyses the differences in competence profiles across organizations and differences of organizational functions where open innovation specialists are needed.

The main research questions are:

(Q1): What are the roles and responsibilities of open innovation specialists in a company?

(Q2): What common competencies do organizations seek from open innovation specialists?

(Q3): What are the differences between competence profiles and job responsibilities across organizations?

Given the sparse literature on the topic, we answer these questions through a qualitative analysis of job offers posted worldwide and collected during two periods: February 2014 and February 2016. One hundred job advertisements with 'open innovation' in the job title or job description were analyzed.

The remainder of this paper comprises five sections. In the next section, we present the theoretical foundations of the human side of open innovation and related skills and competencies. Next, we describe the research design and methodology. In section four we present the findings, which is followed by a discussion and conclusions.

2   Theoretical background

2.1   Open innovation

Open innovation was originally presented as a paradigm shift for high-tech industries, e.g. large manufacturing firms (Laursen & Salter, 2006), chemicals (Kirschbaum, 2005), pharmaceuticals (Lichtenthaler, 2008, Lichtenthaler, 2007, Lichtenthaler & Ernst, 2008, Lichtenthaler, 2010; Thong and Lotta, 2015), electronics (Christensen et al., 2005), automotive (DiMinin et al., 2010), and communications (Asakawa et al., 2010). It can be observed that today, research has also expanded to a wide range of other industries (Chesbrough and Bogers, 2014). Open innovation can be defined as *"the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively."* (Chesbrough, 2006b, p. 1). However, after being criticized about the lack of a proper definition of open innovation (e.g. Knudsen & Mortensen, 2011; Ozman, 2008; Trott & Hartmann, 2009) and after applying recent conceptualizations (Gassmann and Enkel, 2004; Dahlander and Gann, 2010; West and Bogers, 2014), a few years later the definition was re-defined as a *"distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model"* (Chesbrough and Bogers, 2014, p. 17).

As the concept gained interest from academia, several classifications of open innovation activities emerged. For example, Gassmann and Enkel (2004) classified the open innovation process as the *outside-in*, the *inside-out*, and the *coupled* process. Chesbrough et al. (2006) distinguished the purposive inflows and outflows of knowledge into *inbound* and *outbound* open innovation. Inbound open innovation reflects the outside-in process, and outbound open innovation the inside-out process. Later, Dahlander and Gann (2010) emphasized the monetary directions of the knowledge flows by adding the *pecuniary* and *non-pecuniary* dimensions to this classification. As a result, they distinguished two forms of inbound innovation – *acquiring* and *sourcing*, and two forms of outbound open innovation – selling and revealing. Following the classifications by Gassmann and Enkel (2004) and Dahlander and Gann (2010), in their latest work Chesbrough and Bogers (2014) defined the mechanisms to help in managing the knowledge flows in open innovation. For the purpose of this study, we will apply the classification of open innovation (inbound, outbound and coupled) and supporting mechanisms described by Chesbrough and Bogers (2014).

2.2   Skills, competencies, roles and responsibilities of open innovation specialists

Many practitioners and researchers in academia use the term 'skills' and 'competencies' interchangeably (as an example, see section on the analysis of job advertisements). However, skills should be treated as one of the integral elements of competencies, along with "motivation, character traits, knowledge and behaviour" (Proctor and Dutta, 1995, p. 19). According to Colombo and Grilli (2005), skills of an individual are associated with educational background (e.g. Bachelor, Master, Doctoral level), their nature (e.g. engineering, economic), and length of professional experience (e.g. prior employers, prior position).

There is also a vast confusion in regard to competencies, which is often reflected in the inconsistent use of terms, as well as different understandings, e.g. based on cultural differences (Boon and van der Klink, 2002; Cseh, 2003). Most researchers use the term "competency" for describing essential human knowledge, attitudes, and skills at work (Du Chatenier et al., 2010; Sandberg, 2000) and abilities to perform non-routine tasks (Kanungo and Misra, 1992). Competencies can be defined as the "*abilities to successfully meet complex demands in a particular context through the mobilization of psychosocial prerequisites (including both cognitive and non-cognitive aspects)*" (Rychen and Salganik, 2003, p.43) or simply, as an integrated set of "*knowledge, attitudes, and skills of a person*" (Mulder, 2007, p.11). As noted by Kamoche (1996) many researchers and practitioners have composed behavioral profiles of generic competencies that are used for performance evaluation or recruitment. For the purposes of this paper, we will follow the simplified definition of competencies, described by Mulder (2007) and apply it to competencies of open innovation specialists.

Since open innovation requires opening up companies' boundaries (Chesbrough, 2003) and comprises complex activities and mechanisms that companies can adopt, it also includes various tasks that range from technical to marketing and legal (Bianchi et al., 2011) followed by a variety of job responsibilities that are associated with certain personal traits. For example, Chesbrough (2003) identified two critical traits – *risk propensity* and *pragmatism* – that are needed to overcome the so-called 'Not-Sold-Here Syndrome' (Katz and Allen, 1982). While analyzing the role of licensing managers, Bianchi and colleagues (2011) emphasized the *mediating attitude* in terms of conflict minimization between internal and external stakeholder, and *systemic approach*. Du Chatenier et al. (2010) analyzed open innovation teams' competencies, and pointed out the three most important competencies that individuals working in these teams should possess: *combinatory skills, social astuteness, sociability.* Several consulting books also describe needed skills for open innovation teams (e.g. Hafkesbrink and Schroll, 2010; Lindegaard and Kawasaki, 2010; Sloane, 2011), however, these descriptions are mainly based on authors' own experience. The study by Sartori and colleagues (2013) compiles some of these characteristics of individuals that are needed for working in open innovation teams. They mention for example entrepreneurial *mindset, communication skills, ability to comprehend complex requirements, relationship building, curiosity, holistic point of view.* The report by Mortara et al., (2009) distinguishes four categories of skills for open innovation: *introspective, extrospective, interactive* and *technical*, and the accompanying set of desirable personal attributes. Concerning entrepreneurial mindset, the study by Di Minin and colleagues (2010) provides evidence that firms that adopted open innovation have changed the way they

recruit new staff. FIAT, for example, includes *entrepreneurial attitude* in the assessment of new personnel. Several other papers (e.g. Cloyd and Euchner, 2012; Dodgson et al., 2006; Di Minin et al., 2010) also mention the need for stimulating entrepreneurial behavior in R&D departments. Soft skills such as *passion* and *optimism* of managers in OI-driven organizations are emphasized by Martino and Bartolone (2011). Another study (based on an Italian sample) by Petroni and colleagues (2012) explores how the adoption of OI has changed the organizational structures of R&D and HR practices. They conclude that, with the shift from closed toward open innovation, the greater value is placed on engineers who are *capable to work in an external environment* and have *project management skills*. The new roles have been identified in these organizations, involving *technological monitoring*, *gatekeeping* (Chen et al., 2004), *boundary-spanners* or so-called *"T-shaped managers"* (Chesbrough, 2012). Based on case study of Philips, Hacievliyagil and Auger (2010) also emphasize that researchers have changed their working time allocation, as they spend their time on business aspects (e.g. negotiation of partners, scouting for external ideas) apart from work in research labs. Fleming and Waguespack (2007) noted that leaders in open innovation communities need to possess certain social capital, defined as *the boundary-spanning* or *brokerage* of collaborative relations, apart from technical expertise. The study by Saebi and Foss (2015) argues that in order to successfully implement open innovation companies should align the organizational aspects with employed open business model. This includes designing new organizational roles and supporting governance mechanisms. For example, by adopting a market-based innovation strategy, R&D employees should develop expertise in communicating and interacting with researchers and managers across various industries (*T-shaped managers*); for network-based innovation strategy, the emphasis should be placed on *integration experts* who facilitate the integration of externally acquired knowledge across different internal units.

Mortara and Minshall (2014) noted that as the role of open innovation in companies has become strategic, new functions and roles have emerged that are explicitly linked with open innovation. For example, they mentioned the positions as Vice President for Open Innovation at Unilever, or Open Innovation Director at Crown Packaging and Philips, as examples of newly created jobs. With regard to positions of open innovation managers, the recent report by Vanhaverbeke and colleagues (2017) explores their LinkedIn profiles, but not in terms of their roles and responsibilities on the job.

Nevertheless, to the best of our knowledge, there has been no prior attempt to analyze the job offers related to open innovation to identify skills and responsibilities of open innovation professionals in companies, which this study attempts to do.

3   Research Design and Methodology

Employing an open innovation specialist is emerging management practice, as the concept of open innovation was only introduced in 2003. Hence, the research on their roles and responsibilities is still at a very early stage. The aim of this paper is to explore the roles, responsibilities and competencies of dedicated open innovation specialists, thus we adopted a qualitative research strategy. This strategy allows seeking answers to "what", "why", and "how" questions (Yin 2014), and thus is particularly suitable for the study. This study intends to analyse the documentary evidence by means of content

analysis (Boettger and Palmer, 2010; Krippendorff, 2013). Qualitative content analysis in particular can be used to describe a phenomenon, allowing researchers to understand the social reality in a subjective way (Carliner et al., 2015; Zhang and Wildermuth, 2009). This inductive approach to analysis and purposively selected samples (Carliner et al., 2015; Krippendorf, 2013) yields light on general job descriptions that represent the overall view of OI positions, based on the formal description of job advertisements. Carliner and colleagues (2015) who used qualitative content analysis of job descriptions to analyze performance consultants' positions, used a similar justification and approach. However, their work does not consider job descriptions included in job advertisements.

Due to the very limited research on competencies for OI specialists and their roles from the academic perspective, we decided to analyse current job advertisements related to OI in order to investigate what common skills and competencies companies are seeking while recruiting new staff, as well as the roles and responsibilities of open innovation specialists. Although this method has not been used before in the field of OI (except one documented attempt by Ziebarth and colleagues (2010), who developed software tool to match competence profiles with job offers to support competence management for open innovation), other disciplines successfully use content analysis of job advertisements to study emerging phenomena in their field. For example, Aguinis and colleagues (2005) used it to analyze certified HR professionals, Chen and Zhang (2015) for data management professionals, Park and Lu (2009) for metadata professionals, and many others in the field of e.g. health education (e.g. Baker and Cissell, 1994) or librarian education (Shahbazi et al., 2016: Shank, 2006; Tang, 2013).

The job offer analysis, which aimed to study job advertisements listed by companies worldwide, was done in two steps – the first search was done at the beginning of 2014 and the second about two years later. In both cases, the careerjet.com search engine was used, due to the fact that it compiles job offers from different international and national sources. Even though this website is very useful when searching for job offers, it must be kept in mind that most of the job advertisements are repeated, as most companies choose many different channels to post their jobs. The keyword used was "open innovation" in the job title, job description, or job function. Out of 354 and 484 job advertisements in 2014 and 2016 respectively, 100 were selected for the analysis after the exclusion of duplicates and according to other criteria (e.g. "open innovation" used in the general companies' description, job offer posted in English). The main limitation of this study is also related to the main criterion – job advertisements in English – that excluded job offers written in local languages.

All job offers were collected in an MS Excel dataset that was later exported to Nvivo10 software, where the analysis took place. Wordle.net was used for the analysis.

Fig. 1 presents the countries where the jobs were advertised. In both analyzed years, most of them were posted in the USA (33 in 2015 and 25 in 2016). In 2016, Germany was second (4 jobs), followed by China (3), the Netherlands (3), and countries such as Canada, Thailand, Switzerland and Ireland, that had not featured in 2014.
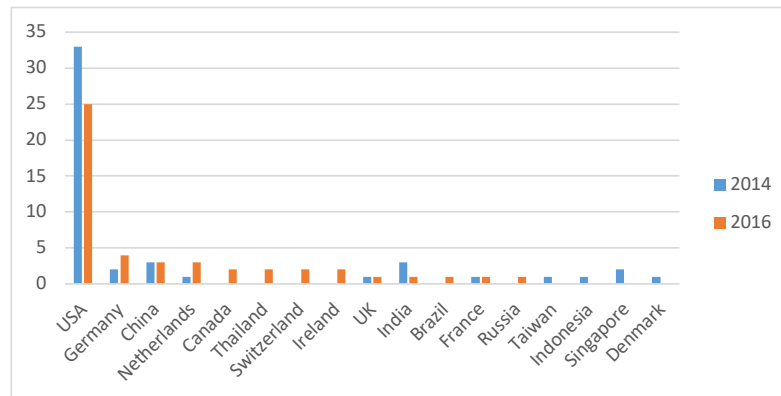
Fig. 1. List of countries with open innovation job posting in February 2014 and 2016.

It is important to note that the analyzed job offers include all available offers at different stages of a career – from internship positions to the director or head of a unit.

4   Findings

The analysis is presented in three blocks. The first block provides findings based on the general overview of the total sample. The second block focuses on jobs from two periods (2014 and 2016) that include 'open innovation' in the job title only. The third block compares the results from 2014 with those from 2016 based on the whole sample of 100 job offers.

4.1   Overview of job advertisements in the field of open innovation

As mentioned in the research design section, the selected job advertisements included 'open innovation' in the title of the job, in the description of roles and responsibilities, or in the job function. It was observed that out of 100 jobs related to open innovation, 23 mentioned 'open innovation' professional directly in the job title. In 2014 there were four (4) explicit 'open innovation' positions, compared to 19 in 2016, which indicates the growing role of open innovation in companies' structures.

There are many job offers that only mention 'open innovation' in the job description, usually in one of five ways:

1) *The ideal candidate for the position needs to have a knowledge of how to best leverage open innovation platforms to source innovation.*

2) *The candidate will manage and grow the project pipeline via both internal and open innovation.*

3) *The candidate needs to have knowledge and experience in identifying innovative partnerships and executing collaborative models for partnership 'in the spirit of open innovation'.*

4) The candidate will internally promote the different Open Innovation activities and identify specific needs for them.

5) The candidate will be working in open innovation environment.

In total, out of 100 jobs related to open innovation, 40% were for managerial, 14% for directorial, and 10% for senior positions. Fig. **2** presents the word buzz of other position titles related to open innovation (after excluding the most common "open innovation", "manager", "director", "senior"). The results indicate that companies seek leaders, engineers, business development managers, product (marketing) managers, analysts, technology scouts, event managers, new business opportunity managers, and business strategy managers.

Fig. 2. Word buzz of job titles in the field of open innovation.

Another finding is that the positions related to open innovation are not only located in R&D departments but are also divided between other organizational functions. These include strategic management, marketing and sales, corporate communications, IT, and purchasing divisions. This adds to the notion of the multidisciplinarity of open innovation, and the tasks and responsibilities of open innovation specialists.

In regard to industries, it was noticed that even though open innovation was originally comprehended as a paradigm shift for large manufacturing firms, it has rapidly extended to new industries including service industries, supporting the insights of Chesbrough (2011) and Chesbrough and Bogers (2014). The consumer goods industry displayed the highest demand for open innovation specialists, followed by the consulting, pharmaceutical, telecommunications, electronics and healthcare sectors (see Fig. **3**).
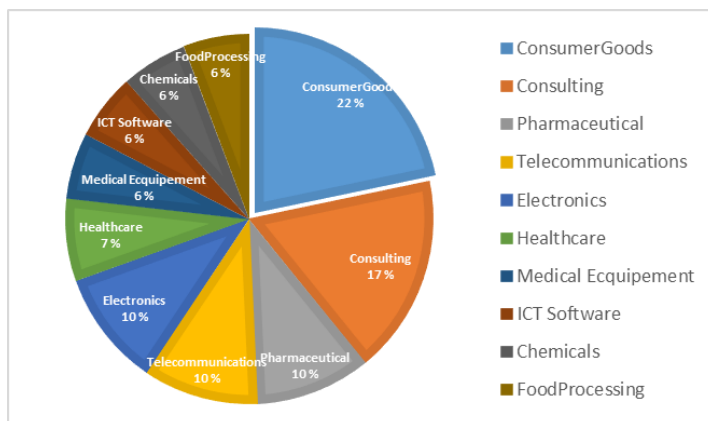
Fig. 3. The structure of the top 10 industries with job offers related to open innovation.

4.2   The 'Open Innovation' specialist – commonalities and differences

Interestingly, the analysis of 23 positions that directly named open innovation professionals found support for findings from another study, which argues that companies define open innovation differently and might have difficulties with identifying which practices can be perceived as open or closed (Dabrowska et al., 2013). To picture it, we used Chesbrough and Boger's (2014) classification of open innovation activities and counted the number of activities mentioned as part of the open innovation specialists' job responsibilities (See Table 1). The analyzed companies stated between four (4) and 11 different OI activities in their job descriptions. The median value was eight. All firms indicated that the candidate should have expertise in inbound open innovation (scouting for new ideas and technologies outside and collaborating with intermediaries, suppliers and customers), 43% of the firms expected the OI specialist to be responsible for the cooperation with universities, and 21% for the cooperation with start-ups. A significant number of the analyzed job profiles (over 69%) stressed that one of the responsibilities of the job is the cooperation within ecosystems or networks or with stakeholders. For the inside-out mechanisms of OI, the most commonly mentioned responsibilities were those related to joint ventures, networks and alliances (over 21%) and activities related to start-ups: spin outs, incubation etc. (over 21%).

Table 1. The number of open innovation activities indicated in 23 job advertisements related to open innovation specialists.

		Number of companies who mention the activity as part of the open innovation specialist's responsibility	%
Outside-in	scouting	23	100,00
	in-licensing IP	2	8,70
	university research programs	10	43,48
	funding start-up companies in one's industry	5	21,74
	collaborating with intermediaries, suppliers and customers	23	100,00
	utilizing non-disclosure agreements	0	0,00
	crowdsourcing	3	13,04
	competitions and tournaments	2	8,70
	communities	0	0,00
	spin-ins or spin-backs	0	0,00
Inside-out	out-licensing IP and technology	2+ 2	17,39
	donating IP and technology	0	0,00
	spin-outs	5	21,74
	corporate venture capital	0	0,00
	corporate incubators	5	21,74
	joint ventures and alliances (i.e., becoming a supplier to or a customer of a new initiative, vs. executing the initiative internally).	5	21,74
Coupled	strategic alliances, joint ventures, consortia, networks, ecosystems and platforms, all involving complementary partners		
	networks	23	100,00
	joint ventures	5	21,74
	ecosystems	16	69,57

Source: Author's own analysis, based on Chesbrough and Bogers (2014) classification of open innovation activities

In regard to job responsibilities, one position for an open innovation professional in the chemical industry in an R&D division went beyond the tasks on R&D or innovation management, and involved tasks from HR management (talent management, interviews

with candidates, training). For example, apart from responsibilities like:

> *"Drive Open Innovation: initiate new research projects with academic and industrial partners (…) Generate and monitor new collaboration projects (…) Motivate and coach colleagues to drive (open) innovation on Innovation Campus, further develop innovation culture, support innovation processes from idea finding to project start (…) Organize open innovation workshops with customers.", it also included:*

> *"(…) organization of events and workshops at universities, represent and present the company at universities (…) Talent Management (…) further develop concept of talent management. (…) Push development of competencies of PhD candidates and PostDocs, including feedback, and organization of trainings (…) Conduct competency-based interviews with candidates".*

This may indicate that the roles and responsibilities, and related to them the skills of open innovation professionals, are becoming more interdisciplinary.

Nonetheless, common skills that the candidate should possess were also identified. Fig. **4** presents the word buzz of the common skills, which indicates that the ideal candidate should have *excellent communication*, *leadership* and *project management skills*; have *problem-solving* skills and be *able to think strategically* and *work in cross-functional teams*; possess *excellent interpersonal skills*; be *able to work independently and as part of the team*, and have the *ability to influence others*. Concerning knowledge, most of the job advertisements mention *cross-disciplinary knowledge* (be it the combination of technology and business; R&D with marketing and management or R&D and sales management) however, more attention in placed on *prior work experience* and proven track record.

Fig. 4. Word buzz of common skills for open innovation professionals based on job advertisement analysis.

Based on the analysis of 23 positions, all naming 'open innovation' in the job titles, we can also map the *key areas of roles and responsibilities* of 'open innovation' professionals. Table 2 presents the summary, with examples taken directly from the job advertisements. The key areas are named in descending order, which means that scouting was mentioned the most often (as part of each and every job responsibility of an open innovation professional). Hence, one of the main responsibilities of this professional would have been *scouting for technologies, ideas, solutions and/or*

business opportunities. It is followed by *developing, managing, building innovation ecosystems* and strategic partnerships. Also, the person was expected to *create and develop open innovation strategies* for the company and manage multiple projects. From the internal perspective, the person was expected to *organize, plan, and manage cross-functional initiatives* within the company to *promote open innovation initiatives*. What was less emphasized, but still relatively common, was *building and designing prizes and challenges for open innovation platforms* and *internal and external crowdsourcing initiatives*. Furthermore, the person was expected to *organize and participate in open innovation events and workshop*s as well as to support the structuring of strategic deals.

**Table 2.** Key areas of roles and responsibilities based on analysis of 23 job offers with

Key areas of responsibility	Examples of Roles and Responsibilities
Scouting for technologies, ideas, solutions, business opportunities	*Scout for innovative and disruptive technologies,*
	Scouting technologies or business opportunities at universities, institutes, or companies, incl. start-ups
	Build and implement state-of-the-art digital scouting capability that provides early warning to emerging disruptive technologies and opportunities
	Evaluate research and new technologies, identify promising candidates, and articulate possibilities to technical and non-technical stakeholders
	Identify strategic innovation targets (startups and/or early stage technologies
Strategic Ecosystem/Networks/ Strategic partnership *(to develop, manage, build, influence, engage)*	*Develop and influence the innovation ecosystem to drive capability, scout for emerging technology, foster external partnerships and incubate strategic collaborations*
	Engage the broader ecosystem including academic/research institutions, entrepreneurial start-ups and other potential partners.
	Build and manage relationships with ecosystem partners (e.g., universities, startups, other R&D labs) designed to discover new business opportunities
	Engage with the innovation ecosystem and to identify and develop high impact opportunities.
	Within our OI ecosystem, manage key external partner engagements
	Manage the network of open innovation partners.
Open Innovation Strategy (to create, develop)	*Collaborative development of open innovation strategy in the context of innovation management.*
	Create & develop Open Innovation strategy that focuses on technology, talent and partners while incorporating an experimental discovery mindset.
	Development of new strategies to get ideas, resources and technology from the outside.

Key areas of responsibility	Examples of Roles and Responsibilities
Project Management	*The execution of open innovation projects.*
	Manage technology projects with strategic partners, universities and/or Corporate R&D Tech Leads to develop prototypes / products with business stakeholders and external manufacturing partners
	Manage technology development projects for technologies that may be adjacent or transformative to the traditional businesses.
	To manage multiple projects concurrently moving them through planning to delivery and execution.
Cross-functional management	*Partners in cross functional teams to develop and manage technology strategies*
	Works closely with packaging, process development, and manufacturing to identify technology needs, working to then identify potential external solutions
	Work cross-functionally to communicate competitive insights within the beverage/snack category and to the broader organization.
	Interact cross functionally with customers, account teams, partners, architects, peers
	Organize, plan, and manage cross-functional, high visibility initiatives within the Open Innovation team
Open Innovation platforms/internal and external **crowdsourcing** (to manage, design)	*Crowdsourcing communities*
	Care of crowdsourcing community on the platform and support of the local community
	Manage open innovation platforms
	Design open innovation activities (e.g. prizes, challenges)
	Open Innovation platforms – craft challenges, crowdsourcing
	Organize and manage external and internal crowdsourcing initiatives to collect new ideas from employees
Open Innovation events (to manage, design, organize, coordinate)	*Manage and coordinate Open Innovation events.*
	Design and conduct events with partners (e.g. workshops, students' events).
	Deliver experiences and workshops with start-ups and ecosystem partners.
IP Management (emphasized the least)	*Develop ownership strategies (IO) and implementation plans for technology platforms*
	Structure strategic deals (equity investment, commercial and/or M&A)

While analyzing the job offers with open innovation in the title, we used Nvivo10 to map the pattern of the most frequently used words (see Fig. 5. Word tree for pattern in words: network, partners, ecosystem in 23 job descriptions with open innovation in the title.). Apart from job responsibilities in building and managing the network of partners,

the word *networking* was also used as a desired qualification (e.g. the person should have a strong technology/start-up/academic network or should demonstrate experience in network management). Other common words were *partners* and *ecosystem,* this also supports our main findings that companies place the responsibilities of engaging and building ecosystems, as well as building relationships with various partners, in the hands of open innovation specialists.
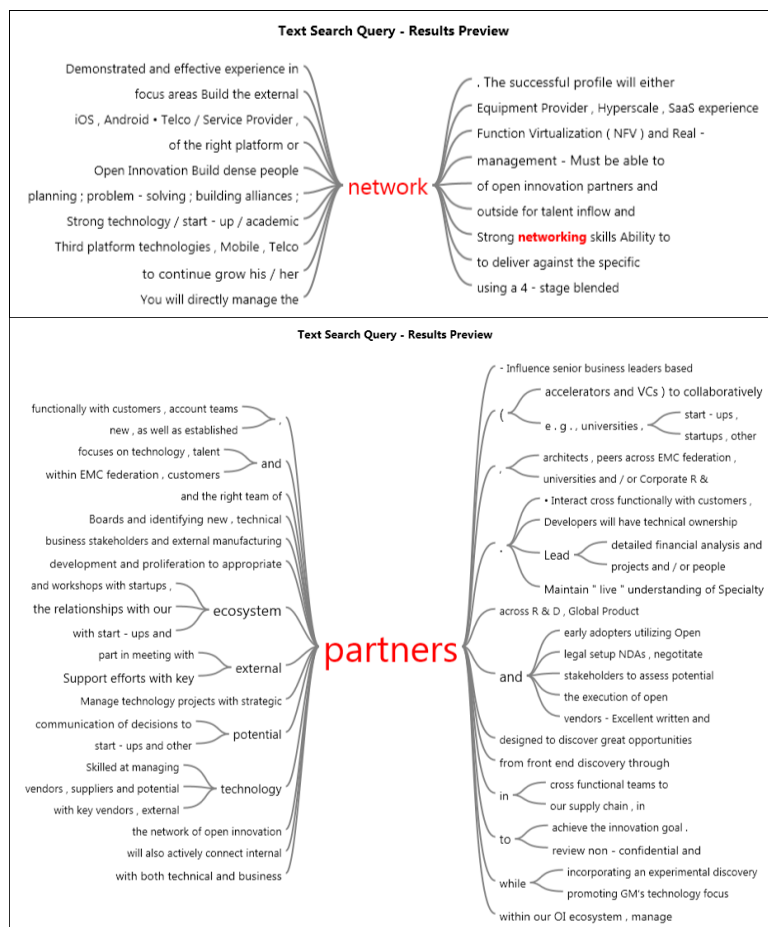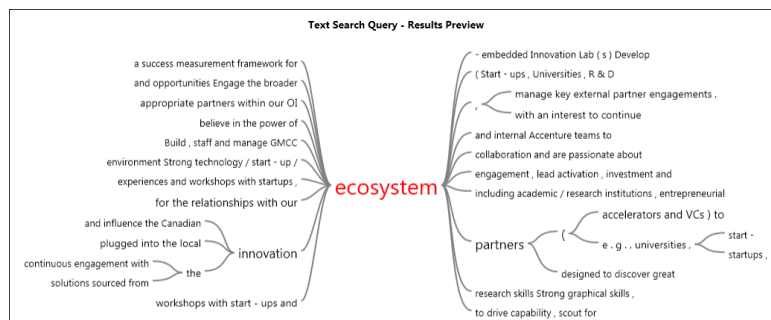
Fig. 5. Word tree for pattern in words: network, partners, ecosystem in 23 job descriptions with open innovation in the title.

4.3   The evolution of jobs related to open innovation

This section focuses on presenting findings based on the comparison of job advertisements with 'open innovation' in the title <u>and</u> in the job description posted in 2014 with the ones posted in 2016. As mentioned in the first section, the jobs advertisements with a clear open innovation function have boomed.

Interestingly, it can be noted that in 2016, compared to 2014, companies placed stronger attention on the *ability to influence others* as a job requirement, with a proven track record and experience in this domain. In addition, in case of positions of open innovation professionals, influencing was part of the job responsibility (See Table 3 for details).

Table 3. List of job titles mentioning the 'ability to influence others' in jobs posted in 2016.

Job Title	Industry	Roles and Responsibilities	Job requirements
Open Innovation Consultant; Open Innovation Business Strategy Analyst	Consulting	*he/she will lead and deliver results through influence and building alliances.*	*Ability to deliver results through alliances and influence*
Open Innovation Manager	Electronics	*Influence senior business leaders based upon business strategies to identify and acquire external technology to deliver on current and future business deliverables*	
Senior Software Engineer, Open Innovation Lab	Engineering, Software		*Ability and track record of influencing and collaborating with others*
Head of Open Innovation	Automotive	*develop and influence the innovation ecosystem to drive capability, scout for emerging technology, foster external partnerships and*	*Highly capable networker that holds established credibility with external stakeholders as a thought leader and influencer*

Job Title	Industry	Roles and Responsibilities	Job requirements
		incubate strategic collaborations	
Project Leader	Pharmaceutical	*Apply your technical, commercial and influencing skills to strengthen the adoption of Bio-based materials across our global organization*	*Outstanding communications and influencing skills including fluent written and spoken English*
Connected Home Architect	Power and Gas		*Someone who can lead multi-functional teams and stakeholders typically through influence in a complex matrix organization Strong people leader with exceptional stakeholder management skills and the ability to operate and influence at all levels.*
Market Analyst Leader/Senior Manager	Home Appliance		*Excellent organizational, communication, and influencing skills*
Director – Treatment and Analytics	Manufacturing		*Strong influence management capability needed*
Engineering Supervisor	Aerospace		*Must be able to influence peers on the relationship between scope, schedule, and resources.*
I&R Refrigeration Innovation Intern	Building Technologies		*Ability to work effectively and influence others in a diverse and dynamic work environment*
Senior Manager Emerging Technologies	Chemicals		*Understanding and influencing OEM strategies concerning applications and material solutions*
Technology Scout	Information Services		*Effectively communicating and presenting technical complex data (both verbally and written) to influence all levels and global audiences High degree of emotional intelligence and excellent facilitation and influencing skills. Effective leadership, communication and influencing skills are necessary for success in this role*

Job Title	Industry	Roles and Responsibilities	Job requirements
			Ability to influence decision-making is critical to bringing complex issues to successful conclusion.
Associate Principal Engineer Team Leader	Consumer Goods		*Strong organizational positioning skills with a demonstrated ability to influence through organizational awareness and effective, clear communication*
Digital Innovation Management	Consumer Goods		*Ability to influence peers and management (IT, non-IT, internal and external) to drive project and process outcomes*

Research indicates that there was another new requirement in 2016 – the candidate's *prior start-up experience*, which was not emphasized in 2014 (see Table 4). Also, surprisingly *knowledge of IP management* was not indicated as often as a job requirement compared to 2014, where it was highlighted more than twice as often as in 2016.

On the other hand, the *entrepreneurial skills/mindset* were mentioned more often in 2014 compared to 2016 and were related to positions of technology scout (chemicals), leader open innovation (consumer goods), consumer market & intelligence (healthcare, cosmetics), and program manager (power and gas).

Table 4. List of job titles in 2016 emphasizing start-up experience and entrepreneurial skills.

Job Title	Industry	Roles and Responsibilities	Job requirements
Head of Open Innovation	Automotive		Startup experience
Open Innovation Senior Manager	ITC Manufacturing, Computer Hardware, Electronics	Identify strategic innovation targets (startups and/or early stage technologies) Evaluation and competitive analysis of startup technologies	
Open Innovation Consultant; Open Innovation Business Strategy Analyst	Consulting	Relationships with our ecosystem partners (e.g., universities, startups, other R&D labs) designed to discover new business opportunities	Prior experience in startups 2+ years of technical start-up or entrepreneurial experience with enterprise technologies
New Business Opportunity Manager	Healthcare	Responsible for establishing mutually beneficial relationships with startups and entrepreneurs.	knowledge: accelerators, start-ups, incubators is a differentiation

Job Title	Industry	Roles and Responsibilities	Job requirements
PhD student	ICT Software	Support intra- and entrepreneurship challenges (hackathons) with employees, students and startups.	
Intern Digital Ventures	Consulting		Have working experience in e.g. consulting, startups or tech-/ engineering-driven environments
Director Innovation Incubator	Financial services		Start-up experience
Senior Director Transactions	Pharmaceutical		Knowledge: IP management; start-ups; strategic management
Digital Innovation Management	Consumer Goods		Ability to influence peers and management (IT, non-IT, internal and external) to drive project and process outcome

5   Discussion

In this rapidly changing and networked business environment, our findings indicate that firms are increasingly creating specific open innovation functions and designing completely new roles. This responds to previous calls for empirical inquiries addressing the "human side" of open innovation research (e.g. Mortara and Minshall, 2014; Podmetina et al., 2013; Vanhaverbeke at al., 2014; West at al., 2006).

Due to our curiosity about who the specialists are behind open innovation adoption, we have explored the roles and responsibilities of open innovation specialists and addressed the skills and competencies related to these roles. It is clear that research in this area is scarce. Thus, we analyzed 100 job advertisements related to open innovation profiles. We identified the most desired set of skills for open innovation professionals (i.e. excellent communication skills, leadership and project management skills, problem-solving, strategic thinking and ability to work in cross-functional teams, interpersonal skills, ability to work independently and as part of the team, and ability to influence others). Concerning knowledge, most of the job offers mentioned cross-disciplinary knowledge. Interestingly, the entrepreneurial skills/mindset were not considered as important, which contrasts with the findings of other researchers (e.g. Cloyd and Euchner, 2012; Dodgson et al., 2006; Di Minin et al., 2010, Mortara et al., 2009). However, the data indicate that companies pay attention to a proven track record and emphasize prior experience with start-ups as a main job requirement. This may suggest that large companies try to increase the collaboration with start-ups, and seek experienced candidates who are not influenced by corporate mentality.

When comparing the two periods when we collected our data, significant changes were

observed. First of all, the number of job profiles indicating 'open innovation' in the title of the job increased. The analysis revealed that in 2016, compared to 2014, companies shifted toward creating, sustaining and influencing the ecosystem. Not surprisingly, *the ability to influence others* was becoming more emphasized as part of the job requirements. The job requirements were focused more on *prior experience* and *proven track record* (especially for managerial positions), rather than on candidates' skills and knowledge. To build and manage relationships with ecosystem partners (e.g. universities, start-ups, other R&D labs); scouting for emerging technologies looking for business opportunities both inside the firm and outside – these are just a few examples of roles and responsibilities assigned to open innovation candidates. Furthermore, cross-functional cooperation was considered an important part of the OI specialist's daily routine. Cross-functional cooperation is considered as internal openness in some studies (e.g. Love et al., 2011), stressing that it also aims at increasing the innovation output of the firm (Powell et al., 1996; Tsai, 2001; van den Bosch et al., 1999). Interestingly, some companies extended the responsibilities to tasks related to human resource management (e.g. talent management, recruitment, selection and training), indicating the true multidisciplinarity that is expected from the right candidates.

In addition, our findings indicate that even though open innovation was originally coined as a paradigm shift within large manufacturing firms, it has rapidly extended to new industries, supporting the findings of other academics (Chesbrough and Bogers, 2014). Furthermore, our findings suggest that the open innovation function has spread beyond traditional R&D and innovation departments toward strategic management, marketing and sales, corporate communications, and even IT and purchasing departments.

The relatively small number of public job advertisements related explicitly to 'Open Innovation' specialists, when compared to the LinkedIn profiles of over 52,000 positions, can be explained by the conclusions of Vanhaverbeke et al. (2017) who found that open innovation managers usually have long tenures in the company. This indicates internal promotions without the need to go public and search for new specialists. This fact also addresses the question whether companies prefer to train employees on open innovation rather than hire external open innovation professionals (Podmetina et al., 2013).

6   Conclusions and avenues for further research

This paper provides a significant contribution to the open innovation field of research by triggering the discussion on essential skills of employees in firms implementing (or planning to implement) open innovation. It presents an interdisciplinary approach by integrating open innovation and human resource management research streams, and by analyzing job profiles of open innovation professionals. It calls for new research on HRM and open innovation by developing sets of skills and competencies needed for the successful adoption of open innovation, providing training and education recommendations for industry, consulting and higher education, and bringing the role of the individual to the front of open innovation research. In addition, the results contribute to the current stream of innovation literature by identifying the key areas of

roles and responsibilities of open innovation professionals. To the best of our knowledge, prior to this study there was no attempt to analyze job advertisements related to open innovation that aimed to identify the skills, roles and responsibilities of open innovation specialists in companies.

The results of this study can be used by companies for creating job descriptions and/or planning to recruit new staff. Moreover, they can be used by universities or other educational institutions while developing the curricula. For example, considering the fact that the majority of the job advertisements stressed that candidates should possess cross-disciplinary knowledge (be it the combination of technology and business, R&D with marketing and management, or R&D and sales management), it can be argued that open innovation should be taught not only on innovation management majors/programs/courses, but should also be available for students from other departments such as engineering, chemistry, biology, pharmaceutical etc. At the same time, basic knowledge of marketing, management and sales should be emphasized, with focus on developing and improving communication, leadership and problem-solving skills. We anticipate that the results will create a discussion on required and desired skills of employees in companies adopting or planning to adopt open innovation, as well as job responsibilities of open innovation professionals.

This study also has some limitations. First, it is based on the analysis of job advertisements that were posted in specific periods in 2014 and 2016, and only reflects jobs advertised in English. This means that it does not include companies with open innovation professionals that were not seeking to recruit new staff at the time. Second, due to the sample size and adopted research methodology, the results cannot be statistically generalized. Third, as indicated by Carliner and colleagues (2015) we acknowledge that job descriptions and advertisements may not match the actual job responsibilities, as they may reflect over-idealized expectations of the position, or in line with findings by Mathews and Redman (2001) they may be poorly designed by unexperienced recruiting organizations.

In order to improve the validity and generalizability of the results, future research could analyze the importance of personal traits and individual skill endowment (c.f. Bianchi and colleagues, 2011). In addition, interviews with companies with open innovation divisions could shed light on the actual roles and responsibilities of open innovation professionals. As the findings reveal the growing importance of open innovation professionals in building and influencing the ecosystems, as well as emphasize candidates' prior experience in working with start-ups, we call for further research in this domain. Furthermore, this study opens new horizons for teaching open innovation, both within university curricula and for practical business training. It sheds light on the importance of practical skills and experience and the necessity of on-the-job training, and puts pressure on transforming teaching methods to more interactive and practice-oriented ones.

7   Acknowledgements

8   References

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Publication V

Dąbrowska, J., Keränen, J., and Mention, A-L. (2017)

**ORGANIZING FOR OPENING UP. RESPONSIBILITIES OF OPEN INNOVATION
PROFESSIONALS**

Conference article. In: *The ISPIM Innovation Summit – Building the Innovation Century,
Melbourne , Australia, 10-13 December 2017*

Organizing for opening up. Responsibilities of open innovation professionals.

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Abstract: Based on in-depth interviews with senior managers who hold positions such as Open Innovation Managers or Directors or Head of Open Innovation units in seven large organizations, we show how the responsibilities of open innovation professionals range between internal and external stakeholder focused, and those who are technically and socially focused. We support this with a set of practices that can be used to facilitate open innovation within both the intra- and inter-firm boundaries. In addition, the data suggest that firm size, type of industry and maturity level of open innovation implementation have a major influence on the kinds of responsibilities that open innovation professionals have. As a company's open innovation capabilities mature over time, then open innovation practices and tools assume their place, and open innovation becomes a "new way of working for everyone" and the "new innovation DNA". The responsibilities of open innovation units become focused on "developing and influencing the innovation ecosystem" or in some cases are discontinued.

Keywords: open innovation; open innovation professionals; open innovation units; responsibilities; practices

1 Introduction

Implementing open innovation (OI) has become a key priority for many companies, as well as for innovation scholars (e.g. Dahlander & Gann 2010; Enkel, Gassmann &

Chesbrough, 2009; West & Bogers 2014) and policy makers (e.g. establishing EU's Open Innovation Strategy and Policy Group). By opening up innovation processes (Chesbrough, 2003), companies report various benefits including increased innovation performance access to new competences, shared innovation costs and risks among others (Chesbrough & Bogers, 2014, 2012; Tidd, 2014). However, many companies still face certain organizational challenges while implementing open innovation (West & Gallaher, 2006; Van de Vrande, De Jong, Vanhaverbeke & De Rochemont, 2009) and emphasize cultural issues as one of their key barriers (Aquilani, Abbate & Codini, 2017; Bigliardi, Ivo Dormio & Galati, 2012; Chesbrough & Crowther, 2006; Mortara & Minshall, 2011; Van der Meer, 2007). Indeed, the implementation of open innovation has resulted in organizational changes not only regarding R&D units but in the whole organization, whose role has become strategic. In order to embrace open innovation large companies now form dedicated open innovation teams (Dahlander, O'Mahony & Gann, 2016; Manzini, Lazzarotti & Pellegrini, 2017; Mortara & Minshall, 2014) and redesign job roles and tasks (Salter, Criscuolo & Ter Wal 2014; XX, 2016; Mortara & Minshall, 2014). As a result, new open innovation titles have emerged, and LinkedIn searches reveal over 52,000 job titles related to 'open innovation' (LinkedIn, January 2018). However, despite increased research and practitioner interest, little attention has been paid to the nature of the role that these dedicated open innovation professionals play in companies' transition toward opening up (Dabrowska & Podmetina , 2016; Mortara & Minshall, 2014), or how they are organized into organizational structures.

The issue calls for more systematic and in-depth study of the responsibilities and practices of dedicated open innovation units and open innovation professionals. Thus, the goal of this submission is to explore how firms organize open innovation units, what kind of responsibilities and practices that open innovation professionals adopt, and how their roles and responsibilities develop over time.

This paper comprises of following sections. In the next section we present the conceptual background of open innovation adoption, new forms of organizing and the main characteristics of open innovation professionals. Secondly, we describe research design and methodology. Finally, we present the findings, followed by a discussion and conclusions.

2 Literature review

We currently witness companies from various industries embracing open innovation (Chesbrough & Bogers, 2014). Even though the original term was based on observations in high-tech industries (Chesbrough, 2003), there is an astonishing diversity of companies currently implementing open innovation practices. From high-tech to low-tech (e.g. Chiaroni, Chiesa & Frattini, 2011; Chesbrough & Crowther, 2006), small- (e.g. Van de Vrande, De Jong & Vanhaverbeke, 2010), to large-sized (e.g. Mortara and Minshall, 2014) to start-ups (Usman & Vanhaverbeke, 2017), to mature (Chiaroni, Chiesa & Frattini, 2010) companies who operate on various continents.

The most recent definition of open innovation describes it as a "distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model" (Chesbrough & Bogers, 2014, p. 17). However, unsurprisingly, it is acknowledged

that companies pay more attention to inward knowledge flows for accelerating internal innovation (West, Salter, Vanhaverbeke & Chesbrough, 2014; West & Bogers, 2014). It can also be observed that most of the empirical papers focus on specific types of collaborative modes, or management aspects from the firm-centric perspective, or on the role of communities in open innovation settings (Randhawa, Wilden & Hohberger, 2016). Indeed, many case studies focus on selected open innovation practices and how R&D units implement these (Vanhaverbeke & Chesbrough, 2014). In addition, researchers suggest that to benefit from open innovation should focus on adjusting their organizational structures to facilitate the transition (Bianchi, Cavaliere, Chiaroni, Frattini & Chiesa, 2011; Dahlander & Gann, 2010; Mortara & Minshall, 2011).

There have been some recent studies on people-centric aspects of open innovation. For example, Lazzarotti, Manzini, Nosell and Pellegrini (2017) investigate the mediating role of internal social capital on the link between open innovation practices and innovation ambidexterity. Bogers, Foss and Lyngsie (2018) analyse human capital in terms of employees' educational diversity and its link with firm-level openness. While analysing intra-organizational challenges in the implementation of open innovation, de Araújo Burcharth, Knudsen and Søndergaard (2014) propose a set of practices to reduce not-invented-here and not-sold-here syndromes, mainly through competence-building training programs for employees. Ahn and collagues (2017) analyse the the personal traits of Korean CEOs on the adoption of open innovation, while du Chatenier and colleagues (2010) propose a competence profile for professionals that work in open innovation teams.

Some of the recent work has also focused on certain roles within organizations to enable employees to function in an open innovation environment. For example, Alexy and colleagues (2013) find that the adoption of open source software in firms has affected changes in job roles and performed tasks. Whelan and colleagues (2011) mention two types of innovation brokers – idea scouts and idea connectors. Aquilani and colleagues (2017) conceptualize the role of open innovation intermediaries for the successful implementation of open innovation and helping to overcome certain organizational barriers. Salter and colleagues (2014) focus on R&D professionals, their challenges in pursuing open innovation and coping strategies. Dahlander and colleagues (2016) investigate elite boundary spanners at IBM. Grounding from the theoretical traditions of leadership and management, Ollila and Yström (2017) identify the roles of facilitator, tactician and sense-giver when analyzing managerial roles in open innovation settings from a collaboration-centric perspective. Moreover, they note that many open innovation scholars provide suggestions for managers but without exploring the managerial roles of engaging in open innovation (Ollila & Yström, 2017). However, these research initiatives say nothing about the dedicated roles of formal open innovation professionals according to job title, or open innovation units within the organization. Nevertheless some acknowledgement can be found in the work of Mortara and Minshall (2014), who mention the OI implementation teams with their championing role, and provide examples, such as the Vice-President for Open Innovation at Unilever or Open Innovation Directors at Crown Packaging and Philips (Mortara & Minshall, 2014). In addition, Vanhaverbeke and colleagues (2017) explore the LinkedIn profiles of open innovation managers in multinational organizations but do not focus on their responsibilities and employed practices.

3 Methodology

Given that employing specific open innovation units and open innovation professionals is an emerging and relatively underexplored management practice (Dabrowska & Podmetina, 2016, Mortara & Minshall, 2014), we have adopted an exploratory, qualitative multiple case research strategy (Yin, 2014). A discovery-oriented exploratory approach allows us explore a complex phenomenon in its natural setting and to develop theoretical insights from empirical observations (Corbin & Strauss, 2015). A multiple case study approach also allows us to compare insights arising from different contexts, thus strengthening the theoretical aspect, as well as generalizability (Eisenhardt & Graebner, 2007).

By using theoretical and purposive sampling logic (Patton, 2015), we have identified firms who employ either a specific open innovation unit, or open innovation professionals. We subsequently conducted in-depth interviews with senior managers who hold positions of Open Innovation Manager/ Director or Head of Open Innovation unit in seven different firms. The firms were of different sizes and operated in several different industries, including consumer electronics, household and professional appliances, pharmaceuticals, chemicals, food and beverages, dairy products, luxury goods and jewellery, and financial services. Furthermore, in-depth interviews were also conducted with experienced consultants with open innovation tools in their portfolios, and who cooperate with various large companies on the open innovation approach.

All interviews were semi-structured and focused on the roles and practices of open innovation professionals both within and outside the company, as well as challenges associated with open innovation implementation, supporting mechanisms and employed practices. The use of open-ended questions allowed the participants flexibility to express their views freely, and facilitated the emergence of naturally occurring data (Creswell, 2013). The interviews lasted between 50 to 105 minutes, and were audiotaped and transcribed verbatim. We complemented the interview data with a large set of secondary data that included firms' internal documents on open innovation strategy and external announcements related to open innovation. NVivo11 software was used to facilitate the data analysis, and in line with exploratory and discovery-oriented study protocols, the coding followed a grounded theory approach with open, axial and selective coding (Corbin & Strauss, 2015).

Firm	Industry	Employees (Global)	Country (launch of open innovation unit)	Year (launch of OI unit)	Participants
Alpha	Diary	19,000+	Denmark	2013	Head of Open Innovation
Beta	Food & Beverages	5,000+	Croatia	2014	Open Innovation Manager
Gamma	Financial services	165,000+	Switzerland	2015	Open Innovation Developer
Delta	Pharmaceutical	5,000+	Denmark	2013	Head of Open Innovation in Research
Epsilon	Luxury Goods & Jewelry	10,000+	Austria	2013	Director Open Innovation

					Networks; Innovation Ventures and Infrastructure
Zeta	*Utilities, Chemicals, Medical devices*	*50,000*	*France*	*2013*	*Customer innovation support*
Eta	*Consumer Goods*	*55,000*	*Italy*	*2011*	*Open Innovation Director*
Theta	*Consulting*	*2*	*Australia*	*(consulting on OI)*	*Consultant*
Iota	*Management Consulting*	*10,000*	*Australia*	*(consulting on OI)*	*Chief Edge Officer*
Kappa	*Consulting*	*2*	*Netherlands*	*(consulting on OI)*	*Consultant*
Lambda	*Consulting*	*2*	*Australia*	*(consulting on OI)*	*Consultant*

4 Findings

New forms of organizing – need for open innovation function

All the interviewees consistently emphasized that in contemporary markets, driven particularly by globalization and digitization, the inputs to innovations were coming increasingly from wider and more heterogeneous groups of stakeholders, often residing outside the company boundaries, such as customers, suppliers, universities, start-ups and industrial networks. Interviewees frequently mentioned issues such as lowering the entry barriers for collaboration, the need to *"increase the amount of explorative projects outside [our] core business","find emerging and breakthrough technologies"* and explained that traditional R&D and NPD functions were often too "closed" and internally-oriented to discover, access and leverage all the ideas, skills and resources located outside the companies' boundaries.

> *"This change now with hyper connectivity, with web platforms, crowdsourcing, and all the new methods [to connect], these are going to change the way we innovate" (Director Open Innovation Networks, Epsilon).*

As a response to the increased need for opening up company boundaries and collaborating with external stakeholders, all the firms in our study had developed new and specific organizational structures within the last six years that focused on facilitating and managing OI, and had their own accountability rules and budget. In our study these ranged typically from individual roles (e.g. Open Innovation Manager at Beta) to project teams and organizational units (two- to three-person open innovation units). For example, Alpha, Delta, Epsilon and Eta had specific open innovation units that were located within the research and development or technology centers, supporting the mainstream of research on an open innovation paradigm observed within the R&D departments (Chesbrough, 2003).

However, the data indicates that the other firms in this study viewed open innovation more broadly and strategically, using a variety of other organizational arrangements. For example, Beta solely employed an Open Innovation Manager as a supporting function who operated at the corporate level, outside the R&D department, and reported directly to the

CEO. This manager led ad hoc teams (not those of the unit) that involved people from different vertical units (e.g. R&D, marketing, financial, manufacturing, production, human resources) depending on the specific project or problem to be solved. Gamma, on the other hand, had two formal open innovation roles (Head of Open Innovation and Open Innovation Developer) who operated in the Transformation and Market Management department.

Responsibilities of Open Innovation Units

Our analysis focused on uncovering specific responsibilities of open innovation units employed across firms. The responsibilities that emerged are by no means exhaustive, as they vary between companies, the specific industry, applied business models, organizational structures etc. However, our analysis identified four categories of responsibilities corresponding to two dimensions (internal/external stakeholders focus and technical/social tasks focus) that open innovation professionals employ (See Table 2). Consistent with earlier research, which highlights the need for both the technical and social capabilities of open innovation professionals (Salter, Criscuolo, Ter Wal, 2014), we consider these in terms of *technically* and *socially* focused tasks. The technical responsibilities relate to developing certain codified or structured procedures, practices, tools and supporting mechanisms, while the socially focused tasks relate to more intangible elements associated with people-centered activities.

In addition, and also consistent with prior research, which stresses the need for opening up company boundaries, managing different stakeholders, including creating an open innovation culture within a company (Chesbrough 2003, Gassmann, Enkel & Chesbrough 2010; Van der Meer, 2007), we distinguish between *internal* and *external* stakeholder focused tasks. Table 3 presents a summary of the identified responsibilities.

While describing these responsibilities, we will also support our analysis with examples of employed practices as part of the outcomes of responsibilities (See Table 3 for the summary of the employed practices).

Table 2 Summary of the responsibilities of open innovation professionals

Technical	*Social*

	Technical	Social
External	- Developing external stakeholder networks (startups, research organizations, universities, suppliers, customers, other industries) and creating value networks in specific areas - Developing and exploring open business models - Exploring use of innovation intermediaries - Building and managing open innovation platform - Technology scouting	- Stakeholder relationship network building and management; influencing innovation ecosystem - Promoting open innovation activities to outside company - Organizing/participating in external events
Internal	- Defining and implementing open innovation strategy and processes - Developing internal IP rules. - Developing open innovation infrastructure - Project management and/or managing spin-offs - Building internal capabilities	- Leading cultural transformation/ change management activities - Community building - Training and knowledge diffusion - Organizing internal events (with/without external participants)

Table 3 Summary of the examples of employed practices

	Technical	Social
External	- Partnership with accelerators - Developing VC programs - Professorship model - Use of innovation intermediaries (e.g. Innocentive, SpecialChem) - Open innovation platform management	- Start-up competitions - Hackathons - Bootcamps with different stakeholders - Supplier Innovation Days - Customer labs
Internal	- Creating focus areas to enhance explorative initiatives - Adopting Want-Find-Get-Manage framework - Rule Book for Innovation - Allocation of 20% of work time to explorative OI projects - Open Innovation process based on lean startup approach - Development of knowledge management infrastructure - Internal partners' technology portfolio database	- Open Innovation Clubs with Honorable Members of the Open Innovation Club - Open Innovation Ambassadors - Innovation Days for employees - Awareness events - "Fuckup night" for employees - Training programs - Hangouts, blogs, internal newsletters

Internal and technical responsibilities

In the early stage of launching formal open innovation units (or employing a sole Open Innovation Manager), many interviewees explained that their main responsibilities were related to *defining and implementing open innovation strategy and processes* as well as *defining internal intellectual property rules*. These technical responsibilities related to

establishing internal processes, and were considered to be crucial, especially during the early stage of open innovation adoption. As one of the Open Innovation Managers explained:

> *"The hardest challenges lie within the company's processes, procedures, and ways of doing things (...) probably the easiest one, is to bring outside world [into the company] and to have a network from outside world." (Open Innovation Manager, Beta)*

In line with findings of Chesbrough and Crowther (2006), who found that companies that implement open innovation start by defining a set of target areas, our analysis confirms that many interviewed companies took a similar path. For example, a Head of Open Innovation from the dairy sector explained: *"we have decided to find areas that are important to the company, depending on the type of partner that we want to interact with"*. An Open Innovation Manager from an insurance company explained *"We try to focus on some focused topics like the ones we are interested in but still we are open to new opportunities, for example health, future of mobility, Augmented Reality, Virtual Reality, big data, Artificial Intelligence"*. A company dealing in luxury goods and jewellery defined "Business Driven Search Fields". For instance, application techniques, jewellery manufacturing excellence, new materials and material combinations. They focused on *'need-seek'*. As the Director of OI Networks explained:

> *"(...) [we started with] the definition of our base, our knowledge base and knowledge technology (...) [by answering the questions] what we are doing, what we are looking for, where is our technology, how do we start it."*

One of the outcomes of "*defining the open innovation strategy which is the technical part of defining how to get knowledge from external sources for company*" in the food and beverage industry was the development of the '*Rule Book for Innovation*'. As the Open Innovation Manager at Beta explained:

> *"...it is a formal institutional way of dealing with innovation, to have a rule book that deals with the incentivizing and organizational governance or management of innovation at company level (...) the process is defined as well. I've gone beyond strategy to the more detailed way of approaching the innovation."*

Some companies (e.g. Beta and Epsilon) explained that they have adopted Slowinski's "Want-Find-Get-Manage" framework as a starting-base to develop an open innovation process (Slowinski & Sagal, 2010). However, another top manager who had prior experience from Unilever (who had adopted the "Want-Find-Get-Manage" in early 2000s) explained that *"We are focusing our interactions on a number of open innovation models or testing open innovation models. Rather than following the frameworks that worked in other companies [referring to Want-Find-Get-Manage employed by Unilever]."* This indicates the need to customize the open innovation practices based on the internal and external factors important for the specific company. Our analysis indicates that in the early stage of open innovation implementation, such units experiment and explore various types of tools and processes in order to develop those that work well. As one top Open Innovation professional explained:

"When people talk about open innovation, they believe in one single type of open innovation that fits everyone, but when you go down to the nitty gritty, not all companies are the same, and within the companies there are different areas of the companies that do open innovation in different ways and need different results." (Head of Open Innovation, Alpha)

For example, the role of the Open Innovation Unit at Gamma (an insurance company) is to support the company's transformation: *"to do innovation in an open, faster, leaner and more agile way than before"* by focusing on accelerating innovations in non-core business areas. As part of their overall responsibility, the team has developed an open innovation process that builds upon the lean start-up approach. This process consists of 1) screening and evaluating project ideas, 2) idea pitches for funding, prototyping and testing, as well as various types of activities from coaching to organizing boot camps with external partners to customer labs, 3) pitching for additional financing to develop the Minimum Viable Product with external developers, 4) final pitching to the board of directors to decide on the product/service launch. Moreover, employees are encouraged to allocate 20% of their working time to explorative, open innovation projects.

Developing knowledge management infrastructure. Part of the responsibilities of open innovation professionals is developing the internal knowledge management platform with information on external partners and their technological portfolios. This knowledge management infrastructure is usually implemented during the later stages of open innovation adoption, as it builds on the input from external activities and on engagement with various types of partners. Our analysis indicates that it is mainly used when a company engages in cross-industry collaboration with large companies, as well as start-ups who have certain technologies and technological capabilities to offer. As one top manager explained:

"If we build up an extra whole network, obviously we need to build a bridge to bring this extra whole network back into the company and you can only do this by having some sort of maturity level of knowledge management within your research department." (Innovation Ventures and Infrastructure Manager, Epsilon)

Project Management and/or Managing Spin-offs. In a few analyzed cases, one of the responsibilities of Open Innovation Managers relates to managing open innovation projects that involve internal and external partners working together, with a dedicated budget and the possibility of creating their own processes and culture. Sometimes these open innovation projects are spun-off. As one Open Innovation Manager explained:

"The spinoff that the company is going to fund (...) will deal with six big open innovation projects that are of strategic importance for the company and that is going to be spun-off for reasons of allowing an agile culture to develop within that kind of context. They will be allowed to build their own culture within the organization because this will be the daughter organization. The purpose is to have an opportunity to get resources from others, but not the culture (...) You also need to have freedom of exploration and development that is sometimes not possible within existing big company processes." (Open Innovation Manager, Beta)

Building internal capabilities. Another responsibility of open innovation professionals is to build internal capabilities for accepting and embracing external knowledge and technologies. This refers to employee-focused activities that embrace the not-invented-here syndrome (Katz and Allen, 1982), as well as building absorptive capacity (Cohen and Levinthal, 1990). To support this, one open innovation professional has said:

> *"First one [task] is building internal capacities for accepting the knowledge from the outside world. The second major point is to build capacities to bring the knowledge from the outside world into the company. The company cannot accept the knowledge if it's not capable of doing so. Let it compare to absorptive capacity of the company. You have to build it before you go beyond the border." (Open Innovation Manager, Gamma)*

Internal and social responsibilities

The internal and social responsibilities of open innovation professionals refer to activities that facilitate the understanding and adoption of open innovation principles among employees. We identified four main responsibilities in this domain. However, they are all linked to activities associated with leading and facilitating the cultural transition.

Leading cultural transformation/change management activities. Several top managers explained that in order to implement open innovation, not only tools and processes need to be developed, but also leading the cultural transformation of the company towards a greater openness towards external ideas and technologies. In a few cases this responsibility was part of the formal job description of open innovation managers. In other cases it emerged naturally while implementing open innovation practices. Leading the cultural transition by a dedicated open innovation unit/professionals is the company's response to internal resistance to change and, associated with this, cultural barriers. Here the role of open the innovation professional is to facilitate and promote the open and collaborative innovation culture – an issue already raised by many scholars (e.g. Aquilani, Abbate & Codini, 2017; Bigliardi et al. 2012; Chesbrough & Crowther, 2006; Mortara & Minshall, 2011). As one top manager noted:

> *"(...) [Open innovation] is a holistic process. It had to start from within the company (...) I started with organizational culture there...When you start to change the culture, you start to change the ways, then you start to change or bring some processes that did exist before (...) It's a game (...) It is resistance that you meet along the way. It is a diplomatic job. I would call my job a kind of diplomatic one, where you have to be careful who to persuade at what time, and why to do it, because it is a change management at the end of the day." (Open Innovation Manager, Gamma)*

Community building. In a few companies, apart from formal open innovation positions, open innovation managers focus on building the internal community. They do so by introducing the informal roles of open innovation champions, calling them Open Innovation Ambassadors (in Gamma, Eta) or form Open Innovation Clubs with Honourable Members of the Open Innovation Club (in Beta). By engaging other employees in open innovation implementation, open innovation professionals ensure the

further dissemination and promotion of open innovation culture to other business units. As one manager pointed out:

> *"They [Honourable Members of the Open Innovation Club] have the title of innovators (...) They are members of an open innovation club. They gather around in the innovation club, and disseminate the idea in their own business units. Up until now, we have had more than 150 members registered. The members are the members, regardless of their formal position within the organization. Are they workers or are they managers? It doesn't matter. They are gathering around the idea of open innovation." (Open Innovation Manager, Beta)*

Training and knowledge diffusion. In many of the interviewed firms, open innovation professionals are responsible for internal training and knowledge diffusion. This includes building innovation excellence by documenting the best practices in open innovation collaboration, sharing lessons learned, building a reward system, building training programs for employees on how to search for external ideas, and how to engage and manage external networks.

> *(...) one of the tools that we want to use in terms of improving our innovation culture or keeping our innovation culture as dynamic as possible is training our employees to use these type of methods [open innovation tools] in their daily work." (Innovation Ventures and Infrastructure Manager, Epsilon)*

This awareness-building is also accomplished by disseminating the activities of the OI unit through internal blogs and newsletters.

Organizing internal events (with/without external participants). Organizing various types of internal events is part the main responsibility for the majority of interviewees in facilitating the open innovation transition. This includes organizing periodic "Innovation Days for Employees" (e.g. Alpha, Beta, Gamma, Epsilon, Zeta); cross-functional innovation workshops or 'Awareness Events' (Gamma). These offer information about the activities of the open innovation team: Start-Up Competitions (Gamma) that are also open to employees. In addition, in the spirit of entrepreneurial 'fail fast, learn fast' approach, encouraging risk-taking among employees is also a feature. The open innovation team at Gamma organizes and promotes the participation of employees in events that promote sharing publicity failure stories (the so-called "Fuckup Night" is an emerging global movement among entrepreneurs in over 80 countries). Our findings indicate that the event is also becoming popular within the corporate environment.

External and technical responsibilities

In the case of external stakeholder-focused responsibilities, the distinction between technical (structured and codified) and social (intangible and people-centric) focused responsibilities can be very vague, as both are performed in synergy. However, when describing the external and technical responsibilities, we refer to those duties that are more formal and structured, and include the development of certain tools, processes and practices for engaging with the external environment.

Developing an external stakeholders' network and creating value networks in specific areas. As open innovation by definition means managing knowledge flows across organizational boundaries (Chesbrough & Bogers, 2014), one of the main responsibilities of formal open innovation professionals/units is engaging with the external environment and developing different forms of external collaboration. This is usually consistent with defining and implementing open innovation strategy, described in the previous section. Open innovation units/professionals collaborate with various external players, e.g. startups, research organizations, universities, suppliers, customers, and companies from other industries. Depending on the project or specific need-seek, the activities are focused on inbound open innovation, or in some cases the role of an open innovation unit is to emphasize the coupled and open innovation approach.

> *"It is important not just looking at open innovation as a new function but as a way of creating value networks for the areas, and how you can, by being in different networks, help them build their own networks tailored to those particular needs" (Head of Open Innovation, Alpha)*

Building the external stakeholder network is consistent with developing and exploring open business models. Here, Alpha, Beta, Epsilon and Eta, for example, explore different open business models (e.g. through partnership with venture capital companies, SMEs, start-ups or other cross-industry partners). Alpha works in governmental co-funded pilot programs on how different actors can support the acceleration of small companies that will eventually have a technology or product that could quickly be transferred to Alpha's portfolio through different methods. As Head of Open Innovation in Alpha explained:

> *"We are looking at ways of collaborating with external small companies, for instance, that have already reduced the risk or have already done some work in their technologies (...). It is easier to think, when you interact with a company like this and things happen, that you know exactly where that technology came from in your portfolio and you can track that." (Head of Open Innovation, Alpha)*

Alpha also formed a public-private partnership with two universities. The company chooses important research topics, and operates an annual competition for research proposals that *"deal with aspects such as how good is dairy in avoiding diabetes, to help with the obesity problem, or helping with bone growth and avoiding osteoporosis".* It also incorporated a professorship model.

Exploring the use of innovation intermediaries. As indicated by several interviewees, part of the responsibilities is to explore the use of innovation intermediary platforms, e.g. Innocentive or SpecialChem, to seek for external solutions for internally defined challenges. However, these activities are not performed on a systematic basis. On the other hand, two interviewees (in Delta and Epsilon) indicated that part of their duties includes the *development and management of an open innovation platform.* In contrast to externally managed open innovation platforms, these companies build and manage their own platforms. For example, Delta created a collaborative space for exploring various partnerships and collaborations in early drug research, and offers research tools and free access to selected research capabilities.

Technology scouting is part of the daily routine of open innovation units. However, the results indicate that technology scouting should be the responsibility of everyone involved in R&D.

External and social responsibilities

Stakeholder-relationship network building and management; influencing the innovation ecosystem. One of the most emphasized responsibilities of open innovation professionals is to build and manage a stakeholder relationships network. Interviewees emphasized that for companies who do not operate in high-tech or fast moving consumer goods industries, and where the technology itself is not of the highest priority, there are certain beneficial elements that open innovation offers. Because *"in the end, it's about the business and the sustainability of the business, rather than a set of activities that you set up in your company to just do innovation."* (Head of Open Innovation, Alpha). Thus, building and managing the stakeholder network was the key priority task among the majority of interviewees throughout the whole open innovation journey. Some interviewees used the term 'innovation ecosystem' and 'open innovation network' interchangeably. However, 'to influence' was also used frequently in this context. As emphasized by interviewees, companies see great potential in building and influencing the innovation ecosystem; for example in understanding how to work with external factors in society, how to interact with the policy-makers, customers and other players in the market, etc.

> *"We can use the networks not just to find and buy a technology or to help technology, but also to influence the factors in society that in the end have a really powerful impact in the business that we have. For instance, if we don't use those influences to show the benefit of dairy and how it is good for health (...) then you have to start developing science and collaboration to help you bring the image of your industry to the right level with the consumers, with the customers, and with all the stakeholders in society."* (Head of Open Innovation, Alpha)

Promoting open innovation activities to the outside environment. Another responsibility of open innovation professionals is to simply go outside the company's door, interact with different stakeholders, promote the open innovation approach, and scout for ideas and technologies. As indicated by several interviewees, due to the long history of in-house development, there was a need to inform other players that the company is open for collaboration, and also to specify what exactly it is looking for. In order to promote open innovation activities and to build a stakeholder-relationship network, open innovation professionals promote their goals online (dedicated company's OI website, or developing a more sophisticated platform using blog, twitter, press releases, writing papers, etc.) as well as *organizing and participating in external events*. For example, organizing periodic start-up competitions, technology hackathons, boot-camps with different stakeholders, supplier innovation days, customer labs or participating in various types of events and conferences (also including academically oriented events). As one interviewee explained:

> *"No one will use an open door if no one knows that it exists. So if you open up the process and you have a good innovation platform in the company and no one knows about it – nothing will happen. You need to promote it – attend conferences, write papers, network – to make it happen."* (Head of Open Innovation in Research, Delta)

5 Discussion and implications

'RIP Open Innovation'. Roles and Responsibilities of Open Innovation units over time

The responsibilities mentioned above provide the overall framework of the main responsibilities. However, the intensity of focusing on certain responsibilities depends on the firm size, type of industry, organizational culture as well as the 'starting point' of open innovation implementation, and what the company wants to achieve though the open innovation team.

The results suggest that a focus on certain activities depends upon a certain maturity level of open innovation implementation. For example, at the early stage of implementation, open innovation units/professionals place a higher emphasis on internal social tasks, while in more mature open innovation settings, the responsibilities of open innovation professionals have more of an external social focus with a strong emphasis on *"developing and influencing the innovation ecosystem"*.

Interestingly, the initial analysis largely confirmed the importance of dedicated open innovation units and open innovation professionals mainly during the early stage of implementing open innovation. The more experienced the company becomes in open innovation, the more likely that certain processes and practices are in place, and the knowledge is then disseminated among employees; the roles and responsibilities of open innovation units can change, and formal units can more easily be discontinued. Thus, in the mature stage, open innovation becomes a "new way of working for everyone" and "new innovation DNA",

> *"I think in five years what I really hope is that my job doesn't exist, that everyone has the skills and the company has already ingrained the best way of working in all the operations and all the innovation processes. So the company can teach new people that are recruited into the company how to do it, and everyone can work with these tools similar to me. There doesn't have to be an open innovation function, but everyone does innovation and everyone does it because it's the only way of doing innovation." (Head of Open Innovation, Alpha)*

Theoretical contributions

The findings from this study make three key contributions to the current open innovation literature. First, they show the responsibilities that strategic and formal open innovation professionals tend to adopt in organizations. While previous research has noted that leading firms have begun to employ specific innovation units to manage open innovation (Manzini, Lazzarotti & Pellegrini, 2017; Mortara & Minshall, 2014), it has not addressed the responsibilities of specific open innovation professionals. This study adds to the current literature by illustrating how the responsibilities of open innovation professionals range between internal and external, and stakeholder and socially focused tasks, and how they change over time.

Second, the findings highlight a set of practices that open innovation professionals use to facilitate open innovation both within and beyond organizational boundaries. While previous research has mainly focused on those open innovation practices that are conducted more informally, often by different functions (Salter, Criscuolo, & Ter Wal, 2014; Chesbrough & Crowther, 2006), this study complements existing research by highlighting open innovation practices that are conducted formally by strategically organized and specialized open innovation professionals.

Finally, the findings also suggest a set of factors that may moderate the responsibilities of open innovation professionals, and indicate how the required responsibilities may change as the open innovation capabilities of organizations mature over time.

Managerial implications

The findings from this study offer several important insights for a broad range of innovation professionals and practitioners. For general managers who are responsible for open innovation, the findings demonstrate the strategic importance of establishing specialist innovation units and OI professional roles, and suggest how the requirements, practices and responsibilities of these specialists may need to change as the OI capabilities of the company mature.

For managers, consultants and other professionals dealing directly with OI, the findings portray a range of different practices that can be used to facilitate OI at the intra- and inter-firm boundaries. The findings offer managers analytical frameworks that can be used as strategic tools or templates to evaluate and design new practices for facilitating open innovation, or as a basis for training and recruiting new OI professionals.

For innovation scholars, the findings highlight the need to understand the roles, functions and outcomes of specific open innovation professionals and their effects on organizational performance, employee openness to external collaboration, as well as innovation management science more broadly. It could be claimed that having dedicated open innovation units for engaging with the external environment may hinder motivation for greater openness from the rest of the employees. Nevertheless, open innovation professionals and units represent an emerging management practice, and we consider this as particularly interesting, actionable, and an important avenue for future research.

Limitations and future research avenues

Given that this study is based on a qualitative research design, it has natural limitations, which nevertheless open up avenues for further research. First, while we drew qualitative insights from a multiple firms in diverse industries, this only tends to support analytical generalization to theory (Yin, 2014). While our findings seem to extend the emerging theories in this area, statistical generalization would suggest future quantitative and cross-sectional studies to confirm and validate the findings.

Second, the responsibilities and practices revealed in this study are by no means exhaustive, but are more likely indicative of the typical practices and norms followed in

specific industries or cultural settings. Future research could either explore this in a broader set of industries or cultural contexts to reveal additional responsibilities and practices, or focus on specific industries in order to broaden the findings.

Third, while our findings indicate that the nature and focus of professional open innovation units evolves over time, they offer only limited insight into why and when this happens. Future research could explore the drivers, barriers and other contingency factors that influence the choice of development trajectories for establishing, developing and managing professional open innovation units.

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