

Lisa Kristina Wimbauer

Innovate with Crowds.

Co-Creation and Idea Evaluation
in Internal and External Crowdsourcing.

Innovate with Crowds.

Co-Creation and Idea Evaluation in Internal and External Crowdsourcing.

Dissertation

zur Erlangung des akademischen Grades
Doktor der Wirtschaftswissenschaften (Dr. rer. pol.)

vorgelegt dem
Ständigen Promotionsausschuss der Wirtschaftswissenschaftlichen Fakultät
der Universität Passau

von Lisa Kristina Wimbauer, M.Sc.
am 18.11.2019

Erstgutachter: Prof. Dr. Carolin Haeussler

Zweitgutachter: Prof. Dr. Andreas Koenig

Tag der Disputation: 29.05.2020

Acknowledgements

“Good company in a journey makes the way to seem the shorter” (Walton, 2012: Ch. I). Since this dissertation was a very special journey, I want to thank a number of people who accompanied me.

First of all, I would like to express my gratitude towards my advisor, Prof. Dr. Carolin Haeussler, for her excellent support. At any time, she was available for feedback and for valuable discussions guiding my journey into the right way. I am also very grateful to my second advisor, Prof. Dr. Andreas Koenig, for his inspiring and motivating remarks during our joint PhD seminars. Further, I want to thank all of my colleagues from the OTE-Chair at the University of Passau who welcomed me so warmly when I ‘jumped’ into their office. Special thanks goes to my co-authors from the ‘crowd-team’, Dr. Patrick Figge and Fabian Hans, for the close, fruitful, and ‘bursty’ collaboration.

As I participated in the PhD program of the BMW Group, I want to thank my amazing colleagues from the department ‘product management compact class cars’ for their constant encouragement and financial support during the last three years. Especially, I would like to thank the best mentors, Dr. Marc Jokisch and Dr. Andreas Meyer, who always provided an environment for academic freedom and immensely supported my personal and professional development. I really enjoyed working on interesting projects and had a great time in an outstanding team. I am also very proud of all master students who brought an academic spirit and a lot of fun to work. Thanks a lot!

My greatest thanks go to my parents, my sister, my grandmother, and my friends for their huge support, their empathy, and understanding when I spent hours working on this dissertation. Thank you to my beloved sister and to my friends for proofreading this thesis. You made this journey possible. Last but not least, I would like to thank my amazing boyfriend Alex for his love, patience, and tremendous encouragement navigating me through the ups and downs of this dissertation. Thank you for joining me on this journey!

Lisa Kristina Wimbauer

Contents

List of Tables	VI
List of Figures.....	VIII
Chapter 1: Introduction to the Dissertation	1
1.1 Relevance	1
1.2 Definitions.....	5
1.2.1 Crowdsourcing.....	5
1.2.2 Types of Crowds and Related Concepts	7
1.2.3 Collaboration, Cooperation, and Co-creation	10
1.2.4 Crowd’s Evaluations, Crowd Voting, and Open Evaluation	11
1.3 Contributions.....	12
1.4 References	17
Chapter 2: External Crowd’s Evaluations in Organizational Idea Selection	27
2.1 Abstract	27
2.2 Introduction.....	28
2.3 Theory.....	32
2.3.1 Organizational and Crowd Evaluation.....	32
2.3.2 Local and Restricted Search.....	35
2.3.2.1 Crowdsourcing as Distant Search.....	36
2.3.2.2 Local Search during Idea Evaluation.....	37
2.3.2.3 Restricted Search during Idea Implementation	39
2.3.2.4 Distant Search but Local Implementation	41

2.4 Hypotheses	43
2.4.1 Evaluation Differences between Organization and Crowd due to Novelty	43
2.4.1.1 Originality.....	44
2.4.1.2 Rarity	46
2.4.1.3 Paradigm Modification	47
2.4.2 Organizational Evaluation Criteria and Idea Implementation	48
2.4.2.1 Company Fit	49
2.4.2.2 Market Potential	49
2.4.2.3 Creativity	50
2.5 Method	51
2.5.1 Data	51
2.5.2 Dependent Variables	52
2.5.3 Independent Variables.....	53
2.5.4 Control Variables	56
2.6 Results	59
2.6.1 Organization’s Favorites and Crowd’s Favorites.....	59
2.6.2 Evaluation of Implemented Ideas	61
2.7 Discussion	64
2.7.1 Theoretical Implications	64
2.7.2 Managerial Implications	67
2.7.3 Limitations and Future Research	70
2.8 Conclusion	72
2.9 References	73

Chapter 3: Collaboration as Opportunity for Project Allocation in an Internal Crowd.....	83
3.1 Abstract	83
3.2 Introduction	84
3.3 Theory	88
3.3.1 Collaboration in Internal Crowds.....	88
3.3.1.1 Scope of Collaboration	88
3.3.1.2 Types of Collaborators	89
3.3.2 Legitimacy Theory.....	91
3.3.3 Hypotheses.....	92
3.3.3.1 Project Initiator’s Call for Collaboration.....	93
3.3.3.2 Employer’s Call for Collaboration	96
3.4 Method	100
3.4.1 Data	100
3.4.2 Dependent Variables	101
3.4.3 Independent Variables.....	103
3.4.4 Employer’s Call for Collaboration.....	104
3.4.5 Control Variables	106
3.5 Results	111
3.5.1 Effect of Project Initiator’s Call	111
3.5.1.1 Relationship between Project Characteristics	111
3.5.1.2 Collaboration on Projects	113
3.5.2 Effect of Employer’s Call	116
3.5.2.1 Collaboration on Projects	116
3.5.2.2 Collaboration of Employees	119

3.6 Discussion	122
3.6.1 Summary	122
3.6.2 Theoretical Contributions	123
3.6.3 Managerial Contributions	125
3.6.4 Limitations and Future Research	127
3.7 Conclusion	129
3.8 References	130
Chapter 4: A Comparison of Co-Creation Behavior in Internal and External Crowds	141
4.1 Abstract	141
4.2 Introduction	142
4.3 Theory	146
4.3.1 Co-Creation in Crowds	146
4.3.2 Crowd Types (In-) Dependent of the Organizational Environment	148
4.3.3 Co-Creation in the Shadow of the Organization	153
4.3.4 Hypotheses	156
4.3.4.1 Team Formation	156
4.3.4.2 Burstiness	158
4.3.4.3 Feedback Constructiveness	160
4.3.4.4 Initial Idea Novelty	163
4.4 Methodology	167
4.4.1 Research Design and Sample	167
4.4.2 Dependent Variables	169
4.4.3 Independent and Control Variables	172

4.5 Results	176
4.5.1 Descriptive Results	176
4.5.2 Regression Analysis	183
4.5.2 Post-Hoc Analysis	187
4.6 Discussion	189
4.6.1 Theoretical Contributions	189
4.6.2 Managerial Contributions	192
4.6.3 Limitations and Future Research	194
4.7 Conclusion	197
4.8 References	198

List of Tables

Table 1.1: Crowdsourcing Compared to Related Concepts	9
Table 1.2: Overview of Dissertation Studies	12
Table 2.1: Literature Overview on Organizational and Crowd Evaluation	35
Table 2.2: Descriptive Overview on the Measures for Evaluation Differences	52
Table 2.3: Descriptive Statistics and Correlation Matrix	58
Table 2.4: Multinomial Logit Model on Crowd's and Organization's Favorites	60
Table 2.5: Classification of Implemented Ideas	62
Table 2.6: Logit Model on Hidden Treasures and Implemented Ideas	63
Table 3.1: Descriptive Statistics. Scope of Collaboration	102
Table 3.2: Descriptive Statistics. Types of Collaborators	103
Table 3.3: Descriptive Statistics. Project Initiator's Call	104
Table 3.4: Overview of Independent and Control Variables	107
Table 3.5: Relationship between Project Initiator's Call, Project Novelty, and Maturity	111
Table 3.6: Descriptive Statistics and Correlation Matrix	112
Table 3.7: Relationship between Project Initiator's Call and Scope of Collaboration	113
Table 3.8: Regression Results. Scope of Collaboration	115
Table 3.9: Regression Results. Interaction Employer's Call on Scope of Collaboration	116
Table 3.10: Descriptive Statistics. Collaboration Before and After Employer's Call	117
Table 3.11: Regression Results. Interaction Employer's Call with Project Initiator's Call	118
Table 3.12: Descriptive Statistics. Collaborators Before and After Employer's Call	120
Table 3.13: Regression Results. Interaction of Employer's Call on Types of Collaborators	121

Table 4.1: Differences between Crowds resulting from Organizational (In-) Dependence.	152
Table 4.2: Descriptive Statistics of Dependent Variables in Internal and External Crowds.	176
Table 4.3: Initial Expert Evaluation of Ideas in Internal and External Crowds.....	180
Table 4.4: Co-Creation Depending on the Level of Initial Idea Novelty.....	181
Table 4.5: Descriptive Statistics and Correlation Matrix.....	182
Table 4.6: Regression Results Direct Effects.....	184
Table 4.7: Regression Results Interaction Effects.	186
Table 4.8: Expert Evaluation of Developed Ideas in Internal and External Crowds.....	188

List of Figures

Figure 2.1: Distribution of Idea Rarity.....	55
Figure 3.1: Internal Crowdsourcing Process	101
Figure 3.2: Employees' Activity.....	119
Figure 4.1: Organizational (In-) Dependence in Internal and External Crowd.....	149
Figure 4.2: Research Model	166
Figure 4.3: Examples of Burstiness.	171
Figure 4.4: Distribution of Team Size in Internal and External Crowds.	177
Figure 4.5: Distribution of Waiting Times in Internal and External Crowds.	178
Figure 4.6: Distribution of Co-Creation Points in Time in Internal and External Crowds.....	179
Figure 4.7: Distribution of Comment Categories in Internal and External Crowds.	180
Figure 4.8: Interaction Effect of Initial Idea Novelty and Crowd Type.....	187

Chapter 1: Introduction to the Dissertation

“You can’t just ask customers what they want and then try to give that to them. By the time you get it built, they’ll want something new. [And] you can get into just as much trouble by going into the technology lab and asking your engineers, ‘OK, what can you do for me today?’ That rarely leads to a product that customers want or to one that you’re very proud of building when you get done. You have to merge these points of view, and you have to do it in an interactive way over a period of time.”

Quote by Steve Jobs describing product innovation.¹

1.1 Relevance

Crowdsourcing is increasingly gaining attention in product development to leverage the wisdom of crowds and of the respective crowd members – whether they are customers or company-internal engineers – to generate new ideas for products or services (Afuah & Tucci, 2012; Howe, 2008). At a general level, crowdsourcing is the “act of having an *undefined* set of people self-select and perform a task with no *ex-ante* contracts or other commitments to get the task performed” which is “not restricted to one person in particular (...) but *open* to anyone” (Afuah, 2018: 12). A prominent example how to use crowdsourcing in the automotive industry is the online community for vehicle design called Local Motors. For instance, if automotive product developers aim to get new insights and inspirations, they are able to crowdsource their questions to the Local Motors platform where everyone – hobbyists, visionaries, designers, engineers, and automotive enthusiasts – is able to post their ideas and preferences. Besides these firm-led projects, the crowd at Local Motors even

¹ Quote from an interview with Steve Jobs conducted by Burlingham and Gendron (1989). This quote has been cited in prior management research (e.g., Katila, Thatchenkery, Christensen, & Zenios, 2017).

independently develops community-led projects. For example, independent designers and engineers who are not hired by Local Motors have worked together to create a self-driving electric bus (Seidel & Langner, 2015). In this example, the task of developing new products is broadcasted to undefined people who self-select to complete the task collectively without a contract.

Crowdsourcing seems to be a promising approach for organizations to overcome challenges widely discussed in innovation and organizational research (Dahlander, Jeppesen, & Piezunka, 2019). First of all, organizations address a crowd hoping to get access to new ideas and projects² which are fundamental to gain and maintain a competitive advantage (Afuah & Tucci, 2012; Piezunka & Dahlander, 2015). Since sourcing ideas from the crowd enables incumbent organizations to search for distant information, the risk of an ‘innovator’s dilemma’ to oversee trends, future customer demands, and new competitors is reduced (Christensen, 2008; Katila & Ahuja, 2002). Furthermore, members in the crowd have the freedom to decide whether they submit an idea or work together with other participants. As crowd members will more likely contribute if they are motivated and knowledgeable to accomplish a project, the organizational effort of coordinating project teams will decrease (Afuah, 2018; Dobrąjska, Billinger, & Karim, 2015). This project-allocation mechanism within the crowd avoids a costly ‘principal-agent dilemma’ which occurs if a manager as principal assigns tasks without full information about the employees’ competencies (Eisenhardt, 1989). A further benefit inherent in crowds is the diverse knowledge of its members. Within crowds, individuals with different knowledge and backgrounds exchange their opinions which has shown to improve the solution quality (Levina & Fayard, 2018; Mattarelli, Schechter, Hinds, Contractor, Lu, & Topac, 2018; Poetz & Schreier, 2012). However, the extent to which an organization can leverage all these benefits is contingent on how crowds are used and which crowd type is addressed.

² Both terms, ‘idea’ and ‘project’ refer to the content submitted to a crowdsourcing platform. Ideas or projects are premature proposals for starting a new technical work which may require a commitment of resources such as time, money, manpower, and energy (von Hippel, 1978). In this dissertation, both terms are used as synonyms.

First, organizations have to decide how to use crowds for product development. In the new product development process, the early phases of the ‘fuzzy front end’³ are particularly relevant to identify, develop, and select ideas for later phases (e.g., Brentani & Reid, 2012; Kim & Wilemon, 2002; Lüthje, Herstatt, & von Hippel, 2005). Murphy and Kumar (1997) define these pre-development stages as *idea generation*, *idea development*, and *idea evaluation*. Since the majority of current studies have positioned crowdsourcing at the first stage of outsourcing idea generation, users within crowds do mainly support in the generation of ideas (e.g., Luo & Toubia, 2015; Piller & Walcher, 2006). Indeed, crowds have shown to provide a vast amount of novel and immature ideas (e.g., Poetz & Schreier, 2012). However, this high number of ideas leads to two open questions: How can these pre-mature ideas be further developed? And who evaluates this high number of heterogeneous ideas? Accordingly, organizations do not face the challenge to generate novel ideas within crowds but to develop the initial submitted ideas and to select the best ideas out of many. As an idea alone does not matter but has to be elaborated and prioritized (Budescu & Chen, 2015; Perry-Smith & Mannucci, 2017), further research is needed how crowds can add value in the subsequent stages of idea development and in the selection of ideas for implementation.

Second, organizations can address different sources to access new ideas. Traditionally, new product development has been considered as a task of experts in research and development departments. With the rise of open innovation (Chesbrough, 2006), *external crowds* have been the major focus of research. For instance, prior studies find that external individuals with distant knowledge provide high quality solutions (e.g., Jeppesen & Lakhani, 2010) or creative ideas (e.g., Poetz & Schreier, 2012). Recently, *internal crowds* of employees come to the fore of crowd research. Internal crowdsourcing includes the advantage of integrating the employees’ distributed knowledge across organizational departments to solve even critical and non-publishable tasks (e.g., Schweisfurth,

³ The term ‘fuzzy front end’ describes a very early stage in product development which is characterized by high uncertainty if an opportunity is considered for further development (Lüthje, Herstatt, & von Hippel, 2005; Ozer, 2009; Schemmann, Herrmann, Chappin, & Heimeriks, 2016).

2017; Zuchowski, Posegga, Schlagwein, & Fischbach, 2016). So far, only few studies analyze the potential of internal crowds and research comparing internal to external crowds is still missing. Thus, the following issues are still open: How can internal crowds be used? How do internal and external crowds differ? Especially a comparison of internal and external crowds will establish an essential foundation for an organization's decision which crowd type to choose (Afuah, 2018).

This dissertation aims to contribute to these open questions *how* crowds and *which* type of crowd can be applied in new product development. In general, the objective is to investigate how different types of internal and external crowds can support organizational decision makers in developing ideas, in allocating projects, and in selecting the best ideas. In particular, this dissertation focuses on how collaboration or co-creation emerges in internal and external crowds and how external crowds can complement organizational idea selection to find ideas with future implementation value. I empirically investigate the potential of an internal crowd as well as the differences between internal and external crowds. By taking an organizational perspective, the purpose of this dissertation is to improve our understanding on how to innovate with internal and external crowds in order to leverage their potential for co-creation and idea evaluation.

1.2 Definitions

This dissertation examines how members in different crowd types collaboratively generate ideas, contribute to the projects of other crowd members as well as support in the idea evaluation. Several general terms have to be defined as they are relevant for all of the following chapters.

1.2.1 Crowdsourcing

Research on crowdsourcing emerged after James Surowiecki (2004) had published his book on ‘The Wisdom of Crowds’. Jeff Howe coined the term ‘crowdsourcing’ in his blog as “the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in form of an open call” (Howe, 2006). This first definition is the fundamental basis for further crowdsourcing research which extended and elaborated the term (e.g., Afuah & Tucci, 2012; Estellés-Arolas & González-Ladrón-de-Guevara, 2012; Howe, 2008; Majchrzak & Malhotra, 2013). The crowdsourcing process starts with the definition of a *specific* task – like submitting ideas on a defined topic – which is broadcasted to a crowd. Then, crowd members are able to post their ideas and work together to solve this task for a fixed period of time. A crowdsourcing process ends with the selection of the best ideas (Dahlander et al., 2019; Lüttgens, Pollok, Antons, & Piller, 2014). The efficiency of crowdsourcing largely depends on the task specified for a crowd (Nickerson & Zenger, 2004). Various studies have explored expert crowds to solve complex, scientific problems like in the NASA Tournament Lab (Boudreau, Gaule, Lakhani, & Woolley, 2014; Lakhani, 2006). However, crowds can also be used to solve creative tasks for product ideation which can be broadcasted to a more general crowd of users and customers (e.g., Bartl, Füller, Mühlbacher, & Ernst, 2012; Fuchs & Schreier, 2011; Jeppesen & Frederiksen, 2006). As this dissertation aims to explore crowdsourcing in new product development, the focus is on engaging crowds for creative ideation instead of problem solving.

Crowdsourcing can have three different forms defined as ‘collaboration-based’, ‘tournament-based’, or a ‘hybrid’ form of both (Afuah, 2018; King & Lakhani, 2013; Lakhani, 2016). During

collaboration-based crowdsourcing, all participants provide their individual inputs which are aggregated to obtain one common solution. Collaboration-based crowdsourcing is organized as a *community* where individuals connect and share their knowledge (Lakhani, 2016). These innovation communities lack formal governance mechanisms. This means that the allocation of tasks and the structure to achieve an outcome lies in the responsibility of the crowd members (Franke & Shah, 2003). The underlying logic behind collaboration-based crowdsourcing is to leverage the ‘wisdom of crowds’ (Budescu & Chen, 2015; Surowiecki, 2004). The wisdom of crowds is based on the assumption that the crowd leads to more accurate decisions through average opinions which outperforms individual decision making (Simmons, Nelson, Galak, & Frederick, 2011). There are certain conditions that constitute a ‘wise’ crowd namely diversity, independence, decentralization, and aggregation (Surowiecki, 2004). Accordingly, a crowd should incorporate individuals with diverse opinions and backgrounds who are independent from the views of other members. In addition, all crowd members should be able to rely on their decentralized, i.e., individual knowledge to make judgements which are then aggregated to a collective decision (Simmons et al., 2011). An example how the aggregated crowd knowledge is used in an automotive context is the above cited online community, Local Motors, where the crowd jointly develops one common solution like the self-driving electric bus (Seidel & Langner, 2015). The collaborative encyclopedia Wikipedia is a further popular example (Boudreau & Lakhani, 2013). In a *tournament-based approach*, crowds can be used to address individual crowd members. This means that a question is broadcasted in an open call to the crowd hoping that at least one individual from the crowd will self-select to offer a relevant solution (Lakhani, 2016). The literature refers to this approach as ‘broadcast search’ (Jeppesen & Lakhani, 2010) or ‘contest-based crowdsourcing’ (Felin & Zenger, 2014; Lüttgens et al., 2014). Tournament-based crowdsourcing is organized as an *innovation contest* in which participants compete to provide the best solution and to win the announced price (Simmons et al., 2011; Terwiesch & Xu, 2008). Innovation contests are characterized by specific design elements like clear rules for participation (for an overview see

Bullinger, Neyer, Rass, & Moeslein, 2010). An example is the BMW Co-Creation Lab, an online innovation contest where individuals submit ideas and compete for winning with their idea (Bartl, Jawecki, Bilgram, & Wiegandt, 2013). *Hybrid forms of crowdsourcing* have emerged which combine collaborative and competitive aspects. These hybrid forms have been conceptualized as ‘community-based innovation contests’ (Bullinger et al., 2010; Hutter, Hautz, Füller, Mueller, & Matzler, 2011). Even if individuals compete to win the price for the best idea, collaboration between individuals is encouraged to develop ideas further. As the hybrid form connects the advantages of innovation contests and communities, the crowdsourcing platform in this dissertation is set up as a community-based innovation contest.

1.2.2 Types of Crowds and Related Concepts

Crowds can be differentiated depending on their embeddedness in the organizational environment into two types – an external and an internal crowd (Afuah, 2018; Schweisfurth, 2017; Zuchowski et al., 2016). During *external crowdsourcing*, companies outsource tasks to external individuals like users or customers outside of the organizational boundaries (Erickson, Trauth, & Petrick, 2012; O'Mahony & Ferraro, 2007). Crowdsourcing with external participants is one facet of opening up the innovation process. *Open innovation* is 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, 2006: 1). Open innovation and external crowdsourcing share the common notion to let internal knowledge purposely outflow (e.g., by publishing a task) and external knowledge inflow (e.g., by adopting external ideas) to enrich the organizational knowledge base (Enkel, Gassmann, & Chesbrough, 2009). However, open innovation and crowdsourcing differ in several aspects. While the task in open innovation is outsourced to persons with ex ante contracts like suppliers or strategic alliances, external crowd members do not require contracts for participation (Bogers et al., 2017; West & Bogers, 2017). In addition, open innovation only addresses external sources whereas crowds can be internal to an organization.

In *internal crowdsourcing*, the participation is only open for employees of the organization (Afuah, 2018; Schweisfurth, 2017). Internal crowdsourcing is defined as “an (a) IT-enabled (b) group activity based on an (c) open call for participation (d) in an enterprise” (Zuchowski et al., 2016: 168). Compared to traditional *hierarchy-based work*, internal crowdsourcing is a more democratic work model in terms of decision making, formal roles, and transparency (Zuchowski et al., 2016). With regards to decision making, employees have the freedom to decide if and how they want to participate. Employees are able to post their own projects on the platform or to contribute to peer projects by collaborating with colleagues. If they aim to work together with colleagues, employees can choose the peer project which fits to their personal interests and fields of knowledge (Zhu, Kock, Wentker, & Leker, 2019; Zuchowski et al., 2016). Since decisions are not made by hierarchy, employees work together regardless of their formal position (Erickson et al., 2012). In addition, internal crowdsourcing embodies values of transparent and open information sharing as all contributions are visible for all colleagues in the organization (Dissanayake, Zhang, & Gu, 2015).

Internal crowdsourcing diverges from traditional forms of employee-driven innovation. *Employee suggestion schemes* enable staff to provide suggestions on how to improve an organization’s products or processes on online platforms. But unlike in internal crowdsourcing, posted ideas in suggestion schemes contain wide, not contest-specific suggestions and the degree of collaboration is often low (Abu El-Ella, Stoetzel, Bessant, & Pinkwart, 2013). Furthermore, internal crowdsourcing differs from *enterprise social networks* which enable the provision and the exchange of information between employees (Huang, Singh, & Ghose, 2015; Leonardi, 2015). First of all, social media networks aim to improve knowledge management in the organization but also provide possibilities for interaction (von Krogh, 2012). Dependent on the system, employees are able to post and store information and build common work spaces (Schneckenberg, 2009). Compared to an enterprise social network, internal crowdsourcing supports collaboration and is more appropriate for idea generation. In sum, internal crowdsourcing combines the advantages of employee suggestion systems by allowing idea generation and the benefits of an enterprise social

network as it offers community functionalities. Within internal crowds, employees are able to submit projects and to collaborate on projects. This comparison of internal and external crowds to related approaches is summed up in Table 1.1. The following dissertation deals with internal and external crowdsourcing.

Table 1.1: Crowdsourcing Compared to Related Concepts.

Approach	External Crowdsourcing	Hierarchy-based Work	Enterprise Social Network	Employee Suggestion	Internal Crowdsourcing
Employee Participants	0	x	x	x	x
Self-selection of tasks	x	0	x	x	x
Idea Generation	x	x	0	x	x
Collaboration	x	x	x	0	x

Note: 'x' indicates that the mechanism applies whereas for '0' the mechanism does not apply.

1.2.3 Collaboration, Cooperation, and Co-creation

Both terms, 'collaboration' and 'cooperation' express that people work together to achieve the same target but the way of working differs. During collaboration, people share their knowledge to achieve a target collectively. In contrast, cooperative individuals have the same target but follow individual benefits to reach this goal (Ashkenas, 2015). In line with prior literature, I use the term 'collaboration' to characterize the way of working together on a crowdsourcing platform (Boudreau et al., 2014; Hutter et al., 2011). In this context, the term 'co-creation' originally defines the joint creation of value during the interaction between users or customers with an organization (Gemser & Perks, 2015; Prahalad & Ramaswamy, 2004). Only recently, co-creation has been used to describe collaborative behavior between individuals who jointly work together on the elaboration of ideas (Mattarelli et al., 2018; Rouse, 2018). Accordingly, this dissertation applies the term 'co-creation' as synonym for collaboration within the crowd.

In community-based innovation contests, employees or external individuals compete to win the announced price for the best idea but are at the same time able to collaborate by exchanging ideas with other participants. Thus, competition and collaboration happen alongside in crowds (Bullinger et al., 2010). This behavioral pattern of collaboration among competing participants is referred to as ‘communitition’ (Bergendahl & Magnusson, 2014; Hutter et al., 2011) or ‘collaborative challenge’ (Jung, Majchrzak, Malhotra, & Johnson, 2012). Various studies have shown that especially the combination of competition and collaboration positively influences the project’s innovativeness (Bergendahl & Magnusson, 2014; Bullinger et al., 2010; Hutter et al., 2011).

Collaboration can be considered on two levels, either on a project or an individual level. On a project level, collaboration has various ‘scopes’ dependent on the commitment of the contributing collaborators. These *scopes of collaboration* range from posting a non-binding comment to entering a commitment as team member (Adamczyk, Bullinger, & Moeslein, 2011; Dissanayake et al., 2015; Ren, Nickerson, Mason, Sakamoto, & Graber, 2014). On an individual level, the *types of collaborators* can be classified according to their activity level. For instance, a crowd consists of active contributors or inactive lurkers (Füller, Hutter, Hautz, & Matzler, 2014; Nonnecke & Preece, 2000). In addition, collaboration is characterized by *how* (i.e., process) and *which information* (i.e., content) crowd members share. Regarding the process, crowd members are able to choose, for example, if they join a team and can decide how intensively they work together with other members (Fuger, Schimpf, Füller, & Hutter, 2017; Riedl & Woolley, 2017). The content which crowd members create is determined, for instance, by the constructiveness of the comments crowd members post on the platform (Riedl & Woolley, 2017; Zhu et al., 2019). This dissertation considers the two levels of collaboration (cf. chapter 3) as well as the process and content of co-creation behavior (cf. chapter 4).

1.2.4 Crowd's Evaluations, Crowd Voting, and Open Evaluation

The terms 'crowd's evaluations', 'crowd voting' (Magnusson, Wästlund, & Netz, 2016; Toubia & Florès, 2007), or 'open evaluation' (Velamuri, Schneckenberg, Haller, & Moeslein, 2017) describe that crowd members have the opportunity to express their opinion by voting on an idea submitted to a crowd platform. Crowdsourced ideas are usually selected by experts of the organization at the end of the contest. However, experts are often overwhelmed and overstrained by the enormous volume and the variety of submitted ideas (Blohm, Bretschneider, Leimeister, & Krcmar, 2010; Di Gangi & Wasko, 2009; Piezunka & Dahlander, 2015). Hence, engaging crowds for idea evaluation has gained more and more attention in theory and practice in order to reduce the workload of expert evaluators and to receive additional information from crowd evaluators (Criscuolo, Dahlander, Grohsjean, & Salter, 2017; Magnusson et al., 2016). For instance, a prior dissertation of Jokisch (2007) indicates that external participants may support internal experts as they rate ideas more or less the same regarding their innovativeness. Crowds are not only explored to evaluate ideas but also to make predictions about future outcomes (Berg, 2016). Some studies claim that crowds may be 'wise' in their predictions (Lang, Bharadwaj, & Di Benedetto, 2016; Simmons et al., 2011) whereas others argue that crowd's evaluations are prone to 'evaluation biases' (Hofstetter, Aryobsei, & Herrmann, 2018; Mollick & Nanda, 2016). In this dissertation, crowds are investigated to complement organizational evaluators in order to predict the idea implementation after the crowd contest (cf. chapter 2).

1.3 Contributions

In the three chapters following this introduction, the dissertation contributes to improve our understanding on how internal and external crowds are able to co-create and evaluate ideas as well as to allocate projects. Each chapter is an independent study with its own introduction, theoretical background, and distinct contribution. An overview of all studies is presented in Table 1.2. In general, all three chapters shed light on the crowd mechanism in different types of crowds – in an internal as well as in an external one. Chapter 2 contributes to external crowdsourcing, chapter 3 adds to the emerging debate of internal crowdsourcing, and the last chapter provides unique insights by comparing of an internal and an external crowd. In addition, this dissertation points out how crowds can be applied in different stages of an innovation process. The focus of chapter 2 is on the use of crowds to evaluate ideas while the subsequent chapters contribute to collaboration and co-creation within crowds. In particular, this dissertation is able to offer empirical insights as all studies draw from a rich database collected at a leading German automobile original equipment manufacturer. In chapter 2, historical data from a crowdsourcing contest in 2010 is analyzed. For the purpose of the study in chapter 3, an internal crowdsourcing contest has been designed. In addition, an identical contest has been conducted with an external crowd. The differences of the internal and external contest are investigated in chapter 4.

Table 1.2: Overview of Dissertation Studies.

Chapter	2	3	4
Study	External Crowd's Evaluations in Organizational Idea Selection	Collaboration as Opportunity for Project Allocation in an Internal Crowd	A Comparison of Co-Creation Behavior in Internal and External Crowds
Crowd Type	External Crowd	Internal Crowd	External Crowd and Internal Crowd
Focus	Evaluation	Collaboration	Collaboration
Dataset	2010	2017	2017/2018

Chapter 2⁴ investigates how external crowds can complement the idea selection of organizational evaluators. Organizations originally apply crowdsourcing to gain access to novel ideas but struggle to sort these ideas out prematurely (Afuah & Tucci, 2012; Piezunka & Dahlander, 2015). Even if there is a growing interest of involving crowds into the idea evaluation to keep these more novel ideas (Magnusson et al., 2016; Velamuri et al., 2017), little is known about why and how crowd and organizational evaluators differ in their idea selection. The study builds on organizational local search behavior (e.g., Katila & Ahuja, 2002; Stuart & Podolny, 1996) to explain differences in organizational and crowd-based idea evaluation. Local search behavior implies that organizational evaluators rely on information from their organizational environment in their decision (Piezunka & Dahlander, 2015). We develop hypotheses that novel ideas are more likely favored by the crowd as their evaluation is not affected by local search. In addition, we claim that organizational idea selection is restricted by the use of formal evaluation criteria (Blohm et al., 2010; Mueller, Melwani, Loewenstein, & Deal, 2018) which induces organizations to overlook ‘hidden treasures’. We define hidden treasures as ideas favored by the crowd, neglected by organizational evaluators during the contest but implemented years later. We empirically investigate evaluation differences based on over 800 ideas from an external crowdsourcing contest and compare these ideas to projects implemented after the contest. We find that crowds favor more novel ideas than organizational evaluators and are indeed able to detect hidden treasures. In general, these results improve our understanding on how crowds select ideas with future value for the organization. In particular, we contribute to the growing research on open evaluation (e.g., Magnusson et al., 2016; Piezunka & Dahlander, 2015; Velamuri et al., 2017) by showing that the crowd’s evaluations can complement the organizational filtering process. Since our findings indicate that the crowd’s

⁴ This chapter is joint work with Prof. Dr. Carolin Haeussler and Dr. Patrick Figge. A prior version of this research has been presented at the Academy of Management Annual Meeting, Boston 2019 (Wimbauer, Figge, & Haeussler, 2019b) and has been accepted for publication in the Proceedings of the Fortieth International Conference on Information Systems, Munich 2019 (Wimbauer, Figge, & Haeussler, 2019a).

evaluations are able to predict the future value of ideas, we add to research on idea implementation (e.g., Schemmann, Herrmann, Chappin, & Heimeriks, 2016; West & Bogers, 2014). Finally, we contribute to theory on organizational search behavior (e.g., Jung & Lee, 2016; Katila & Ahuja, 2002) as our results suggest that unconscious and conscious search processes restrict the decisions of organizational evaluators. We find that crowds can alleviate these search biases as they reveal hidden treasures.

Chapter 3⁵ explores how collaboration within internal crowds allows intra-organizational project allocation. As crowd members have the freedom to decide if and where they contribute, crowd-based allocation increases the employees' motivation and reduces coordination costs. The study draws on theory of legitimacy (e.g., Desai, 2018; Suchman, 1995) to explain which projects employees will choose for collaboration in an internal crowd. Legitimacy is created if employees consider that collaboration is desired on the crowd platform (Bitektine & Haack, 2015). I argue that a call from a project initiator for collaboration provides legitimacy on a micro-level. If the project initiator calls, employees feel legitimated to join this specific project. In contrast, a call from a hierarchical instance, the employer, will create legitimacy on a macro-level increasing overall collaboration within the crowd. Based on data from 121 internal crowdsourcing projects, I empirically investigate the scope of collaboration (e.g., teaming) and the types of collaborators (e.g., lurkers). The findings indicate that the type of a project initiator's call creates an efficient project allocation. For instance, a call for personnel resources improves the chance for building a team. The employer's call changes the scope of collaboration by providing legitimacy for employees to collaborate on projects without the project initiator's call. On an individual level, the employer's call enhances the general level of collaboration by activating collaborators. These findings contribute to research on collaboration in crowds (e.g., Fuger et al., 2017; Hutter et al.,

⁵ For this chapter, Lisa Kristina Wimbauer is the sole author.

2011; Kathan, Hutter, Füller, & Hautz, 2015) by showing how different forms of legitimacy impact the crowd's behavior. In addition, the study sheds light on how co-creation within internal crowds can be stimulated. Finally, crowd-based project allocation has important theoretical and practical implications for designing innovative and agile forms of co-working.

Chapter 4⁶ concludes the dissertation by comparing the co-creation behavior of internal and external crowds. Recently, crowdsourcing is gaining popularity not just to source ideas from diverse individuals but to leverage the crowd's potential to develop these ideas further through co-creation between members (Mattarelli et al., 2018; Riedl & Woolley, 2017). Although different behavior in internal and external crowds is presumed (Afuah, 2018), there is a scarcity of empirical insights on similarities and differences in their co-creation behavior. Therefore, the aim of the last chapter is to investigate how co-creation emerges in these crowd types. In contrast to external crowds, we claim that internal crowd members anticipate the consequences of their commitment for the organizational environment in their decision to co-create. We define this behavior as *co-creation in the shadow of the organization*. To compare the co-creation behavior of both crowds, we use a unique dataset from two identical contests conducted separately with an internal crowd (121 ideas) and an external crowd (207 ideas). Our empirical findings suggest that internal crowd members are less likely to form a team, take more time to coordinate their co-creation activities, but give constructive feedback more often than external crowd members. We find that these different co-creation behaviors are strengthened under the condition of uncertain ideas. According to our assumptions, our results indicate that co-creation of employees, despite acting in an informal crowd, is restricted by the organizational environment. These findings help to gain a better understanding on the crowd mechanism in general and the co-creation dynamics specifically in both crowd types. We complement the growing research on co-creation in crowds (e.g., Kathan et

⁶ This chapter is joint work with Prof. Dr. Carolin Haeussler, Dr. Patrick Figge, and Fabian Hans.

al., 2015; Riedl & Woolley, 2017; Zhu et al., 2019) by revealing that internal and external crowds differ in the co-creation process and the co-created content. Since employees may rely on structures discussed by research on the theory of a firm (e.g., Coase, 1937; Williamson, 1981), internal crowd members tend not to unfold like in an external firm setting – but rather to *co-create in the shadow of the organization*. Finally, these results contribute to the emerging debate on selecting a crowd type (Afuah, 2018) by providing insights for scholars and practitioners which type of crowd – one of employees or one of external actors – to engage depending on their need for co-creation.

1.4 References

- Abu El-Ella, N., Stoetzel, M., Bessant, J., & Pinkwart, A. 2013. Accelerating high involvement: The role of new technologies in enabling employee participation in innovation. *International Journal of Innovation Management*, 17(6): 1–22.
- Adamczyk, S., Bullinger, A. C., & Moeslein, K. M. 2011. Commenting for new ideas: Insights from an open innovation platform. *International Journal of Technology Intelligence and Planning*, 7(3): 232–249.
- Afuah, A. 2018. Crowdsourcing: A primer and research framework. In C. L. Tucci, A. Afuah & G. Viscusi (Eds.), *Creating and capturing value through crowdsourcing*: 11–38. Oxford University Press.
- Afuah, A., & Tucci, C. L. 2012. Crowdsourcing as a solution to distant search. *Academy of Management Review*, 37(3): 355–375.
- Ashkenas, R. 2015. There’s a difference between cooperation and collaboration. *Harvard Business Review*, 20(1): 1–3.
- Bartl, M., Füller, J., Mühlbacher, H., & Ernst, H. 2012. A manager's perspective on virtual customer integration for new product development. *Journal of Product Innovation Management*, 29(6): 1031–1046.
- Bartl, M., Jawecki, G., Bilgram, V., & Wiegandt, P. 2013. The BMW Group Co-Creation Lab: From co-creation projects to programmes. In P. Augsdörfer, J. R. Bessant, K. Möselein, B. von Stamm & F. T. Piller (Eds.), *Discontinuous innovation: Learning to manage the unexpected*: 179–203. Singapore: Imperial College Press.
- Berg, J. M. 2016. Balancing on the creative highwire. *Administrative Science Quarterly*, 61(3): 433–468.
- Bergendahl, M., & Magnusson, M. 2014. Combining collaboration and competition: A key to improved idea management? *European Journal of International Management*, 8(5): 528–547.
- Bitektine, A., & Haack, P. 2015. The “macro” and the “micro” of legitimacy: Toward a multilevel theory of the legitimacy process. *Academy of Management Review*, 40(1): 49–75.
- Blohm, I., Bretschneider, U., Leimeister, J.M., & Krcmar, H. 2010. Does collaboration among participants lead to better ideas in it-based idea competitions - An empirical investigation.

Hawai'i International Conference on System Sciences (HICSS), 5–8 January 2010, Kauai, USA: 1–11.

- Bogers, M., Zobel, A.-K., Afuah, A., Almirall, E., Brunswicker, S., Dahlander, L., Frederiksen, L., Gawer, A., Gruber, M., Haefliger, S., Hagedoorn, J., Hilgers, D., Laursen, K., Magnusson, M. G., Majchrzak, A., McCarthy, I. P., Moeslein, K. M., Nambisan, S., Piller, F. T., Radziwon, A., Rossi-Lamastra, C., Sims, J., & Ter Wal, Anne L. J. 2017. The open innovation research landscape: Established perspectives and emerging themes across different levels of analysis. *Industry and Innovation*, 24(1): 8–40.
- Boudreau, K. J., Gaule, P., Lakhani, K. R., & Woolley, A. W. 2014. From crowds to collaborators: Initiating effort & catalyzing interactions among online creative workers. *Carnegie Mellon University, Research Showcase, CMU, Tepper School of Business*, (1): 1–34.
- Boudreau, K. J., & Lakhani, K. R. 2013. Using the crowd as an innovation partner. *Harvard Business Review*, 91(4): 61–69.
- Brentani, U., & Reid, S. E. 2012. The fuzzy front-end of discontinuous innovation: Insights for research and management. *Journal of Product Innovation Management*, 29(1): 70–87.
- Budescu, D. V., & Chen, E. 2015. Identifying expertise to extract the wisdom of crowds. *Management Science*, 61(2): 267–280.
- Bullinger, A. C., Neyer, A.-K., Rass, M., & Moeslein, K. M. 2010. Community-based innovation contests: Where competition meets cooperation. *Creativity and Innovation Management*, 19(3): 290–303.
- Burlingham, B., & Gendron, G. 1989. The entrepreneur of the decade. Inc. Available at: <https://www.inc.com/magazine/19890401/5602.html>, first accessed 1st of November, 2019.
- Chesbrough, H. W. 2006. *Open innovation: The new imperative for creating and profiting from technology*. Boston, Mass: Harvard Business School Press.
- Christensen, C. M. 2008. *The innovator's dilemma: When new technologies cause great firms to fail*. Boston, Mass: Harvard Business School Press.
- Coase, R. H. 1937. The nature of the firm. *Economica*, 4(16): 386–405.
- Criscuolo, P., Dahlander, L., Grohsjean, T., & Salter, A. 2017. Evaluating novelty: The role of panels in the selection of R&D projects. *Academy of Management Journal*, 60(2): 433–460.

- Dahlander, L., Jeppesen, L. B., & Piezunka, H. 2019. How organizations manage crowds: Define, broadcast, attract, and select. In J. Sydow & H. Berends (Eds.), *Managing inter-organizational collaborations: Process views*: 239–270. Emerald Publishing Limited.
- Desai, V. M. 2018. Collaborative stakeholder engagement: An integration between theories of organizational legitimacy and learning. *Academy of Management Journal*, 61(1): 220–244.
- Di Gangi, P. M., & Wasko, M. 2009. Steal my idea! Organizational adoption of user innovations from a user innovation community: A case study of Dell Ideastorm. *Decision Support Systems*, 48(1): 303–312.
- Dissanayake, I., Zhang, J., & Gu, B. 2015. Task division for team success in crowdsourcing contests: Resource allocation and alignment effects. *Journal of Management Information Systems*, 32(2): 8–39.
- Dobrajska, M., Billinger, S., & Karim, S. 2015. Delegation within hierarchies: How information processing and knowledge characteristics influence the allocation of formal and real decision authority. *Organization Science*, 26(3): 687–704.
- Eisenhardt, K. M. 1989. Agency theory: An assessment and review. *The Academy of Management Review*, 14(1): 57–74.
- Enkel, E., Gassmann, O., & Chesbrough, H. 2009. Open R&D and open innovation: Exploring the phenomenon. *R&D Management*, 39(4): 311–316.
- Erickson, L. B., Trauth, E. M., & Petrick, L. 2012. Getting inside your employees' heads: Navigating barriers to internal-crowdsourcing for product and service innovation. *Proceedings of the 33rd International Conference on Information Systems (ICIS), 16-19 December 2012, Orlando, Florida, USA*: 3628–3639.
- Estellés-Arolas, E., & González-Ladrón-de-Guevara, F. 2012. Towards an integrated crowdsourcing definition. *Journal of Information Science*, 38(2): 189–200.
- Felin, T., & Zenger, T. R. 2014. Closed or open innovation? Problem solving and the governance choice. *Research Policy*, 43(5): 914–925.
- Franke, N., & Shah, S. 2003. How communities support innovative activities: An exploration of assistance and sharing among end-users. *Research Policy*, 32(1): 157–178.
- Fuchs, C., & Schreier, M. 2011. Customer empowerment in new product development. *Journal of Product Innovation Management*, 28(1): 17–32.

- Fuger, S., Schimpf, R., Füller, J., & Hutter, K. 2017. User roles and team structures in a crowdsourcing community for international development – A social network perspective. *Information Technology for Development*, 23(3): 438–462.
- Füller, J., Hutter, K., Hautz, J., & Matzler, K. 2014. User roles and contributions in innovation-contest communities. *Journal of Management Information Systems*, 31(1): 273–308.
- Gemser, G., & Perks, H. 2015. Co-creation with customers: An evolving innovation research field. *Journal of Product Innovation Management*, 32(5): 660–665.
- Hofstetter, R., Aryobsei, S., & Herrmann, A. 2018. Should you really produce what consumers like online? Empirical evidence for reciprocal voting in open innovation contests. *Journal of Product Innovation Management*, 35(2): 209–229.
- Howe, J. 2006. Crowdsourcing. A definition.
https://crowdsourcing.typepad.com/cs/2006/06/crowdsourcing_a.html, first accessed 1st of November, 2019.
- Howe, J. 2008. *Crowdsourcing: How the power of the crowd is driving the future of business*. New York: Crown Business.
- Huang, Y., Singh, P. V., & Ghose, A. 2015. A structural model of employee behavioral dynamics in enterprise social media. *Management Science*, 61(12): 2825–2844.
- Hutter, K., Hautz, J., Füller, J., Mueller, J., & Matzler, K. 2011. Communitition: The tension between competition and collaboration in community-based design contests. *Creativity and Innovation Management*, 20(1): 3–21.
- Jeppesen, L. B., & Frederiksen, L. 2006. Why do users contribute to firm-hosted user communities? The case of computer-controlled music instruments. *Organization Science*, 17(1): 45–63.
- Jeppesen, L. B., & Lakhani, K. R. 2010. Marginality and problem-solving effectiveness in broadcast search. *Organization Science*, 21(5): 1016–1033.
- Jokisch, M. 2007. *Active integration of users into the innovation process of a manufacturer: The BMW Customer Innovation Lab*. München: Dr. Hut.
- Jung, H. J., & Lee, J. J. 2016. The quest for originality: A new typology of knowledge search and breakthrough inventions. *Academy of Management Journal*, 59(5): 1725–1753.
- Jung, Y., Majchrzak, A., Malhotra, A., & Johnson, J. 2012. Encouraging collaborative idea-building in enterprise-wide innovation challenges. *Proceedings of the 33rd International*

Conference on Information Systems (ICIS), 16-19 December 2012, Orlando, Florida, USA: 3651–3661.

- Kathan, W., Hutter, K., Füller, J., & Hautz, J. 2015. Reciprocity vs. free-riding in innovation contest communities. *Creativity and Innovation Management*, 24(3): 537–549.
- Katila, R., & Ahuja, G. 2002. Something old, something new: A longitudinal study of search behavior and new product introduction. *Academy of Management Journal*, 45(6): 1183–1194.
- Katila, R., Thatchenkery, S., Christensen, M. Q., & Zenios, S. 2017. Is there a doctor in the house? Expert product users, organizational roles, and innovation. *Academy of Management Journal*, 60(6): 2415–2437.
- Kim, J., & Wilemon, D. 2002. Focusing the fuzzy front-end in new product development. *R&D Management*, 32(4): 269–279.
- King, A., & Lakhani, K. R. 2013. Using open innovation to identify the best ideas. *MIT Sloan Management Review*, 1: 41–48.
- Lakhani, K. 2006. Broadcast search in problem solving: Attracting solutions from the periphery. *Proceedings of the Technology Management for the Global Future (PICMET) Conference, 8-13 July 2006, Istanbul, Turkey*, (6): 2450–2468.
- Lakhani, K. R. 2016. Managing communities and contests to innovate with crowds. In D. Harhoff & K. R. Lakhani (Eds.), *Revolutionizing innovation: Users, communities, and open innovation*: 109–134. Cambridge, Massachusetts, London: The MIT Press.
- Lang, M., Bharadwaj, N., & Di Benedetto, C. A. 2016. How crowdsourcing improves prediction of market-oriented outcomes. *Journal of Business Research*, 69(10): 4168–4176.
- Leonardi, P. M. 2015. Ambient awareness and knowledge acquisition: Using social media to learn "who knows what" and "who knows whom". *MIS Quarterly*, 39(4): 747–762.
- Levina, N., & Fayard, A.-L. 2018. Tapping into the diversity through open innovation platforms: The emergence of boundary-spanning practices. In C. L. Tucci, A. Afuah & G. Viscusi (Eds.), *Creating and capturing value through crowdsourcing*: 204–235. Oxford University Press.
- Luo, L., & Toubia, O. 2015. Improving online idea generation platforms and customizing the task structure on the basis of consumers' domain-specific knowledge. *Journal of Marketing*, 79(5): 100–114.

- Lüthje, C., Herstatt, C., & von Hippel, E. 2005. User-innovators and “local” information: The case of mountain biking. *Research Policy*, 34(6): 951–965.
- Lüttgens, D., Pollok, P., Antons, D., & Piller, F. 2014. Wisdom of the crowd and capabilities of a few: Internal success factors of crowdsourcing for innovation. *Journal of Business Economics*, 84(3): 339–374.
- Magnusson, P. R., Wästlund, E., & Netz, J. 2016. Exploring users' appropriateness as a proxy for experts when screening new product/service ideas. *Journal of Product Innovation Management*, 33(1): 4–18.
- Majchrzak, A., & Malhotra, A. 2013. Towards an information systems perspective and research agenda on crowdsourcing for innovation. *The Journal of Strategic Information Systems*, 22(4): 257–268.
- Mattarelli, E., Schecter, A., Hinds, P., Contractor, N., Lu, C., & Topac, B. 2018. How co-creation processes unfold and predict submission quality in crowd-based open innovation. *Proceedings of 39th International Conference on Information Systems (ICIS), 13-16 December 2018, San Francisco, CA, USA*: 1–17.
- Mollick, E., & Nanda, R. 2016. Wisdom or madness? Comparing crowds with expert evaluation in funding the arts. *Management Science*, 62(6): 1533–1553.
- Mueller, J., Melwani, S., Loewenstein, J., & Deal, J. J. 2018. Reframing the decision-makers' dilemma: Towards a social context model of creative idea recognition. *Academy of Management Journal*, 61(1): 94–110.
- Murphy, S. A., & Kumar, V. 1997. The front end of new product development: A Canadian survey. *R&D Management*, 27(1): 5–15.
- Nickerson, J. A., & Zenger, T. R. 2004. A knowledge-based theory of the firm – The problem-solving perspective. *Organization Science*, 15(6): 617–632.
- Nonnecke, B., & Preece, J. 2000. Lurker demographics: Counting the silent. *Proceedings of the SIGCHI conference on human factors in computing systems, 1-6 April 2000, The Hague, The Netherlands*: 73–80.
- O'Mahony, S., & Ferraro, F. 2007. The emergence of governance in an open source community. *Academy of Management Journal*, 50(5): 1079–1106.
- Ozer, M. 2009. The roles of product lead-users and product experts in new product evaluation. *Research Policy*, 38(8): 1340–1349.

- Perry-Smith, J. E., & Mannucci, P. V. 2017. From creativity to innovation: The social network drivers of the four phases of the idea journey. *Academy of Management Review*, 42(1): 53–79.
- Piezunka, H., & Dahlander, L. 2015. Distant search, narrow attention: How crowding alters organizations' filtering of suggestions in crowdsourcing. *Academy of Management Journal*, 58(3): 856–880.
- Piller, F. T., & Walcher, D. 2006. Toolkits for idea competitions: A novel method to integrate users in new product development. *R&D Management*, 36(3): 307–318.
- Poetz, M. K., & Schreier, M. 2012. The value of crowdsourcing: Can users really compete with professionals in generating new product ideas? *Journal of Product Innovation Management*, 29(2): 245–256.
- Prahalad, C. K., & Ramaswamy, V. 2004. Co-creation experiences: The next practice in value creation. *Journal of Interactive Marketing*, 18(3): 5–14.
- Ren, J., Nickerson, J. V., Mason, W., Sakamoto, Y., & Graber, B. 2014. Increasing the crowd's capacity to create: How alternative generation affects the diversity, relevance and effectiveness of generated ads. *Decision Support Systems*, 65: 28–39.
- Riedl, C., & Woolley, A. W. 2017. Teams vs. crowds: A field test of the relative contribution of incentives, member ability, and emergent collaboration to crowd-based problem solving performance. *Academy of Management Discoveries*, 3(4): 382–403.
- Rouse, E. D. 2018. Where you end and I begin: Understanding intimate co-creation. *Academy of Management Review*, In Press: 1–62.
- Schemmann, B., Herrmann, A. M., Chappin, M. M.H., & Heimeriks, G. J. 2016. Crowdsourcing ideas: Involving ordinary users in the ideation phase of new product development. *Research Policy*, 45(6): 1145–1154.
- Schneckenberg, D. 2009. Web 2.0 and the shift in corporate governance from control to democracy. *Knowledge Management Research & Practice*, 7(3): 234–248.
- Schweisfurth, T. G. 2017. Comparing internal and external lead users as sources of innovation. *Research Policy*, 46(1): 238–248.
- Seidel, V. P., & Langner, B. 2015. Using an online community for vehicle design: Project variety and motivations to participate. *Industrial and Corporate Change*, 24(3): 635–653.

- Simmons, J. P., Nelson, L. D., Galak, J., & Frederick, S. 2011. Intuitive biases in choice versus estimation: Implications for the wisdom of crowds. *Journal of Consumer Research*, 38(1): 1–15.
- Stuart, T. E., & Podolny, J. M. 1996. Local search and the evolution of technological capabilities. *Strategic Management Journal*, 17(S1): 21–38.
- Suchman, M. C. 1995. Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review*, 20(3): 571–610.
- Surowiecki, J. 2004. *The wisdom of crowds: Why the many are smarter than the few and how collective wisdom shapes business, economies, societies, and nations* (1. ed.). New York, NY: Doubleday.
- Terwiesch, C., & Xu, Y. 2008. Innovation contests, open innovation, and multiagent problem solving. *Management Science*, 54(9): 1529–1543.
- Toubia, O., & Florès, L. 2007. Adaptive idea screening using consumers. *Marketing Science*, 26(3): 342–360.
- Velamuri, V. K., Schneckenberg, D., Haller, J. B. A., & Moeslein, K. M. 2017. Open evaluation of new product concepts at the front end of innovation: Objectives and contingency factors. *R&D Management*, 47(4): 501–521.
- von Hippel, E. 1978. A customer-active paradigm for industrial product idea generation. *Research Policy*, 7(3): 240–266.
- von Krogh, G. 2012. How does social software change knowledge management? Towards a strategic research agenda. *The Journal of Strategic Information Systems*, 21(2): 154–164.
- Walton, I. 2012. *The compleat angler*. Great Britain: Andrews UK Ltd.
- West, J., & Bogers, M. 2014. Leveraging external sources of innovation: A review of research on open innovation. *Journal of Product Innovation Management*, 31(4): 814–831.
- West, J., & Bogers, M. 2017. Open innovation: Current status and research opportunities. *Innovation*, 19(1): 43–50.
- Williamson, O. E. 1981. The economics of organization: The transaction cost approach. *The American journal of sociology*, 87(3): 548–577.
- Wimbauer, L., Figge, P., & Haeussler, C. 2019a. Distant search, but local implementation? Using the crowd's evaluation to overcome organizational limitations in the selection of

crowdsourced ideas. *Proceedings of 40th International Conference on Information Systems (ICIS), 15-18 December 2019, Munich, Germany*: 1-17.

Wimbauer, L., Figge, P., & Haeussler, C. 2019b. Revealing hidden treasures: The crowd's evaluation in organizational idea selection. *Academy of Management Proceedings*, 1: 15433.

Zhu, H., Kock, A., Wentker, M., & Leker, J. 2019. How does online interaction affect idea quality? The effect of feedback in firm-internal idea competitions. *Journal of Product Innovation Management*, 36(1): 24–40.

Zuchowski, O., Posegga, O., Schlagwein, D., & Fischbach, K. 2016. Internal crowdsourcing: Conceptual framework, structured review, and research agenda. *Journal of Information Technology*, 31(2): 166–184.

Chapter 2: External Crowd's Evaluations in Organizational Idea Selection

2.1 Abstract

Organizations increasingly apply crowdsourcing to search for novel ideas. However, when it comes to evaluating these ideas, organizations face the challenge to select the best suggestions without prematurely rejecting the novel ideas they intended to find. To overcome this challenge, our study aims to investigate if crowd's evaluations are able to complement organizational idea evaluation. We argue that organizational local search behavior leads to differences between crowd and organizational evaluators. Further, organizational evaluation is restricted by the use of formal evaluation criteria. Crowds may alleviate these organizational search restrictions by detecting ideas otherwise overlooked by organizational evaluators. Our analysis is based on over 800 crowdsourced ideas evaluated by crowd and by organizational evaluators. Our results suggest that the favorite ideas of the crowd are more novel than the organizational favorites. We also find that the crowd detects ideas that have been, despite their potential, initially overlooked but are later implemented by the organization. We call these ideas *hidden treasures*. These findings contribute to literature on local search as well as to research on the evaluation of crowdsourced ideas for implementation.

Keywords: crowdsourcing; idea evaluation; idea implementation; local search

2.2 Introduction

"If I'd asked people what they wanted, they would have asked for a better horse." (Henry Ford)⁷

According to the quote from Henry Ford, organizations often doubt that outsiders are able to express and communicate their needs for innovative products. In particular, automotive producers question their customers' ability to generate innovative ideas that account for the complexity of the automotive production and are in line with the industry's quality standards (Ili, Albers, & Miller, 2010; Seidel & Langner, 2015). This opinion corresponds to the 'manufacturer-active paradigm' in innovation research according to which product development is performed by organizational experts with users in a passive, merely supporting role. This paradigm has been questioned by a customer-active view proposing that users can successfully play a more active part in the innovation process (Baldwin & von Hippel, 2011; von Hippel, 1978). Accordingly, users are considered as a valuable source of innovation as they are aware of their needs and even come up with solutions to address these needs (von Hippel, 2005). This 'customer-active paradigm' is the theoretical foundation for literature streams such as open innovation (Chesbrough, 2006), user innovation (e.g., Franke & Shah, 2003; Franke, von Hippel, & Schreier, 2006), co-creation (e.g., Prahalad & Ramaswamy, 2004), and crowdsourcing (e.g., Afuah & Tucci, 2012).

Crowdsourcing is gaining attention by organizations to search for novel ideas outside of their organizational boundaries (Afuah & Tucci, 2012). However, organizations face the challenge to identify promising ideas within a large pool of suggestions submitted by the crowd members (e.g., Alexy, Criscuolo, & Salter, 2012; Schweisfurth, Zaggl, & Schöttl, 2017). Especially for novel ideas, the traditional selection processes seem problematic (Mueller, Melwani, & Goncalo, 2012). Organizations that have to evaluate a vast amount of ideas show to pay less attention to novel suggestions (Piezunka & Dahlander, 2015). This tendency of filtering out novel ideas is contrary

⁷ Although often attributed to Henry Ford, the quote is unconfirmed. Nonetheless, the continued and wide-spread use of the quote exemplifies the prevalence of the expressed mindset.

to the organization's original intent to use crowds to enable a more distant search.⁸ In the hope to address this challenge, organizations have started to engage crowds for *idea selection* (Toubia & Florès, 2007; Velamuri, Schneckenberg, Haller, & Moeslein, 2017). Empowering crowds to evaluate ideas is beneficial to reduce the workload of organizational evaluators and to ease the selection effort (Criscuolo, Dahlander, Grohsjean, & Salter, 2017; Piezunka & Dahlander, 2015). Furthermore, the crowd's evaluations may provide additional insights and improve the organization's decision-making on idea implementation (Fuchs & Schreier, 2011; Schemmann, Herrmann, Chappin, & Heimeriks, 2016). Using the crowd's knowledge, skills, and opinions not only for idea generation but also for idea selection is key in contexts that require diverse knowledge (Dahlander, Jeppesen, & Piezunka, 2019; Lakhani, Lifshitz-Assaf, & Tushman, 2013).

Despite these potential benefits of using a crowd for idea selection (Afuah & Tucci, 2012), we know surprisingly little about how crowd and organizational evaluators differ in their idea assessment. Prior studies rather argue that crowds are prone to evaluation 'biases'. For instance, certain aspects related to the idea representation like appealing visual presentation or complex language can distort the crowd's evaluations (Mollick & Nanda, 2016; Simmons, Nelson, Galak, & Frederick, 2011). However, selection processes and potential biases of organizations have received less attention in crowdsourcing contexts. In addition, scholars highlight missing insights into "the subsequent implementation of ideas" (Beretta, 2019: 21) and encourage future research to "investigate the correlation between the idea screening results of different panels and the actual market success of ideas" (Magnusson, Wästlund, & Netz, 2016: 17). As organizations have to overcome barriers for implementation (Antons & Piller, 2015; Lüttgens, Pollok, Antons, & Piller, 2014), little is known about the actual implementation of crowdsourced ideas. So far, we still lack research on how idea evaluation differences relate to subsequent idea implementation.

⁸ 'Distant search' describes a behavior of exploring new types of knowledge, cf. section 2.3.2.1 (Katila & Ahuja, 2002).

The purpose of this study is to provide insights into idea selection differences between crowd and organizational evaluators as well as to improve our understanding on the predictive value of crowd's evaluations for the subsequent idea implementation. Based on the theoretical foundation of *local search behavior* (e.g., Katila & Ahuja, 2002; Piezunka & Dahlander, 2015; Stuart & Podolny, 1996), we argue that organizational evaluators undervalue crowdsourced ideas which are more novel to the organization. As organizational evaluation is relevant for the decision to implement an idea (Dahlander et al., 2019; Schemmann et al., 2016), we expect that the evaluation criteria organizations choose to assess ideas further restrict their ability to select promising ideas. We define this behavior as *restricted search*. Our sample contains 874 ideas from two external crowdsourcing contests conducted at a leading German automotive manufacturer which are all evaluated by organizational experts and received votes from the crowd. First, we investigate the differences between crowd and organizational evaluators in their assessment of novel ideas. Second, we compare the crowdsourced ideas with projects implemented by the organization seven years after the contest. Thereby, we are able to examine whether and to what extent organizations could have profited from considering the ideas the crowd would have selected.

Our findings suggest that organizations indeed favor less novel ideas than the crowd. Crowd's favorites include more original and paradigm modifying ideas compared to organizational favorites. Further, we find that some ideas are favored by the crowd and first ignored by the organization but have later been implemented. Among the ideas that an organization implements several years after the contest, a considerable proportion has been among the crowd's (but not the organization's) favorites during the contest. We call these ideas, which are neglected by an organization but implemented after the contest, *hidden treasures*.

These results contribute to existing research in several ways. First, we add to the growing research on *crowd's evaluations* (e.g., Magnusson et al., 2016; Velamuri et al., 2017) by showing that crowd and organizational evaluators indeed differ in their assessment of idea novelty. Our results support the notion that organizations can rely on crowd's evaluations to identify novel ideas. Second, we

complement research on *idea implementation* (e.g., Schemmann et al., 2016; West & Bogers, 2014) by revealing the ability of crowd's evaluations to predict the future value of ideas. As crowds are able to select additional ideas with potential to be implemented, we suggest that crowds can be leveraged to complement organizational idea selection. The consideration of crowd's evaluations can even prevent organizations from dismissing ideas prematurely. Third, we make contributions to theory on *organizational search behavior* (Jung & Lee, 2016; Katila & Ahuja, 2002; Stuart & Podolny, 1996). Our findings indicate that unconscious local search tendencies induce organizational evaluators to overlook novel ideas during a crowdsourcing contest. Additionally, the organizational decision to implement ideas is restricted by a conscious search process resulting from the application of formal evaluation criteria. We show that crowds can support organizations to diminish these local and restricted search biases as they are able to detect hidden treasures.

2.3 Theory

2.3.1 Organizational and Crowd Evaluation

Crowdsourcing is initially defined as “the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call” (Howe, 2006). Traditionally, the function which is outsourced to a crowd is the generation of ideas for new products and services (Afuah & Tucci, 2012). Recently, scholars have started to investigate if crowds can also be engaged for the *selection* of ideas (Dahlander et al., 2019; Magnusson et al., 2016; Velamuri et al., 2017). One reason for organizations to outsource idea selection is to reduce selection mistakes and to identify more ideas worth implementing. Since crowd members generally combine more diverse knowledge than organizational employees (Boudreau, 2012; Keuschnigg & Ganser, 2017), including crowds in the selection process promises additional insights to the experts’ assessment (Fuchs & Schreier, 2011). If crowds identify further ideas and complement the views of experts, this can increase the effectiveness of idea selection (Velamuri et al., 2017). Another reason for engaging crowds is to relieve the pressure and workload from experts who struggle to evaluate the vast number of submissions (Criscuolo et al., 2017; Jensen, Hiennerth, & Lettl, 2014). If crowd’s evaluations yields similar conclusions, organizations may be able to replace expert judgment without making concessions regarding selection quality. Due to the large number of individuals in the crowd and their often non-monetary incentives (Dahlander et al., 2019), organizations might be able to save resources by asking crowds, for instance, to pre-select a smaller number of ideas which are then evaluated by organizational experts (Velamuri et al., 2017). This may improve the efficiency in idea selection (Criscuolo et al., 2017). However, in order to reap these benefits, organizations need to better understand if crowd’s evaluations lead to the same result or if they select different ideas. Despite the potential of engaging crowds for idea evaluation, only few prior studies compare the idea selection of crowds and experts. Table 2.1 provides a literature overview summarizing relevant empirical studies which have been published during the last five years by top journals in the field

of innovation and management. We compare the studies regarding the evaluators, their context, the organizational decision making on how to proceed with the crowdsourced ideas, and their main findings. The overview shows that prior research focuses *either* on the group of crowd evaluators *or* on expert evaluators. Only the study by Magnusson, Wästlund, and Netz (2016) analyses the conformance of users' *and* experts' evaluations in a field experiment. Also, Mollick and Nanda (2016) compare crowd *and* expert evaluators in the context of art projects. Both studies indicate that crowd's evaluations and expert assessments show considerable levels of agreement. However, compared to experts, the decision making of crowds can be driven by characteristics of ideas that might not be informative for idea quality. For instance, Mollick and Nanda (2016) find that crowd members tend to favor ideas with a certain presentation style (e.g., ideas with pictures) and a certain writing style (e.g., low complexity). Compared to the other studies listed in Table 2.1, the research studies by Magnusson, Wästlund, and Netz (2016) as well as by Mollick and Nanda (2016) are not conducted in an organizational context and do therefore *not* consider organizational evaluators.

Organizational evaluators are usually experts in knowledge domains that fit to the contest topic and rely on their technical, procedural, and solution knowledge to assess the ideas from the crowd (Poetz & Schreier, 2012; Ulrich & Eppinger, 2008). Scholars report that organizational evaluators who have to assess a large number of ideas during their working time face an additional workload which reduces their attention towards novel ideas (Piezunka & Dahlander, 2015; van Knippenberg, Dahlander, Haas, & George, 2015). In addition, one recent study shows that the decision making of evaluators is affected by the scarcity of information provided in the idea description (Kruft, Tilsner, Schindler, & Kock, 2019). Compared to crowds, organizational evaluators do not only evaluate the information in the idea description but also react to cues in the organizational environment. For instance, experts may consider aspects unknown to the crowd, such as how well an idea reflects the current organizational strategy or how well it fits to ongoing projects. Due to their non-organizational contexts, neither Magnusson, Wästlund, and Netz (2016) nor Mollick and Nanda (2016) take such considerations into account. In sum, the few studies that compare crowd's and expert's evaluation have not yet investigated how crowd and *organizational* evaluators differ.

Research summarized in Table 2.1 – which is conducted in an organizational context – focuses only on one evaluator group. The listed studies consider the organizational decision making during or right after the contest (Hoornaert, Ballings, Malthouse, & van den Poel, 2017; Piezunka & Dahlander, 2015; Schemmann et al., 2016). For instance, Hoornaert, Ballings, Malthouse, and van den Poel (2017) as well as Schemmann, Herrmann, Chappin, and Heimeriks (2016) analyze the organizational judgement to implement or reject a crowdsourced idea right after the contest is finished. However, organizational evaluators may intend to implement an idea but be exposed to implementation barriers like the ‘not-invented-here syndrome’⁹ (Antons & Piller, 2015; Lüttgens et al., 2014). Consequently, we still lack research on whether evaluation differences provide value to an organization after the contest. With our study, we aim to contribute to closing this research gap by comparing organizational and crowd evaluators. We do not only focus on evaluation differences but take into account the implementation after the crowdsourcing contest. Unlike prior literature, we take an organizational perspective investigating if organizations may overlook ideas with implementation potential due to possible search restrictions during the contest.

⁹ The ‘not-invented-here syndrome’ describes a negative attitude towards external knowledge (Antons & Piller, 2015).

Table 2.1: Literature Overview on Organizational and Crowd Evaluation.

Study	Evaluators	Context	Organizational decision	Main Findings
Criscuolo et al. (2017)	Organizational	Organizational (Funding of R&D projects)	During contest (Funding)	Funding decisions for internal R&D projects are influenced by the characteristics of the decision making panel as well as by the project's novelty.
Piezunka and Dahlander (2015)	Organizational	Organizational (Online Suggestion Box)	During contest (Attention)	Organizations pay less attention to suggestions with higher content, structural, and personal distance. Effect is stronger for larger number of suggestions.
Schemmann et al. (2016)	Organizational	Organizational (Crowdsourcing)	Right after contest (Implementation)	Organizations are more likely willing to implement popular ideas which received votes from the crowd.
Hornaert et al. (2017)	Crowd	Organizational (Crowdsourcing)	Right after contest (Implementation)	Crowd feedback improves the prediction accuracy of idea implementation status.
Hofstetter et al. (2018)	Crowd	Organizational (Crowdsourcing)	During contest (Quality)	If voting is transparent, reciprocal voting can bias the accuracy of crowd evaluations.
Magnusson et al. (2016)	Users <i>and</i> experts	Field Experiment	-	Panels of technically skilled users, naïve users, and experts agree on the ranking of ideas, less on their absolute scores.
Mollick and Nanda (2015)	Crowd <i>and</i> experts	Theater projects (Crowdfunding)	-	Agreement in funding by crowd and experts. In case of disagreement, crowds more likely fund a project than experts.

2.3.2 Local and Restricted Search

In order to create new ideas or to solve problems, individuals can apply their existing knowledge or search for new knowledge. Traditionally, theory on search behavior has been used to explain how individuals or firms search to generate new ideas (Afuah & Tucci, 2012; Katila & Ahuja, 2002). However, individuals will also search and process information for subsequent decisions following idea generation, namely during idea evaluation and implementation (Piezunka & Dahlander, 2015). In the following section, we refer to current literature on search theory to explain why organizational and crowd evaluators may differ with regards to their evaluation decisions during the contest and how this will affect the idea implementation after the contest is finished.

2.3.2.1 Crowdsourcing as Distant Search

Organizational members may search for new insights and knowledge inside as well as outside of the organizational boundaries. Thereby, the ‘search scope’ defines where to search for knowledge. This search scope can be differentiated into local and distant search (Jung & Lee, 2016; Katila & Ahuja, 2002). *Local search* is often referred to as exploitation of existing knowledge (March, 1991). This means that individuals who conduct local search tend to consider familiar and close alternatives in their decision making (Afuah & Tucci, 2012). Within an organization, local search describes the tendency to build on information and experience that is closely related to the organization’s existing expertise or adjacent to current expertise (Fleming, 2001; Jung & Lee, 2016; Lopez-Vega, Tell, & Vanhaverbeke, 2016; Stuart & Podolny, 1996). For instance, organizations that search locally will stick to established technologies. Local search is the common process. However, as a consequence of local search, alternative solutions may not be considered during problem solving or idea generation (Jeppesen & Lakhani, 2010; Stuart & Podolny, 1996).

Local search behavior emerges due to several reasons and even involves some drawbacks. First, local search can evolve if organizations specialize in particular research and development areas (Rosenkopf & Nerkar, 2001). Since organizational members gain more and more competences and expertise in these specialized domains, their awareness for alternatives can be limited. This spiral of reinforcing expertise is referred to as ‘competency trap’. Especially if the environment is changing, a focus on competences may lead to suboptimal decisions based on outdated information (Reichwald & Piller, 2009). Second, organizational members may search locally because they pursue an ‘economic mindset’. Organizational members who follow an economic mindset aim to reduce costs while increasing revenues (Mueller, Melwani, Loewenstein, & Deal, 2018). According to von Hippel (1994), information about customers’ needs is ‘sticky’. This means that the transfer of specific and implicit customer knowledge is associated with high costs. To avoid the costs of information transfer, organizational members will focus on their in-house knowledge and search locally, for instance, by consulting in-house experts (Reichwald & Piller, 2009; Wang, He,

& Mahoney, 2009). Third, the so called ‘functional fixedness’ can be a reason for local search behavior. This phenomenon describes the tendency to refer to a known, pre-existing solution although an organization is confronted with a new situation. Decisions are made relying on previous experiences, even if they are no longer adequate in a particular situation (Gambeta, Koka, & Hoskisson, 2019; Reichwald & Piller, 2009; Sorensen & Stuart, 2000). Several studies have shown that organizational members who rely on local information generate less novel ideas (Katila & Ahuja, 2002; Poetz & Schreier, 2012).

In order to generate new ideas, organizational members often require knowledge which does not reside within an organization. *Distant* or *boundary-spanning search* describes a search behavior exploring new types of knowledge (Jung & Lee, 2016; Katila & Ahuja, 2002; March, 1991). As distant search reveals additional and unknown opportunities, the exploration of distant knowledge can result in breakthrough innovations and can allow organizations to differentiate from their competition (Fleming, 2001; Jung & Lee, 2016). Organizations broadcasting a problem to a crowd of people aim to tap distant or original knowledge which is not available within their boundaries (Boons & Stam, 2019). Under certain conditions¹⁰, crowds can be used to access such distant knowledge (Afuah & Tucci, 2012). Organizations which usually conduct local search mostly engage in crowdsourcing with the explicit intention to search for distant knowledge.

2.3.2.2 Local Search during Idea Evaluation

Although organizations search for distant knowledge, several studies indicate that they struggle to make use of this type of knowledge (Piezunka & Dahlander, 2015). For instance, evaluators in an organization often reject ideas from colleagues of other departments (Reitzig & Sorenson, 2013; Schweisfurth et al., 2017) or scientific committees dismiss research proposals that draw on distant knowledge domains (Boudreau, Guinan, Lakhani, & Riedl, 2016; Piezunka & Dahlander, 2015).

¹⁰ Afuah and Tucci (2012) find that the probability for crowdsourcing is higher under the following five conditions: the problem can be easily broadcasted to a crowd, distant knowledge for the solution is required, the crowd has a large number of knowledgeable members, the solution is easy to evaluate, and the costs for information technology are low.

Reasons why decision makers reject unfamiliar knowledge originate from bounded rational decisions (Afuah & Tucci, 2012). This means that decision makers have limited time, limited information, and limited cognitive resources to cope with unfamiliar knowledge (Haas, Criscuolo, & George, 2015). Especially Piezunka and Dahlander (2015) show that organizational decision makers, who originally aim to access distant knowledge, pay in the end *less* attention to these distant ideas. They conclude that distant knowledge narrows the attention of organizational evaluators. This effect is even reinforced when organizational evaluators face a high workload to assess a vast number of ideas. Thus, organizations seem to fail to acquire distant knowledge (Piezunka & Dahlander, 2015; van Knippenberg et al., 2015). Similarly, during idea evaluation, organizational evaluators do not only have to pay attention to particular ideas but have to search for the information that is relevant to reach their evaluation decisions. Therefore, we expect that evaluators – even if they originally aimed to search for distant knowledge – will not only pay more attention to local knowledge but also tend to refer to local information in their idea evaluation.

Local search is a general phenomenon that can affect organizational evaluators as well as crowd evaluators. The crowd, however, consists of a large number of individuals with diverse knowledge. Crowd members refer to their individual preferences in making their judgements (e.g., Mueller-Trede, Choshen-Hillel, Barneron, & Yaniv, 2018). On the aggregate level, the local search behavior of the individual crowd members has the potential to cover a broad knowledge area. Due to the diversity in the crowd, local search for one individual can constitute distant search for another (Afuah & Tucci, 2012). In contrast to crowd evaluators, organizational evaluators are less diverse and share a common goal of evaluating on behalf of the organization (Beretta, Frederiksen, & Deichmann, 2017). Thus, they will not respect their individual preferences but consider the benefits of an idea for the organization in their evaluation decisions (Keum & See, 2017). Their common knowledge about the standards, logics, and criteria of the organization as well as the expertise from their organizational employment will induce organizational evaluators to search locally. Since organizational evaluators will have a joint search target, their focus on organizational competences, an economic mindset, and the cognitive fixation may restrict their evaluation decision.

Consequently, we expect that local search behavior will more likely influence the decisions of organizational compared to crowd evaluators. In contrast to crowds, organizational evaluators – even if they apply crowdsourcing to gain distant knowledge – will rely more on the local knowledge they have built up within the organization. Therefore, we argue that local search leads to differences between organizational and crowd evaluators especially in the selection of novel ideas.

2.3.2.3 Restricted Search during Idea Implementation

Search behavior describes a cognitive process which happens unconsciously (Gavetti & Levinthal, 2000; Li, Maggitti, Smith, Tesluk, & Katila, 2013). This implies that individuals take a choice without being fully aware that they are currently conducting local search. Current research shows that organizations have designed ways to consciously control the idea selection process (Poetz & Schreier, 2012). Especially when making complex decisions, managers tend to structure their search process (Baumann & Siggelkow, 2013) and to consider only a narrow set of options (Barsoux, Enders, & Koenig, 2016). With the use of formal *evaluation criteria*, organizations aim to simplify and guide their evaluation decisions. For instance, Dahlander, Jeppesen, and Piezunka (2019: 254) claim that “evaluation criteria are formalized by standards developed *ex ante*”. Most prior studies and experience from practice confirm that the use of formal evaluation criteria by organizations is common for crowdsourcing contests (Blohm, Riedl, Füller, & Leimeister, 2016; Riedl, Blohm, Leimeister, & Krcmar, 2010). Formal evaluation criteria determine the questions that evaluators try to answer. The objective of evaluation criteria is to receive more information on the decision maker’s reasoning behind a specific overall assessment and to apply common standards for idea evaluation (Martinsuo & Poskela, 2011; Poetz & Schreier, 2012). While evaluation criteria may be effective for reaching these goals, they might also have unintended side effects. For instance, if the market potential of an idea needs to be evaluated, information search might be directed towards comparing sales data on current products – while disregarding other search directions. Thus, the information used by organizational evaluators to assess an idea is restricted by the evaluation criteria that are applied in the selection process. Since organizations

themselves determine the evaluation criteria for the assessment of crowdsourced ideas (Mueller et al., 2018), possible unintended constraints on their information search are self-imposed by organizations (Dahlander et al., 2019). We expect that these evaluation criteria chosen by an organization may further limit the organizational evaluator's search behavior by creating a frame for the evaluation decision. Rather than searching for information freely, their search is restricted to specific directions, i.e., 'search parameters'. During crowdsourcing, it is highly unlikely that organizations would ask crowds to apply the same criteria as the organizational evaluators (e.g., company fit). Instead, binary voting has been used in prior studies as the standard method for the crowd evaluation as it is intuitive and easy to understand and can be used without asking for too much additional effort from crowd members (Hofstetter et al. 2018; Hoornaert et al. 2017; Velamuri et al. 2017). In contrast to crowd evaluators, we argue that the search behavior of organizational evaluators is further restricted by the use of evaluation criteria. We define this search behavior of organizational evaluators as *restricted search*.

Evaluation criteria are not only used for the assessment of ideas during a crowdsourcing contest. As crowdsourcing can result in hundreds or even thousands of suggested ideas, it can be challenging for an organization to detect those ideas which they find worth implementing (Li, Kankanhalli, & Kim, 2016). Additionally, organizational evaluation affects the likelihood that an idea will be implemented by the organization after the crowdsourcing contest (Schemmann et al., 2016; Schemmann, Chappin, & Herrmann, 2017). Thus, organizations will use the criteria they have applied during the contest also for their later implementation decisions. Current studies show that crowd votes, the crowd's feedback and the existence of lead users in a crowd can influence the intention of organizational evaluations to implement ideas right after the contest (Hoornaert et al., 2017; Schemmann et al., 2016; Schweisfurth & Dharmawan, 2019). Crowds, in contrast, only make their decisions during the contest but have no influence on the subsequent idea implementation within the organization. Hence, we propose the restricted search will especially influence the implementation decision of organizational evaluators. As a consequence, organizations using

evaluation criteria in their evaluation decision may not only restrict their search for information to these criteria but use these criteria as reference for their idea implementation decision.

2.3.2.4 Distant Search but Local Implementation

Organizational evaluators who decide to implement an idea have to anticipate the success of this idea. Prior research shows that organizations reject external contributions (Piezunka & Dahlander, 2018) and ideas proposed by colleagues with other hierarchical status (Schweisfurth et al., 2017). In addition, decision makers underestimate the existence of user innovations (Bradonjic, Franke, & Lüthje, 2019). If organizations undervalue potentially good ideas, this type of evaluation ‘bias’ is called ‘false negatives’ (Mollick & Nanda, 2016). False negatives are defined as “rejecting relatively good ideas based on an underestimation of their potential success” (Berg, 2016: 435). As argued above, organizational evaluators, who are supposed to assess if ideas are worth being implemented, use formal evaluation criteria which direct their evaluation behavior towards a specific direction. We claim that organizational evaluators may not overlook ideas because of their quality or inherent idea characteristics but rather because they did not look for the required knowledge more distantly. Therefore, the organizational evaluation process may be based on local knowledge more than advisable. Organizational evaluators may underestimate the potential of some ideas in their implementation decision as their search is restricted by the chosen evaluation criteria. Restricted search reinforces the organizational local search and *biases* organizational evaluators to overlook ideas with potential for implementation. This potential bias will only be revealed after the crowdsourcing contest if the later implementation decision is in opposition to the original assessment. We expect that organizational evaluators – who originally intend to search for novel ideas – overlook ideas with potential to be implemented later. Thus, organizations will get stuck in a dilemma of *distant search but local implementation*.

In contrast, the evaluations of crowds are not restricted by evaluation criteria. Even if they do not directly evaluate on criteria like the potential to implement an idea, several studies indicate that crowds are somehow ‘wise’ in their decision and are able predict the success of ideas (Budescu &

Chen, 2015; Palley & Soll, 2019; Soukhoroukova, Spann, & Skiera, 2012). For instance, studies show that crowds are able to forecast the outcome of business initiatives (Lang, Bharadwaj, & Di Benedetto, 2016), or predict soccer and football results (Peeters, 2018; Simmons et al., 2011), but are less accurate than established institutions for the prediction of loans (Mohammadi & Shafi, 2019). On the contrary, other scholars argue that crowd's evaluations are biased (Hofstetter, Aryobsei, & Herrmann, 2018; Mollick & Nanda, 2016; Onarheim & Christensen, 2012). For instance, Hofstetter et al. (2018) find evidence for reciprocal voting behavior, a social bias that can distort the crowd's objective assessment of idea quality. However, as crowd evaluators do not decide on the idea implementation, their potential biases are only restricted to the crowdsourcing platform. As previously suggested (cf. section 2.3.2.3), crowd and organizational evaluators will select different ideas. These evaluation differences may reveal novel ideas which the crowd votes for and which may have potential to be implemented later. During the crowd contest, the crowd may identify potential distant ideas which are sorted out by organizational evaluators. Consequently, we argue that crowd's evaluations are able to detect *hidden treasures*. We define hidden treasures as ideas favored by the crowd, neglected by organizational evaluators but then implemented years later. Accordingly, hidden treasures have the following three characteristics. First, hidden treasures are crowd's favorites. As argued above (cf. section 2.3.2.2), crowd's favorites tend to be more novel as crowd evaluators will rely less on local knowledge in their idea evaluation than organizational evaluators. Second, they are not among the organizational favorites during the contest. Third, research projects or products similar to the hidden treasures are implemented after the contest by the organization. As the search of organizations is restricted by evaluation criteria, they may have overlooked these ideas during the contest but decided to implement them later. Consequently, we expect that crowds can support organizations – who will neglect ideas with potential for implementation due to their restricted search behavior – to find a way out of the dilemma of distant search but local implementation by revealing hidden treasures.

2.4 Hypotheses

In the following, we introduce two sets of hypotheses. First, we argue that three dimensions of an idea's *novelty* create evaluation differences between the crowd and the organization. As organizational evaluators are influenced by local search, ideas based on more distant knowledge are more likely to be favored by the crowd. Second, we claim that the more formal evaluation criteria of organizational evaluators restrict their implementation decision after the crowdsourcing contest. We assume that the crowd, not restricted by these formal criteria, selects ideas that the organization initially overlooks, but later decides to implement.

2.4.1 Evaluation Differences between Organization and Crowd due to Novelty

The original intent of organizations to apply crowdsourcing is the search for distant knowledge in the form of novel ideas. This search for *novel* ideas is defined as 'search target' (Jung & Lee, 2016). In crowdsourcing literature, a few studies already analyzed the novelty of an idea (Beretta et al., 2017; Haas et al., 2015; Mollick & Nanda, 2016). However, the different conceptualization and operationalization of idea novelty in each study makes a comparison and generalization of outcomes across studies challenging. For instance, Mollick and Nanda (2016) measure novelty by an expert assessment whereas Beretta, Frederiksen, and Deichmann (2017) and Haas, Criscuolo, and George (2015) use a language-based method. A literature review conducted by Dean, Hender, Rodgers, and Santanen (2006) summarizes the dimensions of idea novelty used in over 90 studies in creativity literature. They reveal three dimensions of novelty which are most widely used in research, namely *idea originality*, *idea rarity*, and *paradigm modifying ideas*. In our study, we adopt these three novelty dimensions. In the following, we hypothesize that organizational and crowd evaluators differ in the evaluation of idea novelty by focusing on these three novelty dimensions. For each dimension of novelty, our argumentation is structured as follows. First, we define each novelty dimension. Second, we explain why organizational and crowd evaluators differ in the evaluation of these novelty dimensions.

2.4.1.1 Originality

Original ideas “have the characteristic of being ingenious or imaginative” (Dean et al., 2006: 659). An original idea is an out-of-the-box thought that is “unusual, unique, and fresh” (Magnusson et al., 2016: 8). Originality is dependent on how an idea is seen through the lens of a respective evaluator (Franke, Lettl, Roiser, & Tuertscher, 2013). In our context, these are the ideas that deviate clearly from an organization’s product pipeline and innovation strategy. Especially organizational evaluators use strategic thrusts as reference for idea assessment (Behrens, Ernst, & Shepherd, 2014). Thus, an idea is original for the organization if it departs from the strategic thrusts.

Organizational evaluators who search information locally will consider strategic thrusts in their evaluation. When an organization decides to pursue a strategy and builds competencies accordingly, ideas which are not in line with this strategy will be evaluated less favorably (Criscuolo et al., 2017; Froehlich, Hoegl, & Gibbert, 2016). This may actually conflict with the organization’s goals of using crowdsourcing to tap into knowledge outside of the company’s usual search scope. However, we argue that there are two reasons why organizational evaluators judge original ideas less favorably. First, for ideas that comply with the organization’s strategy, evaluators are more likely to either possess the knowledge required to assess them, or have access to that knowledge via colleagues. The knowledge needed to assess more original ideas is more difficult to obtain for them, and poorly understood ideas will not be among the organizational evaluators’ favorites. Of course, evaluators might invest time to acquaint themselves with the content of more original ideas, but this is unlikely to happen. Prior research shows that ideas, which do not match with an evaluator’s expertise, receive less attention (Haas et al. 2015). Second, organizational evaluators are employees voting on behalf of the organization (Katila, Thatchenkery, Christensen, & Zenios, 2017; Keum & See, 2017). They try not to consider personal preferences but rather focus on the idea’s perceived value for the organization (Beretta et al., 2017). For instance, Behrens, Ernst, and Shepherd (2014) find support that middle managers, who are most likely organizational evaluators, emphasize the importance of strategic context (e.g., fit to the

portfolio) in their decision. Ideas that are aligned with the organization's current strategy are more likely to be perceived as valuable (Di Gangi & Wasko, 2009; Hienerth & Riar, 2013). In addition, one study shows that organizations feel pressure and urgency to find solutions to their strategic problems and therefore pay more attention to these solutions (Sullivan, 2010). In sum, the narrow focus of organizational evaluators on the organizational strategy may lead to a competency trap in idea evaluation. This tends to limit the awareness for original ideas which do not fit to the strategy. Crowds, in contrast, are rather independent from organizational constraints in their idea assessment. They are not compensated for selecting ideas and are not held responsible for their evaluations (Mollick & Nanda, 2016). One recent study reports that crowds adopt an 'unrelated' perspective towards an organization which allows them to generate novel ideas (Boons & Stam, 2019). Since their career prospects do not depend on their ability to predict the idea's success and they are not committed to the organization and its strategy, crowd evaluators will favor ideas independent of their accordance with the organizational strategy (Beretta et al., 2017; Hienerth & Riar, 2013). Crowds may even appreciate more original ideas for several reasons. Unlike organizational evaluators, crowds do not experience any risk of reputation loss when they support original ideas that may turn out to be failures (Chan & Parhankangas, 2017). In addition, new product development research finds that crowds are more willing to pay for original concepts (Dahl & Moreau, 2002). Moreover, similar to the mechanism that organizations try to use in idea generation during crowdsourcing contests, the knowledge necessary to adequately understand and appreciate an original idea is likely to be present somewhere among the crowd members (Afuah & Tucci, 2012). Crowd members will have the right expertise to self-identify and assess even original ideas. Distant search for the required knowledge might be required as at least one of the diverse crowd members may already possess the needed knowledge. Due to these reasons, we expect crowd evaluators to favor more original ideas compared to organizational evaluators.

Hypothesis 1a: Original ideas are more likely to be favored by the crowd than by the organization.

2.4.1.2 Rarity

The rarity of an idea expresses how exceptional and unusual the idea is compared to the total idea pool on the crowd platform (Dean et al., 2006; Piezunka & Dahlander, 2015; Toubia & Netzer, 2017). The rarity or so-called content distance is defined as the “extent to which the content of an idea diverges from the content of other generated ideas” (Beretta et al., 2017: 11). Rare ideas are standalone ideas submitted by only one crowd member. In contrast, similar ideas share a closer, more similar content description with other ideas in the contest (Haas et al., 2015).

The emergence of similar ideas in a contest indicates that these topics address a widely held need, suggestive of the market acceptance of the innovation (Kornish & Ulrich, 2011). If several crowd members submit an idea with similar content, clusters or so called “opportunity spaces” (Kornish & Ulrich, 2011: 108) emerge. If more than one crowd member posts a similar idea, organizational evaluators will expect that these ideas are interesting for a higher number of potential customers. Organizational evaluators therefore anticipate high demand for popular ideas with similar content (Kornish & Ulrich, 2011). Since organizational evaluators will pursue an economic mindset and consider especially those ideas that promise the greatest relative advantage and economic returns (Di Gangi & Wasko, 2009; Mueller et al., 2018), they may favor similar ideas on the platform. In addition, to make a similar assessment for unusual, exceptional ideas, organizational evaluators would have to engage in separate search processes that only support them in the evaluation of a single idea. Therefore, it is more likely that they will only engage in extensive search for clusters of ideas, which seem more promising and render the search process more efficient as the retrieved knowledge supports the evaluation of several ideas.

Compared to organizational evaluators, crowds do not care about a high market demand in their rating. For instance, crowds even seem to underestimate the firm’s costs for the implementation of a product (Huang, Vir Singh, & Srinivasan, 2014). Rather, crowds assess ideas according to their individual preferences and needs. Crowd members often prefer niche products which are interesting for a minority of customers (Ozer, 2009; Poetz & Schreier, 2012). The individual tastes of the

crowd members determine which idea crowd members select for evaluation and how they evaluate them (Mueller-Trede et al., 2018; Peeters, 2018). A study on online forums finds that rare ideas stand out from the mass and attract more attention than standard problems (Haas et al., 2015). As crowd members make their decisions based on individual preference, they will select more rare, standalone ideas compared to organizational evaluators.

Hypothesis 1b: Rare ideas are more likely to be favored by the crowd than by the organization.

2.4.1.3 Paradigm Modification

Paradigm modifying ideas change existing patterns by introducing new elements or by altering the relationships between the existing elements of an idea (Dean et al., 2006). In our context, ideas that change the way how major systemic components of a car interact, or ideas that introduce substantial new parts or modules are modifying the paradigm of how things have been done before. These idea changes require an evaluator's domain knowledge in order to perform a valid evaluation (Ozer, 2009). Domain knowledge is defined as a combination of need and solution knowledge (Denker, Eling, & Herstatt, 2016). Need knowledge is about markets' and users' needs, wants, and desires. Solution knowledge deals with the technical feasibility and implementation of ideas, i.e., how to address identified needs by creating products and services (von Hippel, 1994, 2005). Although need and solution knowledge are required for valid evaluation (Magnusson et al., 2016), crowd and organizational evaluators do not possess both types in equal depth.

Organizational evaluators mainly provide solution knowledge. Thus, organizational evaluators are aware of the feasibility of a technology within the current organizational knowledge base and product architecture (Magnusson et al., 2016; Ulrich & Eppinger, 2008). Especially in large organizations, product architectures are institutionalized through organizational routines (Christensen, 2006). Moreau, Lehmann, and Markman (2001) show that solution knowledge can make it even more difficult for experts to assess the risks and potential of novel ideas. When organizational evaluators assess novel ideas based on their solution knowledge, this may lead to a cognitive fixation in their evaluation. The experts' knowledge about industry standards, internal

processes, and their individual expertise will be of limited use when assessing those ideas. Being fixated on their solution knowledge, we expect that organizational evaluators discount paradigm modifying ideas instead of questioning their current knowledge base and engaging in distant search. On the contrary, crowd evaluators have limited solution knowledge due to their lack of insights into how an idea relates to current organizational paradigms (Huang et al., 2014; von Hippel, 1994, 2005). However, crowd evaluators may be users or customers and possess need knowledge which is defined as “an understanding of how the service creates value for the user” (Magnusson, 2009: 580). As crowd’s evaluations are based on need knowledge, they favor ideas customized to their needs (Lüthje, Herstatt, & von Hippel, 2005; Ozer, 2009; Poetz & Schreier, 2012). As needs are quite heterogeneous and overarching (Franke et al., 2006), addressing the need may change more than one element of an existing product. Broader ideas are more likely to touch a respective need or interest and therefore attract more attention within the crowd (Haas et al., 2015). Independent of how many elements of an existing product have to be changed to realize the idea, crowds may favor modifying ideas which fulfil more than one need in parallel.

Hypothesis 1c: Paradigm modifying ideas are more likely to be favored by the crowd than by the organization.

2.4.2 Organizational Evaluation Criteria and Idea Implementation

The process that organizational evaluators use to assess ideas is often more structured and formal compared to how the crowd evaluates. Organizations intentionally guide their evaluators with specific criteria. The most popular evaluation criteria organizational evaluators apply for the assessment of ideas are ‘company fit’, ‘market potential’, and ‘creativity’ (Riedl et al., 2010). Crowd evaluators do not apply such criteria (Velamuri et al., 2017). In the following, we claim that these evaluation criteria restrict organizational evaluators’ search and evaluation behavior. We argue that crowds, who do not share this constraint, are able to identify ideas that organizations overlook: ideas, which are initially neglected by organizational evaluators, but implemented by the same organization years later.

2.4.2.1 Company Fit

The evaluation criterion ‘company fit’ guides organizational evaluators to focus on the perceived alignment of the idea with the organizational knowledge base (Di Gangi & Wasko, 2009). Organizational evaluators using this evaluation criterion are more inclined to search information on the compatibility of the idea with the current competencies and product portfolio (Kim & Wilemon, 2002). Ideas with low fit to corporate strategy are more difficult to implement and are consequently evaluated more critically (Baer, 2012). Therefore, the criterion ‘company fit’ will reinforce the organizational competency trap. As a result, organizational evaluators may initially overlook the potential of ideas they associate with lower company fit to the extent that they do not select them for implementation right away. Crowd evaluators, however, are not influenced by these considerations as they do not use specific formal evaluation criteria. As prior scholars show, crowds may even underestimate the costs of implementing an idea (Huang et al., 2014). However, they may recognize the potential of these ideas as they are not restricted in their information search by concerns about how well the idea aligns with the organizational knowledge base.

Hypotheses 2a: Implemented ideas initially evaluated to fit less to the organization are more likely to be favored by the crowd than by the organization.

2.4.2.2 Market Potential

Organizational evaluators using the criterion ‘market potential’ take into account whether the crowdsourced idea addresses a wide potential customer group or can be offered at a high price (Franke et al., 2006). A high customer’s willingness to buy a product will increase the attractiveness of an idea for implementation (Poetz & Schreier, 2012). In the organizational search for information, this will divert attention to considerations such as the idea’s potential profitability or customers’ willingness to buy at this product a very early stage (Hofstetter et al. 2018; Mueller et al. 2018). Organizational evaluators may neglect ideas during the contest because they attribute low market potential to these ideas. Crowd evaluators are not restricted by these considerations and may favor such ideas although their market potential is not immediately apparent.

Hypotheses 2b: Implemented ideas initially evaluated to have lower market potential are more likely to be favored by the crowd than by the organization.

2.4.2.3 Creativity

As organizational evaluators aim to access distant knowledge, they assess ideas according to the criterion ‘creativity’. Creativity from an organizational perspective means that ideas challenge the current routines and standards (Mueller et al., 2012). It is often unclear how ideas which are assessed as highly creative can be implemented. Ideas which are assessed as creative often involve profound changes that seem unrealistic at first glance. Prior research indicates that user ideas are assessed to be highly creative by organizations (Kristensson, Gustafsson, & Archer, 2004; Magnusson et al., 2016; Poetz & Schreier, 2012). As organizational evaluators search locally for information, they cognitively fixate on their known standards and knowledge. Especially creative ideas do not accord to the prevailing organizational standards or the existent solution knowledge of evaluators (Mueller et al., 2012). While organizational evaluators are primed to assess to what extent an idea defies their expectations, crowd evaluators may simply perceive them as more interesting and favor more creative ideas.

Hypotheses 2c: Implemented ideas initially evaluated to be more creative are more likely to be favored by the crowd than by the organization.

2.5 Method

2.5.1 Data

We analyze data from two external crowdsourcing contests which have been conducted by a leading German automobile manufacturer in 2010. The crowd consists of external participants who have been recruited via an open call on social media platforms. Participants were asked to submit innovative ideas for new products and services in these two contests. The two topics were ‘the future of mobility’ and ‘the interior of the car’. Besides submitting ideas, crowd members also evaluated the ideas on the platform. In total, 398 crowd evaluators voted by using a binary ‘like/dislike’ button. Binary voting is a common method for crowd’s evaluations as it has the benefits of being intuitive and easy to understand (Hofstetter et al., 2018; Velamuri et al., 2017). Organizational evaluators usually assess ideas on more formal evaluation criteria (e.g., Poetz & Schreier, 2012). In our contests, ten organizational experts rated the ideas on the criteria creativity, market potential, and company fit, and provided their overall assessment on a five-point Likert Scale. Therefore, we are able to investigate potential evaluation differences resulting from a restriction by organizational evaluation criteria (cf. hypotheses 2a-2c). Both, the crowd and the organization have evaluated all 874 ideas of the two contests. Contrary to most other studies, this allows us to compare the evaluation of all ideas submitted in the contest, not only the limited number of pre-filtered ideas for which an organizational evaluation usually exists.

The 398 crowd members who have voted on the ideas are on average 30 years old (Min=16, Max=74), 85% are male, and 53% have completed a higher education such as a university degree. They originate from 70 different countries, whereas the most prominent countries are the United States (16%), Germany (14%), and India (6%). Although the contests have been conducted by an automobile manufacturer, only 10% of the crowd evaluators are working in the automotive industry. However, 83% own at least one car which indicates some product experience.

2.5.2 Dependent Variables

In order to test hypotheses 1a-c, we measure differences in idea evaluation. We follow the approach from Mollick and Nanda (2016: 1543) by assigning ideas to one of four mutual exclusive categories: the crowd's favorites (which are favored by the crowd but not by the organization), the organization's favorites (which are favored by the organization but not by the crowd), and ideas which are either favored by none or both of the two groups of evaluators. We generate the categories per contest by using a 25% threshold for the segmentation of categories. The 25% of ideas with the highest evaluation of the respective evaluator group are categorized as 'favorites'. This approach is preferable to a continuous measure as we are not equally interested in evaluation differences for ideas but more in the selection of the best ideas. Similarly, organizations usually do not try to rank all ideas but are interested in identifying only the best ideas generated in their contests. Table 2.2 shows the number of ideas assigned to each of the four categories.

Table 2.2: Descriptive Overview on the Measures for Evaluation Differences.

	Bottom 75% Organizational Evaluation	Top 25% Organizational Evaluation	Total
Top 25% Crowd Evaluation	Crowd's Favorites 198	Everyone's Favorites 89	287
Bottom 75% Crowd Evaluation	No one's Favorites 436	Organization's Favorites 151	587
Total	634	240	874

Note: Table shows absolute numbers of ideas classified into four categories. Threshold for the classification is 25% of top ideas and 75% of bottom ideas. The classification is calculated separately for the crowd's and for the organization's evaluations. Approach is adopted from Mollick and Nanda (2016).

To test hypotheses 2a-c, we require a measure that captures whether an idea was implemented by the organization after the contest. We asked six innovation experts employed by the automotive manufacturer to assess if the ideas generated in the contests in 2010 correspond to ideas in their current R&D project pipeline or to features already introduced to the market seven years later. We were only interested in features or products which have not yet been under development at the time of the contest. To validate the expert assessment and to eliminate the possibility that ideas were

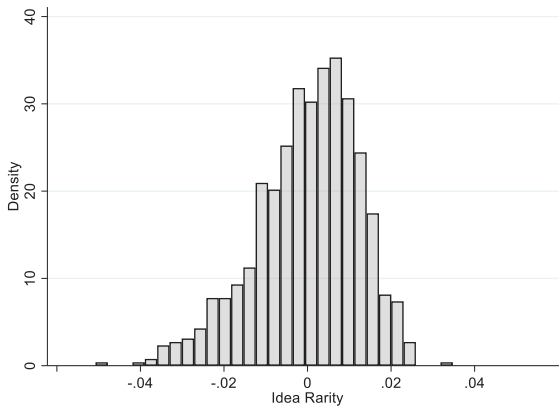
known at the time of the contest, we took two rounds of expert assessment. In a first round, experts assessed if the idea matches with an existing research project or a market offer. In a second round, they had to estimate the timing of the implemented idea. By separating the assessment into these two rounds, experts were explicitly asked to consider the time aspect. In their assessment, experts were allowed to consult specialized internal databases and all other information they had access to. For a limited number of 50 ideas (i.e., about 6%), we were able to calculate the interrater reliability of expert assessments, which showed a rather high level of interrater agreement of 0.94 (Cohen, 1960). As the assessment process was very time consuming, it was not feasible to request more than one expert assessment for the other ideas. We define implemented ideas as the sum of new research projects and market offers. Of the 874 submitted ideas, 186 were identified as implemented. Among those implemented ideas, 57 ideas have been liked by the crowd during the contest but not by the organization. We call this dependent variable to test hypotheses 2a-c ‘hidden treasure’. This binary variable has the value 1 for all implemented ideas which were favored by the crowd but not by the organization, i.e., where a ‘hidden treasure’ to the organization at the time of the crowdsourcing contest.

2.5.3 Independent Variables

To operationalize the novelty of an idea, we include a proxy of the three novelty dimensions identified by Dean, Hender, Rodgers, and Santanen (2006). The first dimension of novelty, *originality*, is measured by comparing an idea to the organization’s strategic thrusts defined in the organizational strategy. The German automobile manufacturer hosting the contests states in the organizational strategy to work in strategic thrusts of developing ‘autonomous’, ‘connected’, ‘electrified’, and ‘shared’ products and services (McKinsey&Company, 2017). Two independent coders manually code if any of the four strategic thrusts are related to the idea description. An interrater agreement of 0.99 and a respective Cohen’s Kappa from 0.71 to 0.98 for the four strategic trusts shows an almost perfect agreement between the coders (Cohen, 1960). In case of the few disagreements, an independent third coder makes the decision. An example from the category

'connected' is the idea 'smartphone data integration' allowing users to connect their smartphone with the car. Idea originality is defined as idea diverging from the organizational strategic thrusts. Thus, we generate the sum of strategic thrusts matched with an idea and inverted the variable, so that high values denote fewer matches. Empirically, coders match an idea to either one or two strategic thrusts (therefore, the minimum value of the variable is $4 - 2 = 2$). The maximum value for originality is 4, where none of the four strategic thrusts matched with the idea description.

The second dimension of novelty, *rarity*, indicates how distant an idea is compared to the other ideas generated in the contest. We follow an approach from Piezunka and Dahlander (2015) to calculate the distance between idea descriptions. The variable is calculated using the complete text of the idea including the idea title, the general idea description, the description of the functionality, the text on the target group, and the written idea benefit. As the two contests have different topics, the calculation is done separately for each of the two contests. First, we process the idea content by converting all words into lowercase and by removing all punctuation, white space, and non-alphabetic characters. Second, we remove all stop words, such as 'and' or 'to', which have little informational value for the assessment of an idea's content. Third, we stem the text by changing each word to its stem or root form (e.g., 'driver,', 'driving', and 'drive' all become 'drive'). Fourth, we transform the text into a vector of words. The resulting value indicates how similar the text of an idea is compared to all other submitted ideas in the crowdsourcing contest. The higher the resulting value, the more similar an idea's text is to all other idea descriptions, i.e., the less rare is the idea (Piezunka & Dahlander, 2015). In order to make the variable easier to interpret, we invert its sign so that higher values denote more novelty (i.e., less similarity of the texts). In addition, we subtract the mean value from each observed value of the variable. Thus, the variable idea rarity has a mean of 0 and ranges from -0.05 to 0.03. *Positive* values can be interpreted as having *higher* rarity compared to the average, whereas *negative* values are *less* rare than an average idea. The distribution of the variable idea rarity is shown in the histogram below (cf. Figure 2.1).

Figure 2.1: Distribution of Idea Rarity.

The last dimension of novelty, *paradigm modification*, has been assessed by two independent coders blind to our study. The binary variable is coded as 1, if an idea changes more than one major element of a product and/or changes the relationship between elements in a major way. Even if the interrater agreement of 0.98 and a Cohen’s Kappa of 0.94 show almost perfect agreement between coders (Cohen, 1960), a third independent coder makes the final decision in cases where the two coders did not agree. A similar approach has been used to measure the complexity of designs (Jensen et al., 2014). An example for a paradigm modifying idea is the idea ‘dynamic interior’ which will allow a dynamic and flexible adaption of interior parts and components. In contrast, ‘massage seats’ are no paradigm modifying idea as this idea will only change one separable component (in this case the seat). Hence, the binary variable paradigm modification describes if an idea includes major changes in more than one element of a product.

Organizational evaluators use the three criteria ‘company fit’, ‘creativity’, and ‘market potential’ for their idea assessment. All criteria are evaluated on a five-point Likert scale. *Company fit* demands evaluators to assess the fit of the idea to the organization. The degree of *creativity* expresses how novel or creative an idea is. With the criterion *market potential* evaluators assess if there is a potential market in terms of a customer’s willingness to buy a product.

2.5.4 Control Variables

In our analyses, we include several control variables for how the ideas are presented. The binary variable *visual presentation* indicates whether the idea was visualized using pictures or not. Pictures have shown to attract the attention of the crowd (Li et al., 2016) and positively influence their funding (Mollick & Nanda, 2016). Pictures can be used as heuristics to determine the potential of ideas which can lead to a so called ‘visual complexity bias’ (Onarheim & Christensen, 2012). Further, we include the *idea length* measured by the number of words used to describe an idea (Boer, Garcia, & Nagar, 2016; Piezunka & Dahlander, 2015). A certain degree of idea length is necessary to ensure an appropriate elaboration. However, too long ideas are difficult to understand and contain irrelevant information causing cognitive load (Beretta et al., 2017; Haas et al., 2015). We also control for the number of *idea comments* as proxy for the attention an idea has received (Piezunka & Dahlander, 2015). Moreover, we control for the *time on platform* measured by the number of days an idea was online. This measure takes into account that ideas posted later have less time to accumulate likes from the crowd. Our dataset includes two crowdsourcing contests, one conducted from March 2, 2010 until April 22, 2010 (51 days) and the other contest from September 6, 2010 until December 15, 2010 (100 days). The variable is calculated by subtracting the date of the first activity per idea from the end date of the contest. The first activity per idea is the earliest date that the idea received a comment, crowd evaluation, or expert evaluation. We take the first activity per idea as proxy for the submission date which was unfortunately not tracked by the platform. All dates have time stamps exact to the second. The minimum value is 0.4 days (i.e., the idea was 9-10 hours on the platform).

Further, we control for idea content. The *idea for product* classifies if the idea contains a product or a service. Two independent coders manually coded the variable as 1 if the idea is for a physical product and 0 otherwise (interrater agreement = 0.99). The *contest scope* indicates the two different contests. The variable is binary with values of 1 for the broader contest topic (i.e., future of mobility) and 0 for the narrower topic (i.e., interior of the car). As the idea quality and their

implementation are dependent on the crowdsourcing problem, we take the contest scope into account (Nickerson & Zenger, 2004).

We also control for the language used in the idea submissions. For all language variables, we used the software Linguistic Inquiry and Word Count (LIWC), which is based on a validated and widely-applied word-count and dictionary-based method (Pennebaker, Boyd, Jordan, & Blackburn). For the definition and the selection of our language controls, we refer to established measures in prior research (Beretta, 2019; Krufft et al., 2019; Mollick & Nanda, 2016; Piezunka & Dahlander, 2015). *Language formality* captures the formal language measured by number of words longer than six letters. Prior studies found that organizational evaluators allocate more attention to formal ideas than crowd evaluators (Mollick & Nanda, 2016; Onarheim & Christensen, 2012). In addition, we control for the *language complexity* measured by the average number of words per sentence (Tausczik & Pennebaker, 2010). Crowds have particularly shown to undervalue ideas with high complexity (Beretta et al., 2017). Like prior studies, we control for the emotionality of the idea (Krufft et al., 2019). To measure *idea emotion*, we subtract negative from positive emotions (Beretta, 2019; Piezunka & Dahlander, 2015). For instance, O'Leary (2016) finds that idea sentiment is positively related to crowd evaluation. Finally, we control for the *first-person pronouns* and the *plural pronouns*. We calculated the extent to which innovators use first-person singular pronouns when formulating their ideas (use of 'I') or plural pronouns (use of 'we') (Beretta et al., 2017). The use of both measures is not duplicated since they are neither measuring the same, nor are they directly opposed to each other. For instance, a text scoring high on first-person pronouns can score low as well as high on plural pronouns. Empirically, the two variables are not really correlated (cf. Table 2.3, $r=0.06$). Theoretically, first-person pronouns reflect identification of the idea creator with the idea (Janssen & Huang, 2008). In particular, the use plural pronouns indicates an identification of the community with the ideas which may influence the evaluation behavior of both audiences (Boer et al., 2016; Rouse, 2018). Table 2.3 shows descriptive statistics and the correlation matrix for all variables used in our analyses.

Table 2.3: Descriptive Statistics and Correlation Matrix.

	Mean	S.D.	Min.	Max.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	
1. Originality	3.75	0.47	2.00	4.00																	
2. Rarity	0.00	0.01	-0.05	0.03	.29*																
3. Paradigm Modification (b)	0.12	0.00	0.00	1.00	-.26**	-.19*															
4. Company Fit	2.08	1.25	1.00	5.00	-.02	-.05	-.12*														
5. Market Potential	1.96	1.30	1.00	5.00	-.16**	-.20*	.12*	-.15**													
6. Creativity	2.74	1.12	1.00	5.00	-.08**	-.09**	-.01	.30*	.06*												
7. Visual Presentation (b)	0.73	0.00	0.00	1.00	.03*	-.04*	-.05*	.06*	.13*	.17*											
8. Idea Length	145.20	99.04	3.00	921	-.11**	-.44*	.10*	.08*	.10*	.15*	.10*										
9. Idea Comments	5.53	3.75	0.00	30.00	-.07**	-.03**	.02	-.00	-.01	.02	.10**	-.03**									
10. Time on Platform	60.78	28.50	0.42	99.35	.29*	.35*	-.13*	.07*	-.30*	-.21*	-.12*	-.05**	.17*								
11. Idea for Product (b)	0.85	0.00	0.00	1.00	.25*	.23*	.05**	-.10**	-.05**	-.05**	.02*	-.03**	.03*	.40*							
12. Contest Scope (b)	1.31	1.00	1.00	2.00	-.39**	-.40**	.20*	-.14*	.25*	.14*	.06**	.01	.04*	-.86**	-.44*						
13. Language Formality	21.75	7.33	0.00	77.42	-.12*	.01*	-.01	.12*	.07*	.05*	.00	.00	-.09*	-.13**	-.12*	.10*					
14. Language Complexity	26.03	20.90	1.00	180.0	-.04**	-.14*	.09**	.06**	.03*	.02	-.00	.14*	-.12*	.01	-.06**	.04**	-.04*				
15. Emotional Tone	2.00	2.60	-8.08	14.29	.08**	.01	-.04**	.04**	-.03**	-.07**	.10**	-.04**	.03*	.14*	.08**	-.14**	.04**	-.09**			
16. First-Person Pronouns	0.70	1.40	0.00	9.80	.08**	.01	-.06**	.01	-.11**	-.08**	.05**	-.02	.05**	.17**	.06**	-.15**	-.19**	-.09**	.15**		
17. Plural Pronouns	0.30	0.83	0.00	7.37	-.01	-.06**	.01	.01	-.02	.05	.01	.05	-.02	.01	.05*	.01	-.13**	.12*	-.02	.06	

Note: Correlations with * are significant at 5%. Number of observations: 874. (b) indicates binary variables.

2.6 Results

2.6.1 Organization's Favorites and Crowd's Favorites

In order to test the hypotheses 1a-c on evaluation differences, we use a multinomial logit regression analysis (cf. Table 2.4). In the model, we compare the crowd's and the organization's favorite 25% of ideas with each other (cf. Table 2.2).¹¹ As we are interested in how the organization's favorites differ from crowd's favorites, we use the organization's favorites as reference group. Our findings in Table 2.4 show that the coefficient for *originality* is positive and significant ($b=0.82$, $p<0.05$). This indicates that with increasing originality of an idea, it becomes more likely that the idea will be among the crowd's favorites rather than the organization's favorites. In addition, the coefficient of *paradigm modification* is positive and significant ($b=1.12$, $p<0.05$). This also indicates that for ideas with higher values of paradigm modification, it is more likely that they are among the crowd's rather than the organization's favorites. These findings support our hypotheses 1a and 1b. Compared to organizational evaluators, the crowd favors more novel ideas in terms of *originality* and *paradigm modification*. Although the coefficient for *rarity* is positive as predicted, it is not significant ($b=21.65$, n.s.). Thus, our hypothesis 1c cannot be supported. Contrary to our hypothesis, the crowd's and the organization's favorites do not differ significantly in terms of how rare an idea is compared to the other ideas in a contest.¹² As suggested by prior literature (Mollick & Nanda, 2016), the control variables indicate that crowds prefer less formal and less complex written ideas with a higher emotional tone than organizational evaluators.

¹¹ For the definition of organization's favorites and crowd's favorites see section 2.5.2.

¹² We conducted two robustness checks. First, our results are robust to excluding the three organizational evaluation criteria from the regression. Second, the findings are robust leaving out the language controls (i.e., language formality, language complexity, emotional tone, first-person pronouns, and plural pronouns).

Table 2.4: Multinomial Logit Model on Crowd's and Organization's Favorites.

Variables		(1) Crowd's Favorites (n=197)	(2) Organization's Favorites (n=151)	(3) Everyone's Favorites (n=89)	(4) No one's Favorites (n=432)
Novelty Dimensions	Originality	0.82** (0.35)		0.66* (0.36)	0.82*** (0.30)
	Rarity	21.65 (15.33)		3.61 (15.47)	19.23 (13.20)
	Paradigm Modification	1.12** (0.55)		0.50 (0.58)	1.10** (0.50)
Organizational Evaluation Criteria	Creativity	-0.98*** (0.18)		-0.17 (0.19)	-1.25*** (0.16)
	Market Potential	-1.13*** (0.15)		-0.09 (0.15)	-1.19*** (0.14)
	Company Fit	-1.86*** (0.18)		-0.15 (0.18)	-1.82*** (0.17)
Controls Idea Presentation	Visual Presentation	0.15 (0.37)		1.00** (0.46)	-0.43 (0.33)
	Idea Length	-0.002 (0.001)		-0.001 (0.001)	-0.001 (0.001)
	Idea Comments	0.29*** (0.05)		0.27*** (0.05)	0.06 (0.05)
	Time on Platform	0.07*** (0.01)		0.06*** (0.01)	-0.003 (0.01)
Controls Idea Content	Idea for Product	0.60 (0.46)		0.10 (0.45)	0.52 (0.38)
	Contest Scope	3.99*** (0.82)		3.43*** (0.85)	0.24 (0.66)
Controls Idea Language	Language Formality	-0.06** (0.02)		-0.03 (0.02)	-0.04** (0.02)
	Language Complexity	-0.01* (0.007)		-0.008 (0.008)	-0.001 (0.006)
	Emotional Tone	0.11* (0.06)		-0.02 (0.07)	0.07 (0.06)
	First-Person Pronouns	-0.05 (0.11)		0.01 (0.12)	-0.004 (0.10)
	Plural Pronouns	0.55*** (0.19)		0.42** (0.19)	0.13 (0.19)
Constant		0.95 (2.16)		-7.87*** (2.29)	9.53*** (1.80)
Observations		874	874	874	874

Note: Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Reference group is organization's favorites.

2.6.2 Evaluation of Implemented Ideas

A first interesting observation in our descriptive statistics concerns the question of how accurate the crowd and the organization are in predicting the ideas that have been implemented after the contest. Out of all 874 ideas submitted by the crowd, in total 186 ideas are judged as implemented (cf. Table 2.5). In addition, Table 2.5 classifies all implemented ideas into the four groups that we used to construct our dependent variables (cf. previous Table 2.2). Out of the 287 ideas that the crowd liked best (cf. Table 2.2), 109 ideas (38%) were implemented. Out of the best ideas according to organizational evaluators ($n=240$, cf. Table 2.2), 112 ideas (47%) are assessed as implemented. This indicates that organizational evaluators are still more accurate in their prediction of implemented ideas – but the crowd evaluators also show a high prediction accuracy. We find this remarkable, given that the decision to implement ideas was made by the organization in the years after the contest. Indeed, the highest share of implemented ideas (58%) is at the intersection of crowd and organizational favorites (cf. everyone’s favorites $n=52$ in Table 2.5; everyone’s favorites $n=89$ in Table 2.2). This means that implementation is most accurately predicted when both evaluator groups agree in their evaluation decision. In addition, we find that the crowd identifies in total 57 implemented ideas among their favorites which are *not* among the organization’s favorites. Compared to all implemented ideas ($n=186$), 57 ideas are a considerable share of 30% additional ideas which an organization may have overlooked. These ideas are hidden treasures at the time of the contest: only the crowd, not the organization, recognizes their ‘true value’ as represented by the organization’s decision to later implement these ideas. This finding supports our assumption that crowds are able to detect hidden treasures.

Table 2.5: Classification of Implemented Ideas.

	Bottom 75% Organizational Evaluation	Top 25% Organizational Evaluation	Total
Top 25% Crowd Evaluation	Hidden Treasures 57	52	109
Bottom 75% Crowd Evaluation	17	60	77
Total	74	112	186

Note: Table shows absolute numbers of ideas classified as implemented by expert assessment. Definition of categories is displayed in Table 2.2.

In order to test our hypotheses 2a-c, we use a logit model based on those 186 ideas identified as implemented. In the first model (cf. Table 2.6, column 1), we use the dependent variable ‘hidden treasures’ which is 1 whenever an implemented idea was among the crowd’s, but not among the organization’s favorites during the contest. Our findings show that the organizational evaluation criterion *company fit* ($b=-2.57$, $p<0.01$) as well as the evaluation criterion *market potential* ($b=-0.94$, $p<0.05$) have significant negative coefficients. This means that both evaluation criteria decrease the probability that an idea is a hidden treasure. Thus, we find support for our hypotheses 2a and 2b. Ideas assessed to have a lower company fit or lower market potential are more likely a crowd’s but not an organization’s favorite – but are implemented by the organization in the years after the contest. In addition, the coefficient for the organizational evaluation criterion *creativity* is positive and significant ($b=1.82$, $p<0.05$). These findings provide support for our hypothesis 2c. Implemented ideas that have been evaluated as more creative are more likely a crowd’s but not an organization’s favorite at the time of the contest.

Our analyses reveal several additional insights. In a logit analysis with all 874 ideas in our sample, we observe that all three evaluation criteria increase the probability of an idea to be implemented (cf. Table 2.6, column 2). Although not hypothesized effects, these relationships may be informative for the interpretation of our findings. At first sight, it might seem counterintuitive that ideas initially judged to have low market potential and company fit are also implemented by the organization. This post-hoc analysis (cf. Table 2.6, column 2) shows that for the full set of

observations this is – on average – not the case. Having higher scores for market potential and company fit increases an idea’s likelihood to be among the ideas that are implemented by the organization. What we argue and find is that due to those evaluation criteria, the organization overlooks some ideas that would have been selected by the crowd: Among all implemented ideas (n=186), the 57 ideas that are ‘hidden treasures’ (i.e., are among the crowd’s but not the organization’s favorites) score lower on company fit and market potential.

Table 2.6: Logit Model on Hidden Treasures and Implemented Ideas.

Variables		(1) Hidden Treasure N = 57	(2) Implemented Ideas N = 186
Novelty Dimensions	Originality	2.45* (1.28)	0.18 (0.22)
	Rarity	70.42 (45.42)	-13.05 (9.47)
	Paradigm Modification	3.29** (1.60)	-0.15 (0.32)
Organizational Evaluation Criteria	Creativity	1.82** (0.80)	0.58*** (0.10)
	Market Potential	-0.94** (0.37)	0.31*** (0.08)
	Company Fit	-2.57*** (0.54)	0.54*** (0.09)
Controls Idea Presentation	Visual Presentation	-0.49 (0.98)	0.07 (0.22)
	Idea Length	-0.001 (0.005)	-0.001 (0.001)
	Idea Comments	0.19** (0.08)	0.08*** (0.03)
	Time on Platform	0.07** (0.03)	0.02** (0.008)
Controls Idea Content	Idea for Product	0.56 (1.40)	-0.16 (0.28)
	Contest Scope	4.22* (2.12)	1.00** (0.47)
Controls Idea Language	Language Formality	-0.08 (0.072)	-0.008 (0.01)
	Language Complexity	-0.05 (0.04)	-0.01** (0.006)
	Emotional Tone	0.05 (0.19)	-0.05 (0.04)
	First-Person Pronouns	-0.09 (0.19)	-0.01 (0.07)
	Plural Pronouns	0.74 (0.51)	0.13 (0.10)
	Constant	-13.80* (7.88)	-6.45*** (1.27)
Observations		186	874

Note: Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

2.7 Discussion

2.7.1 Theoretical Implications

The objective of this study has been to investigate idea evaluation differences between organizations and crowds during two crowdsourcing contests and their effect on the idea implementation several years after the end of the contests. To best of our knowledge, we are one of the first studies to compare idea evaluation in an organizational context with subsequent idea implementation. Our results reveal that organizational and crowd evaluators indeed differ in their assessment of idea novelty. Furthermore, we find that crowds are able to detect additional ideas with potential to be implemented later. This has several theoretical implications.

First, our study contributes to the growing stream of research on engaging *crowds for idea evaluation* (e.g., Kruft et al., 2019; Magnusson et al., 2016; Velamuri et al., 2017) by revealing idea selection differences between organizational and crowd evaluators. Prior research has focused on how crowds may be biased, mainly due to the ‘packaging’ of ideas (Mollick & Nanda, 2016). Scholars have started to discuss if and in what situations a crowd can adequately take over the part of the idea evaluation, i.e., yields similar results to expert evaluators in a non-organizational context (Magnusson et al., 2016; Mollick & Nanda, 2016). Instead, we focus on organizational limitations in idea evaluation and the crowd’s ability to complement organizational evaluators. A decisive reason why we are able to make these contributions is the data we are able to compile. Due to resource constraints it is uncommon that organizational evaluators assess all submitted ideas. More often, only ideas pre-selected via a positive crowd evaluation are judged by organizational experts (Beretta et al., 2017). Our dataset includes assessments of all ideas by both evaluator groups. Therefore, we are able to avoid the selection bias and the distortions that come with organizational evaluators assessing only the ideas which are most promising according to the crowd’s assessment. Compared to prior literature, we focus on a key characteristic of the content of crowdsourced ideas: an idea’s novelty. The search for more novel ideas is one of the primary reasons why a crowdsourcing contest is started in the first place (Piezunka & Dahlander, 2015). We extend prior

research by differentiating between three dimensions of idea novelty (Dean et al., 2006): idea originality, idea rarity, and paradigm modifying ideas. We find support for our hypotheses that compared to organizational favorites, crowds favor ideas which are more original (hypothesis 1a) and more often require paradigmatic changes (hypothesis 1c). We find no support, however, for differences in the evaluation of rare ideas (hypothesis 1b) as our results indicate that crowds as well as organizations both seem to favor rare ideas. One possible explanation for this can be that rare ideas are less obvious compared to similar ideas on the platform. If more than one crowd member comes up with the same idea, this idea may seem too obvious. For instance, if a crowd is asked to generate ideas for the car interior, more than one participant will submit ideas for obvious components like car seats. Obvious ideas like a ‘massage seat’ are easier to generate and may therefore already be known to the organization. Organizational and crowd evaluators may be aware that these ideas are not novel but have been proposed already to the company or are even already on the market. This may explain why both, organizations and crowds, may value rare ideas rather than similar ones. In sum, our findings show that the crowd’s evaluations are an important source of information for organizations which initially set out to search for new ideas.

Since our study goes beyond the comparison of evaluation differences, we make our second contribution to research dealing with *predicting the success* of novel ideas (Berg, 2016) as well as to literature on how to acquire value from external sources by *implementing externally generated ideas* (Di Gangi & Wasko, 2009; Hofstetter et al., 2018; Li et al., 2016; Schemmann et al., 2016). Research on crowd’s evaluations has highlighted that there is a lack of studies that continue investigating the implementation of ideas after the contest (Magnusson et al., 2016; West & Bogers, 2014). Our findings contribute to fill this gap. We compare the evaluation result after the contest to the ideas that the organization implemented in the seven years after the contest. We find that at the time of the contest, organizational evaluators perform more accurately in predicting later implementation. However, we also find that crowds are able to identify a considerable share of ideas which were implemented later by the organization. This confirms our argument that crowd evaluators are able to detect hidden treasures. Nevertheless, we find it surprising how close the

crowd comes to the organizational evaluators' predictive precision considering that the organization decides on an idea's implementation. By revealing that 30% of crowd's favorites are hidden treasures, we show the crowd's ability to predict valuable ideas for the organization. These findings contradict the conclusion of Hofstetter, Aryobsei, and Herrmann (2018) that the crowd is not wise enough to evaluate the value of an idea for organizations. In the cases where the crowd favorited an idea which was later implemented by the organization, the crowd identified even additional ideas earlier than the organization. Thus, the crowd evaluation has a certain quality and can deliver an additional value for the organization but is in general not of higher quality compared to an organizational assessment. Unlike prior research (Magnusson et al., 2016), we do not argue for a replacement of experts, but rather to engage crowds to *support* organizational idea evaluation in order to identify *additional* ideas with potential to be implemented in the future.

Third, we add to established theory on *search behavior* (Jung & Lee, 2016; Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001). As extension to local search theory, we show how formal evaluation criteria introduce what we call *restricted search*. We find support for our proposed effects of a more conscious form of local search caused by a limitation of search scope by formal evaluation criteria. Our results confirm that the evaluation criteria company fit (hypothesis 2a), market potential (hypothesis 2b), and creativity (hypothesis 2c) pose constraints to organizational evaluation behavior. Since organizational evaluators use these formal evaluation criteria, their search for information is not 'free' but restricted by those 'search parameters'. This is not due to a deficiency or restriction of the organizational evaluators per se. We rather interpret this as an unintended consequence of the organization's search specifications. These constraints divert organizational evaluators' search to the extent that they overlook ideas with potential for implementation. Especially for the evaluation criterion *creativity*, we find that the crowd's favorites are assessed to be less creative during the contest (cf. Table 2.4). However, after the contest, ideas judged as creative have a higher likelihood to be among the hidden treasures and implemented ideas (cf. Table 2.6). This finding suggests that crowds can be applied to detect creative ideas with potential to be implemented. For organizational evaluators, this indicates that creativity is not

necessarily a barrier for implementation. Even if organizational evaluators have rejected creative ideas prematurely, they implement some of them years later. By comparing organizational evaluation to the later implementation, we show that evaluators should have tapped more distant knowledge and indeed were biased at the time of the evaluation after the contest. In contrast, the crowd evaluators, who are unconstrained by formal evaluation criteria, are able to identify hidden treasures. Thus, crowds do have the potential to alleviate local and restricted search tendencies.

2.7.2 Managerial Implications

Our study provides several implications for organizations to improve the process of idea evaluation after crowdsourcing contests. In detail, our findings provide insights on the value of the crowd's votes for idea evaluation and idea implementation. In addition, we support organizations in finding hidden treasures and designing their selection process. In the following, we discuss answers to potential questions which may help practitioners for the future design of crowdsourcing contests.

First, organizers of crowdsourcing contests will pose the question whether they will involve the *crowd as evaluators* in the selection process (Dahlander et al., 2019). During the idea selection, managers are susceptible to two types of errors. The first error of 'false negatives' leads to rejecting relatively good ideas based on an underestimation of their potential success. The second error called 'false positives' induces to select bad ideas based on an overestimation of their potential success (Berg, 2016). By considering crowd's favorites, organizations can reduce the error of 'false negatives'. We find that a substantial share of crowd's favorites was first undervalued by organizational evaluators but implemented later. However, organizations should not simply leave the evaluation to the crowd entirely. The crowd identifies *additional* ideas with potential to be later implemented, but they do not select the *same* ideas as organizations. Although we find that crowds select ideas with a comparable accuracy to organizational evaluators, crowds should rather *complement* than substitute organizational idea selection. Thus, we recommend organizations to respect the crowd's favorites but not outsource the evaluation task completely to the crowd.

Second, organizational evaluators should consider carefully whether they *implement what the crowd likes*. For organizations, the strategy of integrating crowds into new product development may follow an appealing, intuitive logic: ask the crowd members what they like, and if they tell you, give it to them (Hofstetter et al., 2018). Empirical research related to online rating behaviors suggests that individual ratings may not reflect the willingness to buy a product (Hofstetter et al., 2018). Our results provide support that crowd's evaluations identify ideas with potential to be implemented later. However, we find indications that the intuitive logic – finding the crowd's favorites and implementing them – is not that easy. Managers should not take the validity of crowd's votes for granted. Our results show that crowd's favorites are novel as they include more original and paradigm modifying ideas. Hence, organizations have to be careful not to blindly implement crowd's favorites as they are quite original and require major changes. These ideas may not meet the organization's expectations of ideas resulting in high profitable products.

Third, we are able to provide some guidelines for organizations to answer the question on how to detect *hidden treasures*. Organizations should separate the 'good from the bad' ideas as our findings show that hidden treasures are more likely among the top 25% of crowd's evaluations. This separation can be done on crowdsourcing platforms by including a filter for top ideas. We also recommend organizations to look at the idea characteristics. Characteristics of hidden treasures are originality and paradigm modification. To make these characteristics more easily visible, the organizers of the contest can include these characteristics into the idea description. If crowd members submit an idea, they have to state if the idea includes a strategic thrust or how much elements will be altered through the submitted idea. Additionally, organizational evaluators should reconsider their idea evaluation. After the crowd contest, they tend to undervalue ideas due to their restricted search using evaluation criteria. Therefore, organizations must be aware not to neglect ideas due to their self-imposed evaluation method. The bias in their assessment can possibly be reduced by carefully considering whether they are given formal evaluation criteria and, if so, which ones. It may also be worth considering to open their search behavior during the evaluation process to attenuate the effects of local search. What's more, a multi-stage process might prove valuable.

It might be a good practice to scan the crowd's favorites a second time, independent from the first assessment these ideas received by organizational evaluators. By considering the crowd's favorites, studying their characteristics, and reviewing the organizational evaluations, organizations may have a higher chance to detect hidden treasures.

Conclusively, organizations need to question how the *selection process* should be designed (Dahlander et al., 2019). We show that organizations will most likely face a trade-off: using crowd evaluation as a complement to organizational evaluation will uncover additional ideas. The crowd evaluation comes relatively cheap since crowd members are motivated to contribute even if they are not incentivized monetarily. However, the decision to use both groups of evaluators to assess all ideas comes at the price of a higher time investment by experts. Organizations have to consider this trade-off for every contest. We would speculate that for contexts similar to ours, where long-lasting and expensive investments for research and development projects are determined and the number of ideas is still manageable, the additional time experts spend on evaluating the ideas might be worth the extra effort. However, we recommend organizations to choose a selection process based on their main target. If organizations aim to improve the accuracy in idea selection, we recommend that organizational evaluators continue assessing all ideas. Before making their final decision, taking a closer look at the favorites of the crowd might uncover additional ideas that were initially overlooked. The favorites of the crowd include more novel ideas and may warrant closer inspection to make sure they are not mistakenly dismissed due to an implicit bias against novelty in the organization's evaluation process. However, if organizations are unable or not willing to commit resources to do so, the crowd might perform reasonably well in selecting a smaller set of ideas that is then assessed by organizational evaluators. In particular, if crowds are used as a 'pre-filter' in a sequential process, organizations should be aware that they will most likely miss ideas that only organizational evaluators would have identified. No matter whether the crowd is used to 'pre-filter' and to relieve organizational evaluators from some burden, or whether the crowd is used to complement and improve organizational decision making: we believe that our study contributes by generating insights into the different evaluation behavior of both groups of evaluators.

2.7.3 Limitations and Future Research

Our study has some limitations which offer potential directions for future research. One limitation is related to the different evaluation criteria of organizational and crowd evaluators. In the contests we investigated, the organizational evaluators use formal criteria and the crowd assesses the ideas using a binary ‘like’ evaluation. Even though this evaluation design is most common in practice and prior research (Velamuri et al., 2017), it limits some of the conclusions we can draw comparing both evaluator groups. For instance, this limitation does not allow us to answer whether the crowd is also prone to restricted search behavior when asked to evaluate using certain formal criteria. In practice, crowds would most likely not be asked to assess the same criteria, such as ‘company fit’ as it is related to the organizational context and to the organizational evaluator’s knowledge base. Nevertheless, if crowds would be given formal criteria to assess, their evaluation may also become constrained. Therefore, an interesting avenue for future research would be to investigate the influence of such search specifications on crowd members.

Further, our study relies on the assessment of experts to determine whether an idea is implemented in the years after the contest. However, we are not able to track and follow-up the path of the originally crowdsourced idea into the status of implementation. Hence, our study cannot inform on the mechanisms causing the idea’s implementation. This leaves some interesting open questions which we are not able to answer during our study. We are not able to state the reasons why organizations decided to implement ideas which they first undervalued during the crowd contest. Even asking organizational evaluators is not possible as they will provide preferable answers. In addition, we have no information on what happened with the ideas right after the crowd contest. It may be that the ideas of the crowd have been used to push an existing internal idea forward or that a crowd idea has been set up as research project. Maybe the organization even felt pressured to implement ideas coming from the crowd. We believe it would be insightful to take a closer look into the ‘black-box’ of what happens to the ideas after a contest. Are teams formed to specify next steps and to plan the implementation of a submitted idea? Are those ideas entering internal product

development workshops and merged with each other, or otherwise changed considerably before product development teams work on their implementation? Are they used as an instrument to lobby for similar ideas that have not yet been able to rally enough support to be implemented? In particular, we would be interested in the reasons why organizations decide to implement ideas which they first undervalued during the contest: when and why did they change their opinion?

Besides taking a closer look at the organizational implementation process, further research can investigate the commercial value of hidden treasures. In addition, while our investigation of idea implementation goes an important step beyond mere evaluation results, we believe that going yet a step further would be exciting. It will be a promising avenue for future research to investigate the commercial value of ideas in terms of sales data, profit contribution or customer satisfaction. For instance, Nishikawa, Schreier, and Ogawa (2013) show that user products performed better on the market in terms of sales revenues and Jensen, Hienerth, and Lettl (2014) find that user generated LEGO designs have some commercial attractiveness. Therefore, it may be interesting for the future to investigate if considering the crowd's evaluations may not only reveal additional but also more profitable hidden treasures. In particular, our study found that organizations initially overlook ideas with low ratings for market potential: do these ideas, if implemented, indeed show lower sales? Similarly, it would be interesting to follow up on ideas initially overlooked due to low ratings of company fit: are those ideas particularly challenging to implement? Was the initial assessment overestimating implementation difficulties, or were the ideas implemented as implementation efforts ultimately proved unsuccessful or too costly?

2.8 Conclusion

In conclusion, we believe that this study contributes to our understanding on the role of crowds during the organizational evaluation process. We provide insights into how the crowd's evaluations support organizations in reducing limitations in the selection of crowdsourced ideas. Our study is one of the first to compare evaluations with idea implementation. Therefore, we are able to pinpoint how local search tendencies in organizational evaluation can be overcome, as some ideas are selected by the crowd but not by the organization at the time of the contest – although they get implemented by the organization years later. Since crowds may provide valuable assistance to recognize novel ideas with future implementation potential, our study offers new insights for research and practice on how the crowd's evaluations can reveal hidden treasures.

2.9 References

- Afuah, A., & Tucci, C. L. 2012. Crowdsourcing as a solution to distant search. *Academy of Management Review*, 37(3): 355–375.
- Alexy, O., Criscuolo, P., & Salter, A. 2012. Managing unsolicited ideas for R&D. *California Management Review*, 54(3): 116–139.
- Antons, D., & Piller, F. T. 2015. Opening the black box of “not invented here”: Attitudes, decision biases, and behavioral consequences. *Academy of Management Perspectives*, 29(2): 193–217.
- Baer, M. 2012. Putting creativity to work: The implementation of creative ideas in organizations. *Academy of Management Journal*, 55(5): 1102–1119.
- Baldwin, C., & von Hippel, E. 2011. Modeling a paradigm shift: From producer innovation to user and open collaborative innovation. *Organization Science*, 22(6): 1399–1417.
- Barsoux, J.-L., Enders, A., & Koenig, A. 2016. Stop jumping to solutions. *MIT Sloan Management Review*, 57: 1–10.
- Baumann, O., & Siggelkow, N. 2013. Dealing with complexity: Integrated vs. chunky search processes. *Organization Science*, 24(1): 116–132.
- Behrens, J., Ernst, H., & Shepherd, D. A. 2014. The decision to exploit an R&D project: Divergent thinking across middle and senior managers. *Journal of Product Innovation Management*, 31(1): 144–158.
- Beretta, M. 2019. Idea selection in web-enabled ideation systems. *Journal of Product Innovation Management*, 36(1): 5–23.
- Beretta, M., Frederiksen, L., & Deichmann, D. 2017. The double selection environment: Ideas selected by crowds and experts, DRUID17 Conference, 12-14 June 2017, NYU Stern School of Business, New York: 1–38.
- Berg, J. M. 2016. Balancing on the creative highwire. *Administrative Science Quarterly*, 61(3): 433–468.
- Blohm, I., Riedl, C., Füller, J., & Leimeister, J. M. 2016. Rate or trade? Identifying winning ideas in open idea sourcing. *Information Systems Research*, 27(1): 27–48.
- Boer, P. de, Garcia, A. C. B., & Nagar, Y. 2016. Accelerating the review of complex intellectual artifacts in crowdsourced innovation challenges. *Proceedings of 37th International Conference on Information Systems (ICIS), 11-14 December 2016, Dublin, Ireland*: 1–17.

- Boons, M., & Stam, D. 2019. Crowdsourcing for innovation: How related and unrelated perspectives interact to increase creative performance. *Research Policy*, 48(7): 1758–1770.
- Boudreau, K. J. 2012. Let a thousand flowers bloom? An early look at large numbers of software app developers and patterns of innovation. *Organization Science*, 23(5): 1409–1427.
- Boudreau, K. J., Guinan, E. C., Lakhani, K. R., & Riedl, C. 2016. Looking across and looking beyond the knowledge frontier: Intellectual distance, novelty, and resource allocation in science. *Management Science*, 62(10): 2765–2783.
- Bradonjic, P., Franke, N., & Lüthje, C. 2019. Decision-makers' underestimation of user innovation. *Research Policy*, 48(6): 1354–1367.
- Budescu, D. V., & Chen, E. 2015. Identifying expertise to extract the wisdom of crowds. *Management Science*, 61(2): 267–280.
- Chan, C. S. R., & Parhankangas, A. 2017. Crowdfunding innovative ideas: How incremental and radical innovativeness influence funding outcomes. *Entrepreneurship Theory and Practice*, 41(2): 237–263.
- Chesbrough, H. W. 2006. *Open innovation: The new imperative for creating and profiting from technology*. Boston, Mass: Harvard Business School Press.
- Christensen, C. M. 2006. The ongoing process of building a theory of disruption. *Journal of Product Innovation Management*, 23(1): 39–55.
- Cohen, J. 1960. A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, 20(1): 37–46.
- Criscuolo, P., Dahlander, L., Grohsjean, T., & Salter, A. 2017. Evaluating novelty: The role of panels in the selection of R&D projects. *Academy of Management Journal*, 60(2): 433–460.
- Dahl, D. W., & Moreau, P. 2002. The influence and value of analogical thinking during new product ideation. *Journal of Marketing Research*, 39(1): 47–60.
- Dahlander, L., Jeppesen, L. B., & Piezunka, H. 2019. How organizations manage crowds: Define, broadcast, attract, and select. In J. Sydow & H. Berends (Eds.), *Managing inter-organizational collaborations: Process views*: 239–270. Emerald Publishing Limited.
- Dean, D., Hender, J., Rodgers, T., & Santanen, E. 2006. Identifying quality, novel, and creative ideas: Constructs and scales for idea evaluation. *Journal of the Association for Information Systems*, 7(10): 646–699.

- Denker, F., Eling, K., & Herstatt, C. 2016. The role of individuals' domain knowledge in evaluating radical new product ideas. *R&D Management Conference, 3-6 July 2016, Cambridge, UK*.
- Di Gangi, P. M., & Wasko, M. 2009. Steal my idea! Organizational adoption of user innovations from a user innovation community: A case study of Dell Ideastorm. *Decision Support Systems*, 48(1): 303–312.
- Fleming, L. 2001. Recombinant uncertainty in technological search. *Management Science*, 47(1): 117–132.
- Franke, N., Lettl, C., Roiser, S., & Tuertscher, P. 2013. Does god play dice? Randomness vs. deterministic explanations of idea originality in crowdsourcing. *35th DRUID Celebration Conference, 17-19 June 2013, Barcelona, Spain*: 1–40.
- Franke, N., & Shah, S. 2003. How communities support innovative activities: An exploration of assistance and sharing among end-users. *Research Policy*, 32(1): 157–178.
- Franke, N., von Hippel, E., & Schreier, M. 2006. Finding commercially attractive user innovations: A test of lead-user theory. *Journal of Product Innovation Management*, 23(4): 301–315.
- Froehlich, J. K., Hoegl, M., & Gibbert, M. 2016. Idea selection in suggestion systems: A thematic similarity perspective. *R&D Management*, 46(5): 887–899.
- Fuchs, C., & Schreier, M. 2011. Customer empowerment in new product development. *Journal of Product Innovation Management*, 28(1): 17–32.
- Gambeta, E., Koka, B. R., & Hoskisson, R. E. 2019. Being too good for your own good: A stakeholder perspective on the differential effect of firm-employee relationships on innovation search. *Strategic Management Journal*, 40(1): 108–126.
- Gavetti, G., & Levinthal, D. 2000. Looking forward and looking backward: Cognitive and experiential search. *Administrative Science Quarterly*, 45(1): 113.
- Haas, M. R., Criscuolo, P., & George, G. 2015. Which problems to solve? Online knowledge sharing and attention allocation in organizations. *Academy of Management Journal*, 58(3): 680–711.
- Hienert, C., & Riar, F. 2013. The wisdom of the crowd vs. expert evaluation: A conceptualization of evaluation validity. *35th DRUID Celebration Conference, 17-19 June 2013, Barcelona, Spain*: 1–32.

- Hofstetter, R., Aryobsei, S., & Herrmann, A. 2018. Should you really produce what consumers like online? Empirical evidence for reciprocal voting in open innovation contests. *Journal of Product Innovation Management*, 35(2): 209–229.
- Hoornaert, S., Ballings, M., Malthouse, E. C., & van den Poel, D. 2017. Identifying new product ideas: Waiting for the wisdom of the crowd or screening ideas in real time. *Journal of Product Innovation Management*, 34(5): 580–597.
- Howe, J. 2006. Crowdsourcing. A definition. https://crowdsourcing.typepad.com/cs/2006/06/crowdsourcing_a.html, first accessed 1st of November, 2019.
- Huang, Y., Vir Singh, P., & Srinivasan, K. 2014. Crowdsourcing new product ideas under consumer learning. *Management Science*, 60(9): 2138–2159.
- Ili, S., Albers, A., & Miller, S. 2010. Open innovation in the automotive industry. *R&D Management*, 40(3): 246–255.
- Janssen, O., & Huang, X. 2008. Us and me: Team identification and individual differentiation as complementary drivers of team members' citizenship and creative behaviors. *Journal of Management*, 34(1): 69–88.
- Jensen, M. B., Hienerth, C., & Lettl, C. 2014. Forecasting the commercial attractiveness of user-generated designs using online data: An empirical study within the LEGO user community. *Journal of Product Innovation Management*, 31(2): 75–93.
- Jeppesen, L. B., & Lakhani, K. R. 2010. Marginality and problem-solving effectiveness in broadcast search. *Organization Science*, 21(5): 1016–1033.
- Jung, H. J., & Lee, J. J. 2016. The quest for originality: A new typology of knowledge search and breakthrough inventions. *Academy of Management Journal*, 59(5): 1725–1753.
- Katila, R., & Ahuja, G. 2002. Something old, something new: A longitudinal study of search behavior and new product introduction. *Academy of Management Journal*, 45(6): 1183–1194.
- Katila, R., Thatchenkery, S., Christensen, M. Q., & Zenios, S. 2017. Is there a doctor in the house? Expert product users, organizational roles, and innovation. *Academy of Management Journal*, 60(6): 2415–2437.
- Keum, D. D., & See, K. E. 2017. The influence of hierarchy on idea generation and selection in the innovation process. *Organization Science*, 28(4): 653–669.

- Keuschnigg, M., & Ganser, C. 2017. Crowd wisdom relies on agents' ability in small groups with a voting aggregation rule. *Management Science*, 63(3): 818–828.
- Kim, J., & Wilemon, D. 2002. Focusing the fuzzy front-end in new product development. *R&D Management*, 32(4): 269–279.
- Kornish, L. J., & Ulrich, K. T. 2011. Opportunity spaces in innovation: Empirical analysis of large samples of ideas. *Management Science*, 57(1): 107–128.
- Kristensson, P., Gustafsson, A., & Archer, T. 2004. Harnessing the creative potential among users. *Journal of Product Innovation Management*, 21(1): 4–14.
- Kruft, T., Tilsner, C., Schindler, A., & Kock, A. 2019. Persuasion in corporate idea contests: The moderating role of content scarcity on decision-making. *Journal of Product Innovation Management*, 38(8): 1227.
- Lakhani, K. R., Lifshitz-Assaf, H., & Tushman, M. L. 2013. Open innovation and organizational boundaries: Task decomposition, knowledge distribution and the locus of innovation. In A. Grandori (Ed.), *Handbook of economic organization: Integrating economic and organization theory*: 355–382. Northampton, MA: Edward Elgar Publishing.
- Lang, M., Bharadwaj, N., & Di Benedetto, C. A. 2016. How crowdsourcing improves prediction of market-oriented outcomes. *Journal of Business Research*, 69(10): 4168–4176.
- Li, M., Kankanhalli, A., & Kim, S. H. 2016. Which ideas are more likely to be implemented in online user innovation communities? An empirical analysis. *Decision Support Systems*, 84: 28–40.
- Li, Q., Maggitti, P. G., Smith, K. G., Tesluk, P. E., & Katila, R. 2013. Top management attention to innovation: The role of search selection and intensity in new product introductions. *Academy of Management Journal*, 56(3): 893–916.
- Lopez-Vega, H., Tell, F., & Vanhaverbeke, W. 2016. Where and how to search? Search paths in open innovation. *Research Policy*, 45(1): 125–136.
- Lüthje, C., Herstatt, C., & von Hippel, E. 2005. User-innovators and “local” information: The case of mountain biking. *Research Policy*, 34(6): 951–965.
- Lüttgens, D., Pollok, P., Antons, D., & Piller, F. 2014. Wisdom of the crowd and capabilities of a few: Internal success factors of crowdsourcing for innovation. *Journal of Business Economics*, 84(3): 339–374.
- Magnusson, P. R. 2009. Exploring the contributions of involving ordinary users in ideation of technology-based services. *Journal of Product Innovation Management*, 26(5): 578–593.

- Magnusson, P. R., Wästlund, E., & Netz, J. 2016. Exploring users' appropriateness as a proxy for experts when screening new product/service ideas. *Journal of Product Innovation Management*, 33(1): 4–18.
- March, J. G. 1991. Exploration and exploitation in organizational learning. *Organization Science*, 2(1): 71–87.
- Martinsuo, M., & Poskela, J. 2011. Use of evaluation criteria and innovation performance in the front end of innovation. *Journal of Product Innovation Management*, 28(6): 896–914.
- McKinsey&Company. 2017. Electrifying insights: How automakers can drive electrified vehicle sales and profitability. *Advanced Industries*, January: 3–28.
- Mohammadi, A., & Shafi, K. 2019. How wise are crowds? A comparative study of crowd and institutions in peer-to-business online lending markets. *DRUID19 Conference, 19-21 June 2019, Copenhagen Business School, Frederiksberg, Denmark*: 1–36.
- Mollick, E., & Nanda, R. 2016. Wisdom or madness? Comparing crowds with expert evaluation in funding the arts. *Management Science*, 62(6): 1533–1553.
- Moreau, C. P., Lehmann, D. R., & Markman, A. B. 2001. Entrenched knowledge structures and consumer response to new products. *Journal of Marketing Research*, 38(1): 14–29.
- Mueller, J., Melwani, S., Loewenstein, J., & Deal, J. J. 2018. Reframing the decision-makers' dilemma: Towards a social context model of creative idea recognition. *Academy of Management Journal*, 61(1): 94–110.
- Mueller, J. S., Melwani, S., & Goncalo, J. A. 2012. The bias against creativity: Why people desire but reject creative ideas. *Psychological science*, 23(1): 13–17.
- Mueller-Trede, J., Choshen-Hillel, S., Barneron, M., & Yaniv, I. 2018. The wisdom of crowds in matters of taste. *Management Science*, 64(4): 1779–1803.
- Nickerson, J. A., & Zenger, T. R. 2004. A knowledge-based theory of the firm – The problem-solving perspective. *Organization Science*, 15(6): 617–632.
- Nishikawa, H., Schreier, M., & Ogawa, S. 2013. User-generated versus designer-generated products: A performance assessment at Muji. *International Journal of Research in Marketing*, 30(2): 160–167.
- O'Leary, D. E. 2016. On the relationship between number of votes and sentiment in crowdsourcing ideas and comments for innovation: A case study of Canada's digital compass. *Decision Support Systems*, 88: 28–37.

- Onarheim, B., & Christensen, B. T. 2012. Distributed idea screening in stage-gate development processes. *Journal of Engineering Design*, 23(9): 660–673.
- Ozer, M. 2009. The roles of product lead-users and product experts in new product evaluation. *Research Policy*, 38(8): 1340–1349.
- Palley, A. B., & Soll, J. B. 2019. Extracting the wisdom of crowds when information is shared. *Management Science*, 65(5): 1949–2443.
- Peeters, T. 2018. Testing the wisdom of crowds in the field: Transfermarkt valuations and international soccer results. *International Journal of Forecasting*, 34(1): 17–29.
- Pennebaker, J. W., Boyd, R. L., Jordan, K., & Blackburn, K. *The development and psychometric properties of LIWC2015*. Austin, TX: University of Texas at Austin.
- Piezunka, H., & Dahlander, L. 2015. Distant search, narrow attention: How crowding alters organizations' filtering of suggestions in crowdsourcing. *Academy of Management Journal*, 58(3): 856–880.
- Piezunka, H., & Dahlander, L. 2018. Idea rejected, tie formed: Organizations' feedback on crowdsourced ideas. *Academy of Management Journal*, 62(2): 1–50.
- Poetz, M. K., & Schreier, M. 2012. The value of crowdsourcing: Can users really compete with professionals in generating new product ideas? *Journal of Product Innovation Management*, 29(2): 245–256.
- Prahalad, C. K., & Ramaswamy, V. 2004. Co-creation experiences: The next practice in value creation. *Journal of Interactive Marketing*, 18(3): 5–14.
- Reichwald, R., & Piller, F. T. 2009. *Interaktive Wertschöpfung: Open Innovation, Individualisierung und neue Formen der Arbeitsteilung* (2., vollständig überarbeitete und erweiterte Auflage). Wiesbaden: Gabler Verlag / GWV Fachverlage GmbH Wiesbaden.
- Reitzig, M., & Sorenson, O. 2013. Biases in the selection stage of bottom-up strategy formulation. *Strategic Management Journal*, 34(7): 782–799.
- Riedl, C., Blohm, I., Leimeister, J. M., & Krömer, H. 2010. Rating scales for collective intelligence in innovation communities: Why quick and easy decision making does not get it right, Proceedings of the 31st International Conference on Information Systems (ICIS), 12-15 December 2010, Saint Louis, MO, United States: 1–21.
- Rosenkopf, L., & Nerkar, A. 2001. Beyond local search: Boundary-spanning, exploration, and impact in the optical disk industry. *Strategic Management Journal*, 22(4): 287–306.

- Rouse, E. D. 2018. Where you end and I begin: Understanding intimate co-creation. *Academy of Management Review*, In Press: 1–62.
- Schemmann, B., Chappin, M. M.H., & Herrmann, A. M. 2017. The right kind of people: Characteristics of successful ideators' online behaviour. *Creativity and Innovation Management*, 26(3): 277–290.
- Schemmann, B., Herrmann, A. M., Chappin, M. M.H., & Heimeriks, G. J. 2016. Crowdsourcing ideas: Involving ordinary users in the ideation phase of new product development. *Research Policy*, 45(6): 1145–1154.
- Schweisfurth, T., Zaggi, M., & Schöttl, C. P. 2017. Does similarity between evaluator and creator affect the evaluation of ideas? *Academy of Management Proceedings*, 1: 1–29.
- Schweisfurth, T. G., & Dharmawan, M. P. 2019. Does lead usersness foster idea implementation and diffusion? A study of internal shopfloor users. *Research Policy*, 48(1): 289–297.
- Seidel, V. P., & Langner, B. 2015. Using an online community for vehicle design: Project variety and motivations to participate. *Industrial and Corporate Change*, 24(3): 635–653.
- Simmons, J. P., Nelson, L. D., Galak, J., & Frederick, S. 2011. Intuitive biases in choice versus estimation: Implications for the wisdom of crowds. *Journal of Consumer Research*, 38(1): 1–15.
- Sorensen, J. B., & Stuart, T. E. 2000. Aging, obsolescence, and organizational innovation. *Administrative Science Quarterly*, 45(1): 81.
- Soukhoroukova, A., Spann, M., & Skiera, B. 2012. Sourcing, filtering, and evaluating new product ideas: An empirical exploration of the performance of idea markets. *Journal of Product Innovation Management*, 29(1): 100–112.
- Stuart, T. E., & Podolny, J. M. 1996. Local search and the evolution of technological capabilities. *Strategic Management Journal*, 17(1): 21–38.
- Sullivan, B. N. 2010. Competition and beyond: Problems and attention allocation in the organizational rulemaking process. *Organization Science*, 21(2): 432–450.
- Tausczik, Y. R., & Pennebaker, J. W. 2010. The psychological meaning of words: LIWC and computerized text analysis methods. *Journal of Language and Social Psychology*, 29(1): 24–54.
- Toubia, O., & Florès, L. 2007. Adaptive idea screening using consumers. *Marketing Science*, 26(3): 342–360.

- Toubia, O., & Netzer, O. 2017. Idea generation, creativity, and prototypicality. *Marketing Science*, 36(1): 1–20.
- Ulrich, K. T., & Eppinger, S. D. 2008. *Product design and development* (4. ed., internat. ed.). Boston: McGraw-Hill/Irwin.
- van Knippenberg, D., Dahlander, L., Haas, M. R., & George, G. 2015. Information, attention, and decision making. *Academy of Management Journal*, 58(3): 649–657.
- Velamuri, V. K., Schneckenberg, D., Haller, J. B. A., & Moeslein, K. M. 2017. Open evaluation of new product concepts at the front end of innovation: Objectives and contingency factors. *R&D Management*, 47(4): 501–521.
- von Hippel, E. 1978. A customer-active paradigm for industrial product idea generation. *Research Policy*, 7(3): 240–266.
- von Hippel, E. 1994. “Sticky information” and the locus of problem solving: Implications for innovation. *Management Science*, 40(4): 429–439.
- von Hippel, E. 2005. *Democratizing innovation*. Cambridge, Massachusetts: MIT Press.
- Wang, H. C., He, J., & Mahoney, J. T. 2009. Firm-specific knowledge resources and competitive advantage: The roles of economic- and relationship-based employee governance mechanisms. *Strategic Management Journal*, 30(12): 1265–1285.
- West, J., & Bogers, M. 2014. Leveraging external sources of innovation: A review of research on open innovation. *Journal of Product Innovation Management*, 31(4): 814–831.

Chapter 3: Collaboration as Opportunity for Project Allocation in an Internal Crowd

3.1 Abstract

Crowd-based allocation of projects offers remarkable opportunities for organizations to increase the motivation of their employees and to reduce organizational coordination costs. However, research lacks insights which projects employees will choose for collaboration in a company-internal crowd. Therefore, this study aims to investigate how a call from a project initiator for resources impacts the collaboration of employees and how the scope of collaboration (e.g., teaming) as well as the types of collaborators (e.g., lurkers) change after a call from the employer for collaboration. I argue that a call from a project initiator will create legitimacy on micro-level. If the project initiator calls, employees who seem to possess the requested resources feel legitimated to join this specific project. A call for collaboration from a hierarchical instance, the employer, will establish legitimacy on a macro-level increasing overall collaboration within the crowd. I empirically investigate the scope of collaboration and the types of collaborators based on 121 company-internal crowdsourcing projects. The results suggest that the project initiator's call indeed leads to efficient project allocation. Commenting increases as an answer to the initiator's call for material resources whereas a call for personnel resources improves the chance for building a team. An employer's call changes the scope of collaboration by creating legitimacy for employees to join projects where the project initiator does not call. On a collaborator level, the employer's call enhances the collaboration by activating lurkers. These findings have theoretical and practical implications on how to foster collaboration in internal crowds which enables crowd-based project allocation.

Keywords: internal crowdsourcing; collaboration; crowd-based project allocation

3.2 Introduction

Crowd-based mechanisms are increasingly gaining attention not only for sourcing ideas but also for engaging a workforce to complete complex tasks (Kittur et al., 2013). Crowd work is not limited to company-external individuals but provides notable benefits for intra-organizational project allocation. Traditionally, projects within an organization are allocated by hierarchy. This means that tasks are delegated top-down from management to the respective employee. As an employer makes decisions on behalf of the employee, a ‘principal-agent dilemma’ may occur (Eisenhardt, 1989). An employer as principal assigns projects under the condition of asymmetric information as only the employee as agent has full information about his or her competencies. This dilemma involves drawbacks of high organizational coordination costs or time-consuming adjustments of the project structure (e.g., Grote, Herstatt, & Gemünden, 2012; Seidel & Langner, 2015). In addition, conflicts of interest arise if projects are misallocated to employees who are not motivated to do this work (Dobrajska, Billinger, & Karim, 2015). Instead of employers allocating and controlling work, crowd-based organizational forms emerge which operate with little or no hierarchy and without formal coordination mechanisms (Dahlander & O’Mahony, 2011; O’Mahony & Ferraro, 2007). Especially literature on distributed innovation assumes that innovative work shifts from hierarchal structures to a network of distributed actors who self-organize collaboration (Boudreau, Guinan, Lakhani, & Riedl, 2016; Kornberger, 2017). *Crowd-based project allocation*¹³ allows employees to select the projects for collaboration on which they prefer to work on. As employees self-select to collaborate on projects within the crowd, crowd-based project allocation has shown to increase the employees’ motivation and to reduce organizational coordination costs (Arazy, Daxenberger, Lifshitz-Assaf, Nov, & Gurevych, 2016). To leverage these benefits, it is

¹³ For the purpose of this study, I define the term ‘crowd-based project allocation’ as a result of collaboration among employees in an internal crowd. If employees decide to collaborate on projects of their colleagues, these projects are allocated via the crowd mechanism.

necessary to shed light on how crowd-based project allocation emerges through the choice of employees to collaborate on projects in a crowd.

Although internal crowdsourcing is a promising approach to give employees the freedom to collaborate on their preferred projects (Boudreau, Gaule, Lakhani, & Woolley, 2014), collaboration has mainly been investigated in external crowdsourcing (Fuger, Schimpf, Füller, & Hutter, 2017; Hahn, Moon, & Zhang, 2008). Most prior research analyses collaboration in form of comments (e.g., Adamczyk, Bullinger, & Moeslein, 2011) or classifies individual user roles in crowds (e.g., Füller, Hutter, Hautz, & Matzler, 2014). Moreover, there is extant literature on the benefits of collaboration (Adamczyk et al., 2011; Blohm, Bretschneider, Leimeister, & Krcmar, 2010; Deichmann & Jensen, 2018) or on the motivation to participate in crowd contests (Acar, 2019; Hars & Ou, 2002; Hertel, Niedner, & Herrmann, 2003; Jeppesen & Frederiksen, 2006; Lakhani & Wolf, 2005; Seidel & Langner, 2015). However, research lacks insights on employees' decision which project to join when provided with similar alternatives. Despite the benefits of crowd-based project allocation, little is known about which projects employees choose for collaboration if they are able to self-select projects in a crowd.

In order to fill these research gaps, this study aims to investigate to what extent a call for collaboration from two different senders is able to foster collaboration in internal crowds. The objective of the study is to explore how a call for resources from the *project initiator*¹⁴ induces colleagues to collaborate and how collaboration can be stimulated after a call for collaboration from a hierarchical instance, the *employer*. The study considers that collaboration on projects can have different *scopes* namely commenting, teaming, and editing (e.g., Fuger et al., 2017; Ren, Nickerson, Mason, Sakamoto, & Graber, 2014; Riedl & Woolley, 2017). In addition, individual *types* of collaborators (e.g., lurkers) are taken into account depending on their activity on the crowdsourcing platform (Füller et al., 2014; Nonnecke & Preece, 2000). The study thereby seeks

¹⁴ A 'project initiator' is defined as the employee who submits a projects or an idea on an internal crowdsourcing platform. The terms 'project' and 'idea' are used as synonyms and describe the submitted text.

to answer the questions of (1) how does a project initiator's call influence the employees' choice to collaborate on projects and (2) how do the scope of collaboration and the types of collaborators change after an employer's call.

I develop hypotheses that the project initiator's call and the employer's call differ in the way how they create *legitimacy* for collaboration in an internal crowd. Legitimacy in the context of this study means that employees perceive collaboration in the crowd as "[...] desirable, proper, or appropriate within a socially constructed system of norms, values, beliefs, and definitions" (Suchman, 1995: 574). Legitimacy theory is applied from entrepreneurship literature (e.g., Pollack, Rutherford, & Nagy, 2012; van Werven, Bouwmeester, & Cornelissen, 2015) to explain this new way of collaborating in internal crowdsourcing. I argue that a call from a project initiator who searches for resources provides legitimacy on a *micro-level* (Bitektine & Haack, 2015; Cattani, Ferriani, & Allison, 2014; Suddaby, Bitektine, & Haack, 2017). If the project initiator calls, employees who can supply the requested resources may feel legitimated to join this specific project. In contrast, an employer's call may establish legitimacy on a *macro-level* (Bitektine & Haack, 2015; Desai, 2018). A call from an organizational authority may construct legitimacy allowing employees to invest resources into projects outside of their daily work. Therefore, the overall collaboration on projects may increase and further employees will be activated after an employer's call. The empirical analysis is based on 121 projects from an internal crowdsourcing contest conducted at a leading German automotive manufacturer. The scope of collaboration is measured by the number of comments, the likelihood for building a team, and for editing a project. Collaborators are operationalized by the number of lurkers (Füller et al., 2014; Nonnecke & Preece, 2000) and 'former' lurkers.¹⁵

¹⁵ 'Former' lurkers are employees which decide to become active after a certain time. Definition cf. section 3.4.2.

The findings contribute to research on crowd-based project allocation (e.g., Boudreau et al., 2016; Dahlander & O'Mahony, 2011; Kornberger, 2017) by showing that the type of project initiator's call for resources matters for the efficient allocation of projects in internal crowds. A project initiator's call for material resources enhances the number of comments on a project whereas a call for personnel resources increases the probability for finding a team. A call for both types of resources improves the chance that a project is edited. In addition, I find indications that the project initiator calls on less novel and highly mature projects. However, especially these novel and less mature projects without initiator's call will need support by collaborators in order to be developed further. But how to push employees to self-select on these projects? The results suggest that the employer's call matters if the project initiator does not call for resources. I find that the employer's call creates legitimacy to collaborate even on projects without initiator's call. In addition, the employer's call enhances the general level of collaboration by activating former lurkers. In sum, these findings contribute to research on collaboration in competitive crowdsourcing contests (e.g., Bullinger, Neyer, Rass, & Moeslein, 2010; Hutter, Füller, Hautz, Bilgram, & Matzler, 2015; Hutter, Hautz, Füller, Mueller, & Matzler, 2011) as they provide a unique view on collaboration from a legitimacy perspective. In particular, the study presents insights on how collaboration within internal crowds works (e.g., how teams form) and how collaboration behavior can be stimulated to foster crowd-based project allocation. Finally, crowd-based allocation of employees has important implications for designing innovative and agile forms of co-working and enabling employee-driving innovation (e.g., Herstatt, Schweisfurth, & Raasch, 2016; Kesting & Parm Ulhøi, 2010).

3.3 Theory

3.3.1 Collaboration in Internal Crowds

Employees not only have the freedom to choose whether they want to participate in an internal crowdsourcing contest, but also whether they aim to contribute individually or collaboratively. Crowd-based project allocation emerges if employees decide to collaborate on a project of their colleagues in an internal crowd. Collaboration in crowds is based on the employees' willingness to freely reveal their knowledge and expertise (Alexy, George, & Salter, 2013; Roy & Sarkar, 2016; von Hippel & von Krogh, 2003). Especially in internal crowds, collaboration promotes the knowledge exchange between employees from different departments (Jung, Majchrzak, Malhotra, & Johnson, 2012; Skopic, Schall, & Dustdar, 2012). Based on prior research, collaboration can have different scopes ranging from commenting and teaming to editing projects (Adamczyk et al., 2011; Dissanayake, Zhang, & Gu, 2015; Ren et al., 2014). According to their activity, types of collaborators can be classified into active participants, former lurkers, and lurkers (Füller et al., 2014; Nonnecke & Preece, 2000).

3.3.1.1 Scope of Collaboration

I argue that collaboration on projects varies in the scope of collaboration which is dependent on the commitment of the contributing collaborators. *Comments* on projects are defined as lowest collaboration scope. Prior research on crowdsourcing shows that comments include feedback (e.g., how to improve a project), represent an evaluation of the project (e.g., positive evaluation), or are used for socializing (e.g., thanking for contributions). Comments spur discussions between the project initiators, peers, and community managers (Adamczyk et al., 2011; Faullant & Dolfus, 2017; O'Leary, 2016). However, comments on projects are a simple, non-binding form of collaboration with no commitment to further support the project.

I expect that collaborators enter into a larger commitment if they decide to join a *team* on a project. Prior studies have shown that teams share the credit if the project is winning but also the risk of being blamed for the project's failure (Bikard, Murray, & Gans, 2015). In addition, project initiators

face a trade-off between the advantages of exchanging knowledge and the disadvantages of coordinating the team members (Deichmann & Jensen, 2018). Prior research on external crowdsourcing increasingly incorporates and highlights the benefits of self-organized teams within crowds (e.g., Benefield, Shen, & Leavitt, 2016; Boudreau et al., 2014; Dissanayake et al., 2015; Fuger et al., 2017; Hahn et al., 2008; Hertel et al., 2003; Riedl & Woolley, 2017; Rokicki, Zerr, & Siersdorfer). For instance, Fuger, Schimpf, Füller, and Hutter (2017) and Boudreau, Gaule, Lakhani, and Woolley (2014) find that a higher proportion of active team members enhances the project quality within external crowds. In addition, Riedl and Woolley (2017) show that the diversity of exchanged information and the speed of information exchange are strong predictors for team performance.

For this study, I define the most elaborated scope of collaboration as *project edit*. In the case of a project edit, participants change the project content which requires a higher commitment and effort than commenting and teaming. Co-production on projects is especially prominent on Wikipedia where the content of original projects is modified and edited by collaborating participants (Arazy et al., 2016). Modification of projects may include a replacement or a new configuration of existing project elements. A study at Amazon Turk finds that crowds generate the most divergent, relevant and effective ads if they modify initial projects. As errors are corrected and good features remain, the project quality improves (Ren et al., 2014).

3.3.1.2 Types of Collaborators

Existing research on collaboration behavior shows that individuals in online communities take different roles associated with distinct behaviors (e.g., Chasanidou, Sivertstøl, & Hildrum, 2018; Dahlander & Frederiksen, 2012; Fuger et al., 2017; Füller et al., 2014; Guo, Zheng, An, & Peng, 2017; Hutter et al., 2011). Various studies have applied a social network analysis in order to identify user roles who differ in their interaction behavior (Fuger et al., 2017; Füller et al., 2014; Hutter et al., 2011; Hutter et al., 2015; Kathan, Hutter, Füller, & Hautz, 2015). However, it does not only matter how participants collaborate but *how many* participants are active in a crowd (Fuger et al.,

2017). One study from Boudreau, Lacetera, and Lakhani (2011) finds that increasing the number of participants on a crowdsourcing platform has two opposing consequences. On the one hand, a high number of participants lowers the chance to win – which diminishes the individual effort to contribute. On the other hand, adding participants to a contest increases the chance that at least one participant will find the best solution (Boudreau et al., 2011). Thus, the activity level is relevant for the crowdsourcing success. Taking into account the activity level, Füller, Jawecki, and Mühlbacher (2007) and Füller, Hutter, Hautz, and Matzler (2014) categorize users based on their posting frequency. ‘Frequent posters’ contribute almost daily, ‘posters’ contribute regularly, and ‘lurkers’ are passive users. Nonnecke and Preece (2000) also show that the majority of participants are lurkers who are silent observers and not active at all. Füller, Hutter, Hautz, and Matzler (2014) argue that lurkers are beneficial to reach the critical mass necessary to spread the news about the contest. They may distribute the information of the existence of the contest which is helpful to attract new members. Moreover, new participants can be impressed by the large number of registered users. However, a high number of lurkers can become a problem. If few participants contribute and nothing is happening in the contest, no participant want to be part of or return to this platform (Füller et al., 2014). Especially lurkers may have valuable comments and ideas which remain silent. Therefore, the aim of each crowdsourcing contest provider is to activate lurkers. When a lurker speaks up for the first time, this is called ‘delurking’ (Nonnecke & Preece, 2000). By waking up lurkers, they can be turned into ‘former’ lurkers. Depending on their activity, this study classifies crowd members into lurkers, former lurkers, and active participants.

3.3.2 Legitimacy Theory

According to Human and Provan (2000), legitimacy is a crucial element in the development of all kinds of social systems – from groups sharing a common interest such as collaborative teams, to networks and organizations. In an early scientific work, legitimacy has been defined as “[...] a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions” (Suchman, 1995: 574). Legitimacy is socially constructed which means that it reflects how an individual or a social group thinks and values the action of an entity (Suddaby et al., 2017). One strategy for gaining legitimacy is to manipulate the current structure by altering existing norms and values and creating new behaviors and beliefs. The goal is to create a perception within the audience that the desired behavior is the right thing to do. In the best case, this set of new behavior is taken for granted (Kumar & Das, 2007; Suchman, 1995; Zimmerman & Zeitz, 2002). Organizational legitimacy is defined as a resource reflecting the approval of an organization (Desai, 2018). In the context of organizational legitimacy, external legitimacy is built on the acceptance of the organization by the society (Suchman, 1995) whereas internal legitimacy refers to the acceptance of an organization by its employees (Bitektine, 2011; Kumar & Das, 2007). Legitimacy is a multi-level construct which emerges through a social judgment either by individuals on a *micro-level* or as an aggregated perception at a *macro-level* (Bitektine & Haack, 2015). At the micro-level, individuals assess some kind of behavior based on their individual level judgement. On a macro-level, collective actors provide validity as collective consensus that actions are legitimate within an organizational context (Bitektine & Haack, 2015). Building legitimacy is especially crucial when setting up management innovations like new structures and procedures within an organization (Birkinshaw, Hamel, & Mol, 2008). When faced with new structures like new ways of working in an organization, legitimacy serves as a guidance to actors on how to proceed (Zimmerman & Zeitz, 2002). Even though internal crowdsourcing is established as a new way of working, there is no research, so far, considering legitimacy as a possible explanation for the employees’ decision to collaborate in internal crowds.

I apply legitimacy theory to the context of internal crowdsourcing. According to legitimacy research, an *entity* establishes a *new structure* which has to be perceived as legitimate by the *evaluating audience* (Suddaby et al., 2017). In this study, this *new structure* is the collaboration behavior on the internal crowdsourcing platform. As collaboration behavior in crowds is a new organizational procedure different to traditional working modes, this refers to the legitimacy type defined as ‘procedural legitimacy’ (Suchman, 1995). The *evaluating audience* are the employees of the organization who assess if the process of collaboration seems legitimate to them. Employees form their beliefs about this new collaboration process. This analytical processing is called ‘cognitive legitimacy judgement’ (Bitektine, 2011). Employees can make their judgements on a micro-level or on a macro-level (Bitektine & Haack, 2015). The *entities* are sources for the creation of legitimacy through their actions and decisions (Bitektine & Haack, 2015). Especially within an organization, internal change agents are required to build legitimacy among employees. Birkinshaw et al. (2008) argues that internal change agents are able to construct two dimensions of legitimacy, namely ‘cognitive’ and ‘normative (or sociopolitical)’ legitimacy (e.g., Aldrich & Fiol, 1994; Bitektine, 2011). Cognitive legitimacy involves judgments that collaboration is taken for granted (Aldrich & Fiol, 1994; Suchman, 1995) whereas normative legitimacy is a broader construct that results from the acceptance of the new procedure as mode of working (van Werven et al., 2015). In this study, the project initiator and the employer are defined as the agents influencing the establishment of legitimacy through their calls for collaboration.

3.3.3 Hypotheses

In the following, I argue how the project initiator and the employer provide legitimacy for collaboration in the internal crowd. First, hypotheses are developed on the effect of the project initiator’s call on the scope of collaboration. Second, I build hypotheses how the scope of collaboration and the types of collaborators change after an employer’s call.

3.3.3.1 Project Initiator's Call for Collaboration

A project initiator is an employee who submits a project to the internal crowdsourcing platform. If the project initiator, for instance, lacks expertise to continue with the project, he or she can call for collaboration by stating the need for resources in the project description. However, asking for support requires that the initiator is aware of what skills and expertise are needed for the successful completion of the project (Deichmann & Jensen, 2018). In order to receive the requested resources, the project initiator has to convince other employees to invest time and effort in terms of posting comments or joining an idea as team member. Thus, the project initiator is in a similar situation as an entrepreneur of a new business venture. An entrepreneur who has an idea for a new business also has to find support from investors (Shah & Tripsas, 2007; Zejnilovic, Oliveria, & Veloso, 2012). During a business pitch, an entrepreneur has to persuade investors to provide resources (Pollack et al., 2012). Especially those entrepreneurs who introduce a novel concept have to demonstrate to stakeholders which resources they need to bring their business forward (Zimmerman & Zeitz, 2002). Like entrepreneurs who pitch their ideas to receive investments, project initiators call for resources to receive support from colleagues in the internal crowd.

Entrepreneurship literature suggests that entrepreneurs need to establish legitimacy to acquire resources like personnel or financial support (e.g., Aldrich & Fiol, 1994; Delmar & Shane, 2004; Zimmerman & Zeitz, 2002). In order to construct legitimacy, the entrepreneur must clearly communicate why the new venture adds value and which resources are vital to leverage this business value (Lounsbury & Glynn, 2001; Manning & Bejarano, 2017; Pollack et al., 2012). Prior research on entrepreneurship recognizes that communication of signals play an important role in convincing stakeholders to support a new venture (e.g., Arthurs, Busenitz, Hoskisson, & Johnson, 2009; Connelly, Certo, Ireland, & Reutzel, 2011; Dushnitsky, 2010).¹⁶ Van Werven, Bouwmeester, and Cornelissen (2015) even argue that a transparent signal in a business pitch is able to grant

¹⁶ Signaling theory describes the behavior among individuals who have different access to information. The sender communicates or signals an information whereas a receiver interprets the signal (Connelly, Certo, Ireland, & Reutzel, 2011). The theory originates from Spence (1973) who described the signal of education in a labor market.

cognitive legitimacy for a new venture. In the case of a project initiator, he or she also has to signal to employees in the crowd that they are allowed and even should collaborate on the project. If the initiator submits an idea to the crowdsourcing platform without stating the need for resources, it may not be clear to other participants if collaboration is desired on the project. However, a call for resources can be an obvious sign for collaboration. As the project initiator himself or herself makes this call, it appears credible for peers on the platform that collaboration on the project is legitimate (Birkinshaw et al., 2008; Cattani, Ferriani, & Lanza, 2017). Since observers or outsiders supply their resources to projects that appear legitimate (Cattani et al., 2014; Desai, 2018), participants are more likely to share their knowledge and make contributions on that specific project. Therefore, the project initiator's call may create the perception for individual employees that it is legitimate to contribute to that specific project submitted to the platform. Thus, I claim that the project initiator's call for resources provides cognitive legitimacy on a micro-level of an individual participant. I expect that collaboration will be higher on projects where the initiators calls.

Hypothesis 1 (a), (b), (c): If the project initiator calls for resources, the collaboration on these projects in terms of (a) comments, (b) teaming, and (c) project edits will increase.

As the project initiator calls for different types of resources, a project initiator's call will not only affect if employees join a project but how they behave on the project. Prior research shows that organizations which signal openness to collaborate attract especially the attention of those collaboration partners who seem to provide the requested information (Alexy et al., 2013). In a crowdsourcing context, seekers who send specific signals about their status receive increased attention of solvers who have a solution to the problem (Pollok, Lüttgens, & Piller, 2019). These studies indicate that the attention of collaborating employees is dependent on the type of signal. As the project initiator is able to call for different resources like material and personnel resources, only these participants who are able to supply these requested resources will feel legitimated to contribute to the project. As a consequence, the call from the project initiator may prevent contributions of participants who do not perceive to possess the requested resources. If the project

initiator calls for *material resources* like a 3D printer, this type of call improves the chance that participants who know about this material will leave a comment on where to find or how to get access to this material resource. However, employees may not join as team member or not support to edit the project as they are not asked to do so. If the project initiator is searching for *personnel resources* like for a developer with programming skills, especially the likelihood for finding team members may increase. Participants who feel legitimated will directly send requests to the project initiator to join the team even if they have no prior collaborative or personnel ties with the owner (Hahn et al., 2008). In addition, project initiators can call for *both types of resources*. For instance, they search for a 3D printer and for a colleague with programming skills. Especially the call for both types of resources signals a high willingness and openness for collaboration. Since employees are asked to join the team as well as to provide material support, the likelihood increases that the initiator at least receives one of these resources. As the project initiator can more likely develop the project with the received resources, the probability for a project edit will be higher on projects with a call for both resources. In sum, I argue that the project initiator's call for a specific type of resource may affect the scope of collaboration as follows.

Hypothesis 2 (a): If the project initiator calls for material resources, the collaboration on these projects in terms of comments will increase.

Hypothesis 2 (b): If the project initiator calls for personnel resources, the collaboration on these projects in terms of teaming will increase.

Hypothesis 2 (c): If the project initiator calls for both, personnel and material resources, the collaboration on these projects in terms of project edits will increase.

3.3.3.2 Employer's Call for Collaboration

In most organizations, employees are used to an employer who is responsible for determining project assignment and team constellation. An employer is a hierarchical instance delegating and distributing work top down to the employees within the organization (Dobrajska et al., 2015; Kittur et al., 2013). The employer establishes formal structures and defines how tasks are allocated. In contrast to these traditional structures, formal coordination mechanisms do not exist within crowds (Faraj, Jarvenpaa, & Majchrzak, 2011; Murray & O'Mahony, 2007; Schneckenberg, 2009). In crowds, employees are able to decide themselves if and on which projects they participate. This freedom to self-select is not embedded in most organizational cultures. Thus, especially the new form of collaborating within crowds may not automatically be regarded as legitimate by employees (Birkinshaw et al., 2008). Collaboration in crowds may even be less self-evident than in more traditional forms of working. For instance, prior research states that organizations implementing internal crowdsourcing as new approach face the challenge that employees refrain from contributing (Erickson, Trauth, & Petrick, 2012).

Current research on innovation management and entrepreneurship highlights that especially the introduction of a new practice requires support from management or from an hierarchical authority to gain legitimacy (e.g., Birkinshaw et al., 2008; van Werven et al., 2015). Prior entrepreneurship studies found that a claim from management or from individuals with high status can provide legitimacy for a new venture (e.g., Higgins & Gulati, 2006; Pollok et al., 2019; Zimmerman & Zeitz, 2002). For instance, arguments from an authority can employ direct credibility and acceptance for a novel business (van Werven et al., 2015). Further studies show that organizational practices set up by authorities can empower participation (Foss, Laursen, & Pedersen, 2011). Hence, individual employees will see their participation in the crowdsourcing platform as well as the collaboration with colleagues as an act of empowerment and choice (Deng, Joshi, & Galliers, 2016; Kirkman, Rosen, Tesluk, & Gibson, 2004). Especially for new structures, authorities can provide cognitive legitimacy as employees perceive the procedure as legitimate. An authority might

not only build cognitive legitimacy. According to Raven (2008), an authority is able to constitute so-called 'legitimate position power'. Legitimate position power means that individuals obey to an authority and feel like they should do what the authority proclaims. If employees feel the obligation to confirm to authority's rules and regulations, especially normative legitimacy is constructed (Levi, Sacks, & Tyler, 2009). Accordingly, the call from the employer for collaboration may shape the perception that collaboration is perceived to be the desirable behavior on the crowdsourcing platform. As the employer establishes common norms and practices for crowdsourcing, employees may feel obliged to collaborate. Therefore, I argue that an employer's call for collaboration constructs cognitive and normative legitimacy on a macro-level. I expect that the collaboration on the crowdsourcing platform increases after the event of an employer's call.

Hypothesis 3 (a), (b), (c): After an employer's call, the collaboration in terms of (a) comments, (b) teaming, and (c) project edits will increase compared to the collaboration before the employer's call.

The employer's call may not only enhance the general level of collaboration but provoke different reactions from employees. The employer demands to generally increase collaboration on the crowdsourcing platform but does not ask for a specific type of contribution on a particular project. However, employees will decide to collaborate on projects *without* project initiator's call due to several reasons. First, projects without project initiator's call may have no or few contribution yet. Scholars show that especially designers on online platforms contribute to these projects where they have the flexibility to add their ideas (Seidel & Langner, 2015). New participants can still make greater contributions through collaboration and provide help on those projects where no one has been active yet. Second, participants who are able to contribute to the projects with project initiator's call may have already written a comment or joined the team. The participants lacking the requested skills will choose the remaining projects without a project initiator's call as they feel legitimated by the employer's call. Before the employer's call, participants may not have collaborated on these projects where no project initiator legitimates them to do so. Third, the

employer's call may not only empower the collaborating employees but also the project initiators to collaborate (Ardichvili, Page, & Wentling, 2003). Especially the project initiators who have not called for resources in their project description yet may now feel legitimated by the employer to collaborate. Thus, project initiators without call will allow more collaboration on their projects in terms of reacting to comments, accepting team partners, or permitting project edits. Consequently, the employer's call may increase the scope of collaboration also on projects without project initiator's call. Therefore, I argue that the employer's call changes the relationship between the project initiator's call and the scope of collaboration as follows.

Hypothesis 4 (a), (b), (c): After an employer's call, the collaboration in terms of (a) comments, (b) teaming, and (c) project edit will decrease on projects where the initiator calls for resources compared to the collaboration before the employer's call.

There are many reasons why individual employees are not active on internal crowdsourcing platforms. This includes a lack of understanding of the new collaboration procedure, a lack of motivation to deal with the new procedure, and even negative risks associated with spending working time on the crowdsourcing platform (Germindl, Strich, & Fiedler, 2017; Preece, Nonnecke, & Andrews, 2004). The employer's call may address these main issues. First, previous studies show that individuals who have a common understanding of working together perceive an obligation to help others. A feeling of shared understanding leads to more collaborative interactions in virtual teams (Kosonen, Gan, & Blomqvist, 2013; Peters & Manz, 2007; Wasko & Faraj, 2005). The employer's call may appeal to the individual sense of obligation and responsibility to support colleagues in the crowd which will legitimate lurkers to collaborate. Second, the motivation of so far inactive employees may be increased through the employer's call (Kirkman et al., 2004). As the employer establishes legitimacy for a new and innovative way of working, employees will be motivated to work in an environment allowing experimentation and new forms of working. Through allowing employees to participate in crowdsourcing activities, employers construct an environment for innovation promoting on-the-job experimentation (Bogers, 2018). Third, spending

working time on a crowdsourcing platform has the negative connotation that an employee is not working at full capacity (Yuan & Woodman, 2010). The employer's call can mitigate these negative consequences. Lurkers who decide to become former lurkers are rather encouraged than criticized for collaborating with others. Thus, the employer's call may create cognitive and normative legitimacy on a collaborator level. I expect that inactive employees will delurk and that the number of former lurkers will be higher after an employer's call.

Hypothesis 5: After an employer's call, the collaboration of employees in terms of the number of former lurkers will increase compared to the collaboration before the employer's call.

3.4 Method

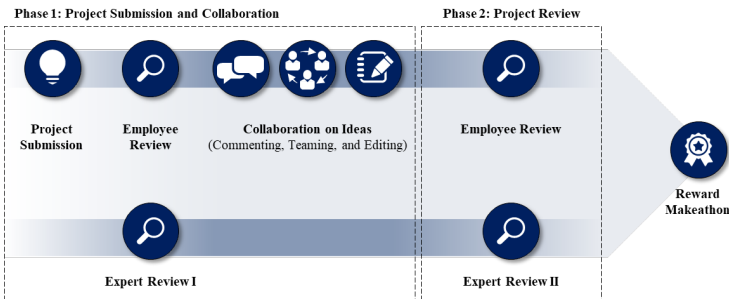
3.4.1 Data

The empirical sample for this study includes 121 projects from an internal crowdsourcing contest conducted at a leading German automotive manufacturer from October to December 2017. In total, 245 employees are registered on the internal crowdsourcing platform. Employees are invited to the online crowdsourcing platform by a company-wide e-mail and a post on the corporate website. Participation is open and voluntary. Participating employees come from 14 different countries, however, 90% originated from Germany. The sample is predominately male including 83% men and 17% women. The employees work in 175 different departments at 19 different locations.

After entering the platform, employees are informed about the process of the crowdsourcing contest (cf. Figure 3.1). The crowdsourcing contest lasts six weeks and has two phases: *project submission and collaboration* (phase 1, duration five weeks), and *project review* (phase 2, duration one week). During the first phase, employees are able to post their projects as response to a specific challenge question on the online crowdsourcing platform. Employees are asked to provide the following content when submitting their project: a project title, a description of the project as well as its benefit and unique selling point, the target group, the project origin (how the project initiator came up with the idea), the time they are already working on the project, the resources needed to develop the project, and their motivation to participate in the contest. After having submitted a project, this becomes visible for all registered participants on the platform. All registered participants have the possibility to comment on posted projects of other participants and to build teams with colleagues. In the middle of the contest, the employer calls for collaboration by sending an e-mail to all registered participants (for details cf. section 3.4.4). During the first phase, employees as well as ten experts review all initial projects submitted to the platform. Experts have been selected based on their expertise on the challenge question and come from different departments including product management, research and development, and production engineering. Employees and experts evaluate the projects on a five-point Likert scale using the same four criteria, namely customer

value, novelty, market potential, and implementation potential. In the second phase of *project review*, developed projects having found at least one team member or having made a significant project edit have the chance for a second review. During this phase, projects are evaluated a second time by the participants and by the experts to account for changes in the project quality due to collaboration. The overall score of an idea is obtained by combining employees' and experts' scores of all four criteria. The three winning projects including their team have the chance to prototype their project during a one-week 'makeathon' and present their prototypes to management.

Figure 3.1: Internal Crowdsourcing Process.



3.4.2 Dependent Variables

Scope of Collaboration. The first set of dependent variables describes the scope of collaboration. The variable *comments* expresses the number of comments per project. As it can be inferred from Table 3.1, a mean number of 5.17 comments per project and a total of 625 comments have been written. Comments have been posted directly under the project and are visible to all participants. The binary variable *team* indicates whether the idea has a team or not. Project initiators have been able to invite members to their team whereas interested employees can send a teaming request as well. More than half of the project initiators have built a team ($n = 64$). For teams, I also report the *team size* as number of additional employees joining a team without counting the project initiator. On projects with team, the team size is on average 1.90 additional team members per project with a maximum of five members per project. The binary variable *project edit* indicates if the project

initiator has adjusted the project content during the contest. In total, 38 project edits have been made. The average expert review for edited projects is 2.68 before the project change and 3.23 after the change. This higher expert review indicates that ideas improve through the project edit.

Table 3.1: Descriptive Statistics. Scope of Collaboration.

Variables	N	Sum	Mean	SD	Min	Max
Comments	121	625	5.17	3.96	0.00	19.00
Team (b)	121	64	0.53	-	0.00	1.00
Team Size	64	109	1.70	0.97	1.00	5.00
Edit (b)	121	38	0.31	-	0.00	1.00

Note: (b) indicates binary variables.

Types of Collaborators. The second set of dependent variables comprises the types of collaborators. In total, 245 employees are registered on the internal crowdsourcing platform. For the further analyses, I take only employees into account which have already been registered before the employer's call. This reduces the sample to 213 employees but allows a balanced sample with observations before and after the employer's call for each employee. Dependent on the time of their first activity on a daily basis, three types of collaborators are considered. *Active participants* are defined as employees who have their first activity (commenting or becoming a team member) within less than the first three days after their registration¹⁷.

Table 3.2 shows that 11% of registered employees are active participants. In contrast, *lurkers* are employees who are registered but not active at any time. Lurkers account for 37% of all registered employees. *Former lurkers* are registered employees who only decide to become active after a time frame above three days. The majority of the registered employees (52%) are former lurker. This

¹⁷ Studies on social media behavior show that users check their status and respond within the reaction time of one day on average (van Koningsbruggen, Hartmann, Eden, & Veling, 2017). As the employees on the internal crowdsourcing platform only work on the platform during the week, we consider additional two days if an employee registered before the weekend but becomes active on Monday in the following week. Therefore, I assume that an employee who is active within less than the first three days is an 'active participant'. If an employee decides to become active after the time period of three days, I define this employee as 'former lurker'. In order to check the robustness of the results, the activity level has also been calculated for a time period of one day and five days. The results are shown in section 3.5.2.2.

high number of former lurkers and lurkers is in line with previous research (Füller et al., 2014). For example, Füller, Jawecki, and Mühlbacher (2007) reported a share of 58% lurkers in their study.

Table 3.2: Descriptive Statistics. Types of Collaborators.

Variables	Frequency (abs.)	Percent (%)
Active Participants	24	11.27
Lurker	78	36.62
Former Lurker	111	52.11
Total (Registered before employer's call)	213	100.00

Note: Reduced sample of 213 employees who are registered before the employer's call.

3.4.3 Independent Variables

The independent variable of interest is the project initiator's call. An initiator submitting a project can call for resources by stating the need for resources in the project description. The initiator's call is operationalized by two variables. First, the binary variable *project initiator's call (b)* indicates if the initiator calls for resources or not. Second, the categorical variable *project initiator's call (c)* has been coded according to the types of resources an initiator asks for. Initiators call for help from their colleagues (personnel resources), ask for specific items to realize their project (material resources), or request both types of resources. An example for a personnel resource call is 'A designer or person having technical skills would be very helpful for the progress of the idea'. For instance, a material resource call is 'I definitely need a 3D printer'. Thus, the variable project initiator's call (c) has four categories, 'no call for resources', 'call for personnel resources', 'call for material resources, and 'call for both resources'. As shown in Table 3.3, 85 project initiators (70%) call for collaboration by stating their need for resources in the project description. If the project initiator requests resources, 33% search for personnel resources, 21% for material resources, and 17% for both resources.

Table 3.3: Descriptive Statistics. Project Initiator's Call.

Variable Category	Variable Value	Frequency (abs.)	Percent (%)
No Call for Resources	0	36	29.75
Call for Personnel Resources	1	40	33.06
Call for Material Resources	2	25	20.66
Call for Both Resources	3	20	16.53
Total	-	121	100.00

3.4.4 Employer's Call for Collaboration

The *employer's call* is operationalized by a manipulation e-mail from the company's management announcing legitimacy for collaboration which has been sent to all registered participants at the middle of the crowdsourcing contest. According to the e-mail, employees submitting comments, building teams, and editing their ideas have the chance to win a price which supports legitimation from management for collaboration. This manipulation e-mail is part of an experimental field study which has been conducted to measure realistic behavior on the platform. A field study has the advantage that participants are not aware of being part of an experiment (Chatterji, Findley, Jensen, Meier, & Nielson, 2016). Accordingly, all participants of the contest received the e-mail representing the employer's call for collaboration. As it cannot be controlled for the fact that employees may talk to each other in an offline context about their participation, it has not been possible to generate one experimental and one control group within this crowdsourcing contest. Thus, designing a control group receiving no information about the manipulation e-mail would not have been viable. However, a comparable crowdsourcing contest conducted on the same crowdsourcing platform can be used as control group. This crowdsourcing contest has a similar topic, namely submitting ideas for future automotive products and services, a comparable contest length of five weeks and initiators also stated their need for resources in the project description. In this contest, employees submitted 179 projects, have written on average 1.9 comments, built 54 teams, and edited 50 projects. As the participants in this comparable contest did *not* receive an e-mail including an employer's call, the contest is applied as control group. In sum, the further

analyses on the effect of the employer's call are conducted with the 'treated' contest (n=95 projects with employer's call) and the 'control' contest (n=179 projects without the employer's call).

In order to investigate the effect of the employer's call on the scope of collaboration (hypotheses 3a-c and 4a-c), the data has been set up as panel with group variable project and two time periods, one before the employer's call (0) and one after the employer's call (1). I use a difference-in-differences (DD) approach to compare a treatment group (that received an e-mail including the employer's call) with a control group (that did not receive an e-mail) at the times before and after the employer's call (Dahlander & O'Mahony, 2011). The difference is calculated between the observed mean outcomes for the treatment and control group before (time = 0) and after (time = 1) the employer's call. This methodological approach has gained interest among social scientists (e.g., Morgan & Winship, 2014) and in organization theory (e.g., Dahlander & O'Mahony, 2011). For hypotheses 4a-c, I aim to further investigate the collaboration before and after the employer's call on two different types of projects, one with initiator's call and one without initiator's call. Therefore, I use an extended DD approach called difference-in-difference-in-differences (DDD) (Imbens & Wooldridge, 2007).¹⁸ As DD and DDD rely on observable characteristics, a time-invariant selection bias may occur. To mitigate this bias, propensity score matching (PSM) is helpful as it matches treatment units with observationally similar control units before estimating the DD impact. Therefore, I first apply PSM with baseline data to make sure that the treatment group is comparable to the control group. The idea is to find projects who are observationally similar in terms of characteristics not affected by the manipulation. This approach adjusts for pretreatment observable characteristics between treated and untreated observations (Rosenbaum & Rubin, 1983). In a first step, a propensity score has been calculated for observations in the baseline time period. Thereby, each project is matched with another project that is most similar in terms of

¹⁸ The DD and DDD estimation is applied according to the instructions from Khandker, Koolwal, and Samad (2009) and Imbens and Wooldridge (2007).

project novelty and project maturity.¹⁹ In a second step, I run separate random effects regressions using DD and DDD predicting the variable of interest (Dahlander & O'Mahony, 2011; Giesselmann & Windzio, 2012). Previous crowdsourcing research has used random effects regression to analyze panel data (Bayus, 2013; Dissanayake et al., 2015). In order to generate a balanced sample with observation for each project before and after the employer's call, I reduce the sample from 121 to 95 projects in the treatment group which have been submitted before the employer's call. Variables which change with the time like project length and project views are included as control variables. The same methodology is applied for the analysis of the types of collaborators (hypothesis 5). The data has been structured as a panel with the group variable user and the two time periods. This sample is reduced from 245 to 213 employees in the treatment group in order to obtain a balanced sample. All results are displayed in section 3.5.2., controls are explained in the following section.

3.4.5 Control Variables

Table 3.4 provides an overview of all independent and control variables. The conducted regression models include controls for project and project initiator characteristics as both may influence the collaboration in internal crowds. Time variant variables are included in the random effects models.

¹⁹ PSM matches projects based on shared characteristics. The two project characteristics, namely project novelty and project maturity, are available for treated and control group. The measures are explained in section 3.4.5.

Table 3.4: Overview of Independent and Control Variables.

Variables	Variable Name	Definition	Measurement
Independent Variables	Project Initiator's Call (b)	Call from project initiator for resources	Binary (1/0)
	Project Initiator's Call (c)	Call from project initiator for resource categories	Categorical (0-3) 0 = No Call 1 = Personnel Resources 2 = Material Resources 3 = Both Resources
Interaction Variables	Employer's Call	Control contest without e-mail (0), treated contest with e-mail (1)	Binary (1/0)
	Time	Time before (0) and after (1) the employer's call	Binary (1/0)
Controls Project Characteristics	Project Maturity	Working hours on project	Categorical (1-3) 1 = Short-term (<1 day) 2 = Medium (1day-1 week) 3= Long-term (> 1week)
	Project Novelty	Competition stated by project initiator	Binary (1/0) 1 = No competition (new) 0 = Competition (not new)
	Project Length	No. of words in project text	Continuous
	Project Views	No. of views per project	Continuous
	Project Age	Time on the platform	Continuous
	Project Trend	Domain popularity in industry	Binary (1/0)
	Project Initial Quality	Initial review of project by experts	Likert Scale, 1-5
Controls Project Initiator's Characteristics	Initiator Motivation for Feedback	Initiator's motivation for feedback	Binary (1/0)
	Project Initiator No. of Projects	No. of posted projects per project initiator	Continuous
	Project Initiator Hierarchical Position	Hierarchical position of project initiator	Binary (1/0)
	Project Initiator Internationality	International background of project initiator	Binary (1/0)
Controls Employees' Activity	Employees' No. of Projects	No. of posted projects per employee	Continuous
	Employees' Experience	Participation in both crowd contests	Binary (1/0)

Controls for project characteristics. The variable *project maturity* indicates how long the project initiator is already working on the project. The prior working hours stated in the project description have been coded manually into three categories: 'short term < 1 day' (1), '1 day < medium term < 1 week' (2) and 'long-term > 1 week' (3). The variable *project maturity* is operationalized as categorical variable with these three categories. The maturity may affect collaboration in two ways.

On the one hand, employees may decide to collaborate on less mature projects as these still leave creative space for improvement. On the other hand, employees may collaborate on more mature projects as they hope for a higher chance of winning the crowdsourcing contest. For the variable *project novelty*, the assessment of the project initiator of the competitive environment is coded. The project is coded as *new* (1) if the project initiator states in the project description that there is no competitive offer on the market. In contrast, if there is already a comparable feature or service available, the project was coded being *not new* (0). Participants might not see the need to contribute to ideas which are already on the market (Brabham, 2010) and therefore collaborate more on novel ideas (Deichmann & Jensen, 2018). The *project length* is operationalized by the number of words in the project description. The project length is a time variant control which is included in the random effects models. Participants may be more willing contribute to projects with a long text that are well comprehensible and detailed as this reduces information uncertainty. An accurate explanation of the project may result in a longer textual description (Hahn et al., 2008). The variable *project views* is operationalized by the number of views per project and controls for the popularity of a project. The project views vary with the time and are included in the random effects models. Popular projects receive more attention and will therefore attract more collaborators (Haas, Criscuolo, & George, 2015). The variable *project age* counts the days the idea is on the platform. Ideas could have been submitted from 24.10.2017 until 28.11.2017. The maximum is 35 days for an idea posted on the 24.10.2017 and minimum is 1 for an idea posted on the 28.11.2017. A high number implies that a project has been published at the start of the contest and has a higher chance for being seen and commented by other users on the platform (Hahn et al., 2008). The binary variable *project trend* is coded as 1 if the project description contains a trend topic and 0 otherwise. Trend topics are those encompassing one of the four *ACES* trends in the automotive industry which are ‘Autonomous driving’, ‘Connectivity’, ‘Electric Mobility’, and ‘Shared Services’ (McKinsey&Company, 2017). Considering the trendiness of the topic addresses the idea’s perceived relevance, strategic importance, and usefulness (Blohm et al., 2010) which may arise the interest of collaborators to join the project (Hahn et al., 2008). The *project initial quality* is

operationalized by the initial expert assessment. The initial project quality is the average expert evaluation of all criteria (customer value, novelty, market potential, and implementation potential) per project assessed after their submission on the platform. Employees might select projects with high score as they have a higher chance of winning the crowdsourcing contest. In addition, employees may rely on the assessment of experts in order to reduce uncertainty (Hahn et al., 2008).

Controls for project initiator's characteristics. The variable *project initiator's motivation for feedback* indicates if the initiator states his motivation to receive feedback in the project description. The variable is 1 if the initiator stated his motivation and 0 otherwise. The motivation to receive feedback on the project may express openness for feedback and attract more crowd members to collaborate on this project. The variable *project initiator's number of ideas* is operationalized by the number of projects submitted by the project initiator and controls for the workload of projects. A higher number of projects may reduce the willingness of the idea initiator to invite team members as he has a higher workload in coordinating the team (Ben-Menaheem, von Krogh, Erden, & Schneider, 2016). The binary variable *project initiator's hierarchical position* describes the hierarchical position within the company. If the employee is a manager in the company, the variable is 1 and 0 otherwise. As the hierarchical position is not visible on the platform, the variables has been coded by using the internal employee directory. Employees might know their supervisors or are able to look it up in the company internal employee directory as well. While one study shows that status of the project initiator in external crowd platforms has no influence on collaboration (Hahn et al., 2008), other studies find evidence for effects of functional role and hierarchical status on knowledge sharing (Ahuja, Galletta, & Carley, 2003). The variable *project initiator's internationality* indicates if the project initiator is German (1) or is an international participant (0). As the majority of participating employees has a German nationality, it is controlled for the fact that an employee is international which can be inferred from the employee's name on the platform. Research on interpersonal knowledge sharing suggests that individuals are more likely respond to problems from other individuals with whom they have connections based on factors such as social

similarity, physical proximity, or prior familiarity (e.g., Espinosa, Slaughter, Kraut, & Herbsleb, 2007; Hinds, Carley, Krackhardt, & Wholey, 2000).

Controls for employees' activity. The continuous variable *employees' number of projects* measures the number of projects per employee. On the one hand, employees with a high number of ideas may increase their collaboration behavior as they are on general very active and aim to receive feedback on their ideas. On the other hand, employees with a high number of projects may have high workload managing their projects – to the detriment of collaboration on others' projects. The binary variable *employees' experience* accounts for the fact that an employee is active in both contests, the one used as treated and the one used as control group. As the contests take place on the same crowdsourcing platform, employees have the chance to participate in both contests. The variable is 1 if the employee participates in both contests and 0 otherwise.

3.5 Results

3.5.1 Effect of Project Initiator's Call

3.5.1.1 Relationship between Project Characteristics

First of all, I investigate the characteristics of the projects submitted to the platform. Table 3.5 displays the relationship between the project initiator's call, the project novelty, and project maturity. The Pearson's chi-squared value (24.21, $p=0.00$) and Cramér's V (-0.45)²⁰ imply a significant, negative relationship between project novelty and the project initiator's call. This means that the project initiator calls more likely for resources if the project is less novel. In contrast, the project initiator's call is significant positively related to project maturity (Pearson's chi-squared=26.78, $p=0.00$, Cramér's V=0.47). This indicates that the project initiator more likely calls for resources if the project maturity is medium or high. Table 3.6 displays a correlation matrix of all variables used in the further analyses.

Table 3.5: Relationship between Project Initiator's Call, Project Novelty, and Maturity.

Variables	Project Novelty		Project Maturity		
	(0)	(1)	(1) Low	(2) Medium	(3) High
No Call from Initiator (0)	7	29	19	12	5
Call from Initiator (1)	58	27	10	31	44
N	65	56	29	43	49
Pearson Chi2 (p-value)	24.21 (p = 0.00)		26.78 (p = 0.00)		
Cramer's V	-0.45		0.47		

Variables	Project Novelty		Project Maturity		
	(0)	(1)	(1) Low	(2) Medium	(3) High
No Call from Initiator (0)	7	29	19	12	5
Personnel Resources (1)	28	12	4	15	21
Material Resources (2)	17	8	4	7	14
Both Resources (3)	13	7	2	9	9
N	65	56	29	43	49
Pearson Chi2 (p-value)	24.35 (p = 0.00)		28.31 (p = 0.00)		
Cramer's V	-0.45		0.34		

²⁰ Pearson's chi-squared test and Cramér's V have been applied as the variable project initiator call (c) and the variable project maturity are categorical variables following Pearson (1900) and Cramér (1999).

Table 3.6: Descriptive Statistics and Correlation Matrix.

Variables	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1 Comments	5.17	3.96	0.00	19.00																	
2 Team (b)	0.53	0.00	0.00	1.00	.40*																
3 Team Size	1.70	0.97	1.00	5.00	.62*																
4 Edit (b)	0.31	0.00	0.00	1.00	.51* .32* .41*																
5 Project Initiator's Call (b)	0.70	0.00	0.00	1.00	.25* .18* -.08 .25*																
6 Project Initiator's Call (c)	1.24	0.00	0.00	3.00	.31* -.07 .37* .37* .77*																
7 Project Maturity (c)	2.17	1.00	1.00	3.00	-.51* -.24* -.49* -.28* .46* .33*																
8 Project Novelty (b)	0.46	0.00	0.00	1.00	.40* .25* .39* .12 -.45* -.32* -.64*																
9 Project Length	1,568	1,284	264	11,779	.26* .25* .08 .33* .16 .28* -.09 .12																
10 Project Views	115	104	1.00	568	.69* .35* .33* .61* .36* .34* -.25* .13 .14																
11 Project Age	17.27	9.35	1.00	35.00	.37* -.04 .01 .27* .35* .34* -.05 -.04 .07 .56*																
12 Project Trend (b)	0.22	0.00	0.00	1.00	.43* .27* .11 .24* .17 .18* -.16 .18* .12 .38* .17																
13 Project Initial Quality	2.56	0.47	1.45	3.85	.30* .19* .21 .18* .22 .28* -.12 .25* .23* .41* .38* .40*																
Project Initiator Motivation 14 Feedback (b)	0.37	0.00	0.00	1.00	.33* .45* .13 .18* .28* .26* -.01 .07 .14 .24* -.03 .21* .21*																
Project Initiator No. of 15 Projects	1.86	1.39	1.00	6.00	-.03 .23* -.10 .03 -.01 -.05 .07 -.03 .05 -.06 -.16 -.02 -.11 .21*																
Project Initiator 16 Hierarchical Position (b)	0.18	0.00	0.00	1.00	-.23* -.28* -.09 -.27* -.02 .08 .12 -.05 -.08 -.26* .01 -.15 .04 -.05 -.20*																
Project Initiator 17 Internationality (b)	0.19	0.00	0.00	1.00	-.18* -.03 -.27* -.11 -.13 -.17 .05 -.13 -.15 -.18* -.32* -.12 -.39* -.13 .39* -.18*																

Note: Correlations with * are significant at 5%. N = 121. (b) indicates binary variables, (c) indicates categorical variables.

3.5.1.2 Collaboration on Projects

Table 3.7 describes the relationship between the project initiator's call and the scope of collaboration. The average number of *comments* is significantly higher for projects with initiator's call (Mean=5.80) than for projects without initiator's call (Mean=3.67). In particular, the average number of comments is higher on those projects where the project initiator calls for material resources (Mean=7.44) compared to projects where the initiator calls for other types of resources. In addition, ideas with project initiator's call in general have a significant higher likelihood of 0.59 of building a *team* than projects without an initiator's call (0.39). From the projects with initiator's call (n=85), 50 calls (0.59) were successful as initiators have found a team. Interestingly, 35 projects (0.41) have not found a team despite the project initiator calling for collaboration. The likelihood for finding a team is higher for projects where the project initiator calls for personnel resources (Mean=0.88) compared to all other projects. However, the project initiator's call does not significantly increase the team size. Compared to all types of calls, the call for both resources leads to the highest average team size with 2.7 team members per idea. In terms of project *edits*, the project initiator's call improves the chance for an edit significantly, especially in response to a call for both resources (Mean=0.75).

Table 3.7: Relationship between Project Initiator's Call and Scope of Collaboration.

Variables	Call from Initiator (n=85)		No Call from Initiator (n=36)	Analysis of Means (p-Value)	
Comments (N=121)	5.80 (4.19)		3.67 (2.87)	p = 0.006	
Team (N=121)	0.59 (-)		0.39 (-)	p = 0.05	
Team Size (N=64)	1.66 (0.94)		1.86 (1.09)	p = 0.51	
Edit (N=121)	0.39 (-)		0.14 (-)	p = 0.007	

Variables	Call for Personnel Resources (n = 39)	Call for Material Resources (n = 20)	Call for Both Resources (n = 26)	No Call for Resources (n = 36)	Analysis of Variance (ANOVA)
Comments (N=121)	4.53 (3.29)	7.44 (4.96)	6.30 (4.13)	3.67 (2.87)	f = 0.007
Team (N=121)	0.88 (-)	0.20 (-)	0.50 (-)	0.39 (-)	f = 0.00
Team Size (N=64)	1.26 (0.56)	2.40 (1.14)	2.70 (0.95)	1.86 (1.10)	f = 0.00
Edit (N=121)	0.30 (-)	0.24 (-)	0.75 (-)	0.14 (-)	f = 0.00

Note: Difference of collaboration (means) with t-test and analysis of variance. N= 121 projects. Standard deviation in parentheses.

To test the first set of hypotheses, different regression models are selected. As the number of comments is a count variable, a negative binominal model is applied. The models for the project team and edit are logit models as both dependent variables are binary. The results in Table 3.8 suggest that the project initiator's call has a positive significant effect on the number of comments ($b=0.62$, $p<0.01$) and on the probability to build a team ($b=2.26$, $p<0.05$). However, the findings show a positive but not significant effect of the project initiator's call on the likelihood for a project edit ($b=1.50$, n.s.).²¹ This supports hypotheses 1a and 1b whereas hypothesis 1c cannot be supported. In particular, the call for material resources has a significant positive effect on the number of comments ($b=0.93$, $p<0.01$) which supports hypothesis 2a. If the project initiator calls for personnel resources, the probability for building a team ($b=9.29$, $p<0.01$) is significantly higher. This finding supports the hypothesis 2b. Lastly, the call for both resources has a positive significant effect on the probability for an edit ($b=7.56$, $p<0.05$) which supports hypothesis 2c. In sum, the findings support the arguments that the collaboration on projects is fostered differently depending on the type of the project initiator's call.

²¹ A post-hoc analysis shows that the effect of the project initiator's call on the project edit becomes significant ($b=2.45$, $p<0.05$) when omitting the control variable 'project views' from the model. The variables project edit and project views are positively correlated (cf. Table 3.6, $r=0.61$). A possible explanation may be that there is lot of activity on projects in terms of comments and teaming before it is edited. This implies a high number of clicks on the project from team members and the project initiator as well as from other interested participants. As project views are a standard control variable (e.g., Haas, Criscuolo, & George, 2015), I keep the variable in the model.

Table 3.8: Regression Results. Scope of Collaboration.

Variables	(H1a) Comments	(H1b) Team	(H1c) Edit	(H2a) Comments	(H2b) Team	(H2c) Edit
Initiator's Call (b)	0.62*** (0.14)	2.26** (0.97)	1.50 (1.44)			
Initiator's Call (1): Personnel Resources				0.54*** (0.15)	9.29*** (3.54)	2.00 (2.25)
Initiator's Call (2): Material Resources				0.93*** (0.17)	-10.19 (6.86)	-1.66 (2.32)
Initiator's Call (3): Both Resources				0.70*** (0.18)	-1.63 (1.95)	7.56** (3.45)
Project Maturity (2): Medium	-0.40*** (0.11)	-0.55 (0.67)	-1.33 (0.90)	-0.39*** (0.11)	-1.01 (0.93)	-1.96 (1.59)
Project Maturity (3): High	-0.88*** (0.16)	-2.12** (0.91)	-2.46* (1.41)	-0.94*** (0.16)	-5.49** (2.93)	-3.11 (2.63)
Project Novelty (b)	0.28** (0.11)	1.20* (0.70)	-0.28 (0.84)	0.29** (0.12)	4.60*** (1.63)	0.83 (1.27)
Project Length	0.00003 (0.00004)	0.0005 (0.0003)	0.0008** (0.0003)	0.00002 (0.00003)	0.0005 (0.0004)	0.001** (0.000554)
Project Views	0.001** (0.0005)	0.009 (0.007)	0.02*** (0.004)	0.0007 (0.0005)	0.03** (0.01)	0.03*** (0.007)
Project Age	0.005 (0.005)	-0.12** (0.06)	-0.05 (0.04)	0.003 (0.005)	-0.13* (0.072)	-0.003 (0.07)
Project Trend	0.15 (0.10)	0.80 (0.78)	-0.67 (0.87)	0.07 (0.10)	4.06*** (1.48)	0.50 (1.23)
Project Initial Quality	0.02 (0.11)	0.09 (0.70)	-0.76 (1.07)	0.04 (0.11)	-1.19 (0.80)	-2.02 (1.26)
Initiator Motivation	0.15 (0.10)	1.71*** (0.58)	-0.43 (0.73)	0.14 (0.09)	6.00 (4.8)	-1.79* (0.96)
Feedback (b)	-0.02 (0.03)	0.46** (0.20)	0.25 (0.22)	-0.004 (0.04)	0.56* (0.30)	0.11 (0.32)
Initiator Hierarchical Position (b)	-0.18 (0.14)	-1.42* (0.84)	-2.20 (1.98)	-0.27* (0.14)	-1.11 (0.83)	-2.69** (1.33)
Initiator Internationality (b)	-0.02 (0.13)	-0.72 (0.76)	-0.96 (0.94)	-0.08 (0.13)	-0.63 (0.98)	0.09 (1.15)
Constant	1.06*** (0.27)	-1.743 (1.79)	-1.06 (2.44)	1.07*** (0.27)	-3.39 (2.6)	-0.84 (3.80)
Observations	121	121	121	121	121	121
Prob > F (or chi2)	0.00	0.00	0.00	0.00	0.00	0.00
R ² (or Pseudo R ²)	0.23	0.44	0.48	0.25	0.77	0.67

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors in parentheses.

3.5.2 Effect of Employer's Call

3.5.2.1 Collaboration on Projects

To test hypotheses 3a-c, PSM followed by a DD approach are adopted using random effects models as described in section 3.4.4.²² The analysis is based on a balanced sample with data on projects before and after the employer's call.²³ The results in Table 3.9 show that the interaction term of the employer's call and the time variable have a significant positive effect on the number of comments ($b=1.18, p<0.01$), the likelihood for a team ($b=1.03, p<0.1$), and the probability for an edit ($b=1.79, p<0.01$). This means that the collaboration on projects in terms of the number of comments, the likelihood for a team, and edit are significantly higher after the employer's call, which supports the hypotheses 3a, 3b, and 3c.

Table 3.9: Regression Results. Interaction Employer's Call on Scope of Collaboration.

Variables	(H3a) Comments	(H3b) Team	(H3c) Edit
Time (b)	-1.49*** (0.24)	-0.62 (0.40)	-1.36*** (0.43)
Employer's Call (b)	0.82*** (0.30)	0.09 (0.48)	-0.46 (0.54)
Time#Employer's Call	1.18*** (0.42)	1.03* (0.61)	1.79*** (0.70)
Project Length	0.0003*** (0.0001)	7.75e-05 (0.0001)	7.44e-05 (0.0001)
Project Views	- (0.003)	-0.005* (0.003)	-0.003 (0.003)
Constant	1.62*** (0.20)	0.28 (0.29)	0.63** (0.32)
Observations	548	204	170
Number of project_id	274	102	85

*Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Standard errors in parentheses. Projects views are not included as controls as the number of clicks are highly correlated (.35) with the number of comments. $N=274$ projects ($n=95$ projects from treated contest, $n=179$ projects from control contest), $N=102$ projects with team ($n=48$ teams from treated contest, $n=54$ teams from control contest), $N=85$ edits ($n=35$ edits from treated contest, $n=50$ edits from control contest).*

²² Approach followed by Dahlander and O'Mahony (2011). Robustness check with ordinary least squares estimation leads to same results following Giesselmann and Windzio (2012).

²³ For the treated contest, 26 projects submitted after the employer's call are excluded as they do not have observations for the first time period. The reduced sample includes 274 projects in total, 95 projects from the treated contest and 179 projects from the control contest.

Table 3.10 compares the collaboration on projects before and after the employer's call by differentiating between projects where the project initiator calls for resources compared to projects without a call for resources. The mean comparison suggests that the number of comments on projects *without* an initiator's call are higher after an employer's call (Mean=3.00) compared to the time before the employer's call (Mean=0.87). In contrast, if the project initiator calls for material resources, projects even receive less comments after the employer's call (Mean=2.75) than before the call (Mean=4.79). Although the probability for building a team does not change, the average number of additional team members on projects without an initiator call is higher after the employer's call (Mean=1.45) compared to the time before the call (Mean=0.45). Lastly, the probability for a project edit does not change on projects without an initiator call. Only if the initiator calls for both resources, the likelihood for a project edit is higher after than before the employer's call. These descriptive results already suggest that collaboration in terms of comments and teaming might be higher after the employer's call on projects where the initiator did *not* ask for a resource.

Table 3.10: Descriptive Statistics. Collaboration Before and After Employer's Call.

Variables	Projects without Initiator Call (0)			Projects with Call for Personnel Resources (1)		
	Before Employer's Call	After Employer's Call	Difference (After-Before)	Before Employer's Call	After Employer's Call	Difference (After-Before)
Comments	0.87 (1.71)	3.00 (3.12)	2.13***	3.14 (3.50)	2.00 (2.38)	-1.14
Team	0.34 (-)	0.67 (-)	0.33	0.52 (-)	0.48 (-)	-0.04
Team Size	0.45 (0.73)	1.45 (1.13)	1.00*	0.60 (0.65)	0.68 (0.75)	0.08
Edit	0.50 (-)	0.50 (-)	0.00	0.55 (-)	0.45 (-)	-0.1
Variables	Projects with Call for Material Resources (2)			Projects with Call for Both Resources (3)		
	Before Employer's Call	After Employer's Call	Difference (After-Before)	Before Employer's Call	After Employer's Call	Difference (After-Before)
Comments	4.79 (3.54)	2.75 (3.50)	-2.04**	2.89 (3.67)	3.32 (3.20)	0.42
Team	0.80 (-)	0.20 (-)	0.40	0.45 (-)	0.56 (-)	0.12
Team Size	0.80 (0.45)	1.6 (0.90)	0.80*	1.34	1.45	0.11
Edit	0.84 (-)	0.17 (-)	-0.67*	0.29 (-)	0.71 (-)	0.43*

*Note: Difference of collaboration (means) on projects before and after the employer's call with t-test in treated contest. N= 95 projects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (two tailed test). Standard deviation in parentheses.*

In order to further investigate the collaboration on different types of projects before and after the employer's call, a DDD approach has been applied (cf. section 3.4.4). According to the random effects models in Table 3.11, the interaction term between the time variable, the employer's call and the project initiator's call has a negative significant effect on the project comments ($b=-2.15$, $p<0.01$), and on the probability for a team ($b=-2.89$, $p<0.05$), but no significant effect on the edit likelihood ($b=-0.77$, n.s.). Thus, hypotheses 4a and 4b can be supported whereas no support is found for hypothesis 4c. These findings suggest that the number of comments as well as the probability for a team decrease after the employer's call on projects where the initiator calls for resources. A more detailed analysis shows that especially when the project initiator calls for material and for personnel resources, the number of comments and the probability for a team are significantly reduced after the employer's call. The call for both resources only leads to a reduction of the number of comments after the employer's call compared to before the employer's call.

Table 3.11: Regression Results. Interaction Employer's Call with Project Initiator's Call.

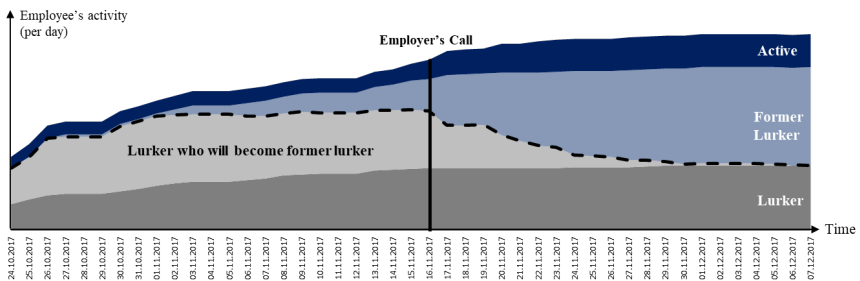
Variables	(H4a) Comments	(H4b) Team	(H4c) Edit
Time (b)	-0.84** (0.37)	-1.59** (0.76)	-2.23* (1.16)
Employer's Call (b)	-0.22 (0.53)	-1.22 (0.92)	-0.94 (1.31)
Time#Employer's Call	2.96*** (0.75)	3.25** (1.28)	2.46 (1.84)
Initiator's Call (b)	1.57*** (0.34)	-0.69 (0.63)	-0.51 (0.88)
Time#Initiator's call	-1.04** (0.48)	1.36 (0.89)	1.02 (1.24)
Employer's Call#Initiator's call	1.10* (0.63)	1.71* (1.01)	0.60 (1.39)
Time#Employer's Call#Initiator's call	-2.15*** (0.90)	-2.89** (1.43)	-0.77 (1.96)
Project Length	0.0002*** (0.0001)	6.32e-05 (0.0001)	6.65e-05 (0.000130)
Project Views	- -	-0.01* (0.00)	-0.003 (0.003)
Constant	0.76* (0.27)	0.78 (0.54)	1.08 (0.82)
Observations	548	204	170
Number of project_id	274	102	85

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Standard errors in parentheses. Sample size see Table 3.9.

3.5.2.2 Collaboration of Employees

With the last set of analyses, I investigate the effect of the employer's call on the types of collaborators. Figure 3.2 displays the activity of all 245 registered employees in the internal contest differentiated according to the three types of collaborators on a daily basis. The date of the employer's call is marked to differentiate the activity before and after the call. As it can be inferred from the figure, the number of lurkers (marked in dark grey) diminishes after the employer's call. A large number of these lurkers (marked in light grey) become former lurkers (marked in light blue) after the employer's call. In addition, the number of active employees (marked in dark blue) increases as some employees still register and become active after the employer's call. The dotted line separates between the lurkers who are not active (marked in grey) and the participating employees who are active or delurked (marked in blue).

Figure 3.2: Employees' Activity.



Note: Employees' activity on a daily basis. Figure displays all $N = 245$ registered employees including employees who registered after the employer's call.

For a further comparison of the types of collaborators before and after the employer's call (cf. Table 3.12), the sample is reduced from 245 to 213 employees who have already been registered before the employer's call. The number of active participants remains stable at a level of 11% before and after the employer's call. However, the number of former lurker increases by 33% after the employer's call. In return, the share of lurker decreases by 33% as these participants decided to 'delurk' after the employer's call.

Table 3.12: Descriptive Statistics. Collaborators Before and After Employer's Call.

Variables	Before Employer's Call	After Employer's Call	Difference (After-Before)
Active Participants	0.11	0.11	-
Former Lurker	0.19	0.52	0.33***
Lurker	0.70	0.37	-0.33***
Total	1.00 (N=213)	1.00 (N=213)	

*Note: Difference in collaborators before and after the employer's call with t-test. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

To test hypothesis 5, fixed effects regressions are estimated comparing the treated to the control contest. The results in Table 3.13 show that the interaction term of the employer's call and the time period has a significant positive effect on the number of former lurkers ($b=4.06$, $p < 0.01$). This indicates that the number of former lurkers increase significantly after the employer's call which supports the hypothesis 5. The project initiator's call has a negative effect on the number of former lurkers ($b=-0.11$, $p < 0.01$) which entails that former lurkers do not become active on projects with initiator call. To validate the results, two robustness checks have been conducted. In a first robustness check, former lurkers are defined as participants who become active after the time period of one day and in the second robustness check after five days. Table 3.13 displays that the results are robust even for these different definitions of former lurkers.

Table 3.13: Regression Results. Interaction of Employer's Call on Types of Collaborators.

Variables	(H5) Former Lurker	(Robustness 1 Day) Former Lurker	(Robustness 5 Days) Former Lurker
Time (b)	5.75*** (1.13)	5.93*** (1.13)	5.82*** (1.19)
Employer's Call (b)	-5.18*** (1.60)	-8.69*** (1.52)	-0.61 (1.26)
Time#Employer's Call	4.06*** (1.31)	4.46*** (1.24)	2.59** (1.15)
Employees' Projects	0.96** (0.49)	1.65** (0.69)	1.19** (0.51)
Employees' Experience (b)	1.38 (1.13)	0.81 (1.27)	2.47** (1.06)
Project Initiator's Call	-0.11*** (0.02)	-0.13*** (0.02)	-0.05*** (0.02)
Constant	-1.79 (1.69)	3.70*** (1.30)	-8.40*** (1.45)
Observations	808	808	808
Number of user_group	404	404	404

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors in parentheses. (b) indicates binary variables. $n = 213$ employees from treated group, $n = 191$ employees from control group. Balanced sample with observation for each employee before ($time = 0$) and after ($time = 1$) the employer's call.

3.6 Discussion

3.6.1 Summary

The first objective of this study is to investigate how the project initiator's call influences the collaboration on projects in an internal crowd. In general, the results show that a call from the project initiator increases the collaboration in terms of comments and the likelihood for teaming (hypotheses 1a-1b). Specifically, the type of call matters for the scope of collaboration. A call for material resources leads to an increase of the lowest scope of collaboration in form of comments (hypothesis 2a). After a call for material, colleagues perceive it as legitimate to post comments on the demanded material. A call for personnel resources enhances the probability for building a team (hypothesis 2b) but does not increase the team size. A possible explanation may be that employees with the requested skills feel legitimated to join the team. But this call may deter employees with other skills to join the team which limits the team size. Contrary to the expectations, a call from the project initiator does not improve the likelihood for a project edit (hypothesis 1c).²⁴ It may be possible that a call for resources in general does not induce the participants in the crowd to supply the resources which are required to edit the project content. Only if a project initiator calls for both resources, the chance for an edit is significantly higher (hypothesis 2c). This indicates that especially searching for both resources increases the likelihood that the project initiator has received the necessary resources in order to modify the project content. In sum, the findings indicate that the project initiator's call creates legitimacy to collaborate on a micro-level which leads to efficient project allocation within the crowd.

The findings further indicate that the crowd-based project allocation can be fostered by the project initiator's call only on certain project types. According to the descriptive results (cf. Table 3.5), the project initiator's call is negatively correlated with project novelty and positively related to project maturity. This relationship may depend on different needs of the project initiator within each

²⁴ The effect of the project initiator's call on the likelihood for a project edit is only significant when omitting the variable project views (cf. section 3.5.1.2).

project phase. One study found that creators need cognitive flexibility in the first phase of generating ideas and support for idea development only in the subsequent elaboration phase (Perry-Smith & Mannucci, 2017). If the project is novel and the maturity is low, the project initiator does not know which resources he will need for the realization of the project. If the project is less novel and the project maturity high, the initiator is in a more elaborated phase and knows which support is needed for the completion of the project. This implies that project initiators can only create legitimacy to collaborate on specific projects. However, especially more novel and less mature will need support from the crowd in order to be developed further although the project initiator does *not* call on these projects.

The results suggest that the employer's call matters for providing legitimacy to collaborate on projects where the project initiator does not call. The results show that the collaboration does not only increase in general after an employer's call (hypotheses 3a-3c). The employer's call has also a significant negative effect on the relationship between the project initiator's call and the number of comments (hypothesis 4a) and the probability for finding a team (hypothesis 4b). After the employer's call, even the projects *without* initiator's call receive comments and employees join these projects. Thus, the employer's call establishes legitimacy to collaborate on projects without initiator's call and thereby supports the crowd-based allocation on these projects. On the level of collaborators, the number of former lurkers is higher after an employer's call (hypothesis 5). By sending a message providing legitimacy for collaboration, the employer activates lurkers which have not been active before. This improves the activity level on the internal crowdsourcing platform. In sum, the employer's call positively influences the general level of collaboration by providing legitimacy on a macro-level in the crowd.

3.6.2 Theoretical Contributions

This study provides several theoretical contributions. The first theoretical contribution relates to the debate on crowd-based project allocation in distributed innovation research (Boudreau et al., 2016; Faraj et al., 2011; Kornberger, 2017). One of the major challenges in organizational

scholarship concerns how distributed social collectives govern, organize, and coordinate work to achieve collective outcomes (Faraj et al., 2011). Decomposing complex work into tasks, coordinating and motivating workers is difficult and time consuming (Benbya & van Alstyne, 2011; Simula & Vuori, 2012). Hence, crowd-based project allocation becomes increasingly attractive since employees self-select the project where they aim to collaborate on. When employees in a crowd self-select to collaborate on a project, they organize work simpler and less costly than in a traditional organization where employers assign project work (Dahlander & O'Mahony, 2011). As relatively little is known about the process of coordinating work in online communities (O'Mahony & Ferraro, 2007), this study sheds light on how projects are allocated in internal crowds. Levering the data from an internal crowd contest, this study presents unique insights on antecedents of project allocation in crowds, namely the call from the project initiator. In addition, the study shows that project allocation changes after the call from the employer.

As project allocation is the result from collaboration behavior between employees, the study contributes to growing research on different forms of collaboration and co-creation behavior on crowdsourcing platforms (e.g., Bergendahl & Magnusson, 2014; Boudreau et al., 2014; Kathan et al., 2015). One of the key challenges in online communities is to sustain collaboration (Wendelken, Danzinger, Rau, & Moeslein, 2014). Existing research focuses either on how to elicit collaboration behavior on projects (Adamczyk et al., 2011; Dissanayake et al., 2015; Ren et al., 2014) or on the collaborating individuals (Füller et al., 2014; Nonnecke & Preece, 2000). Extending prior research, this study provides a differentiated view on the scope of collaboration as well as on the types of collaborators. The results indicate that collaboration can be stimulated differently on a project and a collaborator level. With regards to the scope of collaboration, all types of project initiator's calls activate the simplest scope of collaboration, namely comments. But only specific calls from the project initiator support more elaborated collaboration forms like teaming or editing. Even after an employer's call, employees engage more in commenting and teaming than before the call. Regarding the collaborators, results suggest that lurkers become active after an employer's call.

Third, this study introduces a novel mechanism for explaining the phenomenon of collaboration and co-creation behavior in internal crowdsourcing. Instead of applying social network theory like previous research (e.g., Benefield et al., 2016; Dissanayake et al., 2015; Hahn et al., 2008; Robert, Dennis, & Ahuja, 2008), this is the first study to propose legitimacy theory as a foundation for collaboration in internal crowdsourcing. Legitimacy theory can be used to explain the introduction of new management practices (Birkinshaw et al., 2008; van Werven et al., 2015) as internal crowdsourcing. Especially project initiators like entrepreneurs require legitimacy for their new projects or ventures (Pollack et al., 2012; Zimmerman & Zeitz, 2002). Building on the legitimacy theory from Suchman (1995), the empirical results are in favor of the arguments that the type of project initiator's call creates legitimacy on a micro-level and that the employer's call establishes legitimacy on a macro-level.

Lastly, the study complements research on innovation management and employee-driven innovation (e.g., Herstatt et al., 2016; Kesting & Parm Ulhøi, 2010; Simula & Ahola, 2014). Prior studies claim that employees provide remarkable social and cognitive resources which are spread across the organization (Schweisfurth & Herstatt, 2016). This study shows how internal crowdsourcing can be applied to integrate resources across the company and induce them to work together on projects beyond their original job. Especially the collaboration functionalities offered through internal crowdsourcing can foster knowledge sharing. Thus, internal crowdsourcing combines the advantages of idea generation which are common in employee suggestion systems (Abu El-Ella, Stoetzel, Bessant, & Pinkwart, 2013) and the benefits of community functions from an enterprise social network (von Krogh, 2012).

3.6.3 Managerial Contributions

For practitioners, this study shows that projects in an organization can indeed be allocated via an internal crowd. Crowd-based project allocation provides several advantages especially for large firms. First, it offers a smart approach to connect a dispersed workforce and to enable knowledge sharing between employees who are located in different departments. This means that internal

crowds allow to leverage the diverse knowledge which resides in the company. Second, crowd-based project allocation may speed up the project development. As employees self-select their projects in an internal crowd, employers will save the time which is traditionally needed to set up the right project team. A lack of hierarchy in crowds will realize a faster decision making of the project team. Third, crowd-based project allocation is a more flexible approach than traditional project allocation by hierarchy. It allows to match the current demand of initiators to develop certain projects with the supply of resources in the crowd. As employees are working together independent from their traditional department affiliation, this supports to balance workload in an organization and to reduce departmental borders. Since internal crowdsourcing enables smart, fast, and flexible allocation of projects, it presents one form of *agile* working in organizations (Waldock, 2015). This working mode has not only advantages for the research and development departments but may also provide value for departments like human resources to match people to projects. Therefore, this study shows that internal crowds offers a smart approach to design innovative and agile ways of co-working.

In detail, the findings of the study include several recommendations how to enhance project allocation in an internal crowd. First of all, collaboration within the crowd should be empowered by appropriate community functions. This implies that not only commenting but also teaming and editing functions should be available. Besides that, the possibility to explicitly state the resources needed has shown to trigger collaboration. Thus, employers might further encourage project initiators to take responsibility for the resources needed. However, this study also indicates that the project initiator's call has limits to spur collaboration. The project initiator's call will provide only legitimacy for those collaborators who have the requested skills. Moreover, the project initiator mainly calls if the project is less novel or high mature. One alternative to overcome these constraints may be that all employees are able to co-create on the resources needed. For instance, crowdsourcing platforms can be designed in a way that all employees can support a project initiator to specify the resources needed for the project.

To ensure crowd-based project allocation, employers have to consider how much they intervene into the internal crowdsourcing process. Especially if the crowdsourcing approach is new to the organization, the event of an employer's call for collaboration can legitimize collaboration behavior on the platform. Therefore, employers should encourage their employees to invest time and resources to participate in innovative activities such as crowdsourcing contest. By defining the initial challenge question, an employer also guides and controls which projects employees post on the platform and which projects they develop further. This makes it essential that employers select and formulate the right challenge question which fits to the strategic direction of the organization. In sum, support from the employer is still important to enable crowd-based project allocation.

3.6.4 Limitations and Future Research

The study has some limitations which provide opportunities for future research. The objective of the study is to explain crowd-based allocation of projects. One first limitation is that the employees in the internal crowdsourcing contest only submit creative projects on an innovative challenge question. Thus, the findings are not generalizable for crowd-based allocation of all projects in an organization. Within an organization, the majority of projects which have to be completed may include more standardized work like the fulfilment of legal regulations. These tasks may be less innovative and creative. Therefore, it remains an interesting point for future research if and how standardized and routine projects can be allocated within crowds as well or if these still need management support. In addition, further research can validate if the results hold true for organizations in which internal crowdsourcing is already an established management practice and not a new way of organizing work.

With regards to the collected data, only a limited number of projects have been edited by the project initiator. In this study, only the project initiators had the authorization to edit a project and to post the developed content. Future research may introduce more possibilities for team members to edit a project as it is possible in collaborative communities like Wikipedia (Arazy et al., 2016; Boudreau & Lakhani, 2013). This may stimulate the collaboration on the platform and enable further research

to investigate co-creation between team members and project initiators. In terms of the employer's call, the study may suffer from a selection bias as the experimental and the control group originate from different contests. Setting up a control group within the same contest was not possible as it cannot be controlled for the fact that individuals communicate offline. Thus, the control group has been defined by using a comparable crowdsourcing contest conducted on the same platform (cf. section 3.4.4). To validate the results, future research can analyze the effect of the manipulation by adding a control group to the field experiment and controlling for the possibility of offline communication.

This work focuses on the role of the project initiator but does not take into account the relationship between the project initiator and the self-selected collaborator. Social effects like friendships or prior collaboration of employees on offline projects may influence the intensity of collaboration. In the company hosting the contest, job rotation is very common. Thus, the degree of familiarity between collaborators cannot be controlled for. Even though team members are not in the same department during the crowdsourcing contest, they might have worked together previously. A last limitation is that communication between employees might have occurred outside of the contest. Especially when team members know each other already, a direct exchange of opinions via other communication channels such as phone, e-mail or face-to-face meetings might appear more time-efficient. There was no possibility to control for this happening during the contest. To control for familiarity and offline communication, it would be beneficial to collect this information in future studies via questionnaires.²⁵ Future research can specially examine the relationship between the project initiator and the collaborator over time including their offline communication behavior. This may be interesting as long-term relationships between dyads contribute to 'intimate' co-creation (Rouse, 2018).

²⁵ As the hosting company does not allow to collect personalized data from employees due to data protection reasons, it was not possible to conduct a questionnaire or interviews on offline communication and on the personal relationships between employees.

3.7 Conclusion

Collaboration within internal crowdsourcing offers remarkable opportunities to allow crowd-based project allocation. So far, there has been a lack of research which projects employees will select for collaboration within the crowd when provided with similar alternatives. Therefore, this research aims to investigate to what extent calls for collaboration from two different senders influence the decision to collaborate in internal crowdsourcing. In particular, the results reveal that the project initiator's call creates legitimacy on a micro-level increasing the scope of collaboration on specific projects. The event of an employer's call establishes legitimacy on a macro-level which changes the collaboration scope and activates collaborators. In sum, this work has central contributions to current research on project allocation within internal crowds and draws important implications and interesting avenues for future research on designing innovative and agile forms of co-working.

3.8 References

- Abu El-Ella, N., Stoetzel, M., Bessant, J., & Pinkwart, A. 2013. Accelerating high involvement: The role of new technologies in enabling employee participation in innovation. *International Journal of Innovation Management*, 17(6): 1–22.
- Acar, O. A. 2019. Motivations and solution appropriateness in crowdsourcing challenges for innovation. *Research Policy*, 48(8): 103716.
- Adamczyk, S., Bullinger, A. C., & Moeslein, K. M. 2011. Commenting for new ideas: Insights from an open innovation platform. *International Journal of Technology Intelligence and Planning*, 7(3): 232–249.
- Ahuja, M. K., Galletta, D. F., & Carley, K. M. 2003. Individual centrality and performance in virtual R&D groups: An empirical study. *Management Science*, 49(1): 21–38.
- Aldrich, H. E., & Fiol, C. M. 1994. Fools rush in? The institutional context of industry creation. *Academy of Management Review*, 19(4): 645–670.
- Alexy, O., George, G., & Salter, A. J. 2013. Cui bono? The selective revealing of knowledge and its implications for innovative activity. *Academy of Management Review*, 38(2): 270–291.
- Arazy, O., Daxenberger, J., Lifshitz-Assaf, H., Nov, O., & Gurevych, I. 2016. Turbulent stability of emergent roles: The dualistic nature of self-organizing knowledge coproduction. *Information Systems Research*, 27(4): 792–812.
- Ardichvili, A., Page, V., & Wentling, T. 2003. Motivation and barriers to participation in virtual knowledge-sharing communities of practice. *Journal of Knowledge Management*, 7(1): 64–77.
- Arthurs, J. D., Busenitz, L. W., Hoskisson, R. E., & Johnson, R. A. 2009. Signaling and initial public offerings: The use and impact of the lockup period. *Journal of Business Venturing*, 24(4): 360–372.
- Bayus, B. L. 2013. Crowdsourcing new product ideas over time: An analysis of the Dell Ideastorm Community. *Management Science*, 59(1): 226–244.
- Benbya, H., & van Alstyne, M. 2011. How to find answers within your company. *MIT Sloan Management Review*, 52(2): 65–76.
- Benefield, G. A., Shen, C., & Leavitt, A. 2016. Virtual team networks: How group social capital affects team success in a massively multiplayer online game. *Proceedings 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing, 27 February-2 March 2016, San Francisco, California, USA*: 677–688.

- Ben-Menahem, S. M., von Krogh, G., Erden, Z., & Schneider, A. 2016. Coordinating knowledge creation in multidisciplinary teams: Evidence from early-stage drug discovery. *Academy of Management Journal*, 59(4): 1308–1338.
- Bergendahl, M., & Magnusson, M. 2014. Combining collaboration and competition: A key to improved idea management? *European Journal of International Management*, 8(5): 528–547.
- Bikard, M., Murray, F., & Gans, J. S. 2015. Exploring tradeoffs in the organization of scientific work: Collaboration and scientific reward. *Management Science*, 61(7): 1473–1495.
- Birkinshaw, J., Hamel, G., & Mol, M. T. 2008. Management innovation. *Academy of Management Review*, 33(4): 825–845.
- Bitektine, A. 2011. Toward a theory of social judgements of organizations: The case of legitimacy, reputation, and status. *Academy of Management Review*, 36(1): 151–179.
- Bitektine, A., & Haack, P. 2015. The “macro” and the “micro” of legitimacy: Toward a multilevel theory of the legitimacy process. *Academy of Management Review*, 40(1): 49–75.
- Blohm, I., Bretschneider, U., Leimeister, J.M., & Krcmar, H. 2010. Does collaboration among participants lead to better ideas in it-based idea competitions - An empirical investigation. *Hawai'i International Conference on System Sciences (HICSS), 5–8 January 2010, Kauai, USA*: 1–11.
- Bogers, M. 2018. Innovating by doing: Promoting on-the-job experimentation through a climate for innovation. *International Journal of Entrepreneurial Venturing*, 10(3): 362–393.
- Boudreau, K. J., Gaule, P., Lakhani, K. R., & Woolley, A. W. 2014. From crowds to collaborators: Initiating effort & catalyzing interactions among online creative workers. *Carnegie Mellon University, Research Showcase, CMU, Tepper School of Business*, (1): 1–34.
- Boudreau, K. J., Guinan, E. C., Lakhani, K. R., & Riedl, C. 2016. Looking across and looking beyond the knowledge frontier: Intellectual distance, novelty, and resource allocation in science. *Management Science*, 62(10): 2765–2783.
- Boudreau, K. J., Lacetera, N., & Lakhani, K. R. 2011. Incentives and problem uncertainty in innovation contests: An empirical analysis. *Management Science*, 57(5): 843–863.
- Boudreau, K. J., & Lakhani, K. R. 2013. Using the crowd as an innovation partner. *Harvard Business Review*, 91(4): 61–69.
- Brabham, D. C. 2010. Moving the crowd at Threadless. *Information, Communication & Society*, 13(8): 1122–1145.

- Bullinger, A. C., Neyer, A.-K., Rass, M., & Moeslein, K. M. 2010. Community-based innovation contests: Where competition meets cooperation. *Creativity and Innovation Management*, 19(3): 290–303.
- Cattani, G., Ferriani, S., & Allison, P. D. 2014. Insiders, outsiders, and the struggle for consecration in cultural fields. *American Sociological Review*, 79(2): 258–281.
- Cattani, G., Ferriani, S., & Lanza, A. 2017. Deconstructing the outsider puzzle: The legitimization journey of novelty. *Organization Science*, 28(6): 965–992.
- Chasanidou, D., Sivertstøl, N., & Hildrum, J. 2018. Exploring employee interactions and quality of contributions in intra-organisational innovation platforms. *Creativity and Innovation Management*, 27(4): 458–475.
- Chatterji, A. K., Findley, M., Jensen, N. M., Meier, S., & Nielson, D. 2016. Field experiments in strategy research. *Strategic Management Journal*, 37(1): 116–132.
- Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. 2011. Signaling theory: A review and assessment. *Journal of Management*, 37(1): 39–67.
- Cramér, H. 1999. *Mathematical methods of statistics*. Princeton paperbacks. Princeton: Princeton University Press.
- Dahlander, L., & Frederiksen, L. 2012. The core and cosmopolitans: A relational view of innovation in user communities. *Organization Science*, 23(4): 988–1007.
- Dahlander, L., & O'Mahony, S. 2011. Progressing to the center: Coordinating project work. *Organization Science*, 22(4): 961–979.
- Deichmann, D., & Jensen, M. 2018. I can do that alone...or not? How idea generators juggle between the pros and cons of teamwork. *Strategic Management Journal*, 39(2): 458–475.
- Delmar, F., & Shane, S. 2004. Legitimizing first: Organizing activities and the survival of new ventures. *Journal of Business Venturing*, 19(3): 385–410.
- Deng, X., Joshi, K. D., & Galliers, R. D. 2016. The duality of empowerment and marginalization in microtask crowdsourcing: Giving voice to the less powerful through value sensitive design. *MIS Quarterly*, 40(2): 279–302.
- Desai, V. M. 2018. Collaborative stakeholder engagement: An integration between theories of organizational legitimacy and learning. *Academy of Management Journal*, 61(1): 220–244.
- Dissanayake, I., Zhang, J., & Gu, B. 2015. Task division for team success in crowdsourcing contests: Resource allocation and alignment effects. *Journal of Management Information Systems*, 32(2): 8–39.

- Dobrajska, M., Billinger, S., & Karim, S. 2015. Delegation within hierarchies: How information processing and knowledge characteristics influence the allocation of formal and real decision authority. *Organization Science*, 26(3): 687–704.
- Dushnitsky, G. 2010. Entrepreneurial optimism in the market for technological inventions. *Organization Science*, 21(1): 150–167.
- Eisenhardt, K. M. 1989. Agency theory: An assessment and review. *The Academy of Management Review*, 14(1): 57–74.
- Erickson, L. B., Trauth, E. M., & Petrick, L. 2012. Getting inside your employees' heads: Navigating barriers to internal-crowdsourcing for product and service innovation. *Proceedings of the 33rd International Conference on Information Systems (ICIS), 16-19 December 2012, Orlando, Florida, USA*: 3628–3639.
- Espinosa, J. A., Slaughter, S. A., Kraut, R. E., & Herbsleb, J. D. 2007. Familiarity, complexity, and team performance in geographically distributed software development. *Organization Science*, 18(4): 613–630.
- Faraj, S., Jarvenpaa, S. L., & Majchrzak, A. 2011. Knowledge collaboration in online communities. *Organization Science*, 22(5): 1224–1239.
- Faullant, R., & Dolfus, G. 2017. Everything community? Destructive processes in communities of crowdsourcing competitions. *Business Process Management Journal*, 23(6): 1108–1128.
- Foss, N. J., Laursen, K., & Pedersen, T. 2011. Linking customer interaction and innovation: The mediating role of new organizational practices. *Organization Science*, 22(4): 980–999.
- Fuger, S., Schimpf, R., Füller, J., & Hutter, K. 2017. User roles and team structures in a crowdsourcing community for international development – A social network perspective. *Information Technology for Development*, 23(3): 438–462.
- Füller, J., Hutter, K., Hautz, J., & Matzler, K. 2014. User roles and contributions in innovation-contest communities. *Journal of Management Information Systems*, 31(1): 273–308.
- Füller, J., Jawecki, G., & Mühlbacher, H. 2007. Innovation creation by online basketball communities. *Journal of Business Research*, 60(1): 60–71.
- Germindl, L., Strich, F., & Fiedler, M. 2017. Why do you NOT use the enterprise social network? Analyzing non-users's reasons through the lenses of affordances. *38th International Conference on Information Systems (ICIS), 10-13 December 2017, Seoul, South Korea*: 1–20.

- Giesselmann, M., & Windzio, M. 2012. *Regressionsmodelle zur Analyse von Paneldaten*. Studienskripten zur Soziologie. Wiesbaden: Springer VS.
- Grote, M., Herstatt, C., & Gemünden, H. G. 2012. Cross-divisional innovation in the large corporation: Thoughts and evidence on its value and the role of the early stages of innovation. *Creativity and Innovation Management*, 21(4): 361–375.
- Guo, W., Zheng, Q., An, W., & Peng, W. 2017. User roles and contributions during the new product development process in collaborative innovation communities. *Applied ergonomics*, 63: 106–114.
- Haas, M. R., Criscuolo, P., & George, G. 2015. Which problems to solve? Online knowledge sharing and attention allocation in organizations. *Academy of Management Journal*, 58(3): 680–711.
- Hahn, J., Moon, J. Y., & Zhang, C. 2008. Emergence of new project teams from open source software developer networks: Impact of prior collaboration ties. *Information Systems Research*, 19(3): 369–391.
- Hars, A., & Ou, S. 2002. Working for free? Motivations for participating in open-source projects. *International Journal of Electronic Commerce*, 6(3): 25–39.
- Herstatt, C., Schweisfurth, T. G., & Raasch, C. 2016. When passion meets profession: How embedded lead users contribute to corporate innovation. In D. Harhoff & K. R. Lakhani (Eds.), *Revolutionizing innovation: Users, communities, and open innovation*: 397–437. Cambridge, Massachusetts, London: The MIT Press.
- Hertel, G., Niedner, S., & Herrmann, S. 2003. Motivation of software developers in open source projects: An internet-based survey of contributors to the Linux kernel. *Research Policy*, 32(7): 1159–1177.
- Higgins, M. C., & Gulati, R. 2006. Stacking the deck: The effects of top management backgrounds on investor decisions. *Strategic Management Journal*, 27(1): 1–25.
- Hinds, Carley, Krackhardt, & Wholey. 2000. Choosing work group members: Balancing similarity, competence, and familiarity. *Organizational behavior and human decision processes*, 81(2): 226–251.
- Human, S. E., & Provan, K. G. 2000. Legitimacy building in the evolution of small-firm multilateral networks: A comparative study of success and demise. *Administrative Science Quarterly*, 45(2): 327–365.

- Hutter, K., Füller, J., Hautz, J., Bilgram, V., & Matzler, K. 2015. Machiavellianism or morality: Which behavior pays off in online innovation contests? *Journal of Management Information Systems*, 32(3): 197–228.
- Hutter, K., Hautz, J., Füller, J., Mueller, J., & Matzler, K. 2011. Communitition: The tension between competition and collaboration in community-based design contests. *Creativity and Innovation Management*, 20(1): 3–21.
- Imbens, G. W., & Wooldridge, J. M. 2007. What's new in econometrics?: Difference-in-differences estimation. *NBER Lecture Notes*, Summer, July 30th(10).
- Jeppesen, L. B., & Frederiksen, L. 2006. Why do users contribute to firm-hosted user communities? The case of computer-controlled music instruments. *Organization Science*, 17(1): 45–63.
- Jung, Y., Majchrzak, A., Malhotra, A., & Johnson, J. 2012. Encouraging collaborative idea-building in enterprise-wide innovation challenges. *Proceedings of the 33rd International Conference on Information Systems (ICIS), 16-19 December 2012, Orlando, Florida, USA*: 3651–3661.
- Kathan, W., Hutter, K., Füller, J., & Hautz, J. 2015. Reciprocity vs. free-riding in innovation contest communities. *Creativity and Innovation Management*, 24(3): 537–549.
- Kesting, P., & Parm Ulhøi, J. 2010. Employee-driven innovation: Extending the license to foster innovation. *Management Decision*, 48(1): 65–84.
- Khandker, S. R., Koolwal, G. B., & Samad, H. A. 2009. *Handbook on impact evaluation*. Washington, D.C.: The World Bank.
- Kirkman, B. L., Rosen, B., Tesluk, P. E., & Gibson, C. B. 2004. The impact of team empowerment on virtual team performance: The moderating role of face-to-face interaction. *Academy of Management Journal*, 47(2): 175–192.
- Kittur, A., Nickerson, J. V., Bernstein, M. S., Gerber, Elisabeth, M., Shaw, A., Zimmerman, J., Lease, M., & Horton, J. J. 2013. The future of crowd work. *Proceedings of the conference on computer supported cooperative work (CSCW), 23-27 February 2013, San Antonio, Texas, USA*: 1301–1318.
- Kornberger, M. 2017. The visible hand and the crowd: Analyzing organization design in distributed innovation systems. *Strategic Organization*, 15(2): 174–193.
- Kosonen, M., Gan, C., & Blomqvist, K. 2013. My idea is our idea! Supporting user-driven innovation activities in crowdsourcing communities. *International Journal of Innovation Management*, 17(3): 1–18.

- Kumar, R., & Das, T. K. 2007. Interpartner legitimacy in the alliance development process. *Journal of Management Studies*, 44(8): 1425–1453.
- Lakhani, K. R., & Wolf, R. G. 2005. Why hackers do what they do: Understanding motivation and effort in free/open source software projects. In J. Feller, B. Fitzgerald, S. Hissam & K. R. Lakhani (Eds.), *Perspectives on free and open source software*: 3–30. Cambridge: MIT Press.
- Levi, M., Sacks, A., & Tyler, T. 2009. Conceptualizing legitimacy, measuring legitimating beliefs. *American Behavioral Scientist*, 53(3): 354–375.
- Lounsbury, M., & Glynn, M. A. 2001. Cultural entrepreneurship: Stories, legitimacy, and the acquisition of resources. *Strategic Management Journal*, 22(6-7): 545–564.
- Manning, S., & Bejarano, T. A. 2017. Convincing the crowd: Entrepreneurial storytelling in crowdfunding campaigns. *Strategic Organization*, 15(2): 194–219.
- McKinsey&Company. 2017. Electrifying insights: How automakers can drive electrified vehicle sales and profitability. *Advanced Industries*, January: 3–28.
- Morgan, S. L., & Winship, C. 2014. *Counterfactuals and causal inference*. Cambridge: Cambridge University Press.
- Murray, F., & O'Mahony, S. 2007. Exploring the foundations of cumulative innovation: Implications for organization science. *Organization Science*, 18(6): 1006–1021.
- Nonnecke, B., & Preece, J. 2000. Lurker demographics: Counting the silent. *Proceedings of the SIGCHI conference on human factors in computing systems, 1-6 April 2000, The Hague, The Netherlands*: 73–80.
- O'Leary, D. E. 2016. On the relationship between number of votes and sentiment in crowdsourcing ideas and comments for innovation: A case study of Canada's digital compass. *Decision Support Systems*, 88: 28–37.
- O'Mahony, S., & Ferraro, F. 2007. The emergence of governance in an open source community. *Academy of Management Journal*, 50(5): 1079–1106.
- Pearson, K. 1900. On the criterion that a given system of deviations from the probable in the case of a correlated system of variables is such that it can be reasonably supposed to have arisen from random sampling. *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, 50(302): 157–175.
- Perry-Smith, J. E., & Mannucci, P. V. 2017. From creativity to innovation: The social network drivers of the four phases of the idea journey. *Academy of Management Review*, 42(1): 53–79.

- Peters, L. M., & Manz, C. C. 2007. Identifying antecedents of virtual team collaboration. *Team Performance Management: An International Journal*, 13(3/4): 117–129.
- Pollack, J. M., Rutherford, M. W., & Nagy, B. G. 2012. Preparedness and cognitive legitimacy as antecedents of new venture funding in televised business pitches. *Entrepreneurship Theory and Practice*, 36(5): 915–939.
- Pollok, P., Lüttgens, D., & Piller, F. T. 2019. Attracting solutions in crowdsourcing contests: The role of knowledge distance, identity disclosure, and seeker status. *Research Policy*, 48(1): 98–114.
- Preece, J., Nonnecke, B., & Andrews, D. 2004. The top five reasons for lurking: Improving community experiences for everyone. *Computers in Human Behavior*, 20(2): 201–223.
- Raven, B. H. 2008. The bases of power and the power/interaction model of interpersonal influence. *Analyses of Social Issues and Public Policy*, 8(1): 1–22.
- Ren, J., Nickerson, J. V., Mason, W., Sakamoto, Y., & Graber, B. 2014. Increasing the crowd's capacity to create: How alternative generation affects the diversity, relevance and effectiveness of generated ads. *Decision Support Systems*, 65: 28–39.
- Riedl, C., & Woolley, A. W. 2017. Teams vs. crowds: A field test of the relative contribution of incentives, member ability, and emergent collaboration to crowd-based problem solving performance. *Academy of Management Discoveries*, 3(4): 382–403.
- Robert, L. P., Dennis, A. R., & Ahuja, M. K. 2008. Social capital and knowledge integration in digitally enabled teams. *Information Systems Research*, 19(3): 314–334.
- Rokicki, M., Zerr, S., & Siersdorfer, S. Groupsourcing: Team competition designs for crowdsourcing. *Proceedings of the 24th International Conference on World Wide Web (WWW '15), 18-22 Mai 2015, Florence, Italy*: 906–915.
- Rosenbaum, P. R., & Rubin, D. B. 1983. The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1): 41–55.
- Rouse, E. D. 2018. Where you end and I begin: Understanding intimate co-creation. *Academy of Management Review*, In Press: 1–62.
- Roy, R., & Sarkar, M. B. 2016. Knowledge, firm boundaries, and innovation: Mitigating the incumbent's curse during radical technological change. *Strategic Management Journal*, 37(5): 835–854.
- Schneckenberg, D. 2009. Web 2.0 and the shift in corporate governance from control to democracy. *Knowledge Management Research & Practice*, 7(3): 234–248.

- Schweisfurth, T. G., & Herstatt, C. 2016. How internal users contribute to corporate product innovation: the case of embedded users. *R&D Management*, 46(1): 107–126.
- Seidel, V. P., & Langner, B. 2015. Using an online community for vehicle design: Project variety and motivations to participate. *Industrial and Corporate Change*, 24(3): 635–653.
- Shah, S. K., & Tripsas, M. 2007. The accidental entrepreneur: The emergent and collective process of user entrepreneurship. *Strategic Entrepreneurship Journal*, 1(1-2): 123–140.
- Simula, H., & Ahola, T. 2014. A network perspective on idea and innovation crowdsourcing in industrial firms. *Industrial Marketing Management*, 43(3): 400–408.
- Simula, H., & Vuori, M. 2012. Benefits and barriers of crowdsourcing in B2B firms: Generating ideas with internal and external crowds. *International Journal of Innovation Management*, 16(6): 1–20.
- Skopic, F., Schall, D., & Dustdar, S. 2012. Discovering and managing social compositions in collaborative enterprise crowdsourcing systems. *International Journal of Cooperative Information Systems*, 21(4): 297–341.
- Spence, M. 1973. Job market signaling. *The Quarterly Journal of Economics*, 87(3): 355.
- Suchman, M. C. 1995. Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review*, 20(3): 571–610.
- Suddaby, R., Bitektine, A., & Haack, P. 2017. Legitimacy. *Academy of Management Annals*, 11(1): 451–478.
- van Koningsbruggen, G. M., Hartmann, T., Eden, A., & Veling, H. 2017. Spontaneous hedonic reactions to social media cues. *Cyberpsychology, behavior and social networking*, 20(5): 334–340.
- van Werven, R., Bouwmeester, O., & Cornelissen, J. P. 2015. The power of arguments: How entrepreneurs convince stakeholders of the legitimate distinctiveness of their ventures. *Journal of Business Venturing*, 30(4): 616–631.
- von Hippel, E., & von Krogh, G. 2003. Open source software and the “private-collective” innovation model: Issues for organization science. *Organization Science*, 14(2): 209–223.
- von Krogh, G. 2012. How does social software change knowledge management? Towards a strategic research agenda. *The Journal of Strategic Information Systems*, 21(2): 154–164.
- Waldock, B. 2015. *Being agile in business: Discover faster, smarter, leaner ways to succeed at work*. Harlow, United Kingdom: Pearson.

- Wasko, & Faraj. 2005. Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS Quarterly*, 29(1): 35–57.
- Wendelken, A., Danzinger, F., Rau, C., & Moeslein, K. M. 2014. Innovation without me: Why employees do (not) participate in organizational innovation communities. *R&D Management*, 44(2): 217–236.
- Yuan, F., & Woodman, R. W. 2010. Innovative behavior in the workplace: The role of performance and image outcome expectations. *Academy of Management Journal*, 53(2): 323–342.
- Zejnilić, L., Oliveria, P., & Veloso, F. 2012. Employees as user innovators: An empirical investigation of an idea management system. *Academy of Management Proceedings*, 1: 1–38.
- Zimmerman, M. A., & Zeitz, G. J. 2002. Beyond survival: Achieving new venture growth by building legitimacy. *Academy of Management Review*, 27(3): 414–431.

Chapter 4: A Comparison of Co-Creation Behavior in Internal and External Crowds

4.1 Abstract

Crowdsourcing is increasingly gaining popularity to leverage the crowd's potential to develop ideas further through co-creation between crowd members. Although co-creation patterns are expected to vary, depending on whether a crowd is located within or outside an organization, research lacks insights how the co-creation behavior within internal and external crowds differs. In contrast to external crowds, we argue that internal crowd members anticipate the consequences of their commitment for the organizational environment in their decision to co-create. We define this behavior as *co-creation in the shadow of the organization*. Using a unique dataset from two identically designed contests, conducted separately with an internal and an external crowd, our study aims to compare how members of these crowds initiate co-creation. Our results show that internal and external crowd members indeed differ in their co-creation behavior. As suggested, internal crowd members are less likely to form a team, take more time to coordinate their activities, but provide more often constructive feedback than external crowd members. We find that these different co-creation behaviors are strengthened under the condition of uncertain ideas. These results advance our understanding of the co-creation mechanism in general and contribute to the growing research on co-creation in crowds specifically. Since our study is one of the first providing empirical insights on behavioral differences between internal and external crowds, we add to the emerging debate which crowd type – one of employees or one of external individuals – should be considered for co-creation.

Keywords: internal crowdsourcing; external crowdsourcing, collaboration, co-creation

4.2 Introduction

Imagine a situation with two crowds of people²⁶. The members in both crowds have to complete the same task like designing a car. They can decide to work together with others in their crowd or to complete the task on their own. All actions are visible in the respective crowd. In the end, the individual crowd member or the crowd team with the best car design will win a price. These two crowds have the same preconditions but differ in the environment surrounding them. While one crowd is located *outside* of the organization, the other is based *inside* of that organization. Only the crowd inside of an organization encounters established firm structures like a clear task division and defined organizational boundaries (Santos & Eisenhardt, 2005; Williamson, 1981). But does a crowd unfold differently depending on the environment? Will the members of these crowds differ in the way if and how they work together? Which of these crowds should an organization address to reap the benefits from crowd members working together on a task?

Finding answers to these questions is especially relevant since there is a growing interest in crowdsourcing research to empower co-creation between crowd members²⁷ (e.g., Hutter, Hautz, Füller, Mueller, & Matzler, 2011; Mattarelli et al., 2018). So far, crowdsourcing has been proposed as an attractive approach for firms to obtain diverse ideas submitted by individual crowd members (Afuah & Tucci, 2012). Further, crowds have been analyzed to support in the idea selection of organizations (e.g., Magnusson, Wästlund, & Netz, 2016). However, only few studies have started to investigate co-creation behavior within crowds (e.g., Boudreau, Gaule, Lakhani, Riedl, & Woolley, 2014; Mattarelli et al., 2018). At first glance, it seems remarkable that co-creation

²⁶ A ‘crowd’ is – unlike a team – an undefined set of people (Afuah, 2018; Howe, 2006).

²⁷ The term ‘co-creation’ originally describes the joint creation of value during the interaction of an organization with customers (Gemser & Perks, 2015). Recent studies define co-creation as a social “process in which two people pass ideas back and forth throughout idea generation, elaboration, and evaluation [...] with the goal of developing novel and useful ideas and products” (Rouse, 2018: 10). Accordingly, co-creation between individuals goes even beyond working together but considers a joint elaboration of ideas (Mattarelli et al., 2018). In this study, we use co-creation as synonym for collaborative behavior between crowd members (cf. section 4.3.1)

emerges in a crowdsourcing contest where individuals compete in the first place to win the announced price for the best idea (Bergendahl & Magnusson, 2014; Füller, Hutter, Hautz, & Matzler, 2014). Despite the competitive nature of crowdsourcing, existing research shows that crowd members collaborate by posting comments or by building teams (Bullinger, Neyer, Rass, & Moeslein, 2010; Woolley, Chabris, Pentland, Hashmi, & Malone, 2010). Since first studies find a positive effect of joint work between crowd members on idea quality and on team performance (Riedl & Woolley, 2017; Zhu, Kock, Wentker, & Leker, 2019), co-creation seems to be a promising way for organizations to acquire high quality solutions. But to exploit the benefits of co-creation, organizations have to identify a crowd type whose members engage more in developing ideas than in competing against each other (Schäfer, Antons, Lüttgens, Piller, & Salge, 2017). Hence, knowing more about the behaviors, motivations, and characteristics of different crowds is beneficial when choosing a crowd type according to the organization's need to develop ideas further through co-creation.

Crowd types can be differentiated according to their (in-) dependence from an organization. While employees in the internal crowd are embedded in an organization, external participants are independent from an organization (Afuah, 2018; Schweisfurth, 2017). Although Afuah (2018: 28) points out that the "internal crowd versus external crowd debate is in its infancy and promises to be very enlightening", especially the question, "when should which kind of crowd be used concerning their execution and innovation outcomes has not been answered yet" (Zhu, Sick, & Leker, 2016: 887). To date, most research has either studied the internal crowd (e.g., Zhu et al., 2019) or the external crowd separately (e.g., Boudreau et al., 2014). Just a handful of studies open a theoretical debate on the differences between internal and external crowds (Afuah, 2018; Knudsen, Magnusson, Frederiksen, & Björk, 2018; Simula & Vuori, 2012; Sundic & Leitner, 2018; Zhu et al., 2016; Zuchowski, Posegga, Schlagwein, & Fischbach, 2016). A first empirical study of Schweisfurth (2017) reveals that ideas submitted by internal and external users differ in their quality. His findings indicate that the embeddedness of internal users limits their creativity when

generating new ideas. Although disparities in behavior between internal and external crowd members are presumed (Afuah, 2018), research lacks insights on behavioral similarities and differences between both crowds. This is an important research gap because both crowds entail several exclusive advantages for co-creation like the sharing of proprietary information in an internal crowd (Zuchowski et al., 2016) or the use of diverse knowledge in an external crowd (Jeppesen & Lakhani, 2010). Nevertheless, research has so far not investigated how co-creation behavior differs in internal or external crowds.

To fill this gap, our empirical study aims to compare how internal and external crowd members initiate co-creation. If crowd members decide to co-create, they enter into a commitment to support the idea and the initiator²⁸ (Klein, Brinsfield, Cooper, & Molloy, 2017). We argue that this commitment has direct and indirect consequences for the contributing crowd member. Since internal crowds are dependent on the organizational environment, the consequences of their commitment go even beyond the crowdsourcing contest. This means that the way how employees engage on the crowdsourcing platform has direct implications on the relationship with their colleagues or with the published project. As an indirect consequence, the behavior of employees on the online platform is observed within the organization which can impact their reputation or career (Huang, Singh, & Ghose, 2015; Yuan & Woodman, 2010). We base our arguments on research on 'conditional' co-creation (Boudreau et al., 2014; Frey & Meier, 2004) and reciprocity (Kathan, Hutter, Füller, & Hautz, 2015; Rand & Nowak, 2013) which shows that individuals cooperate based on the expectations of future consequences. Unlike external crowds, we expect that internal crowd members will consider the consequences of their commitment for the organizational environment in their decision to co-create. We define this behavior in the internal crowd as *co-creation in the shadow of the organization*. Accordingly, we hypothesize that internal

²⁸ We define an 'initiator' as the individual who submitted an idea to the crowdsourcing platform. The terms 'idea' and 'project' are used synonymously for the submitted text.

and external crowd members differ in co-creation patterns which require a high commitment, namely team formation, temporal coordination of activities (i.e., burstiness), and constructive feedback. We claim that these differences will be reinforced by novel ideas. To test our hypotheses, we use a unique dataset from two identically designed crowdsourcing contests conducted separately with an internal and an external crowd.

Our findings contribute to research in the following ways. We complement the growing stream of research on collaboration within crowds (e.g., Hutter et al., 2011; Riedl & Woolley, 2017) by revealing that co-creation behavior is dependent on the crowd type. Our empirical results show that internal and external crowd members indeed differ in their co-creation behavior. In detail, internal crowd members less likely form a team, take more time to coordinate their co-creation activities, but provide more often constructive feedback than external crowd members. Further, we contribute to research in creativity and innovation management (e.g., Baer, 2012; Blair & Mumford, 2007) by providing insights on co-creation in crowds under the condition of uncertainty. We find that co-creation differences are reinforced if ideas are novel. Our last but major contribution refers to the organizational dependence of internal crowds (Afuah, 2018; Schweisfurth, 2017) and to research on the theory of a firm (Santos & Eisenhardt, 2005; Williamson, 1981). Our results indicate that employees adapt their co-creation behavior to the organizational environment even if they are operating on a crowdsourcing platform. Thus, co-creation in internal crowds cannot unfold how it would in a non-firm setting. This supports our argument that internal crowd members co-create in the *shadow of the organization*. Since we are, to the best of our knowledge, the first study comparing co-creation between these two crowd types, these results contribute to the emerging debate of crowdsourcing strategy (Afuah, 2018). In their crowdsourcing strategy, organizations have to decide which crowd type – an internal or external one – they will choose depending on their need for co-creation.

4.3 Theory

4.3.1 Co-Creation in Crowds

The term ‘co-creation’ is defined as a joint creation of value through interactions between actors (Lusch & Nambisan, 2015; Perks, Gruber, & Edvardsson, 2012; Ramaswamy & Ozcan, 2018). Originally, co-creation describes the interactions between an organization and their customers referred to as ‘customer co-creation’ (Gemser & Perks, 2015; Mahr, Lievens, & Blazevic, 2014; Nambisan & Baron, 2009; Prahalad & Ramaswamy, 2004). During customer co-creation, value is created as a result from a joint production process between an organization and its customers (Füller, 2010; Gebauer, Füller, & Pezzeri, 2013). For instance, the automotive manufacturer BMW invited users and customers to jointly co-create new ideas for the future mobility in their online Co-Creation Lab (Bartl, Jawecki, Bilgram, & Wiegandt, 2013). Only recently, the term co-creation is also used to explain collaborative interactions between individuals who work together on the elaboration of ideas or projects (Rouse, 2018). Especially Rouse (2018: 10) defines co-creation as a “process in which two people pass ideas back and forth throughout idea generation, elaboration, and evaluation (the phases of the creative process) with the goal of developing novel and useful ideas and products”. This notion of co-creation is adopted in latest research to characterize the collaborative interactions between individual actors in a crowd (Mattarelli et al., 2018). Accordingly, this study applies the term co-creation as synonym for collaboration between individual crowd members.

Co-creation is a social process which requires to start and further build a relationship between individuals (Hargadon & Bechky, 2006; Harrison & Rouse, 2015; Höber, Schaarschmidt, & Kortzfleisch, 2016; Rouse, 2018). Rouse (2018) claims that individuals first have to decide to engage in co-creation and later form, under certain circumstances, a shared interpersonal boundary. If individuals progress in this process of interpersonal interactions and manage to build a relationship, this is called ‘intimate co-creation’ (Rouse, 2018). For co-creation to emerge,

especially the initiating step of member engagement is crucial. To initiate co-creation, a crowd member has to decide if he or she contributes to an idea in order to start the co-creation process. This engagement of one actor is the so-called ‘micro-foundation’ of co-creation. If no actor engages in co-creation, no value creation in the next steps will occur (Storbacka, Brodie, Böhmman, Maglio, & Nenonen, 2016). Whereas existing research examines the interactions of ongoing collaboration among crowd members (Boudreau et al., 2014), we focus on this first step of *initiating co-creation* where the idea initiator and the crowd member make the decision to come together for co-creation. The crowd member’s decision to initiate co-creation expresses a commitment to support the idea and the idea initiator (Bateman, Gray, & Butler, 2011; Randall, Gravier, & Prybutok, 2011; Simula & Ahola, 2014). Commitment is “a volitional psychological bond reflecting dedication to and responsibility for a particular target” (Klein, Molloy, & Brinsfield, 2012: 134). Individuals can develop a commitment to numerous workplace targets like projects, groups of colleagues, or online communities (Hoegl, Weinkauff, & Gemuenden, 2004; Klein et al., 2017; O’ Leary, Mortensen, & Woolley, 2011). Developing and maintaining a commitment incurs costs as individuals spend time and effort towards the committed target (Klein et al., 2012; Klein et al., 2017). For instance, crowd members may invest time and cognitive effort to understand an idea before writing a comment or joining a team. A commitment to co-create has *direct* consequences for the contributing crowd member on interpersonal relationships with the initiator or team members as well as on project-related relationships with the idea published on the crowdsourcing platform (e.g., Puranam, Raveendran, & Knudsen, 2012). This means that a crowd member who decides to co-create will build a new interpersonal network or expand existing relationships with the initiator and other potential team members (Franke, Keinz, & Klausberger, 2013). In addition, the contributing crowd member will assume responsibility to work on the published project and to bring the content of the project forward (Hoegl et al., 2004). Further, a commitment to co-create has also *indirect* consequences for the contributing crowd member. Due to the online character of crowdsourcing contests, co-creation behavior is visible for all members registered on a crowdsourcing platform

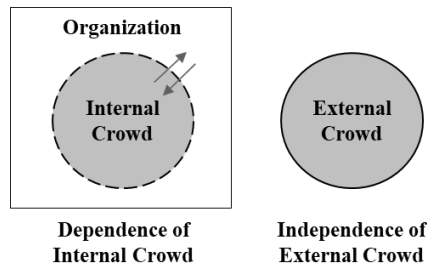
(Anders, 2016; Lount, Doyle, Brion, & Pettit, 2019). As all actions performed during the crowdsourcing contest are transparent for registered participants, co-creation within a crowd is accompanied with revealing information about if and how a crowd member commits to an idea. This implies that the commitment to co-create can be interpreted by other crowd members on the platform (Foege, Lauritzen, Tietze, & Salge, 2019). Since all members in the crowd are able to see the names of the team members, they will, for instance, make inferences about the relationship of the individuals who formed a team (Leonardi, 2015). Or rather, as all written comments are displayed on the platform, crowd members will draw conclusions about the knowledge and interests of others depending on the comment content. In sum, a crowd member's commitment to co-create has direct consequences on relationships towards other people and the project. Additional indirect consequences occur as the commitment to co-create is interpreted by the environment surrounding the crowd type.

4.3.2 Crowd Types (In-) Dependent of the Organizational Environment

Although Afuah (2018) denotes the choice of a certain crowd type as highly important, research comparing internal and external crowd types is still in its infancy. In line with the initial definition of crowdsourcing from Howe (2006), the underlying rationale for using internal or external crowds is the same, namely to outsource a task to unknown individuals who generate and develop a diverse and large number of ideas (Knudsen et al., 2018). Internal as well as external crowds are both fluid forms of organizing and coordinating work (Faraj, Jarvenpaa, & Majchrzak, 2011). In contrast to traditional hierarchy-based work, participation is voluntary and without formal coordination in both crowd types (Zuchowski et al., 2016). This means that individuals are invited by an 'open call' and have the ability to self-select if and how they participate in the crowdsourcing contest (Afuah, 2018; Boudreau et al., 2014). Although both are crowd types, internal and external crowds differ regarding their level of *(in-) dependence from the organizational environment* (see Figure 4.1). Internal crowd members are employees who are embedded within the organization (Ng & Lucianetti, 2018; Schweisfurth, 2017; Yan, Leidner, & Benbya, 2018; Zhang & Guler, 2019).

Schweisfurth (2017) finds that internal lead users²⁹ are dual embedded, in the internal organization and in a user network outside of the organization. Since they have a simultaneous role of employee and user, they experience needs during the usage of a product outside of their work but still generate ideas for products and services depending on their organizational environment. Organizational dependence in a crowdsourcing context means that there are interdependencies between the internal crowd and the organizational environment. For instance, the goals, strategy, and culture of an organizational environment can influence the actions and decision of internal crowd members (Afuah, 2018; Williamson, 1981). In contrast to an internal crowd, external crowds consist of a broader base of individuals including users and customers, suppliers, or research partners who are acting independent from the organizational environment (Afuah, 2018). Independence from the organization implies that external crowds are located outside of the organization often without any affiliation to the organization (Zhu et al., 2016). Thus, the most critical difference between internal and external crowds is their (in-) dependence from the organizational environment (cf. Figure 4.1).

Figure 4.1: Organizational (In-) Dependence in Internal and External Crowd.



Note: Arrows represent interdependencies between the crowd and the organizational environment.

²⁹ Internal lead users are “firm employees who are lead users of their employer’s products or services” (Schweisfurth, 2017: 238). Lead users are users which are ahead of trends in the market and expect to gain benefits from obtaining solutions to their needs (Ozer, 2009; von Hippel, 2005).

The different level of organizational (in-) dependence has implications on further disparities between internal and external crowds. As prior research has to a large extent studied the two crowd types separately, research comparing internal and external crowds is sparse (Afuah, 2018). Only few studies started to conceptualize first differences between internal and external crowds (Afuah, 2018; Knudsen et al., 2018; Simula & Vuori, 2012; Sundic & Leitner, 2018; Zhu et al., 2016; Zuchowski et al., 2016). One study empirically analyzed the idea generation of internal and external users but was not conducted in a crowdsourcing context (Schweisfurth, 2017). These studies are used as reference to discuss similarities and differences between internal and external crowds. On the basis of the literature review from Zuchowski, Posegga, Schlagwein, and Fischbach (2016), Table 4.1 displays those disparities between internal and external crowds which relate to organizational (in-) dependence. First, internal and external crowd types differ with regards to their *members*. As already mentioned above, internal crowd members are colleagues linked through a joint organizational relationship (Afuah, 2018). They may know each other if they have already worked together previously. In contrast, external crowd members will more likely have a private relationship with some participants as they may be colleagues, friends or family members. However, the majority of external crowd members are strangers (Boudreau et al., 2014). Second, different *tasks* can be outsourced to an internal and external crowd. Internal crowd members are able to work on confidential tasks with strategic relevance for an organization (Zhu et al., 2016). As they are all employees, an organization has no intellectual property issues to broadcast critical problems to an internal crowd. In contrast, an external crowd can only be engaged for tasks which can be published respecting intellectual property rights (Simula & Vuori, 2012; Zhu et al., 2016). In most organizations, the participation in crowdsourcing is considered as additional task which employees have to complete during their work time without receiving any additional cash or slack time (Malhotra, Majchrzak, Kesebi, & Loram, 2017; Simula & Vuori, 2012). In comparison, external crowd members are able to work on a crowdsourcing project in their leisure time. Third, the *process* is limited to the time of the crowdsourcing project in both types of crowds. However,

the crowdsourcing process has a more long-term focus in internal crowds (Zuchowski et al., 2016). Since internal crowd members are permanent employees, there is a higher likelihood that they continue working on the projects afterwards. External crowd members only contribute to the project during the limited time of the contest (Zuchowski et al., 2016). Forth, some prior research points out that the organizational environment shapes the type of *knowledge* which is applied for idea generation (Poetz & Schreier, 2012; Schweisfurth, 2017). Due to their embeddedness in the organizational environment, employees mainly possess *solution knowledge*. This means that they have task-specific knowledge from their job function and organization-specific knowledge about processes, products, and strategic directions of the organization (Knudsen et al., 2018; Malhotra et al., 2017; Sundic & Leitner, 2018; Zuchowski et al., 2016). Schweisfurth (2017) argues that ‘ordinary’ employees mainly rely on this solution knowledge during idea generation. As employees consider potential organizational restrictions, they are able to generate ideas which can be implemented in an organization, but which are at the same time less novel. Only selected employees who use the company’s products and experience needs from this usage can build up additional *need knowledge*. Even if these so-called ‘internal lead users’ have solution and need knowledge, they still generate less novel ideas compared to external lead users (Schweisfurth, 2017). Since external users are more distant to the structures of the organization (Jeppesen & Lakhani, 2010) and more likely possess need knowledge, they tend to submit more novel ideas (Bergendahl & Magnusson, 2014; Poetz & Schreier, 2012; Simula & Vuori, 2012). These studies imply that users in the external crowd generate ideas independently from the organizational environment whereas the organizational dependence tends to limit the creative idea generation of employees in an internal crowd (Schweisfurth, 2017). Summarizing, existing research already identifies conceptual differences between internal and external crowds regarding their members, the accomplished task, the long-term orientation of the process, and the underlying knowledge (cf. Table 4.1). However, research is missing if and why internal and external crowd members may behave or collaborate differently on crowdsourcing platforms. Therefore, the objective is to investigate differences and

similarities between internal and external crowds regarding their co-creation behavior. In the following sections, we argue that this level of organizational (in-) dependence accounts for behavioral differences of internal and external crowd members.

Table 4.1: Differences between Crowds resulting from Organizational (In-) Dependence.

Differences	Internal Crowd	External Crowd
Members	Organizational relationship	Private relationship or strangers
Task	Ability to work on confidential tasks No intellectual property issues Accomplish task on top to daily job	Only work on publishable tasks Intellectual property may be an issue Accomplish task in leisure time
Process	Short-term orientated with chance for long-term structure	Short-term oriented one-time projects
Knowledge	Need and solution knowledge	Need knowledge

Source: Own presentation adapted from Zuchowski et al. (2016)

4.3.3 Co-Creation in the Shadow of the Organization

Internal as well as external crowd members who decide to initiate co-creation experience direct and indirect consequences of their commitment on the crowdsourcing platform (cf. section 4.3.1). Due to the organizational dependence of internal crowd members (Afuah, 2018), the commitment of employees to co-create has not only implications on the crowdsourcing platform but also on the organizational environment. Compared to an external crowd, it is more likely that employees have already worked together previously or will work in the future with the same colleagues or on the same project on the crowdsourcing platform and in an offline working context (Zuchowski et al., 2016). Despite these direct consequences on people and project relationships, the behavior of internal crowd members is interpreted by other employees. On crowdsourcing as well as on enterprise social media platforms³⁰, employees publish content which is transparent for all other employees in the organization (Lount et al., 2019). Accordingly, colleagues and supervisors are able to observe the content of messages (what they say) as well as the directionality of messages (to whom they say it). This allows them to make inferences about “who knows what” and “who knows whom” (Leonardi, 2015: 748). In contrast to an external crowd, colleagues and supervisors may use the impression they gain on the platform to assess the behavior of an individual in an organizational context (Höber et al., 2016; Yuan & Woodman, 2010). Research on enterprise social media indicates that employees are aware that their behavior on online platforms potentially entails positive and negative reactions from colleagues and superiors even in an offline context (Germindl, Strich, & Fiedler, 2017; Kaplan & Haenlein, 2010). Consequently, the commitment to co-create in an internal crowd has direct and indirect consequences *beyond* the crowdsourcing platform.

³⁰ Enterprise social media and internal crowdsourcing platforms show certain differences and similarities. In enterprise social media, employees create content by writing blogs on various leisure-related and work-related topics (Roberts & Piller, 2015). Social media platforms are primarily used for knowledge management and allow only a certain extent of interaction between employees (Huang, Singh, & Ghose, 2015). In contrast to social media platforms, contributions in internal crowdsourcing are more focused on a specific contest topic and collaboration between colleagues is supported (Zuchowski, Posegga, Schlagwein, & Fischbach, 2016).

Related literature on interactions between users on online platforms indicates that individuals act depending on their expectations of future consequences (e.g., Boudreau et al., 2014; Franke et al., 2013; Kathan et al., 2015). The expectation of *reciprocity* has been identified as one of the main reasons why users contribute to a community (Lakhani & von Hippel, 2003; Shah, 2006). The term ‘reciprocity’ means that individuals cooperate as they expect to be rewarded by exchange in the future or because they feel the need to repay others for favors they have received in the past (Faraj & Johnson, 2011; Rand & Nowak, 2013). For instance, Haeussler, Jiang, Thursby, and Thursby (2014) find that information sharing among researchers is dependent on reciprocity. Since information sharing as well as all interpersonal interactions are visible in online communities, reciprocity is a common mechanism explaining also online cooperation (Lakhani & von Hippel, 2003). Reciprocity can have direct and indirect implications for involved actors (Hofstetter, Aryobsei, & Herrmann, 2018; Kathan et al., 2015; Rand & Nowak, 2013; Taylor & Nowak, 2009). *Direct reciprocity* implies that individuals cooperate if they expect a direct return from the corresponding person or project (Rand & Nowak, 2013). This is based on the idea “I help you and you help me” (Taylor & Nowak, 2009: 44). For instance, Boudreau, Gaule, Lakhani, Riedl, and Woolley (2014) show that crowd members cooperate conditional on the anticipated reactions of their team colleagues. They increase their own collaboration only if they see that their team colleagues are also participating. This is in line with the finding that active and visible participation of one team member will condition the participation of others (Frey & Meier, 2004; Haas & Park, 2010). Individuals may not only expect direct returns from the person but also from the project they contributed to (Hoegl et al., 2004). If an individual promotes a project, he or she may expect a direct return in form of appreciation for the effort or even monetary compensations. *Indirect reciprocity* occurs if someone contributes to an online community expecting a return from a third person observing the interactions (Rand & Nowak, 2013). The motivation behind indirect reciprocity is that individuals hope to gain reputation and status for their interactions by third parties (Wasko & Faraj, 2005; Wendelken, Danzinger, Rau, & Moeslein, 2014). For example, Wasko and

Faraj (2005) find that individuals share information as they expect that this enhances their professional reputation. Both forms of reciprocity imply that individuals behave differently as they expect to interact with a person or on a project in the future (Hofstetter et al., 2018; Kathan et al., 2015; Rand & Nowak, 2013). In sum, research on reciprocity (Kathan et al., 2015; Rand & Nowak, 2013) and on conditional co-creation (Boudreau et al., 2014; Frey & Meier, 2004) indicates that individuals cooperate under a *shadow of the future*³¹ anticipating the future consequences of their collaborative behavior on online platforms.

In the internal crowd, a commitment to co-create has consequences beyond the crowdsourcing platform. Compared to external crowd members, employees may expect reciprocity not only from people and projects on the crowdsourcing platform but also in the organizational environment. In terms of direct reciprocity, employees may anticipate that a commitment to co-create on the platform implies owing a favor to a colleague even in the organizational environment (Kathan et al., 2015). With regards to indirect reciprocity, the reputation of employees in the organization may be influenced by their online behavior. Thus, internal crowd members have to be aware that their commitment to co-create is not only restricted to the platform but impacts their reputation, appreciation, and career opportunities within the organization (Huang et al., 2015; Milliken, Schipani, Bishara, & Prado, 2015; Yuan & Woodman, 2010). Individuals who are participating in an online community care about these career and reputation issues (Wendelken et al., 2014). We expect that employees will anticipate these implications of their commitment for the organizational environment before committing to an idea on the crowdsourcing platform. Even if they are acting in a crowd context, their behavior is dependent on the potential implications for their standing in the organization. Due to these ‘spillover effects’ of the online behavior to the working context

³¹ The notion of the ‘shadow of the future’ originates from game theory (Fearon, 1998). Game theory is used to describe social interactions and strategic behavior between two or more players (Axelrod, 2006). The notion of the shadow of the future captures the idea that players take into account the impact of their current actions on the future moves of other players. Thus, individuals behave differently if they expect to interact repeatedly with a person in the future (Axelrod & Dion, 1988; Fearon, 1998).

(Huang et al., 2015; Milliken et al., 2015), we claim that the organizational environment imposes barriers and limitations to independent co-creation in internal crowds. In analogy to the notion of the ‘shadow of the future’, we argue that internal crowd members will less anticipate the future implications of their behavior but more the consequences of their commitment beyond the contest. In contrast to external crowd members, internal crowd members co-create respecting the direct and indirect consequences of their commitment for the organizational environment. We define this behavior of internal crowds as *co-creation in the shadow of the organization*.

4.3.4 Hypotheses

Building on the notion of co-creation in the shadow of the organization, we argue in the following how initiating co-creation is pronounced differently in internal and external crowds. Hypotheses are developed on differences in three co-creation patterns which require a high commitment from crowd members: team formation, burstiness, and feedback constructiveness. As especially the novelty of an idea involves a high commitment (e.g., Baer, 2012; Klein et al., 2012; Mueller, Melwani, & Goncalo, 2012), we hypothesize that the idea novelty initially assessed by the organization moderates the co-creation behavior in crowds. We build our argumentation from the perspective of an internal crowd.

4.3.4.1 Team Formation

Crowd members have different ways to initiate co-creation during the crowdsourcing contest. Whereas the majority of prior research has focused on interactions of crowd members through comments (e.g., Bullinger et al., 2010; Hutter et al., 2011; Kathan et al., 2015), few studies already introduce the possibility to form teams within crowds (e.g., Boudreau et al., 2014; Fuger, Schimpf, Füller, & Hutter, 2017; Riedl & Woolley, 2017). Joining a team requires the commitment to support the idea initiator to further develop the idea as a team member. As team members share the credit and the risk of an idea’s failure (Deichmann & Jensen, 2018), teaming involves higher obligations

than posting a non-binding comment. A commitment to a team has direct and indirect consequences which may differ in internal and external crowds.

In both crowd types, joining a team has direct consequences on the interpersonal relationships with the idea initiator and potential other team members. If an idea initiator receives help by a team member, he or she owes the respective person a favor (Kathan et al., 2015). In return, if one team member supports an initiator on the crowdsourcing platform, this individual may expect help as well (Franke et al., 2013). As the idea initiator and team members are colleagues in the internal crowd, there is a higher likelihood that they already have worked together previously or that they expect to work together in the future in an organizational environment (Hargadon & Bechky, 2006). Hence, the expectance of mutual support and the commitment to help the team members will be more long-term oriented in an internal crowd. Although external crowd members also form relationships, these are limited to the time of the contest. Due to these temporary relationships with strangers in the external crowd (Boudreau et al., 2014), external crowd members seem to have low barriers to join as well as to exit a team (Boudreau et al., 2014; Franke et al., 2013). Furthermore, the support of external crowd members is limited to the short contest time and to transitory projects like workshops after the crowd contest (Knudsen et al., 2018). On most external crowd platforms, the intellectual property is transferred to the hosting organization which does not even permit external individuals to further work on the idea beyond the crowd contest (Zuchowski et al., 2016). In internal crowds, forming a team may have the additional direct consequence to continue working on the project afterwards. Employees who indicate interest on an idea as team member in the internal crowd may be asked to continue that project after the contest. For instance, internal teams formed during a contest are often developed into institutionalized project groups (Knudsen et al., 2018). The commitment to a team in the internal crowd also has the indirect consequence that the team membership is visible for all registered employees (Anders, 2016; Lount et al., 2019). Such volunteering behavior is interpreted by others in the workplace (Rodell & Lynch, 2016). Especially in the internal crowd, colleagues or supervisors may require that an employee who once decided to

team up should stay in the team. Quitting a team may shed a negative light on the respective employee. These social expectations from the organizational environment may make the commitment more obligatory and binding for internal crowd members (Knudsen et al., 2018; Milliken et al., 2015). Since the direct as well as the indirect consequences to team up are more long-term orientated in the internal crowd, employees incur a higher commitment compared to external crowd members. As internal crowd members who co-create in the *shadow of the organization* will anticipate these long-term consequences of their commitment, we expect that they less likely form a team than external crowd members.

Hypothesis 1a: Team formation is lower in internal crowds compared to external crowds.

4.3.4.2 Burstiness

Crowd members do not only have to decide whether to co-create by building a team but also when and how often they respond to others. Especially the timing and the coordination of responses presents one major challenge in collaboration but is at the same time very critical for the productivity of collaborating actors (Ben-Menahem, von Krogh, Erden, & Schneider, 2016; Montoya-Weiss, Massey, & Song, 2001; O'Leary & Cummings, 2007). *Burstiness* is a new measurement to operationalize the temporal coordination of collaborative behavior (Boudreau et al., 2014; Riedl & Woolley, 2017). Burstiness is defined as the degree to which individuals “concentrated their communication and work effort during relatively contained time periods versus spreading them out over time more equally” (Riedl & Woolley, 2017: 390). Accordingly, ‘bursty’ co-creation characterizes very intensive and time-restricted bunches of high activity in which individuals synchronize their answers followed by longer periods of silence before the next bursty period starts (Barabási, 2005, 2011; Riedl & Woolley, 2017). A series of experiments conducted by Riedl and Woolley (2017) indicates that teams with high burstiness show high performance as they coordinate their responses rapidly. In contrast, low burstiness results in delayed feedback, interruptions, and long pauses which reduces the interaction synchrony. Further studies confirm

that temporal coordination increases the performance and productivity of virtual teams (Boudreau et al., 2014; Montoya-Weiss et al., 2001). Burstiness expresses a commitment of a crowd member to align their actions with their cooperation partners during a concentrated time period. The direct and indirect consequences of this commitment to bursty co-creation may differ in an internal and external crowd.

On an interpersonal level, bursty co-creation directly implies that crowd members have to invest time to build an intensive relationship with a limited number of people (Boudreau et al., 2014). On internal platforms, one of the main motivations of employees is to exchange ideas with colleagues from other departments (Leonardi, 2015). Employees will expect to profit from the diversity of opinion in the crowd and from building up a network with new colleagues even beyond the crowdsourcing context. Hence, internal crowd members may take the time to spread their reactions among multiple colleagues which will delay their reaction time on one project. In contrast, external crowd members may be less interested to build relationships beyond the crowdsourcing contest but more focused on finding a handful of persons who support them winning the crowdsourcing contest (Foegen et al., 2019; Franke et al., 2013). Consequently, they will aim to work together closely and coordinate their actions with some selected people. For example, they may socialize with some people on the platform and will try to start a vivid discussion concentrating around their idea. Further, bursty co-creation has the direct consequence that individuals need to invest time to work on the project content. For employees, projects in the crowd represent an additional job task which has to be completed during their working time. If internal crowd members invest the time to co-create very intensively while being at work, they will miss this time to complete their daily work they are paid for (Malhotra et al., 2017; Zuchowski et al., 2016). Thus, they will take more time and respond less frequently than external crowd members. As external crowd members are not restricted to cooperate during work, they are more flexible in their reaction times. Especially external crowd members are used to prompt feedback and fast reactions from their behavior on social media platforms. On social media, spontaneous reactions to posts are common without taking

too much time for the formulation of a post before publishing it (van Koningsbruggen, Hartmann, Eden, & Veling, 2017). Accordingly, external crowd members may align their behavior on crowdsourcing platforms and react more spontaneously than internal crowd members. The commitment to bursty co-creation has not only the direct consequence of time investment in a concentrated period but is also interpreted by the environment (Yuan & Woodman, 2010). Especially in an internal crowd, rapid and spontaneous responses may evoke the negative association by colleagues or supervisors that this employee is not working at full capacity (Knudsen et al., 2018). This association may even have implications on the future allocation of work in the organizational environment. One study shows that employees often remain silent if they expect negative consequences on their image (Milliken et al., 2015). Internal crowd members who try to avoid this negative association may refrain from spontaneous reactions or delay their reaction time. In contrast, active and fast reactions in the external crowd may be more positively interpreted by the environment. From an organizational perspective, external crowd members do not utilize working time as they are not employed by the organization. Hence, bursty co-creation in an external crowd is even beneficial for a hosting organization. In sum, the direct as well as indirect consequences to coordinate the co-creation activities in a concentrated time period go beyond the crowdsourcing contest in an internal crowd. We argue that internal crowd members who co-create in the *shadow of the organization* will consider and take time to deliberate these consequences. As this will delay the interactions of internal crowd members and spread the reactions over a longer period of time, we expect less intensive co-creation in an internal compared to an external crowd.

Hypothesis 2a: Burstiness is lower in internal crowds compared to external crowds.

4.3.4.3 Feedback Constructiveness

For successful co-creation in crowds, it does not only matter how crowd members cooperate but also which content they share (Harrison & Rouse, 2015; Leonardi, 2015). Various studies have already investigated the content of comments published in online communities (e.g., Adamczyk,

Bullinger, & Moeslein, 2011; Füller et al., 2014; Kathan et al., 2015). For instance, Adamczyk, Bullinger, and Moeslein (2011) discovered over 20 different comment categories like ‘sharing experience and information’ or ‘confessing problems’ which describe the nature of interactions between users in online communities. *Feedback constructiveness* is the most elaborated form of feedback defined as “intensity with which other participants analyze an idea through constructive comments” (Zhu et al., 2019: 28). A constructive comment includes information on how to improve or to implement an idea (Adamczyk et al., 2011; Zhu et al., 2019). These comments contribute to a deeper understanding, provide new content within a particular field (Zhu et al., 2019), and support to comprehend an idea at a detailed level (Bergendahl & Magnusson, 2014). Thus, constructive feedback supports developing the content of an idea further. Writing a constructive comment requires a higher commitment to share knowledge than posting a simple evaluation (e.g., ‘I like it’). A commitment to publish a constructive comment may have diverse consequences in internal and external crowds.

In order to provide constructive feedback, members in both crowd types have to invest effort to develop and to publish a constructive comment. In an internal crowd, there is a higher likelihood that employees will work together in the future even in an offline context. If an employee contributes to an idea of a colleague, he or she will expect direct reciprocity in the organizational environment (Kathan et al., 2015). As there is a higher chance to collect a favor, internal crowd members will more likely support their colleagues on the crowdsourcing platform. In contrast, external crowd members may have less incentive to share constructive feedback with strangers. They may even benefit more from keeping their knowledge proprietary to use it for their own advantage (Foege et al., 2019). Internal crowd members will not only be motivated to invest effort in order to establish a good relationship with colleagues but will also be interested in promoting their projects on the crowdsourcing platform. Employees may have several reasons which go beyond the crowdsourcing contest to push projects of colleagues. First, contributing employees may expect to work on a project even after the end of the crowdsourcing contest. If the project has

already been developed through constructive feedback, it is easier to continue working on this project. Second, employees may expect that successful projects improve the performance and profitability of the organization. This may secure their job, payment and even provides additional profit if an employee is stakeholder of the organization. External crowd members lack this motivation (Hertel, Niedner, & Herrmann, 2003; Roberts, Hann, & Slaughter, 2006; Shah, 2006). They are neither interested in the project's success nor in the performance of the company. In both crowd types, the content of a comment will be used as a reference for the level of individual knowledge or expertise. Internal crowd members posting a constructive and elaborated comment on the crowdsourcing platform will be seen as knowledgeable by colleagues and supervisors. In contrast to external crowd members, employees can use this chance to showcase their knowledge and expertise to other employees and supervisors to make their name an expert's (Huang et al., 2015; Leonardi, Huysman, & Steinfield, 2013). If colleagues gain the perception that someone is deliberately hoarding knowledge, this has shown to have negative implications on personal relationships (Evans, Hendron, & Oldroyd, 2015). Also external crowd members contribute to crowdsourcing contests in order to reveal their expertise (e.g., Hertel et al., 2003). However, the consequences of the external commitment to post a comment are limited to the crowdsourcing platform. Members of the organization will also interpret the external published comment but the personal implications for the external participants are lower. In sum, the direct and indirect consequences for sharing constructive feedback have implications on the work environment for employees. Based on the assumption of co-creation in the *shadow of the organization*, we claim that internal crowd members will anticipate these consequences and invest more effort to elaborate a constructive comments than external crowd members.

Hypothesis 3a: Feedback constructiveness is higher in internal crowds compared to external crowds.

4.3.4.4 Initial Idea Novelty

In our context, the novelty of a published idea is initially assessed by the hosting organization and visible for all internal and external crowd members on the respective platform. Therefore, the initial idea novelty provides an underlying information for initiating co-creation. Especially novel ideas would need to be developed further by co-creation but involve some uncertainty from an organizational perspective (Baer, 2012; Criscuolo, Dahlander, Grohsjean, & Salter, 2017). First, prior research has shown that ideas assessed as novel are associated with lower feasibility and lower implementation potential by organizational evaluators (Poetz & Schreier, 2012). Since novel ideas cause resistance (Baer, 2012), they are often not successfully implemented. Second, if novel ideas are successfully implemented, their implementation time will take longer (Baer, 2012). As organizations have to adapt their established process to bring a novel idea on the market, the ‘fruits’ of a novel idea will materialize later (Blair & Mumford, 2007). Third, ideas assessed as novel by an organization require special knowledge which does not reside within that organization (Poetz & Schreier, 2012; Schweisfurth, 2017). As it is not sure if novel ideas can be turned into successful products, it may not be worth building up this kind of knowledge. Because novel ideas entail these risks and involve uncertainty, a high commitment from crowd members is necessary to co-create on these ideas.

Due to their organizational dependence, especially internal crowd members will consider these uncertainties in their co-creation behavior. As the behavior of employees has implications beyond the contest (cf. section 4.3.3), it is more likely that employees are more averse to risk and uncertainty compared to external crowd members. Since the success of novel ideas is uncertain and difficult to predict (Baer, 2012; Blair & Mumford, 2007), internal crowd members risk the direct consequence to co-create on an idea which takes long to implement or is not implemented at all. In addition, employees who are associated with supporting novel ideas may experience indirect implications like facing risks of image and reputation losses in their organization (Yuan & Woodman, 2010). Some studies show that organizational members share their knowledge more

selectively under high conditions of uncertainty (Alexy, George, & Salter, 2013). Based on the notion of *co-creation in the shadow of the organization*, we expect that internal crowd members weigh up the risks and opportunities associated with co-creation on novel ideas. Unlike external crowd members, employees will deliberate potential negative consequences beyond the crowdsourcing platform before initiating co-creation on uncertain ideas.

Forming a team has positive consequences, like networking with new persons and realizing an interesting project (Leonardi, 2015). However, forming a team also includes risks of negative experiences in working together with people. For instance, especially uncertain ideas often lead to personal disputes caused by different opinions (Baer, 2012). Further, projects can turn out to be an additional burden and workload (Gebauer et al., 2013). Due to their organizational dependence, internal crowd members enter into a more long-term commitment by joining a team member on an idea. As novel ideas promise less success and less implementation value in an organizational context (Poetz & Schreier, 2012; Schemmann, Herrmann, Chappin, & Heimeriks, 2016), internal crowd members will not risk being associated with an unsuccessful team. Consequently, employees will reduce the team formation on novel ideas. However, prior research shows that external crowd evaluators pay attention to novel ideas as these stand out of the mass (e.g., Haas, Criscuolo, & George, 2015). As the career prospects of crowd evaluators do not depend on their ability to predict the idea's success, they assess an idea unconditional of its risk (Beretta, 2019). Some studies even indicate that crowd evaluators favor novel ideas as these are more aligned with the diverse needs of the crowd (Magnusson, 2009; Ozer, 2009). External crowd members may not only evaluate novel ideas higher but also tend to contribute to these ideas. Therefore, we argue that team formation in the internal crowd will decrease on more novel ideas compared to external crowds.

Hypothesis 1b: The negative relationship between the internal crowd and team formation is strengthened by initial idea novelty. Specifically, internal crowd members will less likely form a team on more novel ideas.

For bursty co-creation to occur, crowd members have to invest time to align their activities in a short period with their interaction partners (cf. section 4.3.4.2). In case of highly novel ideas, individuals need to invest time to understand an idea, to ask the idea initiator further questions or to conduct even own research on this topic. Especially internal crowd members may need more time to find out if and how this idea can be implemented and which established production or marketing processes can be applied (Schweisfurth, 2017; Zuchowski et al., 2016). Crowd members have to invest this time in a concentrated time period but will receive the direct or indirect returns only if the idea is successful later (Criscuolo et al., 2017; Kathan et al., 2015). To avoid committing time to an idea which will only materialize later in the organizational environment, we expect internal crowd members to cooperate less intensively on novel ideas than external crowd members. As external crowd members are independent from the organizational environment, they will care less about the implementation of an idea in the organization. In addition, external crowd members have more diverse backgrounds and knowledge (Jeppesen & Lakhani, 2010; Poetz & Schreier, 2012). This means that there is a higher likelihood of finding an individual in the external crowd who is able to respond quickly without investing so much time for further research. This enables a fast alignment of co-creation activities. As the coordination of activities will be less intensive in the internal crowd, we expect less bursty co-creation on novel ideas compared to external crowds.

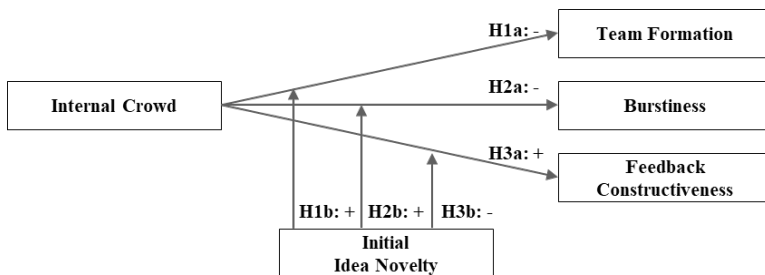
Hypothesis 2b: The negative relationship between the internal crowd and burstiness is strengthened by initial idea novelty. Specifically, internal crowd members will less intensively coordinate their activities on more novel ideas.

In order to provide constructive feedback, crowd members have to invest effort to understand the idea, to find a solution, and to write the comment in a constructive way (cf. section 4.3.4.3). Especially novel ideas deal with topics which are not known to the organization. Within an organization, employees have similar organizational-related knowledge (Knudsen et al., 2018; Malhotra et al., 2017). In order to provide constructive feedback on novel ideas, employees in the internal crowd have to collect additional information. This search for information on a novel topic

requires a commitment of additional effort from internal crowd members (Katila & Ahuja, 2002). Due to the high uncertainty of the idea success in the organizational environment, internal crowd members may not want to invest that effort. Even if they may invest the effort, internal crowd members may shy away from posting a comment as they are uncertain if the content is appropriate (Mihm & Schlapp, 2015). In an external crowd, the knowledge and expertise of crowd members is more distant than in an internal crowd (Afuah & Tucci, 2012; Zuchowski et al., 2016). This means that users may have more knowledge about other industries and products in which the organization has not specialized in. This knowledge distance has shown to be an advantage in the generation of creative ideas or solutions (Chatterji & Fabrizio, 2014; Jeppesen & Lakhani, 2010; Piezunka & Dahlander, 2015). Thanks to this distant knowledge, external crowd members will more easily be able to provide constructive feedback on novel ideas compared to internal crowd members. As the investment of effort will be higher in an internal crowd, we expect less constructive feedback on novel ideas compared to an external crowd. The Figure 4.2 summarizes our hypothesis in a research model.

Hypothesis 3b: The positive relationship between the internal crowd and feedback constructiveness is weakened by initial idea novelty. Specifically, internal crowd members will provide more constructive comments on less novel ideas.

Figure 4.2: Research Model.



4.4 Methodology

4.4.1 Research Design and Sample

In order to test our hypotheses, this study uses a unique dataset gathered from two identical crowdsourcing contests conducted separately with an internal and an external crowd at a leading German automobile manufacturer. The internal crowd contest has taken place from October until December 2017 whereas the external crowd contest has been online from April until June 2018. The internal and the external crowdsourcing contests are designed exactly in the same way and deal with the same topic to ensure the highest possible amount of comparability. However, internal and external participants operate on two separate online platforms which allow no interactions between the internal and the external crowd. Both contests last six weeks and consist of two phases, namely *idea submission and collaboration* and *idea review*. During the first phase, internal as well as external participants are asked for their ideas on a smart and clever interior feature for the future generation of compact class cars. As an answer to this challenge question, participants can post their ideas on the respective platform. In total, our sample contains 328 ideas, 121 ideas are submitted by internal crowd members and 207 ideas are posted by the external crowd. Right after their publication on the platform, submissions are reviewed with regards to their initial quality by a panel of ten automotive experts from the hosting company. Crowd members also have the chance to assess the ideas on the same evaluation criteria. In addition, participants in both crowds have the possibility to co-create with other crowd members on the ideas by posting comments and by forming teams on the ideas.³² Whereas internal crowd members have posted in total 625 comments, external crowd members published 1,797 comments. In total, 64 teams have been built in the internal crowd compared to 94 teams in the external crowd. In addition, initiators who receive feedback on ideas are able to edit the idea content accordingly. In the internal crowd, 38 ideas have

³² For more information on the variables, cf. section 4.4.2.

been edited while 72 ideas have been modified in the external crowd. Commenting, teaming and edits are all visible to the participants on the platform. In the second phase *idea review*, ideas which have formed a team or have been edited are reviewed for a second time in order to account for the development of the idea. The three ideas with the highest combined score of experts' and participants' review are selected as winning ideas. The initiators of these winning ideas including their teams are invited to an innovation workshop. Separate offline innovation workshops are conducted at the end of each crowd contest – one with the winners from the internal crowd, and one with the finalists from the external crowd.

The two crowd types differ in terms of their participants. In total, 245 employees are registered on the internal platform who have been invited by a company-wide e-mail and by a post on the corporate intranet website. External participants are recruited via multiple channels. As the external crowd contest is publicly available for everyone, an open call for participation has been issued on the company's social media websites like Facebook, Twitter, and Instagram. In addition, several offline recruiting events have taken place at the company's headquarter and an invitation e-mail has been sent to leading universities in Germany. Moreover, external participants from a former crowdsourcing contest conducted by the company in 2010 are invited to join the current crowd contest. Finally, 370 external participants are registered on the platform. 19% of these participants have already been registered in the former contest in 2010. This number seems to be equal to an internal crowd since 30% of its members also have been registered in former internal contests.

The registered participants in the internal and external crowd have different demographics. These can be compared by using the Blau's Index (Blau, 1977).³³ In detail, both samples are predominantly male with 77% men in the external crowd and 83% men in the internal crowd. Thus, the Blau's Index for gender diversity is slightly higher in the external crowd (0.35) than in the

³³ The Blau's Index reflects how many different characteristics are in a dataset by taking into account the distribution of these characteristics. The Blau's Index ranges from 0 to 1 whereas a higher number expresses higher diversity (Blau, 1977).

internal crowd (0.28). In terms of nationality, internal employees come from 14 different countries while over 90% originate from Germany. As external participants have 54 different nationalities and only 46% are German, the external crowd has higher international diversity (0.73) than the internal crowd (0.16). Regarding the functional background, we identified eight common working areas in both crowds.³⁴ Internal participants predominantly work in research and development (34%), sales and marketing (22%), and logistics or production (18%). Most external participants also have a job in research and development (22%), in sales or marketing (19%), or in information technology (10%). The Blau's Index for functional diversity is also slightly higher in the external crowd (0.82) than in the internal crowd (0.79). The combined Blau's Index for all three characteristics (Zhu et al., 2019) indicates a higher demographic diversity in the external crowd (0.63) than in the internal crowd (0.41). Whereas all participants in the internal crowd work in the automotive industry, 25% of all registered external crowd members are employed in the automotive industry. In addition, 81% of external crowd members have one or more cars in the household. In the external crowd, 58% are users of the product as they have already driven a compact class car from the hosting company and 15% own one. Therefore, more than half of the external crowd members have product experience.

4.4.2 Dependent Variables

Team formation describes the likelihood for building a team. If crowd members form a team around a respective idea, the variable is coded as 1 and 0 otherwise. To build a team, interested participants can request team membership on an idea or the idea initiator can invite participants as team members to the idea. For successful teaming, the initiator and the potential team member have to accept the teaming request. Team members are listed under the idea and are visible for all

³⁴ The eight common working areas are 'administration and human resources', 'sales and marketing', 'controlling and finance', 'information technology', 'logistics and production', 'purchasing', 'research and development', and 'others'.

participants on the platform.³⁵ In addition to the teaming probability, we report the team size which expresses the number of team members excluding the idea initiator.

Burstiness captures the temporal coordination of collaboration activities in the crowd. Riedl and Woolley (2017: 390) define burstiness as the “[...] degree to which team members concentrated their communication and work effort during relatively contained time periods versus spreading them out over time more equally”. If the time periods between collaboration activities are more concentrated, the burstiness will be higher. We adopt this measure from Riedl and Woolley (2017) and Goh and Barabási (2008) by first calculating the mean waiting time t between collaboration activities in minutes per idea. For the calculation of burstiness we take into account 4,879 time stamps including the collaboration activities for created ideas, posted comments, content edits of an idea, added team members, and idea evaluations by crowd members. From the external crowd, five ideas must be excluded from our analysis as they had less than two activities. Thus, the sample size is reduced to 323 ideas for the calculation of burstiness. For these 323 ideas, we compute a coefficient of variance B which is defined as the ratio of the standard deviation (SD) to the mean (M) of waiting times t (Goh & Barabási, 2008; Riedl & Woolley, 2017).

$$B = \frac{(SDt - Mt)}{(SDt + Mt)} \quad (1)$$

Burstiness can have values between -1 and 1 and is a measure for concentrating or spreading communication over time. A positive value indicates concentrated interactions whereas a negative value expresses completely regular activities (Riedl & Woolley, 2017). Figure 4.3 shows three schematic examples for $-1 \leq B \leq 1$ (Goh & Barabási, 2008). The lines represent co-creation activities like commenting or teaming whereas white areas are the waiting times in between. A value close to zero ($B \approx 0$) describes neutral burstiness meaning that interactions follow a usual

³⁵ We only investigate successful teaming requests as these are visible for all participants on the platform. Due to data protection reasons, we are not allowed to collect data on the possible rejections of team members. Even if team members have the possibility to leave a team, no team member has quit the team after they joined.

distribution pattern (picture a). If the burstiness is high (i.e., close to 1), activities happen very unregularly with long waiting times in between (picture b). As shown in picture (b), ‘bursts’ of concentrated communication emerge (Barabási, 2005). If the burstiness is low (i.e., close to -1), interactions are spread in a very regular and periodic order (picture c).

Figure 4.3: Examples of Burstiness.



Source: Goh and Barabási (2008). Horizontal axis denotes time and each vertical line corresponds to an activity.

Feedback constructiveness expresses the share of constructive comments per idea. Following the approach from Zhu, Kock, Wentker, and Leker (2019), a comment is considered as constructive if it provides concrete hints for improving an idea (*improvement feedback*) or suggestions how to implement an idea (*implementation feedback*). Nonconstructive comments are, for example, comments that do not add new aspects to the idea or merely repeat the content of previous comments. For each crowdsourcing contest, two coders have independently coded all 2,423 comments (626 comments from internal crowd and 1,797 comments from the external crowd). Two binary variables have been coded expressing the feedback constructiveness, namely *improvement feedback* and *implementation feedback*. An example of improvement feedback is ‘I read your idea and there are some parts I really like, but others can be improved. I would suggest [...]’. Implementation feedback is for instance ‘[...] the best way to make this idea work is to have some form of recognition in the car [...]’. For the variable improvement feedback the percentage agreement of the coders is 0.95 and the Cohen’s Kappa 0.94. The agreement rate for

implementation feedback is 0.96 and the Cohen's Kappa 0.95. The Cohen's Kappa indicate an almost perfect interrater agreement (Cohen, 1960). In case of disagreement between the coders, one independent employee of the organization decides the value for the variable. First, the variable *feedback constructiveness* is calculated if a comment includes improvement or implementation feedback on a comment level. Second, the values are summed up on an idea level to express the total number of feedback constructiveness per idea. Third, we calculate the number of feedback comments per idea in relation to the total number of comments per idea. Finally, feedback constructiveness captures the share of constructive comments per idea and ranges from 0 to 1.

4.4.3 Independent and Control Variables

In the following, we define our independent and control variables. In line with prior studies on collaboration behavior (e.g., Hahn, Moon, & Zhang, 2008), we include controls for the idea and the initiator in our models.

Internal Crowd. The internal crowd type is the independent variable of our analysis. The binary variable *internal crowd* indicates the type of crowd while 1 identifies an internal crowd and 0 an external crowd (cf. section 4.4.1).

Controls for idea quality. Experts of the hosting company assess the quality of ideas twice. First, the ideas are assessed right after their submission to the platform. This *initial expert evaluation* indicates the initial idea quality before crowd members start to co-create on ideas. Second, all ideas which have a team, or a content edit are reviewed by a *second expert evaluation* in order to account for possible idea changes. This procedure is performed for internal and external ideas by the same experts using the following four evaluation criteria on a five-point Likert-Scale: novelty, customer value, market potential, and implementation potential. Especially the initial expert evaluation is visible from the start of the contest. Even if the last expert evaluation – in case of a developed idea – determines the winning ideas, internal and external crowd members may rely on the experts' initial assessment to reduce the uncertainty. Thus, we control for the following initial expert

evaluations (Hahn et al., 2008). *Initial idea novelty* describes the average experts' evaluations of the criteria idea novelty. The evaluation criteria idea novelty is defined as 'the idea is new and exciting for the company's customers'. The second evaluation criteria is the *initial customer value* which expresses that 'the idea provides value for the company's customers'. As a third evaluation criteria, experts assess the *initial implementation potential* evaluating if 'this idea can be realized in the company's products'. Finally, the experts review the idea according to the *initial market potential* defined as "the company's customers will buy this idea". All evaluation criteria are calculated as mean expert evaluation score of the criteria per idea. Following the advice of Iacobucci, Schneider, Popovich, and Bakamitsos (2017), the variables are mean centered for the regression analyses.³⁶ The mean centered variable *initial idea novelty* is used as moderator variable for our hypotheses 1b, 2b, and 3b.

Controls for idea characteristics. We control for several characteristics of an idea which may influence co-creation behavior. First, *idea similarity* indicates if ideas have similar content in the internal and external crowd. The binary variable idea similarity is coded as 1 if this idea is similar to another idea and 0 otherwise. We account for idea similarity as internal and external crowd members posted ideas on the same challenge question. Idea similarity is measured by an expert assessment according to an approach by Kornish and Ulrich (2011). In total, six experts have received a list of all 328 ideas without indication if the idea comes from an internal or external crowd member. Their task is to create similar ideas and label them accordingly. The agreement between all raters is 0.90, the interrater reliability according to Cohen's Kappa for the variable is 0.83. This indicates a substantial agreement (Cohen, 1960). As this assessment of similarity depends on individual opinion, we coded a binary variable for idea similarity as 1 only if at least

³⁶ Iacobucci et al. (2017) states that mean centering of the moderator variables has two positive effects. First, mean centering of the moderator variables prior to the calculation of the interaction term $A \times B$ is helpful to clarify the regression coefficient by reducing the correlations $r(A, A \times B)$ and $r(B, A \times B)$. The regression coefficient for the interaction term $A \times B$ will not be affected. Second, the overall model fit R^2 remains undisturbed.

50% of experts agree that this idea is similar to another idea on the list. The expert assessment shows that internal crowds and external crowds correspond in 36% of their ideas if they generate ideas independently on the same challenge question. The categorical variable *idea maturity* indicates how long an initiator is already working on the idea. These prior working hours have been coded manually into three categories ‘short term < 1 day (1)’, ‘medium-term, 1 day until 1 week (2)’ and ‘long-term > 1 week (3)’. Since the interrater agreement of 0.91 and the respective Cohen’s Kappa of 0.86 show almost perfect agreement, these three categories are used to describe the idea maturity. The idea maturity may affect the way of collaboration in two ways. On the one hand, participants will decide to collaborate on less mature ideas as these ideas still leave creative space for improvement. On the other hand, participants will also collaborate on more mature ideas as they hope for a higher chance of winning the crowdsourcing contest. To operationalize the variable *idea trend*, four trends in the automobile industry, namely ‘autonomous’, ‘connected’, ‘electrified’, and ‘shared products and services’ (McKinsey&Company, 2017) have been coded manually. The interrater agreement is 0.95 and the Cohen’s Kappa 0.82. The binary variable *idea trend* is coded as 1 if one of these trends applies and 0 otherwise. Popular topics may arise the interest of collaborators which are more likely to join such an idea (Hahn et al., 2008). The variable *idea length* is operationalized by the number of words in the idea description. Participants may be more willing to contribute to ideas that are well comprehensible and detailed as this reduces information uncertainty. An accurate explanation of the ideas may result in a longer textual description (Hahn et al., 2008; Zhu et al., 2019). The variable *idea views* is measured by the number of views per idea. The number of idea views is a control mechanism for the idea popularity. Popular ideas receive more attention and will therefore attract more collaborators (Haas et al., 2015). The variable *idea age* describes the time of the idea on the platform. The variable is measured by the days an idea is on the platform. A higher number indicates that the idea has been submitted early to the contest. An idea which has been submitted at the beginning of the contest has a higher chance of being seen and commented by crowd members. Furthermore, some participants may prefer to join or comment

recently posted ideas, while other participants may prefer to wait until the idea has found some supporters (Hahn et al., 2008).

Controls for the idea initiator. The variable *initiator repeated participation* indicates if the initiator has already taken part in a prior crowd contest organized by the respective automotive company. The variable is 1 if the initiator has already participated in a prior crowdsourcing contest and 0 otherwise. Internal and external crowd members have been able to participate in maximum three prior contests. In the internal crowd, the variable states if an employee has already participated in a prior contest on the internal platform of the company. For the external crowd, the variable indicates that individuals have already registered in a prior external crowdsourcing contest hosted by the company. Repeated participation has shown to influence the subsequent activity level and the idea outcome (Bayus, 2013; Riedl & Seidel, 2018). The binary variable *initiator call* expresses if the initiator calls for resources in the idea description or not. The initiator either calls for personnel resources (e.g., person with coding skills), for material resources (e.g., 3D printer) or for both types of resources. The call for resources can provide legitimacy for crowd members to contribute to an idea (e.g., Dahlander & O'Mahony, 2011). The variable *initiator motivation* states the motivation of the initiator to be open for feedback from other participants in the crowdsourcing contest. The variable is 1 if the initiator stated that feedback is welcome and 0 otherwise. As the motivation to receive feedback is visible for all employees, this may express openness for feedback and attract more crowd members to this idea. The variable *initiator ideas* controls for the number of ideas submitted per initiator. On the one hand, an initiator posting a number of ideas may be motivated to receive feedback or to win the contest (Shah, 2006). On the other hand, a high number of ideas may reduce the willingness of the initiator to invite team members as he has a higher workload in coordinating the team (Ben-Menahem et al., 2016; Deichmann & Jensen, 2018).

4.5 Results

4.5.1 Descriptive Results

In the following section, we will provide a descriptive overview of the central co-creation patterns indicating first differences between internal and external crowds. Table 4.2 shows all dependent variables including a mean comparison test on differences between internal and external crowds. In the end, Table 4.5 summarizes the descriptive statistics for all variables and their correlations.

Table 4.2: Descriptive Statistics of Dependent Variables in Internal and External Crowds.

Variables	Internal Crowd					External Crowd				P-Value
	N	Mean	SD	Min	Max	Mean	SD	Min	Max	
Team Formation	323	0.53	-	0.00	1.00	0.46	-	0.00	1.00	0.20
Burstiness	323	0.10	0.17	-0.62	0.51	0.22	0.19	-0.53	0.57	0.00
Feedback Constructiveness	323	0.45	0.30	0.00	1.00	0.33	0.27	0.00	1.00	0.00

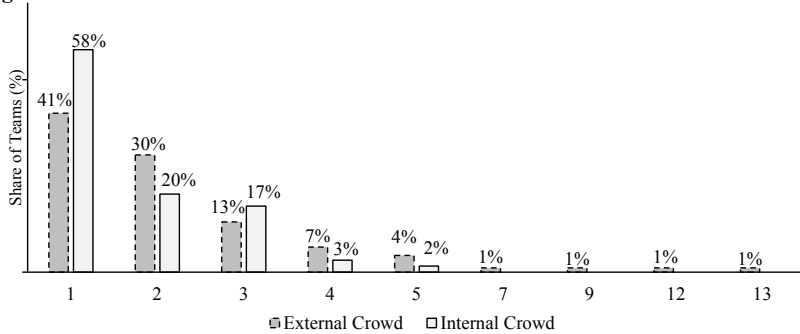
Note: (b) indicates binary variables. P-value is calculated using t-tests comparing the mean values. N = 323 (cf. section 4.4.2)

Team formation describes the likelihood for building a team. As displayed in Table 4.2, the probability for forming a team is 0.53 in the internal crowd. This means that more than half of the internal idea initiators have built a team. In contrast, there is a lower likelihood of 0.46 of finding at least one team member in the external crowd. The mean comparison test shows that the likelihood for team formation does not differ significantly ($p=0.20$) between internal and external crowds. In order to get more insights on the teaming activity, we conduct further analyses on the size of the teams.³⁷ While teams in the internal crowd have on average 1.70 (SD=0.97) team members per idea, the teams in the external crowd are larger with on average 2.33 (SD=2.08) team members per idea. Thus, the average team size is significantly smaller ($p=0.02$) in the internal

³⁷ The variable 'team size' expresses the number of team members excluding the idea initiator for all ideas having built a team. This means if one team member joined an idea, this variable has the value 1.

compared to the external crowd. Interestingly, this difference refers to several very large teams in the external crowd. In the external crowd, four teams have been built with over five and with a maximum of 13 team members whereas the maximum size of team members in the internal crowd does not exceed five team members. The distribution of the team size measured by the number of team members is displayed in Figure 4.4. Restricting the variable team formation to a team size <5 members in the external crowd (Mean=0.44), team formation differs significantly between the internal and external crowd ($p=0.1$).

Figure 4.4: Distribution of Team Size in Internal and External Crowds.

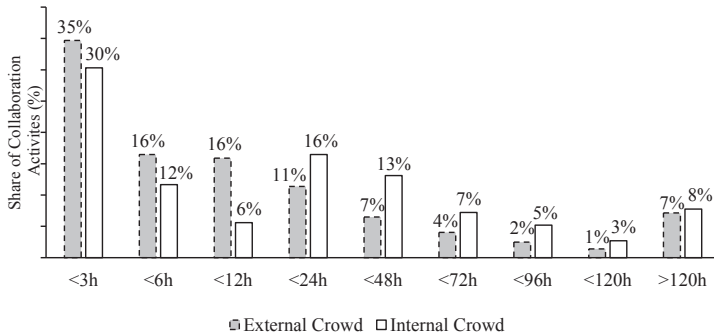


Note: X-axis shows number of team members. Team size is defined as number of team members excluding the idea initiator, no observations for teams with 6, 8, 10, and 11 team members.

Burstiness expresses the temporal coordination of interactions (Riedl & Woolley, 2017). As depicted in Table 4.2, the average burstiness is significantly higher ($p=0.00$) in the external crowd (Mean=0.22, SD=0.19) than in the internal crowd (Mean=0.10, SD=0.17). This means that external crowd members align their co-creation activities in a closer time frame than internal crowd members. As the calculation of burstiness is based on the mean and the standard deviation of waiting times per idea (cf. section 4.4.2), we take a closer look at the waiting times displayed in Figure 4.5. The waiting time for an answer from a crowd member to a previous activity on the idea (e.g., comment) is on average 45.3 hours in the internal crowd and 49.3 hours in the external crowd. However, the waiting times are more spread out from their average in the external crowd

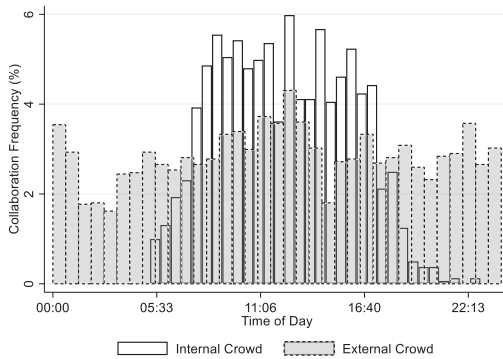
(SD=52.48 hours) than in the internal crowd (SD=27.5 hours). This explains the more bursty interactions in the external crowd.

Figure 4.5: Distribution of Waiting Times in Internal and External Crowds.



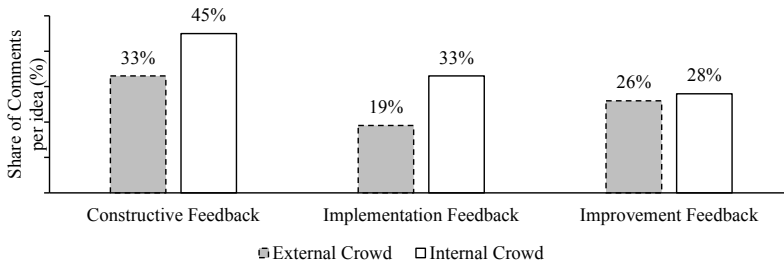
Note: Waiting times are the delta between two consecutive collaboration activities on one idea in hours.

An additional analysis in Figure 4.6 displays the co-creation points in time in internal and external crowds on a daily basis in central European time (CET). In the external crowd, the temporal interactions are rather distributed throughout the day with low activity from 0:00 a.m. to 5:00 a.m. On contrast, the temporal interactions in the internal crowd have a peak between 05:30 a.m. and 05.00 p.m. Apart from this core time, members in the internal crowd show low activity off the job early in the morning and late in the evening.

Figure 4.6: Distribution of Co-Creation Points in Time in Internal and External Crowds.

Note: Co-creation points in time are displayed on a daily basis in central European time (CET).

Feedback constructiveness is defined as the share of constructive comments per idea. In total, internal crowd members write on average 5.17 comments per idea (SD=3.95) whereas the average in the external crowd is 8.88 comments per idea (SD=10.85). A mean comparison test states that commenting activity in total is higher in the external crowd ($p=0.00$). In detail, Table 4.2 and Figure 4.7 indicate that ideas in an internal crowd receive on average 0.45 constructive comments whereas ideas in an external crowd receive on average 0.33 constructive comments. Thus, constructive feedback is significantly higher in internal than in external crowds ($p=0.00$). Constructive feedback includes feedback on how to implement and how to improve an idea (cf. section 4.4.2). A detailed analysis of these comment categories (cf. Figure 4.7) shows that internal and external crowds especially differ in their feedback on how to implement an idea. Internal crowd members give more implementation feedback (Mean=0.33, SD=0.27) than external crowd members (Mean=0.19, SD=0.23). Surprisingly, internal and external crowd members do not differ significantly ($p=0.53$) in their improvement feedback. External crowd members provide on average 0.26 comments with suggestions for idea improvement compared to 0.28 comments with improvement per idea in the internal crowd. Thus, the difference in constructive feedback may be driven by the different level of implementation feedback.

Figure 4.7: Distribution of Comment Categories in Internal and External Crowds.

Note: Distribution of relative comments per idea. Comments can be allocated to more than one category, thus the percentages exceed 100%. $N = 323$.

Initial idea novelty indicates how company experts evaluate an idea in terms of its novelty right after the submission to the crowdsourcing platform (cf. section 4.4.2). According to Table 4.3, initial ideas receive an average initial novelty evaluation of 2.50 in the internal crowd compared to an average novelty of 2.77 in the external crowd ($p=0.00$). However, experts evaluate ideas from the external crowd lower in terms of customer value, market and implementation potential compared to ideas from the internal crowd ($p=0.00$). This suggests that both crowds differ significantly in the quality of submitted ideas, especially the ideas from the external crowds are assessed as more novel than ideas from the internal crowd.

Table 4.3: Initial Expert Evaluation of Ideas in Internal and External Crowds.

Variables	Internal Crowd	External Crowd	Mean Difference
Initial Novelty	2.50 (0.66)	2.77 (0.76)	0.27***
Initial Customer Value	3.04 (0.56)	2.60 (0.50)	-0.44***
Initial Market Potential	2.34 (0.52)	2.05 (0.51)	-0.29***
Initial Implementation Potential	2.72 (0.79)	1.82 (0.71)	-0.90***

Note: Mean difference of initial expert evaluation with *t*-test. $N = 323$. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (two tailed test). Standard deviation in parentheses.

Table 4.4 displays the differences of the dependent variables in internal and external crowds with regard to low and high levels of initial idea novelty. Comparing the co-creation behavior within each crowd reveals that all co-creation patterns in the internal crowd do not change significantly from low to high novelty. However, team formation and burstiness significantly differ for low and high levels of novelty within the external crowd ($p=0.00$). This finding gives a first indication for a moderating effect of idea novelty. Table 4.5 summarizes all variables.

Table 4.4: Co-Creation Depending on the Level of Initial Idea Novelty.

Variables	Internal Crowd			External Crowd		
	Low Novelty	High Novelty	Difference	Low Novelty	High Novelty	Difference
Team Formation	0.46 (0.50)	0.60 (0.50)	-0.14	0.25 (0.44)	0.57 (0.50)	-0.32***
Burstiness	0.08 (0.18)	0.12 (0.17)	-0.04	0.17 (0.21)	0.26 (0.17)	-0.09***
Feedback Constructiveness	0.46 (0.33)	0.45 (0.27)	0.01	0.37 (0.32)	0.32 (0.23)	0.05

*Note: As initial idea novelty is assessed on a Likert-Scale from 1-5, we split novelty on the median. Standard deviation in parentheses. $N = 323$. Difference is tested via t -test. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Table 4.5: Descriptive Statistics and Correlation Matrix.

Variables	Mean	SD	Min.	Max.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	
1. Internal Crowd (b)	0.37		0.00	1.00																		
2. Team Formation (b)	0.48		0.00	1.00	.07																	
3. Burstiness	0.18	0.20	-0.62	0.57	-.31*	.34*																
4. Feedback Constructiveness	0.38	0.29	0.00	1.00	.20*	.02	-.05															
5. Initial Novelty/	2.67	0.73	1.00	4.60	-.18*	.33*	.24*	-.11*														
6. Initial Customer Value/	2.76	0.57	1.00	4.20	.38*	.24*	.05	.08	.15*													
7. Initial Imple. Potential/	2.16	0.87	1.00	4.00	.50*	.28*	-.03	.07	-.02	.51*												
8. Initial Market Potential/	2.16	0.55	1.00	4.00	.26*	.20*	-.005	.09	-.04	.70*	.39*											
9. Idea Similarity (b)	0.36		0.00	1.00	.002	.10	.08	.13*	-.23*	.23*	.35*	.25*										
10. Idea Maturity	1.88	0.92	1.00	3.00	.24*	-.14*	-.24*	.07	-.17*	.03	.06	-.05	-.05									
11. Idea Trend (b)	0.15		0.00	1.00	.15*	.11*	.003	.10	.11*	.17*	.15*	.18*	.16*	-.13*								
12. Idea Length	1,668	1,333	187	11,779	-.06	.30*	.17*	-.06	.20*	.11*	.12*	.14*	-.01	.005	.01							
13. Idea Views	82.19	78.52	1.00	568	.33*	.41*	.21*	.14*	.17*	.45*	.44*	.35*	.22*	-.03	.23*	.26*						
14. Idea Age	23.36	11.45	1.00	41.0	-.41*	-.05	.32*	-.05	.13*	.15*	-.07	.12	.06	-.09	-.01	.03	.18*					
15. Initiator Prior Participation	0.48	0.59	0.00	3.00	-.25*	.01	.10	-.03	.18*	-.15*	-.09	-.05	.05	-.13*	.13*	.008	.07	.25*				
16. Initiator Call (b)	0.77		0.00	1.00	-.13*	.17*	.16*	.08	.17*	.20*	.06	.15*	.09	.07	.09	.12*	.21*	.20*	-.01			
17. Initiator Motivation (b)	0.24		0.00	1.00	.23*	.23*	.02	.06	.17*	.12*	.18*	.09	-.05	-.05	.25*	-.03	.18*	-.03	.11*	.15*		
18. Initiator Ideas	6.49	7.98	1.00	26.0	-.45*	-.10	.12*	-.20*	.19*	-.48*	-.40*	-.42*	-.28*	-.09	-.01	.13*	-.22*	.13*	.40*	-.18*	.15*	

Note: Correlations with * are significant at 5%. Number of observations: 323, (b) indicates binary variable. † Evaluation criteria are not mean centered for descriptive analysis

4.5.2 Regression Analysis

We apply ordinary least squares (OLS) and logit regressions to test the hypothesized relationships.³⁸ For all models, the average variance-inflation factor is 1.7 which indicates low multicollinearity. Table 4.6 displays the results for our models representing hypotheses 1a-3a. Our results show that the internal crowd type has a significantly negative effect on the likelihood of forming a team ($b=-1.47$, $p<0.05$). A further analysis of predictive margins reveals that internal crowd members are less likely (margin=0.35) to form a team than external crowd members (margin=0.56). This margin difference of -0.21 is significant ($p=0.00$).³⁹ This finding supports our hypothesis 1a. In addition, Table 4.6 indicates that the internal crowd type is significantly and negatively related to the burstiness of interactions ($b=-0.11$, $p<0.01$).⁴⁰ Since burstiness is significantly lower in the internal compared to the external crowd, this supports our hypothesis 2a. In addition, we find a positive and significant effect of the internal crowd on the feedback constructiveness ($b=0.09$, $p<0.1$) which supports our hypothesis 3a. In sum, we find support for our hypotheses 1a-3a.

³⁸ In order to account for the possibility that error terms of the dependent variables are correlated with each other, we apply seemingly uncorrelated regressions (Zellner, 1962). As the seemingly uncorrelated regressions yield the same results as the OLS regressions, we assume no correlation of error terms in our analyses.

³⁹ The significant effect of the internal crowd on team formation seems contrary to the non-significant difference shown in the descriptive results (cf. Table 4.2). Post-hoc analyses reveal that the control variables 'idea view' and 'idea age' influence the results of the regression analysis. Omitting one of these variables, the effect of the internal crowd type on team formation becomes not significant ($b=-0.32$, n.s. if omitting idea views; $b=-0.47$, n.s. if omitting idea age). Leaving out both variables, the effect of the internal crowd type on the team formation is not significant and even positive ($b=0.14$, n.s.). The variable internal crowd is in addition significantly correlated to idea views (.33*) and idea age (-.41*). Since especially idea view and idea age are standard control variables taking into account the conditions of an idea on the platform and are used in almost all prior research (Haas, Criscuolo, & George, 2015; Hahn, Moon, & Zhang, 2008), we keep these control variables. Further, the effect of the internal crowd on team formation is significant ($b=-1.0$, $p<0.05$) with a reduced team size <5 external crowd members.

⁴⁰ In order to check the robustness of the results, we calculate the variable *burstiness* again in two different ways. First, the variable is calculated only taking into account interactions of comments in the respective crowd. Second, the variable is calculated only based on the interaction times of the evaluations. For each of these two new generated variables, we run separate regressions using the same controls as for the model 2a. We find support that the internal crowd type has a significant negative effect on burstiness if burstiness is defined as interactions in comments ($b=-0.11$, $p<0.05$) and also if burstiness is defined as interactions in evaluations ($b=-0.08$, $p<0.05$). Thus, our findings are robust even if we define burstiness only as temporal coordination of comments or evaluations.

Table 4.6: Regression Results Direct Effects.

Category	Variables	(H1a) Team Formation	(H2a) Burstiness	(H3a) Feedback Constructiveness
Independent Variable	Crowd Type	-1.47*** (0.53)	-0.11*** (0.03)	0.09* (0.10)
	Initial Novelty	0.81*** (0.23)	0.03* (0.02)	-0.02 (0.03)
Controls Idea Quality	Initial Customer Value	0.16 (0.44)	0.03 (0.03)	-0.03 (0.05)
	Initial Implementation Potential	0.42* (0.23)	0.002 (0.02)	-0.05* (0.03)
	Initial Market Potential	-0.009 (0.38)	-0.04* (0.03)	-0.0009 (0.04)
Controls Idea Characteristics	Idea Similarity	0.19 (0.37)	0.03 (0.03)	0.07* (0.04)
	Idea Maturity	-0.27 (0.17)	-0.03*** (0.01)	0.01 (0.02)
	Idea Trend	-0.27 (0.44)	-0.03 (0.03)	0.03 (0.05)
	Idea Length	0.0003** (0.0002)	1.09e-05 (7.76e-06)	-1.23e-05 (1.26e-05)
	Idea Views	0.02*** (0.004)	0.0005*** (0.0002)	0.0004 (0.0003)
	Idea Age	-0.07*** (0.02)	0.002** (0.001)	-0.0002 (0.002)
Controls Idea Initiator	Initiator Repeated Participation	0.11 (0.30)	-0.02 (0.02)	0.03 (0.03)
	Initiator Call	0.03 (0.41)	0.02 (0.03)	0.05 (0.04)
	Initiator Motivation	1.31*** (0.41)	0.02 (0.03)	0.03 (0.04)
	Initiator Ideas	-0.04 (0.03)	0.0005 (0.002)	-0.006* (0.003)
	Constant	0.69 (0.68)	0.15*** (0.05)	0.25*** (0.08)
	Observations	323	323	323
	Prob > F (or chi2)	0.00	0.00	0.00
	R2 (or Pseudo R2)	0.32	0.26	0.10

Note: Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4.7 shows the results for the moderation effects of initial idea novelty on the relationship between the internal crowd type and the dependent variables. Initial idea novelty has a negative moderating effect on the relationship between the internal crowd and team formation ($b=-1.44$, $p<0.01$) as well as on the relationship between the internal crowd and burstiness ($b=0-.07$, $p<0.05$). This supports our hypotheses 1b and 2b.⁴¹ The graphs displayed in Figure 4.8 demonstrate the nature of the interaction effect for the internal and external crowd. The graphs indicate that the relationship between initial idea novelty and teaming formation as well as initial idea novelty and burstiness are both lower in the internal crowd compared to the external crowd.⁴² Contrary to our assumption, we find no significant moderating effect of initial idea novelty on feedback constructiveness ($b=0.01$, n.s.). As shown in the graphs in Figure 4.8, constructive feedback is slightly reduced on ideas with high novelty in both crowds. However, the effect of constructive feedback is not significantly different in the case of low novel compared to high novel ideas. Internal crowd members still provide more constructive feedback than external crowd members – independent from the novelty of an idea. This result is in line with the descriptive results displayed in the previous Table 4.4. Thus, our final hypothesis 3c cannot be supported.

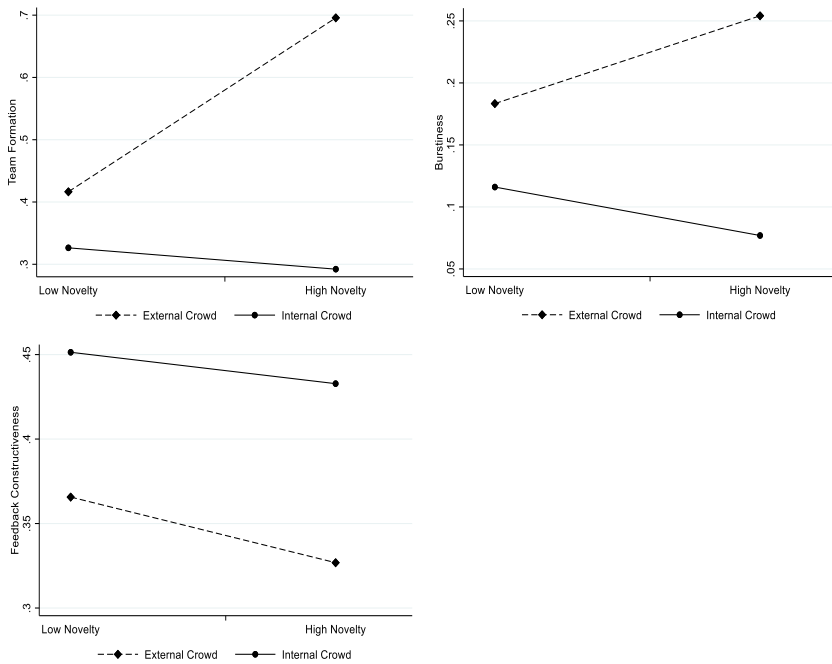
⁴¹ As Riedl and Wooley (2017) use the standardized variable for *burstiness* in their models, we conduct a post-hoc analysis standardizing the dependent variable burstiness. The results indicate that the internal crowd has a significant negative effect on burstiness ($b=-0.60$, $p=0.001$), and the interaction term of the internal crowd and initial idea novelty have a significant negative effect on burstiness ($b=-0.42$, $p=0.05$). These findings show support for our hypotheses H2a and H2b even if the variable burstiness is calculated as standardized variable.

⁴² Some prior studies argue for an inverted u-shaped effect of idea novelty (Crisuolo, Dahlander, Grohsjean, & Salter, 2017). We accounted for this possibility by running separate regressions including idea novelty as squared term. However, we are not able to find an inverted u-shaped effect of idea novelty in our data.

Table 4.7: Regression Results Interaction Effects.

Category	Variables	(H1b) Team Formation	(H2b) Burstiness	(H3b) Feedback Constructiveness
Independent Variable, Interaction Term	Crowd Type	-1.92*** (0.56)	-0.13*** (0.04)	0.10* (0.06)
	Initial Novelty	1.25*** (0.29)	0.05*** (0.02)	-0.03 (0.03)
	Crowd Type # Initial Novelty	-1.44*** (0.50)	-0.07** (0.03)	0.01 (0.05)
Controls Idea Quality	Initial Customer Value	0.34 (0.44)	0.04 (0.03)	-0.03 (0.05)
	Initial Implementation Potential	0.42* (0.24)	0.001 (0.02)	-0.05* (0.03)
	Initial Market Potential	0.05 (0.38)	-0.05* (0.03)	-0.0007 (0.04)
Controls Idea Characteristics	Idea Similarity	0.40 (0.37)	0.04 (0.02)	0.06 (0.04)
	Idea Maturity	-0.50 (0.18)	-0.03*** (0.01)	0.013 (0.018)
	Idea Trend	-0.17 (0.45)	-0.02 (0.03)	0.03 (0.05)
	Idea Length	0.0004** (0.0001)	1.12e-05 (7.70e-06)	-1.23e-05 (1.26e-05)
	Idea Views	0.02*** (0.004)	0.0006*** (0.0002)	0.0004 (0.0003)
	Idea Age	-0.07*** (0.02)	0.002** (0.001)	-0.0001 (0.002)
	Controls Idea Initiator	Initiator Repeated Participation	0.13 (0.30)	-0.01 (0.02)
Initiator Call		-0.03 (0.42)	0.01 (0.03)	0.05 (0.04)
Initiator Motivation		1.30*** (0.41)	0.02 (0.03)	0.03 (0.04)
Initiator Ideas		-0.04 (0.03)	0.0005 (0.002)	-0.006* (0.003)
	Constant	0.82 (0.70)	0.15*** (0.05)	0.25*** (0.07)
	Observations	323	323	323
	Prob > F (or chi2)	0.00	0.00	0.00
	R2 (or Pseudo R2)	0.34	0.28	0.10

Note: Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, Idea quality controls are mean centered.

Figure 4.8: Interaction Effect of Initial Idea Novelty and Crowd Type.

Note: Y-axis is truncated for purpose of visualization. On the x-axis low novelty values are 1 SD below, high novelty values are 1 SD above the mean.

4.5.2 Post-Hoc Analysis

Our basic assumption is that co-creation in crowds provides value resulting in an improved idea outcome. In order to investigate the created value in both types of crowds, we conduct a post-hoc analysis of the expert evaluation of developed ideas. All ideas submitted to the crowdsourcing platform receive an initial expert evaluation before an idea may be developed through co-creation. Developed ideas which have at least one team member and/or a content edit are evaluated a second time at the end of the contest after possible changes have been made through co-creation (cf. section 4.4.1). In Table 4.8, we compare the initial expert evaluation to the second expert evaluation for all

developed ideas in the internal and external crowd (N=180).⁴³ The results of mean comparison tests show that the overall evaluation score, which is calculated as combined score out of all evaluation criteria, improves from on average 2.45 to 3.14 for all developed ideas. In addition, all four evaluation criteria are evaluated higher in the second expert evaluation round compared to the initial evaluation round. These findings suggest that ideas which are developed through co-creation through teams and content edits improve in novelty, customer value, market potential, and implementation potential. Thus, co-creation in both types of crowds seems to provide value in terms of improving the ideas submitted to the platform.

Table 4.8: Expert Evaluation of Developed Ideas in Internal and External Crowds.

Variables	Initial Expert Evaluation	Second Expert Evaluation	Mean Difference
Overall Evaluation	2.45 (0.43)	3.14 (0.54)	0.69***
Novelty	2.92 (0.75)	3.58 (0.88)	0.66***
Customer Value	2.88 (0.52)	3.43 (0.56)	0.55***
Market Potential	2.22 (0.50)	3.02 (0.64)	0.80***
Implementation Potential	2.40 (0.85)	3.07 (0.83)	0.67***

*Note: Mean difference of initial expert evaluation and second expert evaluation for developed ideas with t-test. N=180 ideas in internal and external crowd which are developed through an idea edit and/or team. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (two tailed test). Standard deviation in parentheses.*

⁴³ In order to check the robustness of the results, we calculate the difference of the initial expert evaluation and the second expert evaluation for both crowd types separately. We find that the overall evaluation as well as all evaluation criteria significantly improve in the second expert evaluation compared to the initial expert evaluation in the internal crowd as well as in the external crowd.

4.6 Discussion

4.6.1 Theoretical Contributions

This study aimed at investigating differences in the co-creation behavior between internal and external crowds. To the best of our knowledge, we are the first study analyzing co-creation behavior in a contest where two different crowds – an internal and an external one – submit ideas on the same challenge question. Our analysis exposed that internal and external crowds indeed differ in their co-creation behavior. These findings have several theoretical implications.

First, we contribute to the growing stream of research on *collaboration* and *co-creation behavior* in a competitive crowdsourcing contest (e.g., Boudreau et al., 2014; Hutter et al., 2011; Kathan et al., 2015; Riedl & Woolley, 2017) by showing that co-creation varies depending on the type of crowd. Prior studies in this field have already highlighted that collaboration is a fundamental mechanism by which ideas are improved in crowdsourcing contests (e.g., Zhu et al., 2019). Despite the importance to spur collaboration in crowds, so far a detailed picture lacks how crowd members co-create, when they coordinate their interactions, and which content they create. Therefore, we consider the patterns of co-creation which require a high level of commitment, namely team formation, burstiness, and feedback constructiveness (Riedl & Woolley, 2017; Zhu et al., 2019). We find support for our hypotheses that the likelihood to form a team (hypothesis 1a) as well as the temporal coordination of activities (hypothesis 2a) are both lower in the internal than in the external crowd. These results are in line with our argumentation that internal crowd members consider the consequences of their commitment beyond the crowdsourcing contest. As employees more likely form long-term relationships, which are interpreted by the organizational environment, a higher level of commitment limits the willingness of internal crowd members to build a team compared to external crowd members. In addition, internal crowd members will deliberate the consequences of investing time for coordinating their co-creation activities which delays their interactions. Consequently, the burstiness is lower in an internal than in an external crowd. Since

the consequences of a commitment are limited to the contest environment in the external crowd, external crowd members have low hurdles joining a team or to coordinate their activities in a concentrated time period. In terms of the content crowd members co-create, our findings support our argument that internal crowd members provide constructive feedback more often than external crowd members (hypothesis 1a). This indicates that internal crowd members anticipate the consequences of their commitment and will invest more effort to publish a constructive comment on how to implement and to improve an idea compared to external crowd members. In sum, our results suggest that behavioral differences exist if and how internal and external crowd members initiate co-creation. Our findings complement prior studies on reciprocity (Kathan et al., 2015) and research on conditional cooperation (Boudreau et al., 2014) by revealing that especially internal crowd members anticipate the consequences of their collaborative behavior on online platforms. These insights can also be applied for other online platforms inherent in organizations like enterprise social networks (Huang et al., 2015; Yuan & Woodman, 2010). In addition, our results contribute to gain a better understanding on the co-creation mechanism in crowd types which will be useful for further research building on theory of motivation and participation to co-create (e.g., Hertel et al., 2003; Shah, 2006).

Since we investigate idea novelty as boundary condition for co-creation, we are able to make a further contribution to the field of *creativity and innovation management* (Baer, 2012; Blair & Mumford, 2007). Novel ideas involve high uncertainty if and when they are implemented by the organization (Blair & Mumford, 2007). In addition, they require special knowledge outside of the organizational environment (Poetz & Schreier, 2012; Schweisfurth, 2017). We partly find support that differences in co-creation behavior in internal and external crowds are reinforced under the condition of uncertainty. If an idea is more novel, internal crowd members are less likely to build a team (hypothesis 1b) and coordinate their activities less intensively (hypothesis 2b). However, we find no support for our hypothesis that internal crowd members provide less constructive feedback on novel ideas than external crowd members (hypothesis 3b). Instead, internal crowd

members provide more constructive feedback independent from the novelty of an idea compared to external crowd members. This can be explained in the following ways. First, it seems that internal crowd member will invest effort to publish a constructive comment even on novel ideas. Posting a constructive feedback on a novel idea may have the indirect consequence of making an especially good reputation on colleagues and supervisors. If an employee distinguishes himself to have unique knowledge on novel fields, this may benefit his or her career and reputation. Second, this finding may indicate that there is still diverse and distant knowledge available in an internal crowd. Even if the internal crowd is embedded in an organization, employees from different departments and backgrounds participate. Therefore, some employees in the internal crowd will self-select to provide constructive feedback even on novel ideas. These findings have important implications on the possibility to develop ideas in these two crowd types. In particular, the development of novel ideas into feasible solutions hinges on input and support of other team members (Poetz & Schreier, 2012). Especially if a crowdsourcing contest deals with a novel and future orientated topic, external crowd members may contribute more to the development of novel ideas in terms of teaming and bursty co-creation than internal crowd members. But internal crowd members will still give constructive feedback independent of the novelty of an idea.

Our last but major contribution relates to the theoretical discussions on different *crowd types* (e.g., Afuah, 2018; Zuchowski et al., 2016), to literature on *embeddedness of internal users* (e.g., Schweisfurth, 2017; Yan et al., 2018), and to research on the *theory of a firm* (e.g., Coase, 1937; Williamson, 1981). Even if some studies already highlight differences between internal and external users (Schweisfurth, 2017), the use and application of internal and external crowds is still in its infancy (Afuah, 2018). The unique nature of our dataset allows us to contribute to this research gap by analyzing differences and similarities between internal and external crowds. With regards to different crowd types, we find that independent external crowd members tend to be more active than internal crowds. This is in line with the assumption of Afuah (2018) who expects that external crowd members behave more ‘freely’ compared to an internal crowd. Referring to the literature on

embeddedness of internal users (Schweisfurth, 2017), our results suggest that the organizational dependence restricts the employees' teaming behavior and their temporal coordination of activities. However, if they co-create, employees provide constructive feedback more often than external individuals. These findings also relate to research on the theory of a firm (e.g., Coase, 1937; Santos & Eisenhardt, 2005; Williamson, 1981). The theory of a firm comprises various theoretical foundations for the existence of firms, their structure, and their boundaries. Unlike external crowds, internal crowds encounter these established firm structures like a clear division of tasks (Williamson, 1981). In addition, employees are used to a defined boundaries within their organizational units and towards external actors (Santos & Eisenhardt, 2005). Our findings indicate that employees – although being engaged in an internal crowd – may still adapt their behavior depending on their organizational environment. This means that the internal crowd cannot unfold like in an external setting but seems to be restricted by the internal structure of a firm. That's why internal crowds are – unlike external crowds – co-creating in the *shadow of the organization*.

4.6.2 Managerial Contributions

Our study also provides some implications for practitioners and especially for organizers of crowdsourcing contests which they can consider in their *crowdsourcing strategy* (Afuah, 2018; Schenk, Guittard, & Pénin, 2019). Due to the rise of crowdsourcing contests, crowd members – either employees or external users – have the choice to contribute to multiple occasions (Schäfer et al., 2017). This makes it challenging for organizers of crowdsourcing contests not only to find a crowd for idea generation but also to have active collaborators in the crowd. We applied an approach of using two types of crowds generating ideas and collaborating on the same challenge question. This approach of having two types of crowds on the same topic may not be efficient in the long-term in terms of costs and efforts for a hosting organization. However, based on our results we can derive the following recommendations for organizations which they can take into account for their decision whether to engage an internal or an external crowd. This may support

organizations to deal with the major problem of not knowing in advance which type of crowd is suitable to develop ideas further.

First, organizations should consider in their strategy the *benefits and efforts of co-creation*. For organizations, increasing the level of collaboration in crowds seems promising as they hope that initial ideas will be further improved by crowd members. This can be proven, for both crowd forms, considering the first and second expert evaluation of the submitted ideas. Therefore, we try to give further recommendations on how to select the right crowd to achieve developed ideas through co-creation. Our results may at first glance indicate that organizations searching for a crowd with high co-creation potential should opt for an external one. At a second glance, however, organizations have to consider the efforts involved. Increased collaboration incurs the drawbacks of having to provide more incentives for collaboration (Boudreau, Lacetera, & Lakhani, 2011) and to build a larger team of moderators (Zhu et al., 2019) in order to spur the discussions and to provide answers and reactions. Thus, organizations should be aware of the amount of collaborative activity they need to handle. And sometimes, less is more. This means that internal crowd members have shown less active and less intensive co-creation behavior but provide more often constructive feedback than external crowd members. Since especially constructive feedback improves the idea quality (Zhu et al., 2019), co-creation seems to be more efficient in an internal crowd. Organizations who weight up the costs and effort involved with co-creation might therefore make their decision in favor of an internal crowd.

Second, we advise organizations – especially if they decide to crowdsource a task internally – to take our findings into account for the *design of the crowdsourcing contest*. Our findings indicate that internal crowds refrain from forming teams and committing time in a concentrated period to the crowd contest compared to external crowd members. For using an internal crowd effectively, organizations have to legitimize and maybe also incentivize the formation of teams on the crowdsourcing platform. It may be that recognition for teaming is helpful in order to increase the

activity. In addition, organizations should provide employees with more time to be active on the platform (Zuchowski et al., 2016). This may allow employees to coordinate their activities in line with their actual job which they have to complete. If employees will receive more recognition and more time, their co-creation activities may increase.

Third, organizations should consider the *novelty and confidentiality of topics* which they aim to crowdsource. Organizers of crowdsourcing contests tend to broadcast highly confidential and secret topics to an internal crowd as employees have signed a confidentiality agreement with the hosting organization (Zuchowski et al., 2016). However, our results indicate that the internal crowd may not always be the best address for these topics. Especially internal crowd members refrain to commit to novel ideas which consequently have a lower chance to find adequate team members or to be developed in concentrated time periods. As a consequence, if organizers of crowdsourcing contests aim for higher activity and a faster development of novel ideas, they may choose an external crowd. Nevertheless, our findings also show that internal crowd members still provide more constructive feedback independent from the novelty of an idea. Consequently, organizations are also well advised to take the easier option and broadcast novel topics to an internal crowd. By consulting an internal crowd, organizations will still reap the benefit of more constructive feedback in order to develop also novel ideas further.

4.6.3 Limitations and Future Research

One strength of our study is that the internal and external crowd submitted ideas and cooperated on the same challenge question on separate crowd platforms. Admittedly, this also involves some limitations and raises questions which may be interesting for future research. One major restraint is that we are not able to observe how internal and external participants would interact together on the same platform. This question becomes particular relevant with increasing importance of innovation ecosystems (Gemser & Perks, 2015). Ecosystems are based on the idea of having a broad range of different actors who interact in solving problems and generating ideas instead of

using only single sources separately. Platforms on which internal and external participants work together are so-called 'hybrids' (Sims & Woodard, 2019). Only one case study already provides insights into the management, task processing, and requirements for hybrid platforms where internal and external participants interact with each other (Mrass, Peters, & Leimeister, 2017).⁴⁴ Therefore, there is still avenue for future research on how these two crowds are able to work together in order to achieve synergies. Further, our study uncovers interesting demographic differences between internal and external crowd members in a real setting. To control for these disparities and to enhance the comparability of the samples, further research on co-creation of internal and external participants will be appreciated, for instance, in a laboratory experiment. In addition, our study focused on the first step of initiating co-creation but we are not able to investigate how co-creation evolves over time. However, it may be interesting to further analyze if co-creation progresses differently in internal and external crowds. As internal and external crowd members work on the same topic in our study, we are also not able to compare their results and behavior with regards to different challenge questions (Nickerson & Zenger, 2004). Thus, it still remains open for future research which type of question can be better solved internally or externally.

Our results have revealed further interesting issues which should be investigated in the future. First, we find that internal and external crowd members generate a significant amount of ideas which are similar in terms of content. Our data indicates that internal and external crowds correspond in 36% of ideas if they generate ideas independently on the same challenge question. Thus, future scholars can further analyze how the outputs from these two sources are generated, why these are different or similar and which of these ideas are more often developed through co-creation in internal or external crowds. Second, our findings show that about 20% of the external and 30% of the internal

⁴⁴ For this study, it has not been possible to set up one common platform with internal and external participants due to data protection reasons.

crowd members have already registered in a prior crowdsourcing contest. As repeated participation plays an important role for creative processes in general (Skilton & Dooley, 2010) and for reciprocity considerations specifically (Kathan et al., 2015), future research can investigate the role of prior participation to sustain participation in different crowd types (Langner & Seidel, 2015). Based on our insights on internal and external crowds, future research should analyze which characteristics and types of individual crowd members are beneficial in order to foster co-creation in the respective crowd types.

4.7 Conclusion

Considering that collaboration is the mechanism through which ideas are further developed, a better understanding of co-creation behavior in crowds is essential to choose a particular crowd type. We find that internal and external crowds differ in the way if and how they co-create which is even more pronounced under the boundary condition of uncertainty. Hence, our results outline several patterns in co-creation behavior which allow us to support our argument that internal crowds are – unlike external crowds – co-creating in the *shadow of the organization*.

4.8 References

- Adamczyk, S., Bullinger, A. C., & Moeslein, K. M. 2011. Commenting for new ideas: Insights from an open innovation platform. *International Journal of Technology Intelligence and Planning*, 7(3): 232–249.
- Afuah, A. 2018. Crowdsourcing: A primer and research framework. In C. L. Tucci, A. Afuah & G. Viscusi (Eds.), *Creating and capturing value through crowdsourcing* (First edition): 11–38. Oxford: Oxford University Press.
- Afuah, A., & Tucci, C. L. 2012. Crowdsourcing as a solution to distant search. *Academy of Management Review*, 37(3): 355–375.
- Alexy, O., George, G., & Salter, A. J. 2013. Cui bono? The selective revealing of knowledge and its implications for innovative activity. *Academy of Management Review*, 38(2): 270–291.
- Anders, A. 2016. Team communication platforms and emergent social collaboration practices. *International Journal of Business Communication*, 53(2): 224–261.
- Axelrod, R., & Dion, D. 1988. The further evolution of cooperation. *Science (New York)*, 242(4884): 1385–1390.
- Axelrod, R. M. 2006. *The evolution of cooperation*. New York: Basic Books.
- Baer, M. 2012. Putting creativity to work: The implementation of creative ideas in organizations. *Academy of Management Journal*, 55(5): 1102–1119.
- Barabási, A.-L. 2005. The origin of bursts and heavy tails in human dynamics. *Nature*, 435(7039): 207–211.
- Barabási, A.-L. 2011. *Bursts: The hidden patterns behind everything we do, from your e-mail to bloody crusades*. A Plume book. London: Plume.
- Bartl, M., Jawecki, G., Bilgram, V., & Wiegandt, P. 2013. The BMW Group Co-Creation Lab: From co-creation projects to programmes. In P. Augsdörfer, J. Bessant, K. Mölslein, B. von Stamm & F. Piller (Eds.), *Discontinuous innovation: Learning to manage the unexpected*: 179–203. Singapore: Imperial College Press.
- Bateman, P. J., Gray, P. H., & Butler, B. S. 2011. Research note —The impact of community commitment on participation in online communities. *Information Systems Research*, 22(4): 841–854.

- Bayus, B. L. 2013. Crowdsourcing new product ideas over time: An analysis of the Dell Ideastorm Community. *Management Science*, 59(1): 226–244.
- Ben-Menahem, S. M., von Krogh, G., Erden, Z., & Schneider, A. 2016. Coordinating knowledge creation in multidisciplinary teams: Evidence from early-stage drug discovery. *Academy of Management Journal*, 59(4): 1308–1338.
- Beretta, M. 2019. Idea selection in web-enabled ideation systems. *Journal of Product Innovation Management*, 36(1): 5–23.
- Bergendahl, M., & Magnusson, M. 2014. Combining collaboration and competition: A key to improved idea management? *European Journal of International Management*, 8(5): 528–547.
- Blair, C. S., & Mumford, M. D. 2007. Errors in idea evaluation: Preference for the unoriginal? *The Journal of Creative Behavior*, 41(3): 197–222.
- Blau, P. M. 1977. *Inequality and heterogeneity: A primitive theorie of social structure*. New York: Free Press.
- Boudreau, K., Gaule, P., Lakhani, K. R., Riedl, C., & Woolley, A. W. 2014. From crowds to collaborators: Initiating effort & catalyzing interactions among online creative workers. *Carnegie Mellon University, Research Showcase, CMU, Tepper School of Business*: 1–34.
- Boudreau, K., Lacetera, N., & Lakhani, K. R. 2011. Incentives and problem uncertainty in innovation contests: An empirical analysis. *Management Science*, 57(5): 843–863.
- Bullinger, A. C., Neyer, A.-K., Rass, M., & Moeslein, K. M. 2010. Community-based innovation contests: Where competition meets cooperation. *Creativity and Innovation Management*, 19(3): 290–303.
- Chatterji, A. K., & Fabrizio, K. R. 2014. Using users: When does external knowledge enhance corporate product innovation? *Strategic Management Journal*, 35(10): 1427–1445.
- Coase, R. H. 1937. The nature of the firm. *Economica*, 4(16): 386–405.
- Cohen, J. 1960. A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, 20(1): 37–46.
- Criscuolo, P., Dahlander, L., Grohsjean, T., & Salter, A. 2017. Evaluating novelty: The role of panels in the selection of R&D projects. *Academy of Management Journal*, 60(2): 433–460.
- Dahlander, L., & O'Mahony, S. 2011. Progressing to the center: Coordinating project work. *Organization Science*, 22(4): 961–979.

- Deichmann, D., & Jensen, M. 2018. I can do that alone...or not? How idea generators juggle between the pros and cons of teamwork. *Strategic Management Journal*, 39(2): 458–475.
- Evans, J. M., Hendron, M. G., & Oldroyd, J. B. 2015. Withholding the ace: The individual- and unit-level performance effects of self-reported and perceived knowledge hoarding. *Organization Science*, 26(2): 494–510.
- Faraj, S., Jarvenpaa, S. L., & Majchrzak, A. 2011. Knowledge collaboration in online communities. *Organization Science*, 22(5): 1224–1239.
- Faraj, S., & Johnson, S. L. 2011. Network exchange patterns in online communities. *Organization Science*, 22(6): 1464–1480.
- Fearon, J. D. 1998. Bargaining, enforcement, and international cooperation. *International Organization*, 52(2): 269–305.
- Foege, J. N., Lauritzen, G. D., Tietze, F., & Salge, T. O. 2019. Reconceptualizing the paradox of openness: How solvers navigate sharing-protecting tensions in crowdsourcing. *Research Policy*, 48(6): 1323–1339.
- Franke, N., Keinz, P., & Klausberger, K. 2013. “Does this sound like a fair deal?”: Antecedents and consequences of fairness expectations in the individual’s decision to participate in firm innovation. *Organization Science*, 24(5): 1495–1516.
- Frey, B. S., & Meier, S. 2004. Social comparisons and pro-social behavior: Testing “conditional cooperation” in a field experiment. *American Economic Review*, 94(5): 1717–1722.
- Fuger, S., Schimpf, R., Füller, J., & Hutter, K. 2017. User roles and team structures in a crowdsourcing community for international development – A social network perspective. *Information Technology for Development*, 23(3): 438–462.
- Füller, J. 2010. Refining virtual co-creation from a consumer perspective. *California Management Review*, 52(2): 98–122.
- Füller, J., Hutter, K., Hautz, J., & Matzler, K. 2014. User roles and contributions in innovation-contest communities. *Journal of Management Information Systems*, 31(1): 273–308.
- Gebauer, J., Füller, J., & Pezzeri, R. 2013. The dark and the bright side of co-creation: Triggers of member behavior in online innovation communities. *Journal of Business Research*, 66(9): 1516–1527.
- Gemser, G., & Perks, H. 2015. Co-creation with customers: An evolving innovation research field. *Journal of Product Innovation Management*, 32(5): 660–665.

- Germindl, L., Strich, F., & Fiedler, M. 2017. Why do you NOT use the enterprise social network? Analyzing non-users's reasons through the lenses of affordances. *38th International Conference on Information Systems (ICIS), 10-13 December 2017, Seoul, South Korea*: 1–20.
- Goh, K.-I., & Barabási, A.-L. 2008. Burstiness and memory in complex systems. *Europhysics Letters*, 81(4): 48002.
- Haas, M. R., Criscuolo, P., & George, G. 2015. Which problems to solve? Online knowledge sharing and attention allocation in organizations. *Academy of Management Journal*, 58(3): 680–711.
- Haas, M. R., & Park, S. 2010. To share or not to share? Professional norms, reference groups, and information withholding among life scientists. *Organization Science*, 21(4): 873–891.
- Haeussler, C., Jiang, L., Thursby, J., & Thursby, M. 2014. Specific and general information sharing among competing academic researchers. *Research Policy*, 43(3): 465–475.
- Hahn, J., Moon, J. Y., & Zhang, C. 2008. Emergence of new project teams from open source software developer networks: Impact of prior collaboration ties. *Information Systems Research*, 19(3): 369–391.
- Hargadon, A. B., & Bechky, B. A. 2006. When collections of creatives become creative collectives: A field study of problem solving at work. *Organization Science*, 17(4): 484–500.
- Harrison, S. H., & Rouse, E. D. 2015. An inductive study of feedback interactions over the course of creative projects. *Academy of Management Journal*, 58(2): 375–404.
- Hertel, G., Niedner, S., & Herrmann, S. 2003. Motivation of software developers in open source projects: An internet-based survey of contributors to the Linux kernel. *Research Policy*, 32(7): 1159–1177.
- Höber, B., Schaarschmidt, M., & Kortzfleisch, H. von. 2016. Work environment perceptions as determinants of affective commitment and participation in firm-internal innovation contests. Research-in-Progress Papers. *Proceedings of the 24th European Conference on Information Systems (ECIS), 15 June 2016, Istanbul, Turkey*, 14: 1–10.
- Hoegl, M., Weinkauff, K., & Gemuenden, H. G. 2004. Inter-team coordination, project commitment, and teamwork in multi-team R&D projects: A longitudinal study. *Organization Science*, 15(1): 38–55.

- Hofstetter, R., Aryobsei, S., & Herrmann, A. 2018. Should you really produce what consumers like online? Empirical evidence for reciprocal voting in open innovation contests. *Journal of Product Innovation Management*, 35(2): 209–229.
- Howe, J. 2006. Crowdsourcing. A definition. https://crowdsourcing.typepad.com/cs/2006/06/crowdsourcing_a.html, first accessed 1st of November, 2019.
- Huang, Y., Singh, P. V., & Ghose, A. 2015. A structural model of employee behavioral dynamics in enterprise social media. *Management Science*, 61(12): 2825–2844.
- Hutter, K., Hautz, J., Füller, J., Mueller, J., & Matzler, K. 2011. Communitation: The tension between competition and collaboration in community-based design contests. *Creativity and Innovation Management*, 20(1): 3–21.
- Iacobucci, D., Schneider, M. J., Popovich, D. L., & Bakamitsos, G. A. 2017. Mean centering, multicollinearity, and moderators in multiple regression: The reconciliation redux. *Behavior research methods*, 49(1): 403–404.
- Jeppesen, L. B., & Lakhani, K. R. 2010. Marginality and problem-solving effectiveness in broadcast search. *Organization Science*, 21(5): 1016–1033.
- Kaplan, A. M., & Haenlein, M. 2010. Users of the world, unite! The challenges and opportunities of social media. *Business Horizons*, 53(1): 59–68.
- Kathan, W., Hutter, K., Füller, J., & Hautz, J. 2015. Reciprocity vs. free-riding in innovation contest communities. *Creativity and Innovation Management*, 24(3): 537–549.
- Katila, R., & Ahuja, G. 2002. Something old, something new: A longitudinal study of search behavior and new product introduction. *Academy of Management Journal*, 45(6): 1183–1194.
- Klein, H. J., Brinsfield, C. T., Cooper, J. T., & Molloy, J. C. 2017. Quondam commitments: An examination of commitments employees no longer have. *Academy of Management Discoveries*, 3(4): 331–357.
- Klein, H. J., Molloy, J. C., & Brinsfield, C. T. 2012. Reconceptualizing workplace commitment to redress a stretched construct: Revisiting assumptions and removing confounds. *Academy of Management Review*, 37(1): 130–151.

- Knudsen, M. P., Magnusson, M., Frederiksen, M. H., & Björk, J. 2018. Unleashing the power of internal crowds. *DRUID18, 11-13 June 2018, Copenhagen Business School, Copenhagen, Denmark*: 1–26.
- Kornish, L. J., & Ulrich, K. T. 2011. Opportunity spaces in innovation: Empirical analysis of large samples of ideas. *Management Science*, 57(1): 107–128.
- Lakhani, K. R., & von Hippel, E. 2003. How open source software works: “Free” user-to-user assistance. *Research Policy*, 32(6): 923–943.
- Langner, B., & Seidel, V. P. 2015. Sustaining the flow of external ideas: The role of dual social identity across communities and organizations. *Journal of Product Innovation Management*, 32(4): 522–538.
- Leonardi, P. M. 2015. Ambient awareness and knowledge acquisition: Using social media to learn "who knows what" and "who knows whom". *MIS Quarterly*, 39(4): 747–762.
- Leonardi, P. M., Huysman, M., & Steinfield, C. 2013. Enterprise social media: Definition, history, and prospects for the study of social technologies in organizations. *Journal of Computer-Mediated Communication*, 19(1): 1–19.
- Lount, R. B., Doyle, S. P., Brion, S., & Pettit, N. C. 2019. Only when others are watching: The contingent efforts of high status group members. *Management Science*, 65(7): 3382–3397.
- Lusch, R. F., & Nambisan, S. 2015. Service innovation: A service-dominant logic perspective. *MIS Quarterly*, 39(1): 155–175.
- Magnusson, P. R. 2009. Exploring the contributions of involving ordinary users in ideation of technology-based services. *Journal of Product Innovation Management*, 26(5): 578–593.
- Magnusson, P. R., Wästlund, E., & Netz, J. 2016. Exploring users' appropriateness as a proxy for experts when screening new product/service ideas. *Journal of Product Innovation Management*, 33(1): 4–18.
- Mahr, D., Lievens, A., & Blazevic, V. 2014. The value of customer cocreated knowledge during the innovation process. *Journal of Product Innovation Management*, 31(3): 599–615.
- Malhotra, A., Majchrzak, A., Kesebi, L., & Looram, S. 2017. Developing innovative solutions through internal crowdsourcing. *MIT Sloan Management Review*: 103–123.
- Mattarelli, E., Schechter, A., Hinds, P., Contractor, N., Lu, Cindy, & Topac, B. 2018. How co-creation processes unfold and predict submission quality in crowd-based open innovation.

- 39th International Conference on Information Systems (ICIS), 13-16 December 2018, San Francisco, California, USA:** 1–17.
- McKinsey&Company. 2017. Electrifying insights: How automakers can drive electrified vehicle sales and profitability. *Advanced Industries*, January: 3–28.
- Mihm, J., & Schlapp, J. 2015. Sourcing innovation: Public and private feedback in contests. *Working paper series Insead*, 64: 1–37.
- Milliken, F. J., Schipani, C. A., Bishara, N. D., & Prado, A. M. 2015. Linking workplace practices to community engagement: The case for encouraging employee voice. *Academy of Management Perspectives*, 29(4): 405–421.
- Montoya-Weiss, M. M., Massey, A. P., & Song, M. 2001. Getting it together: Temporal coordination and conflict management in global virtual teams. *Academy of Management Journal*, 44(6): 1251–1262.
- Mrass, V., Peters, C., & Leimeister, J. M. 2017. One for all? Managing external and internal crowds through a single platform - A case study. *Proceedings of the 50th Hawaii International Conference on System Sciences (HICSS), 27 April 2017, Waikoloa, HI, USA.*: 4324–4333.
- Mueller, J. S., Melwani, S., & Goncalo, J. A. 2012. The bias against creativity: Why people desire but reject creative ideas. *Psychological science*, 23(1): 13–17.
- Nambisan, S., & Baron, R. A. 2009. Virtual customer environments: Testing a model of voluntary participation in value co-creation activities. *Journal of Product Innovation Management*, 26(4): 388–406.
- Ng, T. W. H., & Lucianetti, L. 2018. Are embedded employees active or passive? The roles of learning goal orientation and preferences for wide task boundaries and job mobility in the embeddedness-voice link. *Human Resource Management*, 57(5): 1251–1269.
- Nickerson, J. A., & Zenger, T. R. 2004. A knowledge-based theory of the firm—The problem-solving perspective. *Organization Science*, 15(6): 617–632.
- O'Leary, M. B., Mortensen, M., & Woolley, A. W. 2011. Multiple team membership: A theoretical model of its effects on productivity and learning for individuals and teams. *Academy of Management Review*, 36(3): 461–478.
- O'Leary, & Cummings. 2007. The spatial, temporal, and configurational characteristics of geographic dispersion in teams. *MIS Quarterly*, 31(3): 433.

- Ozer, M. 2009. The roles of product lead-users and product experts in new product evaluation. *Research Policy*, 38(8): 1340–1349.
- Perks, H., Gruber, T., & Edvardsson, B. 2012. Co-creation in radical service innovation: A systematic analysis of microlevel processes. *Journal of Product Innovation Management*, 29(6): 935–951.
- Piezunka, H., & Dahlander, L. 2015. Distant search, narrow attention: How crowding alters organizations' filtering of suggestions in crowdsourcing. *Academy of Management Journal*, 58(3): 856–880.
- Poetz, M. K., & Schreier, M. 2012. The value of crowdsourcing: Can users really compete with professionals in generating new product ideas? *Journal of Product Innovation Management*, 29(2): 245–256.
- Prahalad, C. K., & Ramaswamy, V. 2004. Co-creation experiences: The next practice in value creation. *Journal of Interactive Marketing*, 18(3): 5–14.
- Puranam, P., Raveendran, M., & Knudsen, T. 2012. Organization design: The epistemic interdependence perspective. *Academy of Management Review*, 37(3): 419–440.
- Ramaswamy, V., & Ozcan, K. 2018. What is co-creation? An interactional creation framework and its implications for value creation. *Journal of Business Research*, 84: 196–205.
- Rand, D. G., & Nowak, M. A. 2013. Human cooperation. *Trends in cognitive sciences*, 17(8): 413–425.
- Randall, W. S., Gravier, M. J., & Prybutok, V. R. 2011. Connection, trust, and commitment: Dimensions of co-creation? *Journal of Strategic Marketing*, 19(1): 3–24.
- Riedl, C., & Seidel, V. P. 2018. Learning from mixed signals in online innovation communities. *Organization Science*, 29(6): 1010–1032.
- Riedl, C., & Woolley, A. W. 2017. Teams vs. crowds: A field test of the relative contribution of incentives, member ability, and emergent collaboration to crowd-based problem solving performance. *Academy of Management Discoveries*, 3(4): 382–403.
- Roberts, D. L., & Piller, F. T. 2015. Finding the right role for social media in innovation. *MIT Sloan Management Review*, 57(3): 41–47.
- Roberts, J. A., Hann, I.-H., & Slaughter, S. A. 2006. Understanding the motivations, participation, and performance of open source software developers: A longitudinal study of the Apache projects. *Management Science*, 52(7): 984–999.

- Rodell, J. B., & Lynch, J. W. 2016. Perceptions of employee volunteering: Is it “credited” or “stigmatized” by colleagues? *Academy of Management Journal*, 59(2): 611–635.
- Rouse, E. D. 2018. Where you end and I begin: Understanding intimate co-creation. *Academy of Management Review*, In Press: 1–62.
- Santos, F. M., & Eisenhardt, K. M. 2005. Organizational boundaries and theories of organization. *Organization Science*, 16(5): 491–508.
- Schäfer, S., Antons, D., Lüttgens, D., Piller, F., & Salge, T. O. 2017. Talk to your crowd. *Research-Technology Management*, 60(4): 33–42.
- Schemmann, B., Herrmann, A. M., Chappin, M. M.H., & Heimeriks, G. J. 2016. Crowdsourcing ideas: Involving ordinary users in the ideation phase of new product development. *Research Policy*, 45(6): 1145–1154.
- Schenk, E., Guittard, C., & Pénin, J. 2019. Open or proprietary? Choosing the right crowdsourcing platform for innovation. *Technological Forecasting and Social Change*, 144: 303–310.
- Schweisfurth, T. G. 2017. Comparing internal and external lead users as sources of innovation. *Research Policy*, 46(1): 238–248.
- Shah, S. K. 2006. Motivation, governance, and the viability of hybrid forms in open source software development. *Management Science*, 52(7): 1000–1014.
- Sims, J., & Woodard, C. J. 2019. Community interactions at crowd scale: Hybrid crowds on the GitHub platform. *Innovation*, 42(8): 1–23.
- Simula, H., & Ahola, T. 2014. A network perspective on idea and innovation crowdsourcing in industrial firms. *Industrial Marketing Management*, 43(3): 400–408.
- Simula, H., & Vuori, M. 2012. Benefits and barriers of crowdsourcing in B2B firms: Generating ideas with internal and external crowds. *International Journal of Innovation Management*, 16(6): 1–19.
- Skilton, P. F., & Dooley, K. J. 2010. The effects of repeat collaboration on creative abrasion. *Academy of Management Review*, 35(1): 118–134.
- Storbacka, K., Brodie, R. J., Böhmman, T., Maglio, P. P., & Nenonen, S. 2016. Actor engagement as a microfoundation for value co-creation. *Journal of Business Research*, 69(8): 3008–3017.

- Sundic, M., & Leitner, K.-H. 2018. Co-creation from a telecommunication provider's perspective: A comparative study on innovation with customers and employees. In C. L. Tucci, A. Afuah & G. Viscusi (Eds.), *Creating and capturing value through crowdsourcing* (First edition): 236-267. Oxford: Oxford University Press.
- Taylor, C., & Nowak, M. A. 2009. How to evolve cooperation. In S. A. Levin (Ed.), *Games, groups, and the global good*: 41–56. Berlin, Heidelberg: Springer Berlin Heidelberg.
- van Koningsbruggen, G. M., Hartmann, T., Eden, A., & Veling, H. 2017. Spontaneous hedonic reactions to social media cues. *Cyberpsychology, behavior and social networking*, 20(5): 334–340.
- von Hippel, E. 2005. *Democratizing innovation*. Cambridge, Massachusetts: MIT Press.
- Wasko, M. M., & Faraj, S. 2005. Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS Quarterly*, 29(1): 35–57.
- Wendelken, A., Danzinger, F., Rau, C., & Moeslein, K. M. 2014. Innovation without me: Why employees do (not) participate in organizational innovation communities. *R&D Management*, 44(2): 217–236.
- Williamson, O. E. 1981. The economics of organization: The transaction cost approach. *The American journal of sociology*, 87(3): 548–577.
- Woolley, A. W., Chabris, C. F., Pentland, A., Hashmi, N., & Malone, T. W. 2010. Evidence for a collective intelligence factor in the performance of human groups. *Science (New York)*, 330(6004): 686–688.
- Yan, J., Leidner, D. E., & Benbya, H. 2018. Differential innovativeness outcomes of user and employee participation in an online user innovation community. *Journal of Management Information Systems*, 35(3): 900–933.
- Yuan, F., & Woodman, R. W. 2010. Innovative behavior in the workplace: The role of performance and image outcome expectations. *Academy of Management Journal*, 53(2): 323–342.
- Zellner, A. 1962. An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias. *Journal of the American Statistical Association*, 57(298): 348–368.
- Zhang, L., & Guler, I. 2019. How to join the club: Patterns of embeddedness and the addition of new members to interorganizational collaborations. *Administrative Science Quarterly*, 63: 1-39.

- Zhu, H., Kock, A., Wentker, M., & Leker, J. 2019. How does online interaction affect idea quality? The effect of feedback in firm-internal idea competitions. *Journal of Product Innovation Management*, 36(1): 24–40.
- Zhu, H., Sick, N., & Leker, J. 2016. How to use crowdsourcing for innovation? A comparative case study of internal and external idea sourcing in the chemical industry. *Portland International Conference on Management of Engineering and Technology (PICMET), 04-08 September 2016, Honolulu, HI, USA*: 887–901.
- Zuchowski, O., Posegga, O., Schlagwein, D., & Fischbach, K. 2016. Internal crowdsourcing: Conceptual framework, structured review, and research agenda. *Journal of Information Technology*, 31(2): 166–184.

