DIRK DEICHMANN

Idea Management

Perspectives from Leadership, Learning, and Network Theory

IDEA MANAGEMENT:

PERSPECTIVES FROM LEADERSHIP, LEARNING, AND NETWORK THEORY

Idea Management:
Perspectives from leadership, learning, and network theory

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To my parents

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CHAPTER 1
INTRODUCTION

The front cover of this dissertation depicts a painting by René Magritte called “la Golconde” (Golconda in English). In this picture, Magritte portrays objects and figures such as the grey and spotless house façade, the clean sky, and almost identical men in bowler hats. By themselves, these objects and figures are emotionless and seem pretty unoriginal. However, in their combination, the simple motifs gain a new and interesting meaning. “Magritte established a pictorial space that was capable of encompassing the entire world, including its mysteries […]. Only on second glance do we recognize vertical, horizontal, and diagonal axes that lead the eye forward and into the background” (Gohr, 2009: 276).

In my view, la Golconde is a good example with which the different features and characteristics of an idea can be illustrated. Magritte painted a surrealistic picture of how something could be, it is an image of a vision. Similarly, ideas are conceptions in the mind; they are a product of mental activity expressing a “thought or suggestion to a possible course of action” (Oxford English Dictionary, 2000). Ideas question the status quo, some even break with the past and render existing competences, views, and structures obsolete; similar to a process of “creative destruction” as described by Schumpeter (1934). As a result, ideas are threatening to some people, because they challenge the present order and established routines (Van de Ven, 1986). Moreover, new ideas can be ambivalent at first. The meaning and true impact of an idea might not immediately be recognizable or appreciated; this can hamper their implementation (Mahnke, Venzin, & Zahra, 2007; Mumford, 2003). Particular structures, elements, and twists in the painting by Magritte are only visible at second sight. The painting also serves as a powerful illustration that establishing connections between known concepts and solutions fosters innovation. Magritte re-used many objects from earlier paintings, such as the blue sky or the man in the bowler hat. Through the blending of existing conceptions and ideas, new combinations

emerge with different forms and shapes and old images are seen in a new light (Hargadon & Sutton, 1997). Finally, just like a painting, the beauty and value of an idea, whether it is novel and useful (Amabile, Conti, Coon, Lazenby, & Herron, 1996) lies in the eye of the beholder and is contingent on the other ideas that are currently available (Shalley, Zhou, & Oldham, 2004). What seems creative and new to one person might be a useless imitation to another (Van de Ven, 1986).

IDEAS AND IDEA MANAGEMENT

In this dissertation, we examine employee ideas in a business context. Bower (1930: 26) is probably one of the earliest authors touching upon the issue of these ideas. He defines business ideas as plans, constantly conceived by business men or women with the aim that "their own or some other business may make more money". In the context of this dissertation, we are interested in ideas as sources for new products or services, new processes, organizational or strategic changes. These ideas generally may serve to improve existing structures, prevent anticipated problems, or take advantage of specific opportunities. We investigate ideas that were voluntarily submitted by employees inside a company. Thus, the behavioral syndrome we are referring to is initiative taking behavior defined as the process by which an individual or group of individuals takes an "active and self-starting approach to work" and go "beyond what is formally required" in their job (Frese, Fay, Hilburger, Leng, & Tag, 1997: 140). The concept of initiative taking is closely related to constructs such as taking charge (e.g., Morrison & Phelps, 1999), proactivity (e.g., Grant & Ashford, 2008; Parker & Collins, 2010), voicing issues or types of organizational citizenship behavior (e.g., Detert & Treviño, 2010; Podsakoff, MacKenzie, Paine, & Bachrach, 2000), but focuses more on a creative or innovative aspect embedded in an idea (Frese, Teng, & Wijnen, 1999; Ohly, Sonnentag, & Pluntke, 2006). Ideas can be more radical, for instance a concept about a new business model; or more incremental, as in a suggestion to improve a work process.

To stimulate, support, and channel employee ideas, companies often use formal idea management programs (Dickinson, 1932; Fairbank & Williams, 2001; Reuter, 1977; Van Dijk & Van den Ende, 2002). Idea management programs are based on voluntary contributions of

employees (Reuter, 1977). Vandenbosch, Saatcioglu, and Fay (2006: 260) define idea management as "the process of recognizing the need for ideas, and generating and evaluating them". Idea management schemes are considered under the umbrella of high-performance human resources practices that are aimed at achieving organizational excellence through increasing employee involvement (Jensen, Johnson, Lorenz, & Lundvall, 2007). Employees who suggest ideas take a consultative role to management on issues they consider important as well as where they possess more information and expertise than their leaders (Kim, MacDuffie, & Pil, 2010).

A classic form of these management programs is a suggestion box. The first suggestion schemes were established at the end of the 19th century. For instance, in 1872 the CEO of the German steel producer Krupp, Alfred Krupp, instructed his executives to "gratefully accept" ideas suggested by employees and later this directive evolved into a formal suggestion scheme, which is still in use today (ThyssenKrupp VDM, 2011). The first record of a suggestion box put into operation belongs to the Scottish shipyard William Denny and Brothers. William Denny started the creativity program in 1880 with the aim of stimulating both small improvement suggestions and the submission of ideas that could lead to more major inventions (Dickinson, 1932; Robinson & Stern, 1998).

Companies operating suggestion schemes or idea management programs have reported significant cost savings. For instance, the German telecommunication company, Deutsche Telekom, reported cost savings of 136 Million Euro in 2010 with more than 10,000 ideas that were submitted by employees in that year (Deutsche Telekom, 2011). Even more impressive, the German conglomerate Siemens issued a press release stating that they implemented 1.5 Million employee suggestions and ideas in the past 100 years, which saved the company in total over three billion Euro (Siemens, 2010). On the other hand, the Anglo-Dutch energy company Shell, which has focused more on creating new blockbuster innovations, reported that their voluntary idea management program, called GameChanger, played a significant role in advancing their technological position and specifically secured 90 patent series for the company from 1996 to 2007 (Shell, 2007).

CHALLENGES IN IDEA MANAGEMENT

Generally, there is broad consensus that by identifying and seizing new opportunities, a company is better able to adapt to technological, regulatory, or consumer changes and ensure survival (e.g., De Clercq, Castañer, & Belausteguigoitia, in press; Howell & Higgins, 1990; Teece, Pisano, & Shuen, 1997). Due to emerging shifts in work design driven by more complex, interdisciplinary jobs and tasks, managers increasingly need to rely on their employees to initiate new ideas (Crant, 2000; Frese & Fay, 2001; Grant & Ashford, 2008; Grant & Parker, 2009). Increased competitive pressure coupled with tight financial reserves makes the question of how companies can most effectively use every available resource and talent to continuously spot opportunities and create innovations particularly relevant. However, if managers want to effectively capitalize on employees' initiative taking behavior and specifically on their idea submissions, they should tackle the three following challenges.

Idea Quantity

The first issue is the quantity of ideas. Employees demonstrate creative or proactive behavior through the submission of multiple ideas (Ohly, Sonnentag, & Pluntke, 2006). Moreover, "the number of ideas, on average, represents the 'innovative capacity' of the search process" (Koput, 1997: 531). Evolutionary perspectives emphasize that good ideas are selected from a large variety of suggestions (Campbell, 1960; Simonton, 1999). Research specifically shows that the quantity of ideas is related to idea quality (Diehl & Stroebe, 1987) and an increase in idea implementation (Axtell, Holman, Unsworth, Wall, & Waterson, 2000; Frese, Teng, & Wijnen, 1999). Hence, a productive idea generation process can be seen as a necessary first step in an idea trajectory. The question is how one can promote a higher number of idea submissions? To tackle this issue we focus on different leadership styles; building on the notion that leaders have a very influential role in stimulating followers to increase their creative output or to become more innovative (George, 2007; Jung, Chow, & Wu, 2003; Mumford, Scott, Gaddis, & Strange, 2002).

Idea Quality

Second, while there is evidence for the idea quantity-quality relationship, increasing just the amount of generated ideas might be too simple of a solution. Indeed, there are downsides to managing a large quantity of submitted ideas. Mainly, it is costly to administer and review all the ideas (Kijkuit & Van den Ende, 2010; Litchfield, 2008). Thus the question is which mechanisms should one embrace to increase the quality of ideas? We focus on what people learn from the performance of their prior ideas. In doing so, we are one of the first to directly address learning behavior for non-required activities such as submitting ideas. We also examine the role of social network structures and relationships between people who work on an idea; building on and extending the concept of a social side of creativity (Burt, 2004; Fleming, Mingo, & Chen, 2007; Kijkuit & Van den Ende, 2007; Kijkuit & Van den Ende, 2010; Obstfeld, 2005; Perry-Smith & Shalley, 2003; Perry-Smith, 2006; Uzzi & Spiro, 2005).

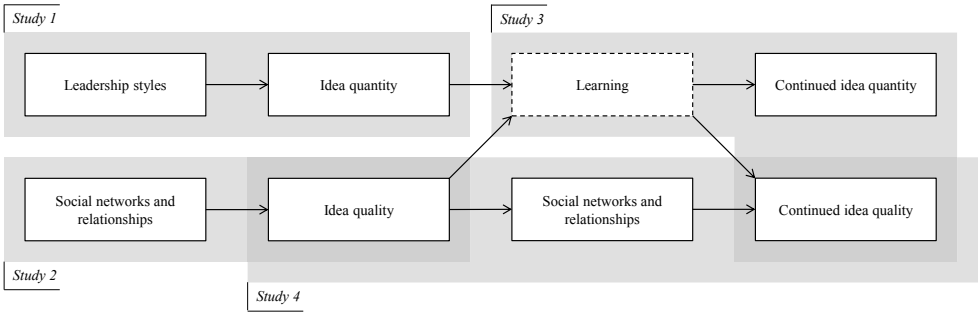
Continued Ideation

Lastly, as ideas are generated in an employee's spare time, in addition to the day-to-day job, there is the risk of alienating idea originators or quickly burning out their creative potential when their ideas are not managed appropriately. However, only when employees constantly think about possible improvements and new opportunities (Skilton & Dooley, 2010) do their firms have a full pipeline of ideas which can provide the agility and edge to compete in a dynamic business. The question therefore is: how can one design a sustainable idea-promotion process in which employees repeatedly take initiative and generate multiple high-quality ideas over time? In addressing this question we focus on individual learning behaviors and specifically on experiences people accumulate over time based on the outcomes of their creative efforts. Learning theories have shown that individuals repeat behavior that led to a success and stop actions that resulted in negative outcomes (Greenberg & Baron, 2002; Skinner, 1953; Staddon & Cerutti, 2003). Learning research also indicates that individual results improve with more experience (Edmondson, James, & Roloff, 2007; Levitt & March, 1988). We build on these prior frameworks and extend them to a context characterized by discretionary behavior.

OVERVIEW OF THE DISSERTATION

This dissertation consists of four empirical papers that address aspects of the identified challenges in idea management from the individual, dyadic, group, or network perspective. An overview of the studies and the research questions that are addressed is broadly depicted in Figure 1.

FIGURE 1
Conceptual Framework



We collected data within three multinational companies using a range of methods and sources. Our purpose was not to compare the three different company approaches and the findings of the different studies. Instead, for each paper, we focused on exploring specific mechanisms with varying theoretical underpinnings. Nevertheless, and as Figure 1 suggests, there are some overlaps between the different studies. For instance, both study two and four build on the social network literature. Moreover, study three and four examine how idea quality can be improved over time.

The overarching theme in this dissertation is an investigation of creative and innovative behavior by organizational members including the antecedents, characteristics, and direct and indirect outcomes of this behavior. Hence, we are taking a behavioral approach, viewing ideas as outcomes generated and developed by human beings that work together in a complex social system (George, 2007; Shalley, Zhou, & Oldham, 2004; Woodman, Sawyer, & Griffin, 1993). The context within which we investigate such behavior is idea management programs in organizations. These programs are largely driven by the input of employees, their judgments and

motivations (Reuter, 1977). We adopted a behavioral approach because of the belief that it is not so much the specific idea management system or the peculiarities of a company's approach to ideas that defines whether idea management is effective and successful, but rather how employees and managers in a company think about, use, and experience those systems.

In fact, all three companies had formal managerial processes and organizational structures in place to foster the generation and development of ideas as conceived by their employees. However, the ideas differed in their degree of radicality as the idea management process in study one specifically focused on the submission of improvement ideas whereas the idea management programs in all other studies concentrated more on the stimulation of radical ideas. As we point out above, we focus less on these differences or similarities, but rather on how human behavior and interactions between people can be utilized, supported, influenced, or changed, in order to drive the effectiveness of any idea management program in terms of idea quantity, idea quality, and continuous employee efforts. The following summary provides a brief overview of the key frameworks that were developed and tested in the four studies of this dissertation.

Study One - Leveraging Leadership to Cultivate Improvement Ideas: The Contingent Effect of Leader Mindsets

In the first study, we investigate the role of leadership styles on idea quantity. Leadership styles have been recognized as one of the most critical factors influencing follower creative and innovative behavior (George, 2007; Jung, Chow, & Wu, 2003; Mumford, Scott, Gaddis, & Strange, 2002). Particular attention has been paid to transformational and transactional leadership (Bass, 1985; Podsakoff, MacKenzie, Moorman, & Fetter, 1990; Yukl, 1999). A transformational leader aims to inspire and support followers to perform better than imagined by actively engaging the followers' personal value systems. Many studies have argued that transformational leadership drives individual creative and innovative behavior (e.g., Howell & Avolio, 1993; Jung, Chow, & Wu, 2003), but there are also studies showing no effects of transformational leadership, or even negative effects (e.g., Basu & Green, 1997; Jaussi & Dionne, 2003; Krause, 2004). On the other hand, a transactional leader aims to influence followers in an exchange related manner using contractual agreements and rewards for desired performance levels. While there is evidence for a direct negative relation between transactional

leadership and innovative follower behavior (e.g., Nederveen Pieterse, Van Knippenberg, Schippers, & Stam, 2010; Rank, Nelson, Allen, & Xu, 2009), there is also work showing positive effects (e.g., Jung, 2001) and even evidence that groups with a transactional leader generate more original ideas than groups with a transformational leader (Kahai, Sosik, & Avolio, 2003). The mixed and sometimes opposing findings for both leadership styles point to more complex patterns related to these behaviors. We propose that the effectiveness of the leadership style depends on the mindset of the leader. As such, the same leadership style can have very different effects on the idea submissions of followers depending on the leader's beliefs and his or her way of approaching the idea generation task (Kuhnert & Lewis, 1987). In particular, we investigate two mindsets that might serve as moderating variables: how the organizational identification of the leader enhances the effectiveness of a transformational leadership style and how a leader's commitment towards an idea management programs enhances the effects of a transactional leadership style.

Study Two - Going with the Flow? Activating Work Ties For Idea Development

In the second study, we investigate the role of social ties as an important mechanism that people use to "build" an idea. Extending earlier work by Kijkuit and Van den Ende (2007; 2010), we analyze the antecedents of the involvement intensity of two people working on an idea; the measurable aspect of this involvement is termed idea tie strength. We specifically explore which network content (functional- and departmental co-membership and similarity in seniority or similarity in decision-making power) and structural elements (joint friends, tie centrality, and tie strength) shape the intensity of the idea-related discussions, thus the idea tie strength. Subsequently, we also investigate how the idea tie strength influences the success of an idea. We build on the notion that in a knowledge intensive environment, strong ties should exercise a beneficial role. Specifically, strong ties are better suited in the handling and transfer of complex and difficult to verify information (Hansen, 1999; Reagans & McEvily, 2003), they make exchange processes more efficient and less risky (McFadyen & Cannella Jr., 2004; Nebus, 2006), and can better motivate nodes in a relationship to acquire and process knowledge from one another (Sosa, 2010).

Study Three - Rising from Failure and Learning from Success: The Role of Past Experience in Personal Initiative Taking

In this study, we investigate how success and failure experiences of people's prior idea submission efforts, influence a) the inclination to submit new ideas, and b) the performance of those ideas. We take a learning perspective, essentially concentrating on the consequences of prior performance outcomes. Classical learning theories show that individuals repeat behavior that led to a success and stop actions that resulted in negative outcomes (Greenberg & Baron, 2002; Skinner, 1953; Staddon & Cerutti, 2003). Moreover, learning curve research indicates that individual results improve with more experience (Edmondson, James, & Roloff, 2007; Levitt & March, 1988). We test and extend these theories in a context characterized by very different conditions for learning than one in which employees perform tasks that are required as part of their job description. People who take initiative are often very intrinsically motivated and thus eager to learn. Moreover, as the task of initiative taking is of a discretionary nature, negative outcomes are not visible and have few serious repercussions, while positive outcomes are rare experiences. In this paper we demonstrate that for these reasons, learning behavior unfolds differently in the context of initiative taking compared to job-related activities. Since initiative taking is often a collective activity, we also address the influence of learning on both the idea initiators as well as contributors.

Study Four - Dynamics of Social Network Structures across Multiple Idea Proposals

In our fourth study we investigate the reciprocal dynamic between outcomes of prior creative ideas and the social structure of the network which worked on that idea. While we have an increased understanding of how relationships impact the process of initiating and developing ideas, we know very little about how ideas, and particularly their performance outcomes, reshape the social network structures that produced those ideas, and how the altered structures help or hinder subsequent performance (Lee, 2010; Perry-Smith & Shalley, 2003). Research on network dynamics has mainly focused on exploring how certain network structures evolve (e.g., Sasovova, Mehra, Borgatti, & Schippers, 2010; Soda, Usai, & Zaheer, 2004; Zaheer & Soda, 2009) without considering both the performance antecedents and performance outcomes of this evolution. In order to predict how idea inventors can achieve or maintain beneficial network structures for generating and continually developing high quality ideas, we need to know how

social network structures result from prior performance, shape subsequent performance, and serve as a lynch pin between prior and subsequent performance. This is particularly important for companies which do not just wish to have a single burst of creativity from their employees, but which want to create an environment of permanent and high quality outcomes, such as ideas.

The final chapter of this dissertation summarizes and integrates the findings of the four studies. We sketch the contours of a more comprehensive model for idea management and discuss general theoretical and practical implications. We recognize that idea management programs are not self-starting nor self-sustaining (Fairbank & Williams, 2001; Ohly, Sonnentag, & Pluntke, 2006). The study of creative and innovative behavior of employees within companies marks an important step forward to further our understanding of how the structures of idea management programs can be improved to boost the continuous submission of a large number of high quality ideas by employees. Our studies show that there is clear social side to the generation and development of ideas (Kijkuit & Van den Ende, 2007; Perry-Smith & Shalley, 2003; Perry-Smith, 2006) and that idea management programs only come to fruition if we know how to utilize, support, influence, and change the behavior of idea originators and their interactions with managers, co-workers, and other network members. Together, the insights of these four studies illustrate the complexity of idea management. They also show how through leadership and individual learning, within social networks, idea originators exchange knowledge, build on each other's expertise, make sense of their experiences, and become motivated to continuously submit ideas that improve procedures or shape new opportunities for a firm.

CHAPTER 2

LEVERAGING LEADERSHIP TO CULTIVATE IMPROVEMENT IDEAS: THE CONTINGENT EFFECT OF LEADER MINDSETS[1]

ABSTRACT

Evidence about whether and how transformational and transactional leaders influence their employees to generate improvement ideas is inconclusive. We advance leadership and innovation literature by examining the moderating role of leader mindsets to better explain the effects of transformational and transactional leadership on improvement idea generation. Using multilevel field data, we show that the effect of transformational leadership is contingent on the leaders' organizational identification. The stronger the leaders' identification, then the more positive the effects of transformational leadership will be. Interestingly, this cross-level interaction on follower idea submissions is mediated by employee commitment to an idea management program. The effect of transactional leadership, however, is contingent on the leaders' commitment towards idea management programs: the higher the leaders' commitment, the more positive the effects of transactional leadership. Important theoretical and practical implications of these findings are discussed.

[1] *with Daan Stam*

INTRODUCTION

In this study we investigate how leaders successfully manage and influence improvement idea generation by followers. We define improvement ideas as the small-scale suggestions made by employees targeted at improving company processes, e.g., making the processes costly and more efficient, safe, or enjoyable. Improvement ideas are very important for organizational learning (Arthur & Huntley, 2005), boosting organizational growth (Banbury & Mitchell, 1995), or realizing much greater efficiencies and higher firm performance (Baer & Frese, 2003).

In order to better understand how employees can be motivated and influenced to generate more improvement ideas, we focus on the leader. Leadership styles, and in particular transformational and transactional leadership, have been recognized as one of the most critical factors influencing creative and innovative behavior of employees (Bass, 1985; Podsakoff, MacKenzie, Moorman, & Fetter, 1990; Yukl, 1999). But evidence for the effect of transformational and transactional leaders is inconclusive. Some research has shown that transformational leadership drives individual creative and innovative behavior (e.g., Howell & Avolio, 1993; Jung, Chow, & Wu, 2003) but there are also studies showing no effects or even negative effects (e.g., Basu & Green, 1997; Jaussi & Dionne, 2003; Krause, 2004). For transactional leadership, things are much the same. While there is evidence for a direct negative relation between transactional leadership and innovative follower behavior (e.g., Nederveen Pieterse, Van Knippenberg, Schippers, & Stam, 2010; Rank, Nelson, Allen, & Xu, 2009), there is also work showing positive effects (e.g., Jung, 2001) and even evidence that groups with a transactional leader generate more original ideas than groups with a transformational leader (Kahai, Sosik, & Avolio, 2003).

The mixed and sometimes opposing findings for both leadership styles point to more complex patterns related to these behaviors. We propose that the effectiveness of the leadership style depends on the mindset of the leader. As such, the same leadership style can have very different effects on the idea submissions of followers depending on the leader's beliefs and his or her way of approaching the idea generation task (Kuhnert & Lewis, 1987). Building on prior studies which have proposed the idea that leaders with the same style influence followers differently when the leaders have different values and motivations (House & Howell, 1992; Howell, 1988),

we argue that the mindset of the leader defines how serious, authentic, and convincing a particular leadership behavior is to the follower. We investigate two mindsets that might serve as moderating variables: how the organizational identification of the leader enhances the effectiveness of a transformational leadership style and how a leader's commitment towards an idea management program enhances the effects of a transactional leadership style. We examine these questions using a multilevel field study.

This study advances the leadership and innovation literature in several ways. First, we focus on a type of innovation that has not yet received the attention it deserves: improvement ideas. Specifically, with this study we hope to provide valuable information on how different leadership styles (i.e., transformational and transactional leadership) may foster improvement idea generation. Second, we investigate the boundary conditions under which these different leadership styles influence the followers' creative output. This allows us to offer new explanations for the past, mixed and inconsistent findings about the effects of transformational and transactional leadership. Specifically, our study sheds light on the importance of leader mindsets as moderators that activate the effect of a leadership style. This is especially important as there is a perception that all employees of a company ought to be committed to programs and initiatives that allow them to submit their creative improvement ideas and that leaders should use a "one size fits all" approach in managing these idea systems.

THEORETICAL BACKGROUND

Improvement Ideas

We study the voluntary submission of improvement ideas by people who take an "active and self-starting approach to work" and who go "beyond what is formally required" in their job (Frese, Fay, Hilburger, Leng, & Tag, 1997: 140). Voluntarily generating ideas is closely related to the activities and concepts of taking charge (e.g., Morrison & Phelps, 1999), proactivity (e.g., Grant & Ashford, 2008), voicing issues or types of organizational citizenship behavior (e.g., Detert & Treviño, 2010; Podsakoff, MacKenzie, Paine, & Bachrach, 2000). When the idea generated is an improvement idea, there is a focus on the creative and innovative aspect

embedded in an idea (Frese, Teng, & Wijnen, 1999; Ohly, Sonnentag, & Pluntke, 2006). Improvement ideas have an incremental character; they suggest ways to improve work processes or how to make them more efficient and safe. When successfully implemented, the ideas might turn into process innovations (Baer & Frese, 2003) and/or save substantial amounts of money (Fairbank & Williams, 2001). For instance, in its corporate responsibility report, the German telecommunication company, Deutsche Telekom, reports a cost savings of 136 Million Euro in 2010 with more than 10,000 ideas that were submitted by employees (Deutsche Telekom, 2011). Even more impressive, the conglomerate Siemens recently issued a press release stating that they have implemented 1.5 Million employee suggestions and ideas in the past 100 years, which saved the company in total over three billion Euro (Siemens, 2010).

To stimulate, support, and channel improvement ideas, companies often use formal idea management programs (Fairbank & Williams, 2001; Frese, Teng, & Wijnen, 1999; Van Dijk & Van den Ende, 2002). A classic form of these systems is a suggestion box. Idea management schemes fall under the umbrella of high-performance human resources practices that serve to achieve organizational excellence through increasing employee involvement (Jensen, Johnson, Lorenz, & Lundvall, 2007). Employees who suggest ideas take a consultative role to management on issues they consider important as well as where they possess more information and expertise than their leaders (Kim, MacDuffie, & Pil, 2010). Thus, next to improving the company, such ideas also enhance the engagement of employees with the company. Potentially, everyone in a company can submit an improvement idea, making this an important issue for management.

Leadership and Idea Submissions

Leadership behavior has been recognized as one of the most critical factors influencing creative behavior in a working context (George, 2007; Jung, Chow, & Wu, 2003; Mumford, Scott, Gaddis, & Strange, 2002). This is particularly important when considering voluntary idea submissions through an idea management program, because with his or her behavior, a leader can influence the degree to which employees are committed, see the need for continuous improvement and subsequently voice their creative ideas (Detert & Burris, 2007). Leaders play such an important role because they both set the goals and motivate the followers – influencing

the manner in which they approach and accomplish these goals (Jung, 2001; Redmond, Mumford, & Teach, 1993).

To address how specific leadership behaviors affect employees in submitting improvement ideas, we focus on transformational and transactional leadership (Burns, 1978). A transformational leadership style aims at inspiring, actively engaging, as well as transforming subordinates to the degree that they are able to perform better than imagined (Bass, 1985; Podsakoff, MacKenzie, Moorman, & Fetter, 1990; Yukl, 1999). Leaders show transformational behavior when they articulate a shared vision of the future, act as role models, foster the acceptance of collective goals, set high expectations and also when they intellectually stimulate and support the individual development needs of subordinates (Bass, 1985; Podsakoff, MacKenzie, Moorman, & Fetter, 1990). Transformational leadership means that followers adopt the internal values and standards of leaders and therewith alter their beliefs about and commitments to the targets that their leader finds important (Kuhnert & Lewis, 1987). Transactional leadership, on the other hand, refers to a style in which the expectations for an exchange relationship between the leader and the subordinate are clearly expressed by the leader. Hence, these leaders communicate specific expectations and offer rewards contingent on whether the followers accomplish the agreed-upon objectives (Bass, 1985; Podsakoff, MacKenzie, Moorman, & Fetter, 1990). Due to the focus on concrete actions and less on the internalization of leader values, transactional leadership does not require that the beliefs and goal commitments of followers change (Bass, 1985; Kuhnert & Lewis, 1987). Instead, followers seek to accomplish the goals set by the leader because of the rewards related to the accomplishment.

Several studies have investigated the role that transformational and transactional leadership plays for creativity and innovation, but the findings remain mixed. Considering transformational leadership, some studies show a positive relationship with creativity (e.g., Howell & Avolio, 1993; Jung, Chow, & Wu, 2003). They argue that by exhibiting courage and dedication, transformational leaders arouse the followers' emotions; they inspire and support them to question the status quo, to be curious, and to come up with new approaches and ideas for their work (Bass, 1985; Gong, Huang, & Farh, 2009; Shin & Zhou, 2003). However, not all research results point towards a positive relationship between transformational leadership and the

followers' creative output. Basu and Green (1997), for instance, found transformational leadership to be negatively related to innovative behavior. One explanation that they offer is that transformational leaders can sometimes be intimidating to followers as they exercise too much pressure on the followers to perform beyond the leader's expectations and the followers' capabilities. Also, as transformational leaders are very much involved in the innovation process "they may view followers who are not up to their standards to be less innovative" (Basu & Green, 1997: 493). In the studies by Krause (2004) and Jaussi and Dionne (2003) transformational leadership were not related to individual creativity or innovative behavior.

For transactional leadership, things are much the same. First, there is evidence for a direct negative relation between transactional leadership and innovative follower behavior (e.g., Nederveen Pieterse, Van Knippenberg, Schippers, & Stam, 2010; Rank, Nelson, Allen, & Xu, 2009). The underlying reasoning is that transactional leaders only encourage people to perform to the degree that is expected from them (Bass, 1985; Podsakoff, MacKenzie, Moorman, & Fetter, 1990), leaving little leeway and discretion for an employee to exercise curiosity. Transactional leaders may also be perceived as controlling and de-motivating. As Rank et al. (2009) find in their study, they can hamper the creative and innovative behavior of followers. However, similar to the transformational leadership construct, there are conflicting findings for the relationship between transactional leadership and individual creative output measures. For instance, Jung (2001) found a positive influence from transactional leadership. Moreover, Kahai, Sosik, and Avolio (2003) showed that groups with a transactional leader generate more original ideas than groups with a transformational leader.

More recent research has argued for and found that the effectiveness of transformational and transactional leadership is contingent on contextual factors. For example, "followers' conservation", that is, acting and conforming to social expectations while favoring harmony in interpersonal relationships (Shin & Zhou, 2003) and psychological empowerment (Nederveen Pieterse, Van Knippenberg, Schippers, & Stam, 2010) were found to moderate the leadership style-creativity relationship. Our study further explores the complexity of how a leadership style influences the generation of improvement ideas by subordinates. Specifically, the moderators suggested in prior studies are all follower level constructs, like psychological empowerment of

followers or conservation of followers, which may be different for each and every follower. Although informative, this is also highly impractical as one leader often manages multiple followers. Therefore, we advance prior studies by looking into *leader* mindsets that can activate and enhance the effect of transformational and transactional leadership. Prior studies have proposed the idea that leaders with the same style influence followers differently when the leaders have different values and motivations; for instance, collective versus individual interests (House & Howell, 1992; Howell, 1988).

We are interested in studying followers' voluntary contributions to an idea management program. To do so, we focus on two leader mindsets that appear to be particularly relevant in this context: organizational identification and commitment to the improvement idea generation system. Specifically, we argue that while transformational leaders have the potential to persuade followers to forfeit their individual needs in favor of the needs of the organization, by contributing improvement ideas, these leaders will only do so to the extent that they deem the organization important (i.e., identify with the organization). Furthermore, we argue that while transactional leaders have the potential to (extrinsically) motivate followers to exert the effort to accomplish the goals of the leader, by contributing improvement ideas, these leaders will only do so to the extent that improvement idea submission is their goal (i.e., they are committed to the improvement idea generation system). We develop these ideas as hypotheses in the following section.

HYPOTHESES

Transformational Leadership and Idea Submissions

The inconsistent findings for the relationship between transformational leadership and the generation of improvement ideas point towards boundary conditions under which the effect of transformational leadership is enhanced or activated.

The essence of transformational leadership is to transform subordinates to the degree that they are able to perform better than imagined (Bass, 1985; Podsakoff, MacKenzie, Moorman, &

Fetter, 1990; Yukl, 1999). By communicating their norms and values, transformational leaders inspire others to alter their beliefs about and commitments to a target (Kuhnert & Lewis, 1987). Improvement ideas mainly benefit the organization and are therefore organizationally oriented behaviors. So, if a leader wants to inspire and motivate their followers to come up with suggestions that bring the organization forward, the leader's identification with the organization is an important mindset for enhancing the effect of the transformational leadership style. Organizational identification relates to the "perceived oneness with an organization and the experience of the organization's successes and failures as one's own" (Mael & Ashforth, 1992: 103).

The leader's organizational identification activates the intrinsic motivation effect of transformational leadership (Wang, Oh, Courtright, & Colbert, 2011), because it signals that leaders are concerned with the organization just as employees are, through the submission of improvement ideas. As such, the leaders serve as good role models whose empowering, inspiring, and supporting behavior is perceived as authentic and persuasive (Gong, Huang, & Farh, 2009). Having a role model who is sacrificing his or her own interests for the collective good (Podsakoff, MacKenzie, Moorman, & Fetter, 1990) is especially important when considering that idea submissions to an idea management scheme are voluntary acts. Moreover, the combination of transformational leadership and a leader's organizational identification is very effective because it elevates subordinates to "perform beyond the expectations specified in the implicit or explicit exchange agreement" (Dvir, Eden, Avolio, & Shamir, 2002: 735) and to engage in voluntary motivated work behaviors that serve the good of the company. A leader who focuses on the promotion of a follower's creative behavior (Jung, Chow, & Wu, 2003), in combination with a high organizational identification, gives a follower a sense meaning and direction because a higher order target is defined and support to reach that target is offered.

Because improvement ideas are directed towards benefiting the organization, transformational leaders who adhere to and share organizational values and beliefs persuade followers that the submission of such ideas is important. Moreover, leaders who identify with the organization also stress the collective duty of people to contribute to the organization's future. Thereby, they instill a feeling of obligation among followers to help the organization reach its objectives

(Eisenberger, Stinglhamber, Vandenberghe, Sucharski, & Rhoades, 2002; Hill, Seo, Kang, & Taylor, in press). Followers subsequently "internalize the goals of the collective, […] view actions that support the psychological and social context of their work as meaningful and consistent with their self-concept" (Wang, Oh, Courtright, & Colbert, 2011: 231). To summarize, transformational leaders exert influence on followers to generate more ideas when they themselves identify with the organization, because, by setting a good example and being a socialized leader, followers are motivated to also contribute to the collective good.

Hypothesis 1: *The leaders' organizational identification positively moderates the relationship between transformational leadership and the followers' idea submissions.*

An important mediator in the relation between transformational leadership and employee idea submissions is employee commitment to idea management programs. There are several researchers who have pointed out that employee commitment is key in the effort to gain the followers' support for organizational change and innovation initiatives (e.g., Herscovitch & Meyer, 2002; Klein & Sorra, 1996). Commitment is characterized by a "dedication to and responsibility for a particular target" (Klein, Molloy, & Brinsfield, in press: 16). The target is in our case the acceptance, support of, and engagement in an idea management program. Such a commitment also reflects the employee's acceptance of the need for constant adaptation and change and his or her eagerness to be a facilitating party in this process (Klein, Wesson, Hollenbeck, & Alge, 1999; Klein, Molloy, & Brinsfield, in press).

The potential mediating role of employee commitment stems from the notion that transformational leadership is considered to be an important antecedent of the internalization of values (Klein, Molloy, & Brinsfield, in press). Transformational leaders often highlight existing opportunities for change and promote follower confidence in the idea that they can successfully shape that change, through, for instance, their engagement in idea management programs. As such, transformational leaders mobilize the devotion and commitment of people to such programs (Hill, Seo, Kang, & Taylor, in press). Commitment is reflected in a higher motivation to display innovative behavior and consequently leads to increased idea generation.

Hypothesis 2: *The followers' commitment to an idea management program mediates the moderation between transformational leadership and the leader's organizational identification on the followers' idea submissions.*

Transactional Leadership and Idea Submissions

The divergent findings associated with the relationship between transactional leadership and idea submissions illustrates that more complex relationships should also be considered to uncover the effect of this leadership style.

The essence of transactional leadership is to motivate followers to reach agreed-upon objectives by communicating expectations and rewarding people upon completion of the objectives (Bass, 1985; Podsakoff, MacKenzie, Moorman, & Fetter, 1990). If leaders want to convince their followers to work for the goal of generating more improvement ideas, leader's commitment to such a program is an important mindset for positively moderating the effect of transactional leadership. Thus, the nature of the transactional leadership style is activated and enhanced through a leader's strong commitment to an idea management program because subsequently, a goal about more idea submissions to such a program will become more convincing to employees. When employees feel that their leader is commitment to and involved in an idea management program, they will more easily adopt his or her idea generating goal and the submission of many ideas to the program will also become their goal.

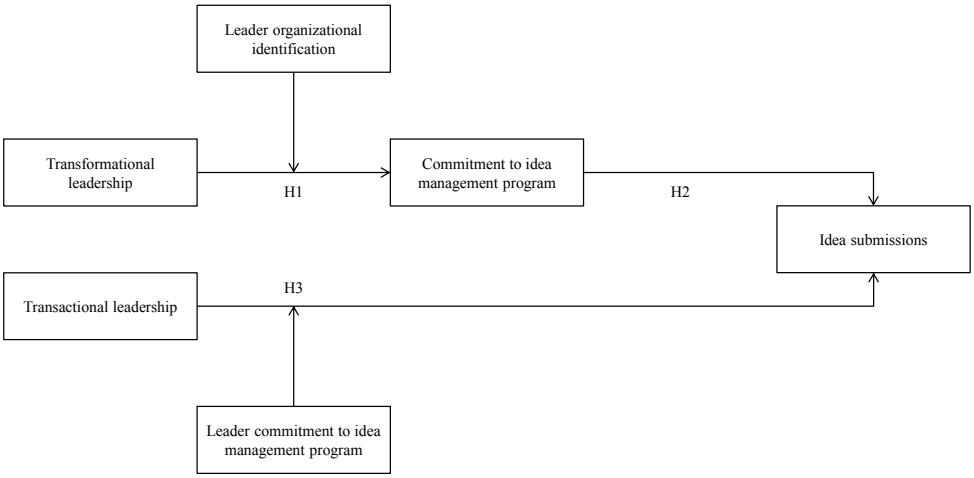
By committing to an idea management program, transactional leaders also provide clarity to subordinates about which activities they need to perform in order to be rewarded for ideas. Moreover, the extrinsic motivation argument engendered in transactional leadership (Wang, Oh, Courtright, & Colbert, 2011) applies to our context because, while idea submissions are based on a voluntary basis, employees nevertheless receive a small gift and a chance to win prizes in a raffle. The combination of transactional leadership and a leader's commitment to the idea management program gives a positive signal that it is worth the time and effort for an employee to submit ideas and that he or she will be fairly rewarded for such efforts (Schriesheim, Castro, Zhou, & DeChurch, 2006). Additionally, if followers want to make a positive impression on their leader, it is very attractive for them to contribute to the program with ideas; this effect is

enhanced by a transactional leadership style that provides appropriate reward structures (Hollenbeck & Klein, 1987).

Hypothesis 3: *The leaders' commitment to the idea management program positively moderates the relationship between transactional leadership and the followers' idea submissions.*

The above hypotheses are depicted in Figure 1.

FIGURE 1
Conceptual Framework



METHOD

Research Setting, Sample, and Procedures

This study was conducted in four German branches of a multinational logistics company, which we call "Loco" for the purpose of anonymity. Prior to setting up the survey, we visited two sites of the company to reach an understanding about the interrelationships and processes that accompany the generation of ideas. We also sought qualitative insights into what employees thought about the suggestion system and how they viewed the role of the leader in this process. We talked to around 20 leaders and employees at all hierarchical ranks and with different

degrees of idea submission activity. From these interviews, we learned a lot about the company context and how the idea management program was put into practice. One manager for instance said: *"I like the idea management program, because I think that knowledge is the main capital of our company. Employees know what they can improve and make themselves heard through submitting ideas"*. Leaders often expressed the value of employee ideas and knew about their influential role as a leader: *"It has to do with setting an example. As a manager you have to be open for new experiences and constantly be willing to learn. You should not believe that you know everything; many things your employees will know better"*. One manager also said, *"You really see a difference in participation rate of employees between managers who welcome ideas and those who don't really care"*. Confirming the influential role of a leader, employees also told us about their negative experiences: *"When I say something about a problematic situation, the answer I get is that things are just done like this. Why should I even bother to raise my voice again?"* A leader, on the other hand, also said: *"Many of these ideas you can scrap immediately. Sometimes this whole idea management program is ridiculous with ideas that are submitted on a level, we don't have to go"*.

We used questionnaires to measure the constructs in our model. We prepared the questionnaires in English first. Wherever possible we used German translations and tested versions of the instruments we selected. For the translation of other survey items, we used the standard method of back-translation. We adapted all constructs that used statements and Likert scales because these response formats can be potentially ambiguous as intensity is built into the item stem (Rossiter, 2002). Instead, we changed the statements into questions and built intensity into the answering formats. The translated questionnaire was pre-tested with ten employees of Loco and ten employees from a different organization. We asked each of the pre-test participants to go through the questionnaire and comment on items that could be ambiguous or difficult to understand. The pre-testing supported the validity of the questionnaire items. All questionnaire items are listed in Appendix A.

The central management of Loco made an open call for participation in our study among Loco branches in a regional district. Four branches eventually agreed to participate in the research project and questionnaire. Each branch has one managing director and approximately five

department leaders. The departments represent functional units of the company. The average department head count is about 15 employees. These are people having office jobs who directly report to the department head. We set up two different questionnaires, one for the department managers and one for the subordinates. Confidentiality was a major concern for the company and its union representatives. To guarantee confidentiality, we did not ask for the name of the participants and used ranges when asking for the age of the participants. Furthermore, we promised that we would not break down analyses to a branch or department level and that the controls that we would put into the analysis for those levels, would disguise the respective name.

We distributed the questionnaire to the department managers during personal visits of the branches. We took the completed questionnaires with us on the same day. For absent leaders, we left an envelope with a questionnaire behind. Twenty-one department leaders completed the questionnaire (a 100 percent response rate, an average of 5.3 department leaders per branch). The questionnaire for the subordinates were randomly distributed to a selection of three to 12 subordinates per supervisor, depending on the number of office workers per department head. All subordinates (as well as leaders that were absent during our site visit) were asked to seal their completed questionnaire in the attached envelope and place them in or send them to centrally located drop boxes. We asked one contact person in each branch, who was responsible for administering other employee surveys as part of their usual duties and therefore aware of data security concerns, to send us the drop boxes four weeks after we installed them. One-hundred and fifty subordinates returned the questionnaire (a 48 percent response rate, an average of 7.1 subordinates per department leader). Due to missing data, the number of completed questionnaires was 121.

The demographic profile of the department leaders is as follows: 71 percent were male, most respondents ticked the 46 to 55 age bracket (67 percent) and enjoyed high school education (62 percent). The average functional tenure was eight years. From the subordinates that responded, 23 percent were female, most respondents ticked the 46 to 55 age bracket (49 percent) and most of them had achieved an a high school degree (36 percent). The average functional tenure was 11.5 years.

Dependent Variables

Idea submissions. Employee idea submissions is a count variable, summing up all the ideas that an employee submitted in 2008 and 2009. Following Shalley, Gilson, and Blum (2009), we argue that employees are best suited to indicate how many ideas they generated. Employees at Loco are especially well aware of the number of ideas they submitted in a given year, because for every idea, they receive points and with more points, they have higher chances in raffles that are organized every year. In an electronic idea management recording system, they can also follow how many ideas they submitted. To ensure confidentiality (no name was asked from respondents) and due to the high number of employees, it was not feasible to either have supervisors rate the number of ideas or get access to the archival idea records. Moreover, as Axtell et al. (2000) have shown, supervisory ratings correlate (.62) with self-reported measures related to idea generation.

To further validate our measure, we conducted a study in one of the four branches where we asked the idea manager, who is responsible for the administration and tracking of ideas in the database of the idea management program, to provide us with the anonymous individual submission records from people of one department who might have received a questionnaire from us. In those records, no employee name was provided, but the gender and age bracket of the person, and how many ideas were generated in a particular year was visible. We then tried to match this information with the questionnaires that we received from that branch and that department. We found that in 80 percent of all cases the employees reported the same number of ideas on the questionnaire that was recorded in the suggestion system and that in the remaining 20 percent of the cases, only marginal differences occurred. We sent our results, together with the other demographic data back to the idea manager to check the matching procedure. Our contact confirmed that the differences in idea submissions for 20 percent of our cases were indeed marginal and that they could be related to administrative procedures and delays in the recording system. This finding is very similar to that of Ohly, Sonnentag, and Pluntke (2006) who correlated the number of ideas as reported by respondents with the number of ideas as reported in the idea management database. They also found that both measures were highly correlated (.81).

Employee commitment to idea management program. We used the goal commitment scale consisting of five items validated by Klein, Wesson, Hollenbeck, Wright, and DeShon (2001) which is based on the earlier work of Hollenbeck, Klein, O'Leary, and Wright (1989) to measure the followers' commitment to the idea management program. A German-translated version of this scale published by Menold (2006) was adapted. We replaced "goal" with "idea management program" in each item. While idea management does not refer to a specific goal, the items nevertheless capture the commitment of a person to subscribe to the program and his or her willingness to contribute to it by submitting ideas.

Independent Variables

Transformational leadership. We measured transformational leadership with a scale by Podsakoff and his colleagues (Podsakoff, MacKenzie, Moorman, & Fetter, 1990; Podsakoff, MacKenzie, & Bommer, 1996). We use a German adaptation of the instrument which was tested by Heinitz and Rowold (2007). Their findings show that the scale is readily usable and suitable for assessing German managers. The construct captures six dimensions, including five items for *articulating a vision*, three items for *providing an appropriate model*, four items for *fostering the acceptance of group goals*, three items for *high performance expectations*, four items for *providing individualized support*, and three items for *intellectual stimulation*. As in previous research (e.g., Kirkman, Chen, Farh, Chen, & Lowe, 2009; Schaubroeck, Lam, & Cha, 2007), we combined the different facets of transformational leadership into an overall, higher-order index.

Transactional leadership. Transactional leadership was also measured with a scale by Podsakoff and his colleagues (Podsakoff, MacKenzie, Moorman, & Fetter, 1990; Podsakoff, MacKenzie, & Bommer, 1996). Again, we rely on a German adaptation by Heinitz and Rowold (2007). More specifically, transactional leadership is captured with four items measuring *contingent reward*.

Leader organizational identification. We use the six-item scale by Mael and Ashforth (1992) to measure leader identification with the company.

Leader commitment to idea management program. For leader commitment to the idea management program, we use the same scale as for employee commitment to the idea

management program from Klein, Wesson, Hollenbeck, Wright, and DeShon (2001). Again we rely on a German-translated version of this scale by Menold (2006).

Control Variables

We control for employee organizational identification using the same scale that we used for leader organizational identification by Mael and Ashforth (1992). Employee organizational identification was important to include because it might be an alternative explanation for how employee commitment to an idea management emerges and how this commitment could influence employee submission of improvement ideas.

We also included other *demographic variables* as prior research argued that they can relate to creativity (e.g., Zhang & Bartol, 2010). In addition age (under 18, 18 to 25, 26 to 35, 36 to 45, 46 to 55, 56 to 65, and 66 or older), we controlled for gender (1 for male and 0 for female), functional tenure (in years), and for the leader-follower supervision length (in years). Moreover, we posed a question measuring educational level (no degree, general school, junior high school, vocational baccalaureate, and high school).

Analysis

We used hierarchical linear modeling (HLM) to analyze the data with two levels: employee (level 1) and department leader (level 2) following the model-building strategy by Hox (2010). We used Stata 11.0 to run mixed effects Poisson regressions on our count variable idea submissions and mixed effects linear regressions to fit models with our normally distributed interval variable commitment to idea management (Rabe-Hesketh & Skrondal, 2008). All explanatory variables were grand mean centered before they were entered into the estimation.

RESULTS

In Table 1, we report descriptive statistics of the measures as well as a correlation matrix. Transformational and transactional leadership as well as organizational identification all correlate positively and significantly with commitment to the idea management program, but not

significantly with idea submissions. We checked the variance inflation factors (VIF's) for all primary measures. None appear to exceed the recommended value of 10 (Kennedy, 2003).

To examine the appropriateness of our individual level measures, we investigated their factor structure using confirmatory factor analysis with EQS 6.0. Due to substantial Kurtosis, we used robust measures of fit (Bentler & Wu, 2004). The reported fit-indices are chi-squares (χ^2; differences in nested model fits are indicated by a $\Delta\chi^2$), Steiger's original root mean square error of approximation (RMSEA), the Bollen's fit index (IFI), and the comparative fit index (CFI). First we investigated a model in which all items were loaded on one factor. This showed a bad fit to the data (see Table 2). Next, we differentiated between leadership items (transformational and transactional leadership) and follower items (organizational identification and commitment to idea management program) by loading these items on two different factors. Although the fit of this model was substantially better than that of the prior model ($\Delta\chi^2$= 254.96, Δdf= 1, $p < .001$), the model fit was still not good. In a subsequent step, we differentiated between the commitment to an idea management program and organizational identification by having these items load on two different factors (while the leadership items loaded on a third). Again the fit of this model was substantially better than that of the prior model ($\Delta\chi^2$ = *75.79*, Δdf= 2, $p < .001$), thus supporting the distinction between organizational identification and commitment to idea management program, however, model fit was not good. In a next step, we also differentiated between transformational and transactional leadership by having these items load on two different factors as well. Again, the fit of this model was substantially better than that of the prior model ($\Delta\chi^2$ = 103.88, Δdf= 3, $p < .001$), supporting the distinction between transactional and transformational leadership. However, the model fit was still modest. One of the reasons for the modest model fit could be that transformational leadership is a construct made up of several sub dimensions. Therefore, we ran a final model in which the transformational leadership items loaded on their prospective sub factors and these six sub factors loaded on one overall, higher-order transformational leadership factor. The fit of this model was adequate ($\Delta\chi^2$ = 292.00, Δdf= 17, $p < .001$), supporting our use of the different scales in further analyses.

TABLE 1
Descriptive Statistics and Correlation Matrix

Variable	Mean	S.D.	Min.	Max.	1	2	3	4	5	6	7	8	10	11
1. Commitment to idea management program	3.60	0.80	1.20	5.00										
2. Idea submissions	10.13	19.01	0	129	0.26 *									
3. Transformational leadership	3.65	0.57	1.95	4.87	0.48 *	0.03								
4. Transactional leadership	3.70	0.89	1.25	5.00	0.48 *	0.07	0.73 *							
5. Organizational identification	3.88	0.59	2.33	5.00	0.32 *	0.06	0.28 *	0.19 *						
6. Gender	1.77	0.42	1	2	-0.01	-0.08	0.02	-0.09	-0.05					
7. Age	4.79	0.77	2	6	0.01	-0.09	-0.01	-0.12	0.01	0.03				
8. Educational level	3.74	1.12	2	5	-0.07	0.00	0.06	0.22 *	-0.14	-0.20 *	-0.26 *			
9. Job tenure	11.57	6.94	2	37	0.02	-0.04	-0.04	-0.05	0.08	0.10	0.13	-0.29 *		
10. Leader job tenure	8.05	4.99	2	20									-0.44 *	
11. Leader organizational identification	3.98	0.49	3.00	5.00									0.00	0.30
12. Leader commitment to idea management program	3.85	0.73	2.20	5.00										

n (level 1) = 121, *n* (level 2) = 21. * $p < .05$

TABLE 2
Fit Indexes for Confirmatory Factor Analyses

	χ^2	*df*	IFI	CFI	RMSEA
One Factor Model	1567.99 ***	629	0.56	0.56	0.12
Two Factor Model[1]	1313.03 ***	628	0.68	0.68	0.10
Three Factor Model[2]	1237.24 ***	626	0.71	0.72	0.10
Four Factor Model[3]	1133.36 ***	623	0.76	0.76	0.09
Final Factor Model[4]	841.36 ***	606	0.89	0.89	0.06

^ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

[1] Transformational and Transactional leadership load one factor and Organizational identification and Commitment to idea management program on a second factor.

[2] Transformational and Transactional leadership load one factor, Organizational identification on a second factor and Commitment to idea management program on a third factor.

[3] Transformational leadership, Transactional leadership, Organizational identification and Commitment to idea management program all load on different factors.

[4] Transactional leadership, Organizational identification and Commitment to idea management program all load on different factors and Transformational leadership loads on six sub-factors that subsequently load on 1 higher order factor.

TABLE 3
Results of Mixed Effects Poisson Regression Analysis of Idea Submissions

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Intercept	1.77 *** (0.26)	-0.16 (0.46)	0.02 (0.57)	-2.24 ** (0.84)	-2.07 ** (0.76)	-2.02 ** (0.75)	-1.73 * (0.80)	-1.77 * (0.77)	-1.82 * (0.77)
Level 1 variables									
Gender		1.02 *** (0.10)	1.03 *** (0.10)	1.64 *** (0.14)	1.66 *** (0.14)	1.67 *** (0.14)	1.95 *** (0.16)	1.96 *** (0.16)	1.96 *** (0.16)
Age		-0.22 *** (0.05)	-0.22 *** (0.05)	-0.16 ** (0.05)	-0.17 ** (0.06)	-0.18 *** (0.06)	-0.24 *** (0.06)	-0.25 *** (0.06)	-0.25 *** (0.06)
Educational level		0.21 *** (0.04)	0.22 *** (0.04)	0.28 *** (0.04)	0.29 *** (0.04)	0.29 *** (0.04)	0.11 * (0.05)	0.10 * (0.05)	0.11 * (0.05)
Job tenure		0.02 *** (0.01)	0.02 *** (0.01)	0.02 ** (0.01)	0.01 * (0.01)	0.01 * (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
Transformational leadership		-0.67 *** (0.13)	-0.67 *** (0.12)	-0.31 (0.35)	-0.50 (0.58)	-0.43 (0.59)	-0.21 (0.16)	-0.19 (0.16)	-0.17 (0.16)
Transactional leadership		0.15 * (0.07)	0.15 * (0.07)	-0.15 (0.10)	-0.23 * (0.11)	-0.24 * (0.11)	0.24 (0.31)	0.26 (0.34)	0.22 (0.33)
Organizational identification		0.20 *** (0.06)	0.20 *** (0.06)	0.18 ** (0.07)	0.17 * (0.07)	0.17 * (0.07)	-0.24 *** (0.07)	-0.25 *** (0.07)	-0.25 *** (0.07)
Commitment to idea management program		0.48 *** (0.06)	0.48 *** (0.06)	0.60 *** (0.07)	0.62 *** (0.07)	0.63 *** (0.07)	0.60 *** (0.08)	0.61 *** (0.08)	0.61 *** (0.08)
Level 2 variables									
Leader job tenure			-0.03 (0.05)	0.02 (0.07)	-0.01 (0.06)	-0.01 (0.06)	0.03 (0.07)	0.05 (0.06)	0.05 (0.06)
Leader organizational identification			0.20 (0.52)	0.51 (0.75)	0.47 (0.63)	0.16 (0.64)	0.31 (0.73)	0.36 (0.66)	0.43 (0.67)
Leader commitment to idea management program			1.12 *** (0.31)	1.34 ** (0.46)	1.36 *** (0.38)	1.30 *** (0.38)	1.28 ** (0.44)	1.36 *** (0.41)	1.25 ** (0.40)
Cross-level interactions									
Transformational leadership x Leader organizational identification						-2.04 (1.39)			
Transactional leadership x Leader commitment to idea management program									0.74 * (0.44)
Factor variable				Transformational leadership	Transformational leadership	Transformational leadership	Transactional leadership	Transactional leadership	Transactional leadership
Covariance structure	*Identity*[1]	*Identity*[1]	*Identity*[1]	*Identity*[1]	*Unstructured*[2]	*Unstructured*[2]	*Identity*[1]	*Unstructured*[2]	*Unstructured*[2]
Log restricted-likelihood	-905.15	-760.91	-755.07	-697.36	-694.50	-693.26	-656.59	-655.91	-654.55
χ^2_{Change} (df_{Change})	1090.97 (1) ***[3]	288.48 (8) ***	11.68 (3) **	115.41 (1) ***	5.73 (1) **	2.49 (1) ^	196.95 (1) ***[4]	1.37 (1)	2.70 (1) *
Variance of residuals	-	-	-	-	-	-	-	-	-
Variance of intercepts	1.34	1.63	0.83	1.65	1.08	1.06	1.58	1.26	1.26
Variance of slopes					5.57	5.80		2.01	1.77
N (level 1)	121	121	121	121	121	121	121	121	121
N (level 2)	21	21	21	21	21	21	21	21	21

Standard errors are in parentheses. ^ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; two-tailed tests ecept for cross-level interaction and likelihood-ratio tests.
[1] Short for "multiple of the identity": All variances are equal and all covariances are zero. [2] Allows all variances and covariances to be distinct. [3] Compared to one level intercept-only model.
[4] Compared to Model 3.

TABLE 4
Results of Mixed Effects Linear Regression Analysis of Commitment to Idea Management Program and Results of Mixed Effects Poisson Regression Analysis of Idea Submissions

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	DV: Commitment to idea management program						DV: Idea submissions	
Intercept	3.60 *** (0.10)	3.35 *** (0.59)	3.29 *** (0.61)	3.35 *** (0.60)	3.24 *** (0.59)	3.30 *** (0.59)	-1.73 * (0.83)	-2.02 ** (0.75)
Level 1 variables								
Gender		0.14 (0.15)	0.20 (0.16)	0.19 (0.16)	0.23 (0.16)	0.21 (0.16)	1.69 *** (0.14)	1.67 *** (0.14)
Age		0.02 (0.08)	0.03 (0.08)	0.04 (0.08)	0.03 (0.08)	0.02 (0.08)	-0.15 ** (0.05)	-0.18 *** (0.06)
Educational level		-0.04 (0.06)	-0.02 (0.06)	-0.04 (0.06)	-0.03 (0.06)	-0.03 (0.06)	0.16 *** (0.04)	0.29 *** (0.04)
Job tenure		0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.02 * (0.01)	0.01 * (0.01)
Transformational leadership		0.31 ^ (0.17)	0.32 ^ (0.17)	0.31 ^ (0.18)	0.29 (0.19)	0.33 ^ (0.18)	-0.36 (0.53)	-0.43 (0.59)
Transactional leadership		0.27 * (0.11)	0.26 * (0.11)	0.27 ** (0.11)	0.27 * (0.11)	0.26 * (0.11)	0.15 (0.09)	-0.24 * (0.11)
Organizational identification		0.26 * (0.10)	0.27 ** (0.10)	0.25 * (0.10)	0.24 * (0.10)	0.23 * (0.10)	0.16 * (0.06)	0.17 * (0.07)
Commitment to idea management program								0.63 *** (0.07)
Level 2 variables								
Leader job tenure			-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	0.00 (0.07)	-0.01 (0.06)
Leader organizational identification			0.13 (0.24)	0.16 (0.22)	0.30 (0.25)	0.23 (0.25)	0.44 (0.75)	0.16 (0.64)
Leader commitment to idea management program			0.13 (0.15)	0.16 (0.14)	0.21 (0.15)	0.21 (0.15)	1.36 ** (0.44)	1.30 *** (0.38)
Cross-level interactions								
Transformational leadership x Leader organizational identification						0.51 * (0.29)	-1.25 (1.26)	-2.04 (1.39)
Factor variable				Transformational leadership	Transformational leadership	Transformational leadership	Transformational leadership	Transformational leadership
Covariance structure	*Identity*[1]	*Identity*[1]	*Identity*[1]	*Identity*[1]	*Unstructured*[2]	*Unstructured*[2]	*Unstructured*[2]	*Unstructured*[2]
Log restricted-likelihood	-143.48	-132.45	-135.26	-135.09	-133.70	-132.54	-731.76	-693.26
χ^2_{Change} (df_{Change})	3.64 (1) *[3]	22.05 (7) ***	-5.61 (3)	0.34 (1)	2.78 (1) *	2.32 (1) ^		77.01 (1) ***
Variance of residuals	0.55	0.38	0.38	0.37	0.35	0.35	-	-
Variance of intercepts	0.10	0.10	0.11	0.08	0.14	0.12	1.53	1.06
Variance of slopes					0.08	0.04	4.52	5.80
N (level 1)	121	121	121	121	121	121	121	121
N (level 2)	21	21	21	21	21	21	21	21

Standard errors are in parentheses. ^ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; two-tailed tests except for cross-level interaction and likelihood-ratio tests.
[1] Short for "multiple of the identity": All variances are equal and all covariances are zero. [2] Allows all variances and covariances to be distinct. [3] Compared to one level intercept-only model.

Test of Hypotheses 1 and 2: The Relationship between Transformational Leadership and Idea Submissions

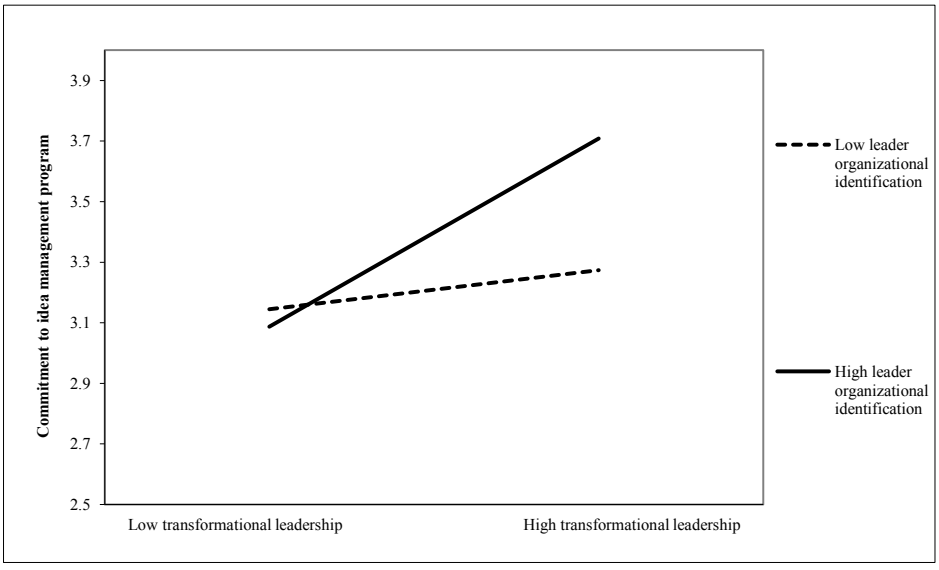
To investigate our first hypothesis, we first used a model-building approach with idea submissions as the dependent variable. Using the steps outlined by Hox (2010), we found that allowing the intercepts to vary made a significant difference to the model (Table 3, Model 1: $\Delta\chi^2 = 1090.97$, $\Delta df = 1$, $p \leq .001$). Moreover, the slope of the effect of transformational leadership on idea submissions varied across employees (Table 3, Model 4: $\Delta\chi^2 = 115.41$, $\Delta df = 1$, $p \leq .001$). Slopes and intercepts also significantly covaried (Table 3, Model 5: $\Delta\chi^2 = 5.73$, $\Delta df = 1$, $p \leq .01$). However, the cross-level interaction of transformational leadership and leader organizational identification on employee idea submissions, while making a slight difference to the model (Table 3, Model 6: $\Delta\chi^2 = 2.49$, $\Delta df = 1$, $p \leq .10$), appears to be negative and insignificant (Table 3, Model 6: $b = -2.04$, non significant). Hence, Hypothesis 1 was not confirmed. There is no direct effect of the proposed cross-level interaction on employee idea submissions.

In Hypothesis 2, we argued that the cross-level interaction might be mediated by employee commitment to the idea management program. In classic mediation analysis (Baron & Kenny, 1986), a requirement in the first step is to establish a direct relationship between the interaction of transformational leadership by leader organizational identification and the outcome variable, employee idea submissions. In step two, the cross-level interaction (the initial variable) will be regressed on the mediator and in step three, the cross-level interaction and the mediator will be regressed on the outcome variable. Some studies suggest that the first step is not necessary (e.g., Shrout & Bolger, 2002). "[S]tep 1 is not required, since a path from the initial variable to the outcome is implied if steps 2 and 3 are met" (Langfred, 2004: 397). Hence, while we could not establish a direct relationship between the initial variable and our outcome variable (see Hypothesis 1), we nevertheless continued with the mediation analysis.

Before testing the cross-level interaction of transformational leadership and leader organizational identification on employee commitment to the idea management program, we needed to establish a new model-building approach with employee commitment to the idea management as the outcome variable. Following the approach by Hox (2010), we first find that the relationship between transformational leadership and employee commitment to the idea management

program showed significant variance in intercepts across employees (Table 4, Model 1: $\Delta\chi^2$ = 3.64, Δdf = 1, $p \leq .05$). However, the slope of the effect of transformational leadership on commitment to the idea management program did not vary across employees (Table 4, Model 4: $\Delta\chi^2$ = 0.34, Δdf = 1, non significant). Nevertheless, slopes and intercepts did covary (Table 4, Model 5: $\Delta\chi^2$ = 2.78, Δdf = 1, $p \leq .05$). While the model-building approach by Hox (2010) suggests that significant slope variance is necessary before moving to a test of cross-level interactions, LaHuis and Fergusen (2009: 431) recently argued that "the significance tests for slope variance components do not always reflect what is happening in terms of how Level 2 variables relate to the slope". We therefore follow their recommendation to test cross-level interactions "regardless of significance of slope variance" (LaHuis & Ferguson, 2009: 433). Indeed, adding the cross-level interaction of transformational leadership and leader organizational identification makes a significant contribution to the model (Table 4, Model 6: $\Delta\chi^2$ = 2.32, Δdf = 1, $p \leq .10$). The interaction itself significantly accounted for variation in employee commitment to the idea management program (Table 4, Model 6: b = .51, $p \leq .05$). We depict this interaction effect in Figure 2.

FIGURE 2
Interaction between Transformational Leadership and Leader Organizational Identification Predicting Commitment to Idea Management Program



It shows that a high, in contrast to a low, leader organizational identification and a very transformational leadership inspire followers to be more committed to the idea management program. In the next step, we tested the effect of the mediator, commitment to the idea management program, on idea submissions while controlling for our initial independent variable, the interaction between transformational leadership and leader organizational identification. We found a significant and positive association between commitment to the idea management program and idea submissions (Table 4, Model 8: $b = .63$, $p \leq .001$). After conducting the Sobel test, we found a significant score for our mediator ($z = 1.73$, $p \leq .05$), meaning that the commitment to the idea management program carries the influence of the cross-level interaction of transformational leadership and leader organizational identification to the dependent variable, idea submissions, thus confirming Hypothesis 2.

TABLE 5
Mediation Results

Mediator	Path		
Commitment to idea management program	Transformational leadership x Leader organizational identification > Idea submissions	-1.25	(1.26)
	Transformational leadership x Leader organizational identification > Commitment to idea management program	0.51 *	(0.29)
	Commitment to idea management program > Idea submissions (controlling for Transformational leadership x Leader organizational identification)	0.63 ***	(0.07)
	Transformational leadership x Leader organizational > Idea submissions (controlling for Commitment to idea management program)	-2.04	(1.39)
	Sobel test: *z*-value: 1.73, s.e.: 0.19, *		

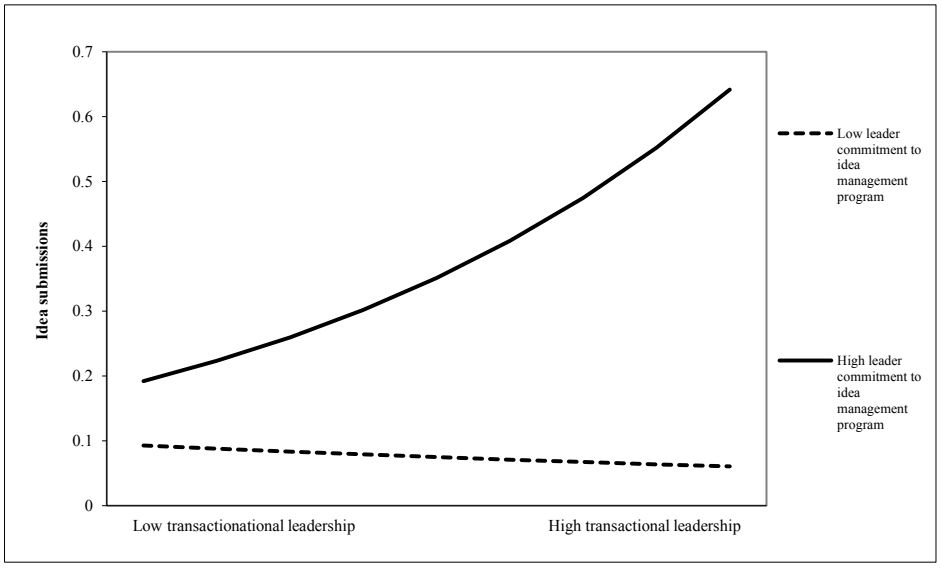
^ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; one-tailed test.

For robustness, we additionally checked potential effects of other cross-level interactions. In Appendix B, Table B1, we report these complementary analyses. First, the cross-level interaction of transformational leadership with leader commitment to the idea management program had no significant effect on employee idea submissions (Table B1, Model 4: $b = -.68$, non significant). Moreover, other interactions on the mediator, employee commitment to the idea management program, were not significant, including transformational leadership by leader commitment to the idea management program (Table B1, Model 1: $b = .18$, non significant), transactional leadership by leader organizational identification (Table B1, Model 3: $b = .20$, non significant), and transactional leadership by leader commitment to idea management program (Table B1, Model 3: $b = .02$, non significant).

Test of Hypothesis 3: The Relationship between Transactional Leadership and Idea Submissions

We find that there is significant variability in slopes of the effect of transactional leadership on idea submissions (Table 3, Model 7: $\Delta\chi^2 = 196.95$, $\Delta df = 1$, $p \leq .001$). However, the slopes and intercepts did not covary (Table 3, Model 8: $\Delta\chi^2 = 1.37$, $\Delta df = 1$, non significant). Following the recommendation by LaHuis and Ferguson (2009: 433) to test cross-level interactions "regardless of significance of slope variance" we continued and found that adding the cross-level interaction of transactional leadership and leader commitment to the idea management program improved model fit (Table 3, Model 9: $\Delta\chi^2 = 2.70$, $\Delta df = 1$, $p \leq .05$). The interaction turned out to be significant and positive (Table 3, Model 9: $b = .74$, $p \leq .05$). This finding confirms Hypothesis 3. In Figure 3, we depict this moderation.

FIGURE 3
Interaction between Transactional Leadership and Leader Commitment to Idea Management Program Predicting Idea Submissions



It shows that a high, in contrast to a low, leader commitment to the idea management program, stimulates followers to significantly increase their idea submission activity.

Again, we checked for robustness. We examined whether leader organizational identification could be an alternative moderator for the relationship between transactional leadership and idea submissions, but the interaction was not significant (Table B1, Model 4: b = .42, non significant).

DISCUSSION

In this study, we investigated the role of transformational and transactional leadership in managing improvement idea generation. We found that the effect of these leadership styles was activated and enhanced by leader mindsets. While we could not confirm a direct effect of the cross-level interaction of transformational leadership by leader organizational identification on ideas generated by employees, we found that this interaction effect is mediated by employee commitment to the idea management program. Hence, we found evidence for a mediated moderation: Transformational leadership moderated by leader organizational identification had an indirect effect on how many ideas employees would generate. For transactional leadership, on the other hand, we found a direct, positive effect on idea submissions which was further enhanced by leader commitment to the idea management program. These results offer new opportunities and challenges for scholars and practitioners interested in utilizing improvement ideas by employees to boost innovation and company performance through effective leadership.

Theoretical Implications

First, our study offers contributions to the innovation management literature. Increased attention has been put on either knowledge-intensive workers and/or on radical innovations. However, research on improvement ideas and idea management programs in which people from all ranks and functions can participate is very scarce (see, for notable exceptions, Axtell, Holman, Unsworth, Wall, & Waterson, 2000; Fairbank & Williams, 2001; Frese, Teng, & Wijnen, 1999; Oldham & Cummings, 1996). This is especially surprising considering the benefits of these ideas and management programs. Improvement ideas usually need less financial support than radical ideas and require no major changes in organizational structures (Dewar & Dutton, 1986). Instead of requiring large investments that may pay off in the long run, improvement ideas often save money in the short term (Fairbank & Williams, 2001). Moreover, idea management programs

can serve purposes beyond just fostering innovative company performance. Being able to express and be rewarded for ideas that improve company processes and work conditions can be very motivating, evoke positive feelings and emotions (Amabile, Barsade, Mueller, & Staw, 2005), as well as improve employee work satisfaction (Ohly, Sonnentag, & Pluntke, 2006). Thus, our study offers important insights into the social processes and contingencies of how ideas emerge. We confirm that idea management programs are not self-starting (Fairbank & Williams, 2001; Ohly, Sonnentag, & Pluntke, 2006). More is needed than a management process with particular selection stages and an appropriate reward structure for idea submitters (Fairbank & Williams, 2001). Idea management is heavily reliant on managers, their attitudes and behaviors. Not only are they important to select ideas, but also to continuously motivate employees to commit to such a program and to contribute ideas.

Furthermore, evidence for the contingent nature of the effect of transformational and transactional leadership on follower creativity, innovative behavior, or idea generation is growing with recent research finding various moderation and mediation patterns (Gong, Huang, & Farh, 2009; Nederveen Pieterse, Van Knippenberg, Schippers, & Stam, 2010; Shin & Zhou, 2003). However, these studies focus entirely on follower characteristics to explain the effect of a particular leadership style. We advance the research on the influence of leader behaviors on follower creative idea generation by examining the role of leader mindsets. We find that the power of a transformational leadership style depends on how much a leader identifies with the company and that the effect of transactional leadership depends on the degree to which a leader is committed to an idea management program. Although prior research has suggested that leader motivations and mindsets could be important to take into account (House & Howell, 1992; Howell, 1988), as far as we know, no research has empirically investigated the interaction between leader mindsets and leader behavior. Our findings therefore suggest the contours of a more comprehensive model of leadership influences on follower idea generation.

We also contribute to the literature on transformational and transactional leadership by showing that these leadership styles affect idea submission through different processes with different boundary conditions. Our investigation on the effect of leadership styles reveals that transformational leadership (enhanced by leader organizational identification) positively drives

employees' attitudes towards an idea management program whereas transactional leadership (moderated by leader commitment to the idea management program) positively shapes followers' creative actions, i.e., idea submissions. As such, our findings confirm that transformational leadership goes hand in hand with altering followers' attitudes, beliefs, and goals. Transformational leaders drive followers to internalize their values and therefore manage to stimulate the followers' subjective creative attitudes, i.e., inspire followers to commit to an idea management program. Transactional leaders, on the other hand, focus more on goal compliance and achievement. Follower attitudes might not be altered as a consequence (Bass, 1985; Kuhnert & Lewis, 1987), but the focus on accomplishing and rewarding agreed-upon goals is an effective mechanism to drive objective follower creative actions, i.e., idea submissions.

By disentangling the subjective attitude towards creative action from the objective creative action, we offer new insights into why studies that looked into the number and quality of ideas generated (e.g., Jung, 2001; Kahai, Sosik, & Avolio, 2003) found a positive influence of transactional leadership, whereas studies that investigated subjective creative behavior and attitudes (e.g., Howell & Avolio, 1993; Jung, Chow, & Wu, 2003) found a positive effect of transformational leadership. Based on our finding that a high commitment to an idea management program is closely related to an increase in the number of ideas that employees contribute to such a program, we conclude that both transformational leadership and transactional leadership are equally important and not that one is more or less effective than the other. The indirect effect of transformational leadership compared to the direct effect of transactional leadership on idea submissions also confirms prior findings by Podsakoff et al. (1990). They looked into the relationship between these leadership styles and organizational citizenship behavior. They found an indirect effect of transformational leadership, mediated by the followers' trust in the leader, and a direct effect of transactional leadership. We further these findings by offering an explanation related to the different nature of the outcome variables and more specifically, the difference between an attitude and a concrete behavior.

Importantly, the majority of prior studies have only focused on the pivotal role of transformational leadership (Gong, Huang, & Farh, 2009; Jaussi & Dionne, 2003; Shin & Zhou, 2003; Sosik, Kahai, & Avolio, 1998). Confirming the very scarce evidence from experimental

studies about the positive effect of transactional leadership in a creativity context (Jung, 2001; Kahai, Sosik, & Avolio, 2003), our field data findings are among the first to illustrate the powerful effect of transactional leadership in motivating followers to submit more creative ideas, directly, and in combination with leader commitment to the idea management program. Our findings are in line with studies by Schriesheim et al. (2006) and Vecchio, Justin, and Pearce (2008) who, for different contexts, also highlighted a greater potential of transactional leadership behavior than previously expected. Moreover, in their meta-analysis, Judge and Piccolo (2004: 763) report that contingent rewards, our proxy for transactional leadership, had a higher validity in business compared to college or other academic settings. "[B]usiness leaders may be better able to tangibly reward followers in exchange for their efforts". Therefore, this leadership style might, at least in some contexts, be more authentic and convincing to followers as it gives them clear direction, fair rewards, and a feeling of security.

Managerial Implications

Results presented in this study point towards the importance of both transformational and transactional leadership. As such, we recommend that organizations promote and raise awareness about both of these leadership styles and develop management programs in which leaders learn about and develop them (Dvir, Eden, Avolio, & Shamir, 2002). Moreover, we found that leader mindsets, such as organizational identification and commitment to an idea management program, are important catalysts for a particular leadership behavior. Leader organizational identification can be stimulated by boosting organizational prestige and distinctiveness through, for instance, internal branding initiatives or symbolic practices to emphasize external threats (Mael & Ashforth, 1992; Van Knippenberg & Sleebos, 2006). Because identification is a self-referential process, a higher organizational prestige and distinctiveness reflects on the self-definition of a person and in that way can increase organizational identification (Mael & Ashforth, 1992; Van Knippenberg & Sleebos, 2006). We expect that leader commitment to an idea management program can be influenced as much as employee commitment is also shaped: through the interaction of transformational leadership on the part of the leader's boss and his or her organizational identification. Thus, we suspect trickle-down effects of leadership behaviors (Yang, Zhang, & Tsui, 2010). Evidence from the interviews that we conducted in the four branches supports such an expectation. For instance, one leader said about his boss: *"For sure,*

the head of the branch plays a motivating role […]. Managers and staff know about his attitude and act accordingly". Provided that the effect of transformational and transactional leadership cascades down the hierarchies, it is important to train top managers on these behaviors.

Limitations and Future Research

Our study is subject to a number of limitations that present opportunities for future research. First, one issue in our study is its cross-sectional design which precludes causal inferences. Similar to other studies (e.g., Gong, Huang, & Farh, 2009), we cannot rule out that leadership behaviors are shaped by how much an employee commits to an idea management program or by how many ideas the follower submits. While we based our hypotheses and the proposed direction of relationships on prior theory, there is an opportunity for future research to conduct studies looking into these relationships and changes over time.

We also conducted this study in one large organization with the advantage of being able to hold organizational context factors constant. However, people's motivation to commit and voluntarily contribute to an idea management program in a large corporation might be very different compared to smaller organizations. Moreover, such programs might not even exist in smaller companies; instead, ideas might be discussed directly with the leader or supervisor. While the findings and proposed implications might therefore only hold for large organizations which do have idea management programs in place, it would be interesting to test the generalizability of the identified relationships in a variety of organizations e.g., different sizes, industries, or countries. While this study sheds light on shopfloor employees, a group of workers which often have been overlooked (Axtell, Holman, Unsworth, Wall, & Waterson, 2000; Unsworth, 2001), future research could also test whether the same leadership behaviors shape commitment and idea contributions of employees in higher ranked positions with a greater degree of knowledge-intensive work.

A strength of this study is that we gathered data at multiple levels. However, our dependent variable and some independent constructs were evaluated by the same source. For our dependent variable, idea submissions, we made every effort to minimize this potential issue. It is reasonable to argue that employees are best suited to indicate how many ideas they generated (Shalley,

Gilson, & Blum, 2009) and Axtell et al. (2000) also showed that supervisory ratings correlate (.62) with self-reported measures related to idea generation. Moreover, Ohly, Sonnentag, and Pluntke (2006) found that the number of ideas as reported by respondents correlated strongly with the number of ideas as reported in the idea management database (.81). We were also able to validate such a strong correlation in our data with a study in one of the four branches. Finally, because we investigate interaction effects with data from two independent sources we believe that, all in all, common method variance should not pose a serious threat to our findings. However, we suggest that future research replicate our study with third-party evaluations or complete archival records of employee idea submissions.

These limitations notwithstanding, our research takes important steps toward better understanding how leadership mindsets shape the effects of leadership behavior on idea submissions. The larger implications of this are also reflected in an employee's quote with which we would like to close: *"I am convinced of the fact that when my leader is aware of me, listens to me when I say something, and grants me influence in decisions through my ideas, I will come to work differently. My work is meaningful and I have value for the company"*.

APPENDIX A

Items for Primary Measures

Commitment to idea management program. Respondents answered the following question: "The following questions are related to your perceptions of the idea management program. Please tick according to your opinion the most appropriate." (1 = "not at all", 2 = "small", 3 = "moderate", 4 = "high", 5 = "very high").

1. How serious do you take the idea management program?
2. How much are you interested in the idea management program?
3. To what degree are you committed to making personal contributions to the idea management program?
4. To what degree can one make you ignore the idea management program?*
5. To what degree does it pay off to contribute to the idea management program?

Transformational leadership. Respondents answered the following question: "This section is about the leadership style of your immediate leader, that is your supervisor. Please estimate how frequently your leader shows the respective behavior." (1 = "never", 2 = "seldom", 3 = "sometimes", 4 = "often", 5 = "always").

Articulating a vision:

My leader…

1. is always seeking new opportunities for the organization.
2. paints an interesting picture of the future for our group.
3. has a clear understanding of where we are going.
4. inspires others with his/her plans for the future.
5. is able to get others committed to his/her dream.

Providing an appropriate model:

1. leads by "doing" instead of only "telling" what needs to be done.
2. acts as a role model for his/her staff.
3. leads by given the right example.

Fostering the acceptance of group goals:

1. fosters collaboration among work groups.
2. encourages employees to be “team players”.
3. gets the group to work together for the same goal.
4. develops a team attitude and spirit among employees.

High performance expectations:

1. shows us that he/she expects a lot from us.
2. insists on only the best performance.
3. will not settle for second best.

Providing individualized support:

1. acts without considering my feelings.*
2. shows respect for my personal feelings.
3. behaves in a manner thoughtful of my personal needs.
4. treats me without considering my personal feelings.*

Intellectual stimulation:

1. has stimulated me to rethink the way I do things.
2. has ideas that have challenged me to reexamine some of my basic assumptions about my work.
3. challenges me to think about old problems in new ways.

Transactional leadership. Respondents answered the following question: “This section is about the leadership style of your immediate leader, that is your supervisor. Please estimate how frequently your leader shows the respective behavior.” (1 = “never”, 2 = “seldom”, 3 = “sometimes”, 4 = “often”, 5 = “always”).

Contingent reward:

My leader…

1. always gives me positive feedback when I perform well.
2. frequently does not acknowledge my good performance*.
3. commends me when I do a better than average job.
4. personally compliments me when I do outstanding work.

Organizational identification. Respondents answered the following question: "Please answer a few questions about your company- Loco." (1 = "not at all", 2 = "small", 3 = "moderate", 4 = "high", 5 = "very high").

1. To what extent does it feel like a personal insult when someone criticizes your company?
2. To what extent are you interested in what others think about your company?
3. To what extent do you "we" rather than "they" when you talk about your company?
4. To what extent are your company's successes your successes?
5. To what extent does it feel like a personal compliment when someone praises your company?
6. To what extent would you feel embarrassed if a story in the media criticized your company?

Items with an asterisk (*) were reverse coded.

APPENDIX B

Additional Analyses

TABLE B1
Results of Mixed Effects Linear Regression Analysis of Commitment to Idea Management Program and Results of Mixed Effects Poisson Regression Analysis of Idea Submissions

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	DV: Commitment to idea management program						DV: Idea submissions			
Intercept	3.22 ***	(0.59)	3.36 ***	(0.60)	3.28 ***	(0.60)	-2.05 **	(0.76)	-1.78 *	(0.77)
Level 1 variables										
Gender	0.24	(0.16)	0.17	(0.16)	0.19	(0.16)	1.66 ***	(0.14)	1.95 ***	(0.16)
Age	0.03	(0.08)	0.03	(0.08)	0.04	(0.08)	-0.18 ***	(0.06)	-0.25 ***	(0.06)
Educational level	-0.03	(0.06)	-0.02	(0.06)	-0.02	(0.06)	0.29 ***	(0.04)	0.10 *	(0.05)
Job tenure	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)	0.01 *	(0.01)	0.00	(0.01)
Transformational leadership	0.33 ^	(0.19)	0.28 ^	(0.17)	0.27	(0.17)	-0.50	(0.59)	-0.18	(0.16)
Transactional leadership	0.27 *	(0.11)	0.28 *	(0.11)	0.29 **	(0.11)	-0.24 *	(0.11)	0.24	(0.34)
Organizational identification	0.23 *	(0.10)	0.27 **	(0.10)	0.27 **	(0.10)	0.17 *	(0.07)	-0.25 ***	(0.07)
Commitment to idea management program							0.62 ***	(0.07)	0.60 ***	(0.08)
Level 2 variables										
Leader job tenure	-0.02	(0.02)	-0.03	(0.02)	-0.03	(0.02)	-0.01	(0.06)	0.05	(0.06)
Leader organizational identification	0.31	(0.25)	0.18	(0.23)	0.19	(0.24)	0.43	(0.63)	0.32	(0.67)
Leader commitment to idea management program	0.17	(0.16)	0.14	(0.15)	0.14	(0.15)	1.26 ***	(0.39)	1.37 ***	(0.42)
Cross-level interactions										
Transformational leadership x Leader commitment to idea management program	0.18	(0.19)					-0.68	(0.82)		
Transactional leadership x Leader organizational identification			0.20	(0.18)					0.42	(0.71)
Transactional leadership x Leader commitment to idea management program					0.02	(0.11)				
Factor variable	Transformational leadership		Transactional leadership		Transactional leadership		Transformational leadership		Transformational leadership	
Covariance structure	*Unstructured*[1]		*Unstructured*[1]		*Unstructured*[1]		*Unstructured*[1]		*Unstructured*[1]	
Log restricted-likelihood	-133.99		-135.03		-136.08		-694.13		-655.73	
χ^2_{Change} (df_{Change})										
Variance of residuals	0.35		0.38		0.38		-		-	
Variance of intercepts	0.13		0.09		0.10		1.08		1.94	
Variance of slopes	0.07		0.01		0.01		5.68		1.27	
N (level 1)	121		121		121		121		121	
N (level 2)	21		21		21		21		21	

Standard errors are in parentheses. ^ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; two-tailed tests except for cross-level interaction tests.
[1] Allows all variances and covariances to be distinct.

CHAPTER 3

GOING WITH THE FLOW? ACTIVATING WORK TIES FOR IDEA DEVELOPMENT[2]

ABSTRACT

In this study, we analyze the antecedents of the involvement intensity of two people working on an idea; the measurable aspect of this involvement is termed idea tie strength. Subsequently, we investigate whether idea tie strength contributes to the success of the employees' new product ideas. Our findings reveal that only structural aspects of the network such as joint friends, tie centrality, and tie strength predict idea tie strength. For network content aspects such as functional- and departmental co-membership or similarity in seniority or similarity in decision-making power, we did not find significant effects. Idea tie strength also mediates the relation between tie strength and idea success. Together, the findings shed more light on temporal relationships, why and how they emerge, and how managers can manage these to foster creativity and innovation in their organization.

[2] *with Bob Kijkuit and Jan van den Ende*

INTRODUCTION

Significant research has gone into examining the need for firms to innovate. By identifying and seizing new opportunities, a company is better able to adapt to technological, regulatory, or consumer changes and ensure survival (e.g., De Clercq, Castañer, & Belausteguigoitia, in press; Howell & Higgins, 1990; Teece, Pisano, & Shuen, 1997). Innovations emerge from entrepreneurial ideas (Van de Ven, 1986). But instead of just generating more ideas, developing a select number of promising ideas is often more effective, less costly to administer, and more manageable to review (Kijkuit & Van den Ende, 2010; Litchfield, 2008). Following this logic we take a social network perspective to explore how idea performance (i.e., the adoption of ideas) can be improved.

Literature on how networks influence creative outcomes is proliferating increasingly (Burt, 2004; Fleming, Mingo, & Chen, 2007; Obstfeld, 2005; Perry-Smith & Shalley, 2003; Perry-Smith, 2006; Uzzi & Spiro, 2005). Through social ties, people communicate their creative ideas, absorb different views and feedback, and discuss improvements to their ideas (Ford, 1996). More specifically, relationships can be used to leverage each other's experiences, get emotional support and bundle resources for creative efforts (Nebus, 2006; Tsai & Ghoshal, 1998).

Social ties are thus an important mechanism that people use to "build" an idea. Early studies have referred to the importance of weak ties as a mechanism to become connected to different social worlds and gain access to non-redundant information residing in those networks. This non-redundant information can, when combined with existing knowledge, elevate levels of creativity (Granovetter, 1973; Perry-Smith, 2006). However, more recent studies have found that strong ties, characterized by frequent interaction, long duration, and emotional closeness, are the most beneficial for idea generation (Sosa, 2010) and idea development (Kijkuit & Van den Ende, 2010). Idea generation requires a knowledge intensive environment in which people must know and trust each other (Granovetter, 2005; Reagans & McEvily, 2003). Thus, strong ties exercise a beneficial role in the handling and transfer of complex and difficult to verify information (Hansen, 1999; Reagans & McEvily, 2003). Most importantly, strong ties make exchange processes more efficient and less risky as a result of shared understandings, habits, and experiences (McFadyen & Cannella Jr., 2004; Nebus, 2006). Strong ties can also motivate both

nodes in a relationship to acquire and process knowledge from another (Sosa, 2010). Finally, they can be a sign of social support which, researchers demonstrate, positively relates to creativity (Madjar, Oldham, & Pratt, 2002).

In this study, we investigate how people get involved in the work on ideas, thus shedding light on the antecedents of tie strength intensity in an idea proposal. We call the degree of involvement: idea tie strength. Idea development follows the generation of an idea, but precedes its implementation. It is in this process that the concept behind the idea is revised and corroborated and where the initiators consult colleagues and friends to build a robust case for their idea (Kijkuit & Van den Ende, 2007). Building on arguments related to the ability, motivation, and opportunity for people to discuss an idea with another person (Adler & Kwon, 2002), we explore which network content and structural elements shape the intensity of the respective discussions. The question we address in this study is: Which network elements explain idea tie strength? Subsequently, we investigate how work-related tie strength (i.e., more long-term professional relationships between two people) and idea tie strength influence the success of the idea; in our context this means the acceptance of the idea by a review panel.

Our study offers several contributions to the literature, as well as practical implications for managers. First, by differentiating between the work-related tie strength of two people and the idea-based tie strength (which is shorter-term, more ad-hoc, and restricted to the idea development task than the first type of tie strength) our study shows how temporary relationships evolve from and co-exist with long-lasting interactions. So far, much of the creativity and social network literature has focused only on the long-lasting relationships at work. There is, however, a need to shed light on interactions that are limited in time, for instance related to the life of an idea or a project. Short-term involvements in specific projects are becoming an increasingly applied way of working for knowledge intensive firms (Ashford, George, & Blatt, 2007; Starbuck, 1992). This method of organizing work implies that the structures and staffing of the projects are temporary. Furthermore, our study investigates one of the most critical processes in an idea trajectory – the idea development. It is this process that witnesses the building of an idea. Therefore, this study illuminates a process in which the groundwork for an idea is laid; a process which has not gained very much attention by researchers up until now (George, 2007). Finally,

our study gives advice to innovation managers on which relationships they should encourage to achieve higher levels of interaction and thus better levels of creative output (Sosa & Marle, 2010).

THEORETICAL BACKGROUND

Specific network characteristics surrounding a tie influence the extent to which both nodes engage in the relationship. One issue is the ability of people to understand each other. Regardless of ability, people need to be motivated to talk to and help another person. Lastly, given the ability and motivation, there should be an opportunity to form and strengthen ties (Adler & Kwon, 2002).

The ability of two people to interact with each other has often been linked to the idea of "homophily" in the network literature. The homophily principle relates to the notion that "similarity breeds connection" (McPherson, Smith-Lovin, & Cook, 2001: 415). In other words, people are more likely to have social ties with people who have similar sociodemographic attributes such as race, sex, religion, age, etc. which results in more homogenous personal networks. Homophily is argued to enhance the strength of interpersonal ties (Ibarra, 1995), because people are better able to appreciate and understand each other when they have a similar background and thus a shared life history, experiences, and attitudes (Reagans, in press). In a similar vein, Cohen and Levinthal (1990) argue that interacting persons are better able to absorb knowledge from each other when they can draw associative links to what they already know. Accordingly, the authors stress the importance of people's prior related knowledge, including basic skills, a shared language, and an understanding of the cutting edge scientific or technological knowledge. Research by Faraj and Sproull (2000) also supports the notion that for people to form meaningful ties, they need to be active in the related domains. Faraj and Sproull (2000) also advocate the importance of employees being familiar with each others' experiences and skills. Homophily, prior related knowledge, and familiarity with each others' knowledge pools is expected to be even more critical in knowledge intensive tasks such as generating and developing an idea; a context characterized by uncertainty, ambiguity, as well as highly tacit and

complex knowledge exchange (Borgatti & Cross, 2003; Dougherty, 1992; Kim & Wilemon, 2002; Von Hippel, 1994).

The drivers motivating people to engage in a relationship is a common theme in the social network literature and researchers have stressed the importance of factors such as psychological safety (Baer & Frese, 2003; Edmondson, 1999), trust (Granovetter, 2005; Reagans & McEvily, 2003), as well as reciprocity beliefs (Argote, McEvily, & Reagans, 2003). A key issue in this respect is the interpersonal risk of losing face. Moreover, the informal nature of the interaction makes norms related to reciprocity especially important. While helping on specific project work will be repaid directly, helping on an idea may never lead to any direct form of repayment. This makes the perception of reciprocity an important determinant of the expected contributions.

Sufficient ability and motivation to engage in a dyadic relationship "are even more valuable when coupled with opportunity" (Argote, McEvily, & Reagans, 2003: 575). In this respect, Borgatti and Cross (2003) addressed the importance of accessibility. A person working on an idea proposal may wish to consult a particular expert, but may have difficulty in getting access. This might be due to the difference in hierarchy, lack of time, or a combination of both. A high-level marketing manager may not only have a very busy schedule, but also a personal secretary that is difficult to pass. A key dimension influencing opportunity is the effect of propinquity. Physical proximity increases the probability of serendipitous interaction (Borgatti & Cross, 2003). Access and propinquity are critical factors in an idea trajectory, because such a proactive task cannot and does not prescribe the degree of a voluntary contribution of nodes to an idea.

As illustrated before, social ties influence creative outcomes (Burt, 2004; Fleming, Mingo, & Chen, 2007; Obstfeld, 2005; Perry-Smith & Shalley, 2003; Perry-Smith, 2006; Uzzi & Spiro, 2005). However, much research has focused on network structure as a source from which relationships derive their value (Adler & Kwon, 2002; Kilduff & Brass, 2010). The problem with this approach is that it treats "different kinds of relationships as more or less equivalent because the focus is on [the] structure rather than the content of ties" (Kilduff & Brass, 2010: 327). Recent studies that have paid attention to the content conveyed through ties (e.g., Kijkuit & Van den Ende, 2010; Reagans, in press; Sosa, 2010) confirmed that it is important to consider this

notion in addition to the structural explanations used in social capital research. While network structure remains a distinctive driver that shapes creative outcomes, aspects related to the organizational background and functional membership of two people (i.e., network content) might serve as complementary explanations for why people engage in a relationship. These explanations focus on the opportunities to interact and the value of diverse knowledge, skills, and capabilities for idea outcomes.

HYPOTHESES

First, we hypothesize about the role that idea tie strength has with respect to the success of a creative proposal. We then explore network content and network structural reasons, as well as mediating mechanisms that could predict idea tie strength (see also Figure 1 and Table 1).

FIGURE 1
Conceptual Framework

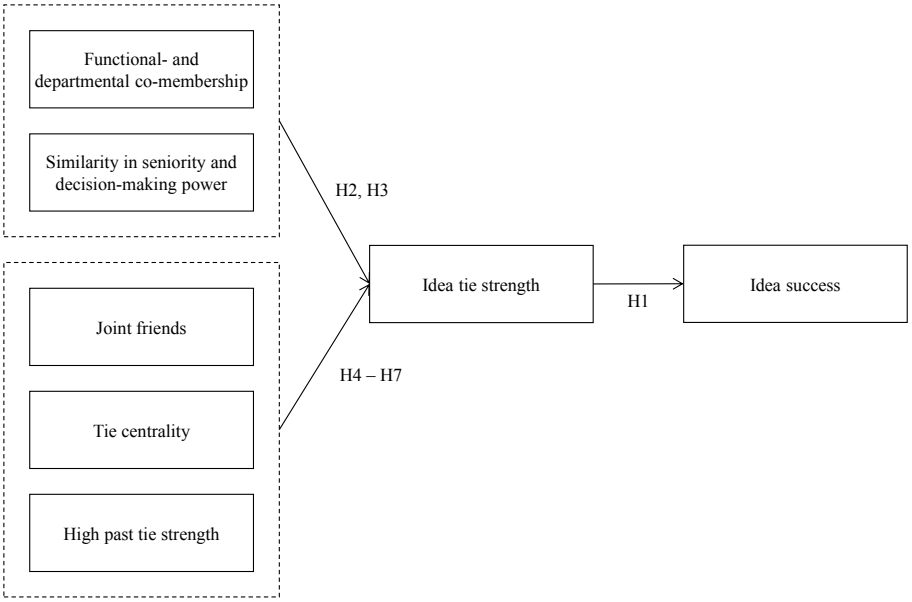


TABLE 1
Ability, Motivation, and Opportunity Reasons Related to Idea Tie Strength

Construct	Ability	Motivation	Opportunity
Functional- and departmental co-membership	• Similar capabilities, beliefs, and norms		• Co-location • Socializing on similar occasions
Similarity in seniority and decision maker power		• Psychological safety	• Socializing on similar occasions
Joint friends	• Resolving conflict • Aligning views	• Higher willingness and obligation • Psychological safety	
Tie centrality	• Aligning views	• Higher willingness and obligation	• Being communication bottleneck
Tie strength	• Complex knowledge exchange	• Higher willingness and obligation • Psychological safety	

We distinguish between idea tie strength, which refers to the more specific discussion intensity of two people about an idea proposal, and tie strength, which is the more general, work-related intensity between two actors in a relationship.

Idea Tie Strength and the Effect on Subsequent Idea Success

While previous research highlights the information diversity advantages that can potentially stem from weak ties (Baer, 2010; Perry-Smith & Shalley, 2003; Perry-Smith, 2006; Zhou, Shin, Brass, Choi, & Zhang, 2009), the instrumental role of strong ties in an innovation context may be underestimated. A Research & Development (R&D) context, such as the one investigated in this study, is an environment of uncertainty, ambiguity, and tacit knowledge (Borgatti & Cross, 2003; Dougherty, 1992; Kim & Wilemon, 2002; Von Hippel, 1994). Technical feasibility and market success are often unclear at the beginning of an idea and planning and coordination in this phase can be cumbersome and costly. Intense idea discussions between people could attenuate the disadvantages of the front-end because these interactions, just like strong ties, build up feelings of trust which help people rely on each other (Granovetter, 2005; Reagans & McEvily, 2003). Trust also provides the safety for people to suggest something more radical and risky (Baer & Frese, 2003; Edmondson, 1999) and these ideas, in turn, may become more successful innovations. As a result of shared understandings, habits, and experiences, communication flows become easier when people have a high idea tie strength which impacts exchange processes as they become more efficient and less risky (McFadyen & Cannella Jr., 2004; Nebus, 2006). Again, this translates into higher chances for idea success, because people understand each

others' perspectives and viewpoints and are better able to integrate them into the idea. High discussion intensity, just like high tie strength, is also a sign of a higher motivation between the two actors engaging in an idea (Sosa, 2010). This illustrates a form of social support which positively relates to creativity (Madjar, Oldham, & Pratt, 2002). Thus, the high discussion intensity across a tie about an idea shows a commitment to helping each other and gives both actors the room and security to share their, maybe more radical or controversial, perspectives. Accordingly, we hypothesize that capitalizing on these knowledge pools increases the chance of idea success, which is the acceptance of the idea by the review panel.

Hypothesis 1: *Idea tie strength of people in a relationship is positively associated with idea success.*

Network Content and the Effect on Idea Tie Strength

Functional and departmental co-membership. In work environments, formal structures coordinate individual and collective action (Blau, 1957). Formal structures are designed to provide people with the opportunity to specialize, give them access to and responsibility over relevant resources, and thereby increase a firm's efficiency. Various methods exist for firms to organize their labor, including a division of personnel across functional areas, geographical markets, business units, and even combinations in the form of so-called "matrix" organizations. Often in larger firms, people are not only assigned to specific functions (e.g., marketing, finance, research), but further subdivided into specific departments within those functions (e.g., the marketing function is further subdivided into communications, product marketing, or sales).

The assignment of people to specific functions or departments creates the possibility for those members to interact with each other for two reasons. First, people are most often assigned to a specific organizational role based on their capabilities. Organizational members of the same function or department will therefore share a set of common skills, beliefs, and norms, which will increase the ease of communication and improve the predictability of behavior (Ibarra, 1995). This rationale draws on the ability argument.

Second, people are more likely to be co-located when they are from similar, in contrast to different, functions or departments. This will also contribute to idea tie intensity, since people

"are more likely to have contact with those who are closer […] in geographic locations than those who are distant" (McPherson, Smith-Lovin, & Cook, 2001: 429). Moreover, it can be expected that people of a function or department are also more likely to socialize with each other. The latter reasons build on the opportunity argument. Hence, we argue that the benefit of opportunity and ability resulting from co-membership in functions or departments is positively related to tie intensity.

Hypothesis 2: *Functional and departmental co-membership of people in a relationship is positively associated with idea tie strength.*

Similarity in seniority and decision-making power. Seniority and decision-making power have been identified as aspects of organizational structure and hierarchy that can influence the intensity of the creative involvement of two people. People in higher organizational ranks have reached a higher seniority status. Decision-making power, on the other hand, is related to the voting right of a person in an idea evaluation panel. This vote is about whether to proceed with an idea or not. Generally, one can say that decision-makers tend to be in more senior positions and more senior people also have decision-making power. As such, a similarity between nodes in terms of seniority or decision-making power should affect idea tie strength as a function of the same underlying reasons.

Lazega and Van Duijn (1997) conducted a study within a US corporate law firm on the advice networks of lawyers and found that similarity in seniority positively influenced tie intensity. Dissimilarity, on the other hand, was found to negatively impact tie intensity. The findings were also supported in a study by Han (1996). Lazega and Duijn (1997) concluded that in uncertain situations, people might prefer advice from peers for reasons of face-saving or accountability. As such, people with similar seniority or decision-maker status can talk to each other more easily. This motivational argument is related to the need of people for psychological safety (Baer & Frese, 2003; Edmondson, 1999) especially in an innovation context which is characterized by high uncertainty and ambiguity (Kim & Wilemon, 2002). Building upon this motivation argument, we therefore expect that dissimilarity in seniority status or decision-making power is negatively related to idea tie strength.

An additional reason from the opportunity perspective, not mentioned by Lazega and Duijn (1997), is the so-called "glass ceiling" between different levels of seniority or decision-making power. It is not uncommon for people to have lunch, sit, or socialize with those who are in similar positions. In particular, senior people come together more often as they go to the same meetings. Similarly, decision-makers meet each other regularly in idea evaluation panels. Hence, the occasions to which people are invited based on their organizational role, provides them with an opportunity to discuss an idea.

Hypothesis 3: *Similarity in the seniority and decision-making power of people in a relationship is positively associated with idea tie strength.*

Network Structure and the Effect on Idea Tie Strength

Joint friends. Researchers have highlighted that dense networks contribute to, amongst other outcomes, an increased willingness to help (Reagans & McEvily, 2003) as a fuction of reputation and group norm effects. It is reasonable to assume that such effects would also manifest themselves at the relationship level and this could explain why certain ties are stronger than others. The concept of density is a network level construct and as such is not directly applicable to the relationship level. A comparable construct at the relationship level are "Simmelian ties" (Krackhardt, 1999; Simmel, 1950). Technically speaking, Simmelian ties refer to ties which are embedded in cliques or at the very least triads.

One benefit of Simmelian ties is the ease of conflict resolution (Krackhardt, 1999). In a dyadic relation, disagreement about, for instance, the appropriate technology or market application of an idea proposal could lead to an escalation of conflicts or the hardening of positions. The advantage of a third party is that he or she can "reformulate and present the concerns of the other parties without […] harsh rhetoric and emotional overtones" (Krackhardt, 1999: 185). A triad thus has the ability to ease and increase the interaction between two people while helping to align views.

An additional benefit of triads over dyads, not directly mentioned by Krackhardt (1999), is the motivational effect on an increased willingness to help. The group norm effect can not only resolve a potential conflict, but may also create a feeling of social obligation to help more extensively. In the context of the generation and development of an idea, people may also feel

more committed to an idea and have a sense of ownership. Furthermore, the feeling of psychological safety is also likely to increase due to the group norms associated with triads. We therefore propose that ties, surrounded by "common third persons", are more likely to be stronger in terms of idea tie strength.

Hypothesis 4: *The presence of joint friends surrounding two people in a relationship is positively associated with idea tie strength.*

Tie centrality. Another network structural aspect relates to commitment and ownership. A good indication of the extent to which people feel committed to and are enthusiastic about an idea is the number of actors with which they discuss that particular idea. It shows their willingness and obligation to move an idea forward; an ability argument. Centrality thus refers here to the relative degree centrality of people in the idea network. Centrality can be a sign of the relevance of somebody's expertise regarding a given idea and therefore an interesting source of information that people turn to. The more central a tie, the more idea tie strength we can expect, because these central ties need to coordinate, channel, and distribute the available knowledge and information requests among each other. Through this bottleneck role, an opportunity is created which enhances idea tie strength.

Hypothesis 5: *Higher average tie centrality for people in a relationship is positively associated with idea tie strength.*

Tie strength. Research suggests that the cooperative behavior associated with strong ties follows from norms of mutual gain and reciprocity and are assumed to grow over time (Argote, McEvily, & Reagans, 2003; Granovetter, 1973; Rowley, Behrens, & Krackhardt, 2000). The potential pay-off stemming from a contribution to an idea proposal is assumed to be high. If the idea turns into a success, people who contributed can expect status benefits and/or become member of a future project team. On the other hand, a proposal could also be rejected, which will prevent any direct pay-off and may even lead to negative status effects. In a purely "transactional" relationship, one could assume that people would only contribute at a minimum level, purely as a form of reciprocity (Adler & Kwon, 2002) or a general form of politeness. However, in a situation where people have, over time, built up a strong work-related bond, they will be motivated to provide

more help (Sosa & Marle, 2010), because of trust (Granovetter, 2005; Reagans & McEvily, 2003) and norms of reciprocity (Argote, McEvily, & Reagans, 2003).

Additional benefits of strong work-related ties relate to the motivation perspective which includes psychological safety (Baer & Frese, 2003; Edmondson, 1999). As discussed earlier, strong ties can ensure that people do not fear the risk of losing face, reputation or acceptance, because they propose or contribute to an idea that was, for instance, considered too simple or far-fetched. Psychological safety can also mitigate the risk of "spill-over" and competition (Bogenrieder & Nooteboom, 2004; Reagans & McEvily, 2003) ensuring that people do not fear that others will misuse a contribution for their own benefit without rewarding them.

From an ability perspective, strong, previous work-related ties are also better able to transfer complex knowledge (Hansen, 1999; Uzzi, 1997). Actors have had a chance to assess the quality of the information provided by each other which might increase the effectiveness of interpersonal communication (Moenaert & Souder, 1996). Lastly, prior strong ties also ensure the reliability of information under conditions of uncertainty (Ibarra, 1995).

Hypothesis 6: *Tie strength between two people in a relationship is positively associated with idea tie strength.*

Tie Strength and the Mediating Effect of Idea Tie Strength on Subsequent Idea Success

Our last hypothesis refers to the mediating effect of idea tie strength. Prior research has shown that there is a positive correlation between a friendship and an advice tie (McDonald & Westphal, 2003). Similarly, it is reasonable to assume that a strong work-related tie positively influences an idea-related tie. In the prior hypothesis, we argued that less fear of losing face and a higher willingness and obligation to help, are potential reasons for this positive relationship. On the other hand, as illustrated before, high idea tie strength should be positively related to idea success because both actors have the room and security to openly share their knowledge and perspectives which, in turn, should help in building a better idea proposal. Consequently, high idea tie strength carries the positive effect of work-related tie strength to subsequent idea success. In other words, the more general tie strength lays an optimal foundation for trust, reciprocity, and safety, which allows network actors to have stronger idea tie strength. Through

this channel, they can discuss a concrete idea more openly and intensively. In turn, this should translate into a better idea proposal, because several perspectives and knowledge sources were taken into consideration. Thus, the idea has a sound foundation before going to the review panel.

Hypothesis 7: *Idea tie strength mediates the positive association between tie strength and idea success.*

METHOD

Sample and Setting

We tested our hypotheses with data collected during a 14 month long, longitudinal, on-site field study in a multinational company active in the fast-moving consumer goods industry, which we call "Faco" for the purpose of anonymity. By conducting over 200 structured interviews in two central R&D labs located in different European countries and using additional archival data, we were able to map all of the dyadic relationships surrounding 17 new product ideas.

The R&D scientists in the two labs were able to submit new, research-oriented ideas to a funnel management system. Our study concentrates on the process preceding the first review gate. This "development" process started when people formulated their idea and ended at the first gate, where a panel reviewed the idea proposal. The majority of the work on the idea proposal was done before this gate. As there was no funding available for this process, scientists needed to work on the idea during their spare time. The first gate serves as a "readiness review" and standardized review criteria, known across the company, included overall company fit, general market potential, and fit of the idea proposal with the lab's competences. Having passed the first gate successfully, initiators were asked to further refine their idea. Later, an overall screening was organized where the management would make a definite decision about whether and how to go ahead with and/or fund the implementation of the idea. We classified ideas that passed this gate as a "success" and proposals that did not pass it as a "failure".

One example of the process involves the idea of adding an enzyme to food as a means to create new health benefits; a group of people proposed this idea. Initially, the initiators focused on high-end enzymes to be added to dairy products for the Western world. However, in the

development phase, the initiators focused on a different direction. They recognized that paying attention to low-cost enzymes for non-dairy food as a means to target bacterial infections common in third world countries would improve the idea. In large parts, the initiators were able to do so by discussing the initial idea with each other, using their network connections to get feedback, and accessing expertise which could be helpful in refining the idea.

Our study includes ideas that came up during large information sessions organized by the labs on specific topics, during regular small scale work meetings, and during scientific activities. Transcripts of the information sessions, in combination with regular talks with line managers, ensured that we could contact people shortly after they had started working on a particular idea.

We only focused on the development process and did not include relationships from the earlier idea generation process, because we had incomplete information about the true discussion intensity of people regarding an idea in this phase of the process. We also excluded all other relationships between people in the process preceding idea development. We do this because not all ideas passed into the idea development process and we would have needed to run analysis for such a preceding process separately. As this was beyond the scope of this paper, we decided to focus on the process with the most comparable and complete information.

We used both interview and archival data. Structured questions in the interviews provided us with quantitative indicators about the relationships and the participants' involvement in an idea. We interviewed all people with whom the initiators had discussed the idea for longer than 15 minutes to ensure that we contacted people who had made a substantial contribution to the idea. In case the contacts disagreed on the intensity of the discussion, we reconfirmed the data with the original respondent. This strategy solved apparent contradictions. The overall response rate was around 95%.

Dependent Variables

Idea success. As described earlier, we classified ideas as successful (i.e., we coded the variable with a value of one) when they passed the overall screening organized by Faco to review the idea.

Idea tie strength. We measure our other dependent variable as the length of the discussion between two actors regarding one idea. In the case of repeated discussions during the idea development phase, we took the total discussion time. We grouped the results into four categories: less than 30 minutes, between 30 and 90 minutes, between 90 and 180 minutes and more than 180 minutes. Such ordinal classification of frequency is consistent with earlier studies (e.g., Reagans, in press; Sosa, 2010).

Independent Variables

Functional and departmental co-membership. Both variables were constructed on a binary scale. A value of one indicates that two people belong to the same function or department and a zero indicates that two people belong to different ones.

Similarity between people in seniority and decision-making power. To measure similarity in seniority, we used human resource management data from Faco on employees' hierarchical levels. There were six hierarchical levels in the company. Entry level university graduates started at level one, whereas the board of directors reached level six. The difference in seniority between person *i* and *j* was calculated using the following formula:

Difference in seniority$_{ij}$ = $\sqrt{(Seniority_i - Seniority_j)^2}$

We reverse-coded the subsequent result to obtain a similarity in seniority measure.

To calculate similarity in decision-making power, we used a basic dichotomous variable. The variable was assigned a value of one if the personnel were members of a review gate and a zero for all other actors. In the next step, we assigned a value of one to two people that have the same decision-making power and a value of zero if there is a difference.

Joint friends. To assess whether one or more mutual friends surround a particular relationship, we use a relative indicator that accounts for the size of ego networks. A mutual friend (or joint alters) refers here to a situation in which two people who discuss an idea also discuss the same idea with the same other person (alter). The indicator is calculated in the following way. First, we used the "Simmelian ties" routine in the social network analysis program UCINet VI

(Borgatti, Everett, & Freeman, 2002) to calculate the number of Simmelian ties or mutual friends for each relation in a given network (Krackhardt, 1999). The problem with this value is that it tells us little about the relative importance of a particular relationship to each actor. For instance, when two people, A and B, are both surrounded by two mutual alters but the total number of people surrounding A is much smaller than that surrounding B, the mutual alters related to A have a much stronger impact on the relationship. For this reason, we adjusted the initial score by dividing it by the degree centrality of the respective actor; we did the same for the other actor, added both values and divided the result by two. As a result, the value of this indicator ranges from zero to one.

Tie centrality. The relative centrality of a tie within each idea network was calculated as follows: first, for each network, we calculated the degree centrality of each person within that network (simply the number of ties of a person). Second, we calculated the relative degree centrality of each person in a network by dividing a person's degree centrality by the highest degree centrality found for any person in that network. Subsequently, we add the individual scores of the two nodes that form a tie and divide by two in order to reach the average relative degree centrality of each relationship.

Tie strength. To measure the work-related tie strength, we asked respondents to indicate the frequency of previous work-related communication. This measure can be used as an indication of strength within relatively homogeneous groups such as co-workers. The options for the question of how frequently the respondent talks to another person were: more than once a week, between once a week and once a month, less than once a month, and no prior contact. In an initial version of the interview, we also included an item about emotional closeness, but each respondent interpreted this question differently and we decided not to include it in subsequent interview questions.

Control Variables

Network size refers to the number of people in the idea network during the development process (Baer, 2010; Kijkuit & Van den Ende, 2010). We controlled for size because it could influence

the idea tie strength. For instance, in a very large network there might be less time for people in a particular relationship to discuss the idea one-on-one.

Unfortunately, we could not consult decision-makers (i.e., middle-line reviewers or management team members) to give an indication about the *potential* of an idea, because interviewing them could influence the decision process. Moreover, respondents indicated that they did not want their idea to be reviewed before "it was ready". Outside reviews were not allowed by the company for reasons of confidentiality. Nevertheless, as we wanted to get an indication of the idea characteristic, we asked the respondents seven related questions. We did so in the first month after the initiation of the idea. The response to these questions were ratings on a five-point Likert scale and focused on projected market opportunities, size of the market, technical feasibility, competitor protection, and internal funding chances. On average, we had seven respondents per idea proposal. We averaged the seven items to reach one idea potential score.

While we only investigate idea tie strength in the idea development process, we use available information about relationship patterns in the phase preceding and succeeding the idea development process to construct two additional control variables. First, we include a *repeated tie* measure which indicates whether a dyadic tie in the development process of an idea already existed in the idea generation process. People's relationships become stronger the more opportunities they have to exchange knowledge with each other (Van de Ven, 1986). Thus, nodes in a tie could be inclined to discuss an idea more intensively in the development process when they already discussed an idea in the generation process. *Idea involvement similarity* was included to control for another alternative explanation regarding idea tie strength. It could be that people who were involved in several processes related to the idea were implicitly considered champions (Howell & Higgins, 1990). One could expect that these people discuss an idea more intensively with each other. We calculated this variable by totaling the number of processes in which an individual was involved during the idea trajectory (with a maximum of three phases: idea generation, development, post development). The following formula represents the measure of the difference in idea involvement between person *i* and *j*:

$$\text{Difference in idea involvement}_{ij} = \sqrt{\left(Idea\ involvement_i - Idea\ involvment_j\right)^2}$$

We reverse-coded the subsequent result to get the idea involvement similarity measure.

Analysis

We used ordinal logistic regression models because our dependent variable has four outcome categories. To test the appropriateness of fitting an ordinal regression model to the data, we performed a test for the proportional odds assumption (Long & Freese, 2006). The test checks whether the models assume correctly that the probability curve for all the logits are parallel. For tests involving our binary dependent variable, idea success, we use logistic regressions. Tests for mediation in logistic regression must be modified, because the variance of the residual is fixed in the equations. The scale is contingent on the prediction, which depends, in turn, on the independent variables that are included in the equation. To make the coefficients comparable across the equations, we multiplied each coefficient by the standard deviation of the predictor variable and then divided it by the standard deviation of the outcome variable (Herr, 2010; Mackinnon & Dwyer, 1993). Following suggestions by Baron and Kenny (1986) and Shrout and Bolger (2002), we use the Sobel test to assess the significance of the indirect effect and the effect ratio to construct the strength of mediation.

Since the dataset came from network level data, there is a potential problem of non-independence (cf. Jensen, 2008) or within-cluster dependence among the observations (cf. Washington & Zajac, 2005). In such situations, observations within a cluster should not be treated as independent. Instead, the clusters themselves are independent and to account for this "within-cluster" dependence of the ties and/or ideas, we employed the robust estimator function in Stata. Williams (2000) explains that the between-cluster variance estimator in this procedure is an unbiased estimator of the variance of a linear statistic. This estimator increases the accuracy of the assessments of the sample-to-sample variability of the parameter estimates even when the model is mis-specified. This results in an increased standard error of estimates and thereby provides a more appropriate test of the hypotheses (Washington & Zajac, 2005). Due to the use of robust standard errors, adjusted for clustering, we applied the Wald test instead of the more conventional likelihood-ratio test (Sribney, 2007).

Coefficients estimated through a logistic regression do not directly indicate an effect size. Instead, magnitude is determined by the change in a particular independent variable compared to its starting value, as well as the values of all other independent variables (Hoetker, 2007; Long & Freese, 2006). To interpret the findings, we calculated the changes in predicted probabilities, following procedures suggested by Long and Frese (2006).

RESULTS

In Table 2 we report the means and standard deviations of the measures as well as a correlation matrix. We checked the variance inflation factors (VIFs) for all reported models and none appears to be higher than 2.07 (highest mean VIF was 1.52) and thus do not exceed the recommended value of 10 (Kennedy, 2003). We also conducted the Box-Tidwell Transformation test and found that nonlinearity is not a problem in our models (Hilbe, 2009).

Test of Hypothesis 1: The Relationship between Idea Tie Strength and Subsequent Idea Success

Our results indicate that there is a positive relationship between idea tie strength and performance of an idea (Table 3, Model 5: $b = .62$, $p \leq .10$). The discussion intensity of two people regarding an idea therefore contributes to the overall success of that idea. The Wald test is significant, indicating an improvement in model fit. In Table 4, we provide additional detail to interpret the coefficients. Specifically, we report the marginal effects and factor change coefficients for both unit and standard deviation increases. Note that when the effect of one variable is calculated, all others remain constant at their mean value.

TABLE 2
Descriptive Statistics and Correlation Matrix

Variable	Mean	S.D.	Min.	Max.	1	2	3	4	5	6	7	8	9	10	11	12
1. Idea success	0.52	0.50	0.00	1.00												
2. Idea tie strength	1.81	0.92	0.00	4.00	0.09											
3. Tie strength	2.95	1.02	0.00	3.00	0.24 *	0.12 *										
4. Functional co-membership	1.85	0.36	0.00	1.00	0.01	0.12 *	0.30 *									
5. Departmental co-membership	1.34	0.47	0.00	1.00	-0.01	0.09	0.54 *	0.30 *								
6. Seniority similarity	3.39	0.70	0.00	3.00	0.13 *	0.08	0.15 *	0.10	0.00							
7. Decision-maker similarity	2.81	0.39	0.00	1.00	-0.03	0.08	0.01	0.08	0.02	0.35 *						
8. Joint friends	0.27	0.22	0.00	0.83	0.01	0.43 *	-0.10	0.06	-0.07	-0.07	-0.07					
9. Tie centrality	0.54	0.19	0.09	0.98	-0.19 *	0.64 *	-0.13 *	0.14 *	0.05	0.02	0.07	0.40 *				
10. Idea network size	20.40	9.19	3.00	36.00	0.72 *	0.03	0.11	-0.01	-0.12 *	0.10	-0.02	0.14 *	-0.23 *			
11. Idea potential	4.66	0.33	3.67	5.11	0.35 *	0.13 *	0.24 *	0.01	-0.01	0.00	-0.12 *	0.10	-0.03	0.28 *		
12. Repeated tie	0.10	0.30	0.00	1.00	-0.05	0.28 *	-0.10	0.08	-0.07	0.03	0.01	0.25 *	0.30 *	-0.13 *	0.05	
13. Idea involvement similarity	3.27	0.65	0.00	3.00	-0.08	0.02	0.24 *	0.21 *	0.17 *	-0.03	-0.06	0.07	-0.04	-0.06	-0.02	0.11 *

$n = 331$, clusters = 17. * $p < .05$

TABLE 3
Results of (Ordinal) Logistic Regression Analysis

Variable	Model 1 DV: Idea tie strength (base)		Model 2 DV: Idea tie strength		Variable	Model 3 DV: Idea success (base)		Model 4 DV: Idea success		Model 5 DV: Idea success	
Cut point 1	3.41	(1.43)	10.64	(2.81)	Constant	-17.18	(16.65)	-17.10	(13.25)	-16.42	(12.99)
Cut point 2	4.68	(1.51)	12.69	(2.75)							
Cut point 3	6.86	(1.50)	15.80	(2.80)							
Cut point 4	9.55	(1.82)	18.93	(2.89)							
Idea network size	0.00	(0.01)	0.03 *	(0.01)	Idea network size	0.39 *	(0.16)	0.48 ***	(0.12)	0.47 ***	(0.12)
Idea potential	0.69 *	(0.29)	0.56	(0.47)	Idea potential	2.37	(3.05)	1.98	(2.30)	1.88	(2.27)
Repeated tie	1.71 ***	(0.33)	0.70 ^	(0.41)	Repeated tie	0.63	(0.71)	1.56 ***	(0.48)	1.32 **	(0.50)
Idea involvement similarity	0.01	(0.12)	-0.04	(0.22)	Idea involvement similarity	-0.28	(0.31)	-0.58 **	(0.20)	-0.61 **	(0.21)
Functional co-membership			-0.56	(0.39)	Functional co-membership			-0.80	(0.62)	-0.65	(0.61)
Departmental co-membership			0.02	(0.32)	Departmental co-membership			1.65 *	(0.82)	1.77 *	(0.76)
Seniority similarity			0.11	(0.19)	Seniority similarity			0.25	(0.29)	0.27	(0.28)
Decision-maker similarity			0.35	(0.29)	Decision-maker similarity			-0.48	(0.59)	-0.54	(0.56)
Joint friends			2.23 **	(0.76)	Joint friends			-0.95	(1.95)	-1.63	(1.69)
Tie centrality			9.46 ***	(0.82)	Tie centrality			0.14	(1.90)	-1.65	(2.79)
Tie strength			0.59 ***	(0.12)	Tie strength			0.40 ^	(0.21)	0.29	(0.20)
					Idea tie strength					0.62 ^	(0.35)
Wald χ^2	54.69 ***		477.09 ***		Wald χ^2	8.77 ^		70475.91 ***		18070.50 ***	
Pseudo R^2	0.04		0.29		Pseudo R^2	0.57		0.62		0.63	
Log pseudolikelihood	-373.30		-277.53		Log pseudolikelihood	-98.20		-86.50		-84.88	
Wald test (added to base)			396.30 ***		Wald test (added to base)			294.51 ***		411.63 ***	
N	331		331		*N*	331		331		331	
Clusters	17		17		Clusters	17		17		17	

Robust standard errors are in parentheses. ^ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; two-tailed tests.

TABLE 4
Changes in Predicted Probabilities

Variable	Idea success (Table 3, Model 5)		
	Marg. eff.	-+1/2	-+ s.d. /2
Idea network size	0.08	0.08	0.67
Idea potential	0.31	0.31	0.10
Repeated tie	0.16	0.22	0.07
Idea involvement similarity	-0.10	-0.10	-0.07
Functional co-membership	-0.11 [+]	-0.11	-0.04
Departmental co-membership	0.29 [+]	0.29	0.14
Seniority similarity	0.04	0.04	0.03
Decision-maker similarity	-0.09	-0.09	-0.04
Joint friends	-0.27	-0.27	-0.06
Tie centrality	-0.28	-0.27	-0.05
Tie strength	0.05	0.05	0.05
Idea tie strength	0.10	0.10	0.09

[+] Marginal effects are for discrete change of dummy variable from 0 to 1.

Tests of Hypotheses 2 to 6: The Relationship between Network Content and Network Structure and Idea Tie Strength

We cannot confirm our hypotheses regarding network content and idea tie strength. While the coefficients of departmental co-membership (Table 3, Model 2: $b = .02$, non significant), similar seniority (Table 3, Model 2: $b = .11$, non significant), and similar decision-maker status (Table 3, Model 2: $b = .35$, non significant) are, as we expected, positive, they are not significant. Functional co-membership shows a negative, but insignificant coefficient (Table 3, Model 2: $b = -.56$, non significant).

The results regarding network structure confirm our Hypotheses 4 to 6. Joint friends (Table 3, Model 2: $b = 2.23$, $p \leq .01$), tie centrality (Table 3, Model 2: $b = 9.46$, $p \leq .001$), and tie strength (Table 3, Model 2: $b = .59$, $p \leq .001$) all positively shape idea tie strength between two nodes. For all coefficients, we conducted joint Wald tests which turn out to be significant, indicating an improvement in model fit.

Test of Hypothesis 7: The Relationship between Tie Strength and Subsequent Idea Success Mediated by Idea Tie Strength

Our last hypothesis refers to the mediating effect of idea tie strength on idea success. We follow Baron and Kenny's (1986) four-step procedure complemented with Mackinnon and Dwyer's (1993) and Herr's (2010) recommendations for mediation testing in logistic regressions. We first

tested the direct effect of tie strength on idea success and found a positive and significant relationship (Table 3, Model 4: $b = .40$, $p \leq .10$). For the second step, we reported earlier that tie strength significantly accounted for variation in idea tie strength (Table 3, Model 2: $b = .59$, $p \leq .001$). The third step involves testing the effect of the mediator on idea success while controlling for our initial independent variable, tie strength. We found a significant and positive association between idea tie strength and idea success (Table 3, Model 5: $b = .62$, $p \leq .10$). The last step requires examining whether idea tie strength completely mediates the relationship between the independent and the dependent variables. We do find complete mediation since tie strength is insignificant when idea tie strength is added to the model (Table 3, Model 5: $b = .29$, non significant). As described earlier, because we use different models to calculate indirect effects (logistic and ordinal logistic regression), we standardized the coefficients and standard errors. Those rescaled values (see Table 5) can then be used in the Sobel test which assesses whether the indirect effect of tie strength on subsequent idea success via the mediator is significantly different from zero. We find a significant score for our mediator, meaning that idea tie strength carries the influence of tie strength to the dependent variable, idea success, thus confirming Hypothesis 7.

TABLE 5
Mediation Result

Path	Comparable *b*	Comparable s.e.
Tie strength > Idea success	0.22	0.12 ^
Tie strength > Idea tie strength	0.31	0.06 ***
Idea tie strength > Idea success (controlling for Tie strength)	0.29	0.17 ^
Tie strength > Idea success (controlling for Idea tie strength)	0.15	0.11
Sobel test: *z*-value: 1.67, s.e.: 0.06, ^		

^ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; two-tailed tests.

DISCUSSION

Our findings reveal that a higher discussion intensity between two people in the development phase of an idea proposal matters for the subsequent success of that idea. What drives the decision of two people to discuss an idea at length or in brief with each other? Network content aspects play no role, but network structural elements all positively influence idea tie strength. We also found evidence for a full mediating role of idea tie strength on the relationship between tie

strength and idea success. We now further discuss these findings and point towards theoretical and practical implications, limitations, as well as future research directions.

Theoretical Implications

First, this study examines a critical process in the life of an idea. Specifically, we investigate how nodes in a relationship build ideas through discussion with one another. In the development phase of an idea, during which people prepare their idea for a first official gate review, idea tie intensity mattered for the final acceptance of the idea. One explanation for this finding could be that the groundwork for the success of an idea is laid in the development phase. Longer exchanges of information facilitate a greater depth of research or brainstorming about the problem that the idea aims to solve. A higher idea tie strength could also make sure that both people are on the same page and agree about the appropriate next steps in the process.

Our study then shows which network content and network structural elements facilitate idea tie strength. All of our hypotheses related to the association between network content and idea tie strength were rejected; whereas all hypotheses about the relationship between network structural variables and idea tie strength were accepted. One explanation for this finding could be that functional- and departmental co-membership, as well as similarity in seniority and decision-making power, do not include both a strong ability and motivational component that would explain and justify a higher engagement of one person with another. On the other hand, all network structural explanations encompassed a combination of ability and motivational elements. Underneath the motivation to engage in a relationship are important factors such as psychological safety (Baer & Frese, 2003; Edmondson, 1999), trust (Granovetter, 2005; Reagans & McEvily, 2003) as well as reciprocity beliefs (Argote, McEvily, & Reagans, 2003). Moreover, ideas do not involve concrete, predefined tasks and are often related to self-starting, proactive and problem-overcoming behavior by employees to improve existing processes and products, to prevent anticipated problems, or to take advantage of new opportunities (Frese, Teng, & Wijnen, 1999; Frese & Fay, 2001). Strong abilities to understand and help each other are necessary in this context. While the network content aspects offered opportunities for people to interact with each other, they missed the combination of the core ability and motivational components that would promote people to discuss an idea with each other. On a related note, the network content

variables that we tested might only indicate the similarity between two people on the surface (Reagans, in press). The network structure variables could indicate more "deep" similarity in behaviors, attitudes, and beliefs and, as such, were better able to predict idea tie strength. The fact that opportunities for people to interact did not appear significant might also be related to the purpose of relationships in different processes of an idea trajectory. In the development process, where the groundwork for the idea is laid and the concept behind an idea is refined, the ability and motivation to provide a meaningful contribution to the idea seem to be more important. While speculative, it could be that in the idea generation phase, variables related to network content might still explain idea tie strength, because in this first phase, some of the initial relationships are formed that come up with and support an idea. These might be more easily developed as a result of different opportunities for people to interact.

We also found evidence of a mediating role of idea tie strength in the relationship between tie strength and idea success. The results indicate that the benefits of strong ties, such as psychological safety, information quality, reliability, and communication effectiveness, outweigh any adverse effects. The benefits of these strong work-related ties carry through to idea success via idea tie strength, a higher engagement of two people in an idea development. Differentiating between different tie strengths, the temporary, idea tie strength and the more enduring, work-related tie strength, could therefore also be very important for future studies to obtain a finer-grained understanding of when and how strong ties matter.

Managerial Implications

Our study gives advice on which relationships innovation managers must encourage to achieve higher levels of interaction on an idea and thus higher levels of idea success (Sosa & Marle, 2010). Joint friends, tie centrality, and tie strength increase idea tie strength in the idea development phase. Managers can facilitate these higher levels of network structure by creating opportunities for people to meet and interact with each other. One concrete measure could be to encourage job rotation systems through which employees can more easily form new bonds of which some will endure and become stronger over time. Innovation managers that supervise ideas could also take a more active, interfering role by inviting people to join the idea in the development phase and thereby increase tie centrality.

The findings regarding functional and departmental co-membership as well as similarity in seniority and decision-making status as related to idea tie strength suggest that the content conveyed through ties does not significantly improve or dampen the degree of idea tie strength. This is good news for managers because it means that people talk with others about ideas independent of their organizational membership, seniority, or decision-making influence. The finding could be a result of the organizational culture of Faco which aims at fostering a collaborative culture with short communication paths and few organizational layers.

Limitations and Future Research

In this study we were not able to observe all phases of an idea trajectory. It would be interesting to get a better understanding of the initiation or idea generation phase and which network content and structural elements drive idea tie strength and, eventually, idea success throughout the whole trajectory. While many of the findings, reported for the development phase, probably also hold for other phases, we suspect that network content factors such as functional or departmental co-membership would exercise a bigger role in the generation phase, because here the opportunity arguments raised earlier would hold greater influence. One possible path to explore this issue would be to conduct a qualitative study where the researcher could observe social interactions in a company across time and subsequently trace back the state of a particular relationship given that it showed up in a generated idea.

Another limitation of our study is the context of a particular company. Future research should replicate our study in different companies. A possible extension could be to investigate creative ideas that are not generated by people in R&D, but also by people in other departments, for instance finance or supply chain management. At Faco, the ideas were generated and further developed by their own employees, but it could also be worthwhile to investigate more open innovation approaches and how, for instance, idea tie strength and idea success evolve over time with people from outside the company.

An assumption we made was that ideas are successful when they are selected or approved. However, what is seen as “success” naturally depends on the eye of the beholder. Future research could do more intense follow-up studies on what happened to the succeeded or failed ideas; and

how performance changed the relationships of the people that contributed to the idea. An argument could be that some idea initiators are also just more successful in "selling" their ideas to the review committee (De Clercq, Castañer, & Belausteguigoitia, in press). However, in our study there was no indication that political factors such as the personal interests of members of the review committee influenced the decision to adopt an idea. We interviewed 10 line reviewers and two people of the support team and asked them about the review criteria they used, how the decision making procedure took place, and whether they knew the people that had submitted an idea. The interviews revealed that most reviewers had no prior knowledge of the ideas and their originators until they were discussed during a review meeting; with the exception of cases in which their subordinates generated the ideas. As a demonstration that political influence seemed to play no role in the review process we can look closer at our variable tracking the involvement of a decision maker in a dyad. We ran additional analyses and explored whether zero, one, or two decision-makers in a dyad influenced idea success, but found no significant relation.

Finally, future research could also explore the interdependency between work and idea ties. In this study we showed that work-related ties, existing prior to the idea development work, positively shaped the idea discussion intensity in a dyad. A next step could be to investigate how the success of an idea reshapes the tie of two people. Such research would contribute to a better understanding of the evolution of multiplex relationships. Building on recent work of Murnieks, Haynie, Wiltbank, and Harting (in press) it would be interesting to investigate whether the interdependency between work and idea ties influences more cognitive mechanisms, for instance similarity in decision-making processes within a dyad.

To conclude, our study sheds light on how ties in an R&D context influence creative work. While previous work on network structuring has focused on more enduring and stable working relations, this study contributes to the literature by combining these stable relations with more instrumental, idea-based, interactions. Specifically, we explore the antecedents of these relationships in the critical development phase of an idea. The context is characterized by much uncertainty, because it is difficult to estimate the chances of acceptance of an idea. Offering a contribution to the idea in the form of discussion time is voluntary and direct repayment for this favor is not guaranteed. On the other hand, these more informal interactions, which are used to

mobilize, steer, or facilitate action and behavior become an increasingly important element of today's work (Grant & Parker, 2009). With our study, we have provided a more detailed understanding of how these interactions emerge from and exist next to long-term, work-related relationships.

CHAPTER 4

RISING FROM FAILURE AND LEARNING FROM SUCCESS: THE ROLE OF PAST EXPERIENCE IN PERSONAL INITIATIVE TAKING[3]

ABSTRACT

We investigate how success and failure experiences of people who take initiative, influence a) the inclination to take new personal initiatives, and b) the performance of those initiatives. Using the data of 1,792 radical ideas suggested by 908 employees, we unexpectedly find that failure, but not success experiences of initiators increase the likelihood of repeat initiative taking. We confirm our hypothesis that there is a positive effect of involving successful initiators on subsequent personal initiative performance. Our findings illustrate how learning unfolds in the context of personal initiatives and gives insights into how managers can support continuous and superior personal initiative taking.

[3] *with Jan van den Ende*

INTRODUCTION

Managers increasingly rely on their employees to take the initiative, to go beyond their assigned tasks, take charge themselves, and initiate new ideas in addition to their day-to-day jobs (for reviews, see Crant, 2000; Frese & Fay, 2001; Grant & Ashford, 2008; Grant & Parker, 2009). To be able to quickly adapt to new business environments, they need employees that take initiative without being told to do so, without an explicit role requirement, and without an already formulated problem (Unsworth, 2001). People who take initiative for instance submit concepts for potential markets, propose new product and service ideas, or initiate changes in work processes making them safer and/or more efficient (Frese, Kring, Soose, & Zempel, 1996; Frese, Teng, & Wijnen, 1999; Morrison & Phelps, 1999; Parker, Williams, & Turner, 2006; Unsworth, 2001). The outcomes of personal initiative taking can be very rewarding for both employers and employees. More efficient processes can save money, new products may generate new sources of profit, and more involved employees may be more satisfied and be more committed to the organization.

Managers who want to capitalize on initiative taking face two issues. First, although they generally appreciate initiative taking, they have to decline many initiatives because only a few can actually be implemented. This raises the question of how the rejection of initiatives affects future initiative taking by the same employees. Indeed, it is important that employees do not take initiative sporadically but on a continuous basis. Only when employees constantly think about possible improvements and new opportunities (Skilton & Dooley, 2010) do their firms have a full pipeline of initiatives which can provide the agility and edge to compete in a dynamic business. The second issue that managers face is the question of how the quality of initiatives can be improved over time. A high number of low quality initiatives is costly to administer and to review (Kijkuit & Van den Ende, 2010; Litchfield, 2008). To strike a balance between quantity and quality, companies must ask to which extent and what did their employees learn from prior initiative taking experiences.

This paper explores these issues. We take a learning perspective, essentially concentrating on the consequences of prior performance outcomes. Classical learning theories show that individuals repeat behavior that led to a success and stop actions that resulted in negative outcomes

(Greenberg & Baron, 2002; Skinner, 1953; Staddon & Cerutti, 2003). Moreover, learning curve research indicates that individual results improve with more experience (Edmondson, James, & Roloff, 2007; Levitt & March, 1988). We test and extend these theories in a context characterized by very different conditions for learning than one in which employees perform tasks that are required as part of their job description. People who take initiative are often very intrinsically motivated and thus eager to learn. Moreover, the task of initiative taking is of a discretionary nature, negative outcomes are not visible and have few serious repercussions, while positive outcomes are rare experiences. In this paper we demonstrate that for these reasons, learning behavior unfolds differently in the context of initiative taking compared to job-related activities. Since initiative taking is often a collective activity, we also address the influence of learning on both the initiative initiators as well as contributors.

Our study setting is the radical idea suggestion system of a multinational firm with archived data spanning 1,792 ideas suggested over the course of 12 years by 908 employees. Contrary to our expectation, we find that it is not prior success, but failure experience that is positively associated with repeat initiative taking. We do find confirmation for our other hypotheses which argue that success experiences of initiators and contributors boost the performance of personal initiatives.

Our study contributes to the literature since it is one of the first to directly address learning behavior for non-required activities such as taking initiative (Frese, Teng, & Wijnen, 1999; Parker, Williams, & Turner, 2006; Parker, Bindl, & Strauss, 2010; Unsworth, 2001). It offers insights into how employees make inferences regarding performance outcomes based on prior personal initiatives. Given that such initiative taking is becoming an increasingly essential element of today's work (Crant, 2000; Frese & Fay, 2001; Grant & Ashford, 2008; Grant & Parker, 2009), our findings reveal important differences between proactive behaviors and job-related tasks; that is, required tasks of employees (Parker & Collins, 2010). We also advance recent research aimed at disentangling total experience into success and failure components (cf. Madsen & Desai, 2010). Specifically, we study how the different elements of experience in initiative taking shape distinct learning patterns. Finally, our study provides important

managerial recommendations for firms wanting to stimulate continued initiative taking behavior of their employees and to improve the outcomes of this behavior.

THEORETICAL BACKGROUND

Personal Initiative

Recently, Grant and Parker (2009) highlighted some emerging shifts in work design theories driven by rapid technological advances, increased competitive pressure and more complex, interdisciplinary jobs and tasks. In today's world, firms have to be more dynamic, which requires employees to be more collaborative and able to quickly adapt to new situations. Increasingly, companies are relying on employees who initiate change proactively. These employees cross the boundaries of a "nine-to-five" job. They display personal initiative defined as "a behavior syndrome resulting in an individual's taking an active and self-starting approach to work and going beyond what is formally required in a given job" (Frese, Kring, Soose, & Zempel, 1996: 38). Personal initiatives refer to ideas as indicators of self-starting, proactive and problem-overcoming behavior by employees to improve existing processes and products, to prevent anticipated problems, or to take advantage of new opportunities (Frese, Teng, & Wijnen, 1999; Frese & Fay, 2001).

Personal initiative is closely related to constructs such as taking charge (e.g., Morrison & Phelps, 1999), proactivity and proactive creativity (e.g., Grant & Ashford, 2008; Grant & Parker, 2009; Parker & Collins, 2010; Unsworth, 2001), voicing issues or types of organizational citizenship behavior (e.g., Detert & Treviño, 2010; Podsakoff, MacKenzie, Paine, & Bachrach, 2000), as well as internal corporate entrepreneurship (e.g., Jones & Butler, 1992). The concept of taking initiative is, like organizational citizenship behavior, discretionary (Podsakoff, MacKenzie, Paine, & Bachrach, 2000). However, taking initiative tends to focus on a creative behavior perspective (Frese, Teng, & Wijnen, 1999), while not making any claim about the novelty of a course of action taken. In contrast to types of intrapreneurship, taking initiative can result in, but is not limited to, the study of internal venture creations.

Personal initiatives can be generated alone or by employees who are embedded in a group of people, who also contribute to the idea. Initiators can be considered the owner and often the "brain" behind the initiative whereas other contributors help to improve and develop the initiative (see Howell & Higgins, 1990 for a similar differentiation between champions and non-champions). The different roles people take in a personal initiative lead to different involvement and commitments. For instance, champions or initiators display more transformational leadership behavior, have a vision about the idea, and thereby energize others to become committed to an initiative, as well (Howell & Higgins, 1990).

To stimulate, support, and channel personal initiatives, companies often use formal processes (Fairbank & Williams, 2001; Frese, Teng, & Wijnen, 1999; Van Dijk & Van den Ende, 2002). A classic form of these systems is for instance a suggestion box where employees can submit an idea that they have. While suggestion boxes stimulated the submission of ideas for improvement, the design of new systems may stimulate more radical ideas for management to consider. Generally, these approaches bring structure to a fuzzy or ambiguous process and aim to capitalize on the initiatives for the firm. A systemized approach can take out potential risks that initiators may face, by not punishing failure of initiatives (Jones & Butler, 1992). This is largely achieved by not making the negative outcome decisions visible to audiences beyond the initiator and the idea review committee. Authors such as Cooper (2001) have studied the journey from an idea to an innovation by proposing a variety of process models that capture the diverse challenges along the way. Essentially these structures may be summarized in several phases including an initiation phase and several development phases where more and more flesh is put to the bones of a personal initiative (Kijkuit & Van den Ende, 2010). In these processes there are thus one or more decisions points where managers give a "go" or "no-go" decision about the further development or execution of a personal initiative. In line with this process, we consider a rejection at some point in the trajectory as a failure and an adoption or acceptance of the idea by the management or firm as a success.

Learning from Personal Initiatives

It is important to study what people learn from outcomes of personal initiatives for two reasons. First, because it is a discretionary activity, employees could decide to stop taking initiative

which, in turn, could damage the innovative output of a company (Frese, Kring, Soose, & Zempel, 1996; Frese, Teng, & Wijnen, 1999; Morrison & Phelps, 1999; Parker, Williams, & Turner, 2006). Second, companies should be interested in novel and high quality ideas so that they invest their money and resources as efficiently as possible (even on non-required activities). In this regard, it seems logical that learning from prior experiences would be an important strategy for a company.

Generally, two mechanisms are critical to understand how learning unfolds between a past and a subsequent future action: operant conditioning and outcome improvement. First, theories of operant conditioning imply that individuals learn based upon the consequences of behavior (Staddon & Cerutti, 2003). "Behaviors with positive consequences are acquired; behaviors with negative consequences tend to be eliminated" (Greenberg & Baron, 2002: 56). Operant conditioning thus refers to the role contingencies play in maintaining or reinforcing as well as decreasing or stopping a behavior (Skinner, 1953). As a second learning mechanism, the classic outcome improvement or learning curve notion implies that desired results improve with experience gained (Edmondson, James, & Roloff, 2007). This theory rests on the old adage "practice makes perfect" and relates to a form of learning by doing, the purest form of learning from direct experience (Levitt & March, 1988). For both operant conditioning (to do something again) and outcome improvement (to do something better), experience serves as a key ingredient from which people make inferences.

These theories have traditionally been tested in work contexts with employees that did the jobs that they were supposed to do (Van de Ven & Polley, 1992). As argued before, a context in which employees take initiatives offers very different conditions for learning. First, personal initiatives are often generated by people with high intrinsic motivation (Frese, Teng, & Wijnen, 1999; Morrison & Phelps, 1999). Intrinsically motivated people tend to direct their energy and time towards activities that they experience as autonomy supportive (Deci & Ryan, 1992). Working on a personal initiative clearly provides this freedom. Intrinsically motivated people also seem to approach an activity more as an end in itself (Kruglanski, 1975), they choose more difficult tasks in the absence of external rewards (Shapira, 1976), and are generally more

motivated to learn (Gong, Cheung, Wang, & Huang, in press; Parker & Collins, 2010), irrespective of the outcome.

Second, conditions and characteristics also differ in personal initiatives because of other consequences of performance outcomes. For instance, in a job-related task, low performance would probably lead to a negative job appraisal and, in the worst case, to a dismissal. For many job-tasks and company operations it is crucial to be successful and prevent as many failures as possible (Haunschild & Sullivan, 2002; Madsen & Desai, 2010). The consequences of a failed personal initiative are usually less severe, because, at least in the short- or mid-term, organizational survival does not depend on whether the initiative is a success or a failure. Moreover, the negative outcomes of initiative taking are often not visible to a broader audience. The initiatives are ideas in progress and abandoned before serious sums of money are allocated to their development (Fairbank & Williams, 2001; Frese, Teng, & Wijnen, 1999; Van Dijk & Van den Ende, 2002). Therefore, successful personal initiatives should stand out more than failed ones, although failing with a personal initiative bears only a few risks for individuals and companies.

We argue that these differences between job-related tasks and personal initiatives decrease the gap between failure and success experiences; failure should have less of a negative effect on repeat initiative taking, but employee initiative taking is still reinforced more by prior success experience. For subsequent initiative performance, the differences between job-related tasks and personal initiatives also shape learning processes and we predict a higher effect of learning from success experience than from failure experience.

HYPOTHESES

Learning to Do It Again

First, we will hypothesize about the effect of prior success or failure experience on repeat initiative taking. Learning theory suggests that successful outcomes of prior activities result in increased repeated efforts related to those same activities (Skinner, 1953). Behavior of people

who are successful is reinforced by the positive feedback of the environment and by direct or future rewards associated with the success. Initiators might expect that the stocks of knowledge they accumulated are best qualified for being utilized again (Schwab & Miner, 2008). Moreover, actions that are interpreted as positive provide a base of familiarity and boost confidence in one's abilities (Levinthal & March, 1993) which trigger repeat initiative taking. People therefore learn to make more use of what they are good at.

Performing well with a personal initiative also gives the employee a feeling of recognition, because there are generally few successful initiatives compared to the number of proposals screened through institutionalized processes (Fairbank & Williams, 2001; Frese, Teng, & Wijnen, 1999; Van Dijk & Van den Ende, 2002). The positive feedback that initiators get might motivate them to take initiative again because they learn that their company values successful personal initiatives. The positive feedback about an initiative might also be understood as support from management (Zhou & George, 2001) and therefore as an encouragement to take an initiative again.

While an initiative failure might not have as many negative repercussions, and is not as visible as a negative outcome in a job-related task, it can still foster a feeling of helplessness (Mikulincer, 1989). Following failure, it is more difficult for initiators to maintain a high level of self-esteem. Perceived self-efficacy should decrease and with it the feeling of being able to perform the task successfully in the future (Shea & Howell, 2000). Negative outcome feedback teaches initiators not to pursue the activity any longer (Cannon & Edmondson, 2001; Shepherd, 2003), because future failures can be expected (Brunstein & Gollwitzer, 1996). As initiative taking is discretionary by definition, it is easier for employees to decide not to take initiative any more. Over time they might have also learned that failure in performing is usually negatively associated with career progress, salary, or status. Initiators could fear appearing incompetent, an embarrassment they would generally want to avoid (Milliken, Morrison, & Hewlin, 2003). Moreover, they could develop a belief that it is futile to speak up (Detert & Treviño, 2010) which would impair their inclination to continue coming up with personal initiatives.

Hypothesis 1: *An initiator's prior success experience increases the likelihood of repeat initiative taking more than does prior failure experience.*

Learning to Improve

In our next research question we address how prior success and failure experiences of initiators and contributors affect the quality of personal initiatives. As successful initiatives are usually rare events, success experiences generally stand out more than failure experiences. Achieving success with a personal initiative can have a major impact on the organization and on the initiator and this impact of a rare event stimulates learning (Lampel, Shamsie, & Shapira, 2009).

Success experience also provides employees with a frame of reference and proven routines (Gersick & Hackman, 1990). Successful initiators witness the development of their idea from its inception to implementation and therefore can see the bigger picture behind a new initiative. Different elements of the initiative taking process can be contrasted with one another, allowing employees to get a feeling for strategies that lead to success (Kim, Kim, & Miner, 2009). For example, for personal initiatives to succeed, a match between the initiative and company requirements must be created. This is a process of "sensemaking" in which both the initiative or the company requirements can be adapted (Kijkuit & Van den Ende, 2007). The initiator is considered to be the focal point for all enquiries and responsible for articulating the benefits of an idea (Howell & Higgins, 1990). By being at the center of all activities, the initiator gains direct experience and an explicit understanding of how best to align company needs with individual capabilities.

Initiative success can also send a strong signal to other organizational members who may seek to connect with the respective initiator (Hallen, 2008; Perry-Smith, 2006). These new contacts might open doors to novel insights, perspectives, or experiences that the initiator can innovatively combine with his or her pool of knowledge in a new effort (Zaheer & Soda, 2009).

While we argued before that failure in taking initiative might not have as many negative repercussions and is not as visible as a negative outcome in a job-related task, it also creates less pressure to learn. Initiators, recognizing the voluntary aspect of initiative taking, might be less concerned with the larger implications of a rejection. The knowledge that initiators can gain from a failure is restricted to why the idea was not able to solve a particular problem or why it was not the best fit for a particular opportunity. Moreover, initiators that failed cannot gain experience

related to all phases of the initiative. This strategic knowledge, however, might be more important for the success of a subsequent initiative than the ability to pinpoint deficiencies in a particular phase.

Hypothesis 2: *An initiator's prior success experience increases the likelihood of initiative success more than does prior failure experience.*

As proactive initiative takers often seek to collaborate with other employees to pursue their goals (Gong, Cheung, Wang, & Huang, in press), our next hypothesis also refers to the positive influence contributors have on an initiative, given that they possess past success experience in taking initiatives.

Contributors provide social capital which is positively related to employee creativity (Gong, Cheung, Wang, & Huang, in press; Perry-Smith, 2006). They directly bring with them a pool of information, experiences, and resources that can be utilized to succeed again (Zaheer & Soda, 2009). Contributors, that have successfully initiated an idea in the past, are of particular value. Similar to the arguments made before, these contributors were very much involved in sensemaking processes as they developed an initiative from start to finish. These processes provided them with proven strategies and routines that they can transfer to a new initiator to boost the performance of the respective initiative. Failure experience is expected to play a minor role again.

Hypothesis 3: *A contributor's prior success experience increases the likelihood of initiative success more than does prior failure experience.*

METHOD

Sample and Setting

To study the relationship between previous initiative experiences and repeated initiative taking and initiative success, we focus on a type of personal initiative which relates to the generation and development of creative ideas. In doing so, we follow previous researchers who investigated

personal initiative from its creative angle (e.g., Frese, Teng, & Wijnen, 1999; Parker, Williams, & Turner, 2006).

This study was conducted in an international energy company, which we call "Enco" for the purpose of anonymity. Enco has set up an innovation program to invest in novel, early stage ideas that might radically transform the landscape of the energy industry. This program gives employees the chance to proactively create and develop ideas. The firm's review committee evaluates and manages all of the incoming ideas in a database. The existing database, comprising information about thousands of ideas, served as the centerpiece of our investigation. In addition to collecting and complementing information from this database, we attended team meetings, sat in idea evaluation panels, and held informal conversations with members of the review committee. This qualitative data greatly helped us to reach an understanding of the research setting (Mintzberg, 1979). We also had around 25 semi-structured interviews with recent initiators. Of these interviews, Table 1 highlights employees' statements, regarding whether it would or would not matter if their idea were accepted or rejected, from ten exemplary cases.

Our unit of analysis was the idea. At Enco, an idea is always attributed to one initiator who is in charge of the idea. It is primarily the choice of the initiator to involve more people in his or her initiative. The process of generating, developing, and evaluating ideas is structured as follows. After the submission of a short description of the idea, two main gates have to be passed before funding is awarded. First, proponents get the opportunity to briefly pitch their initiative in front of team members of the innovation program. If this first screening is passed, then the initiators get some time to develop their proposal further. Following this primary development phase, the idea and project plan is presented to a broader group of experts, the second panel. The panel assesses the potential, viability, and impact of the idea. A decision is then made regarding a project plan for the idea – whether and how to go ahead and fund a proof of concept stage. If funding is awarded, the proposal formally becomes a project. Throughout the study we classify a successful idea as one that was approved after the second panel and an unsuccessful idea as one that did not get accepted after either the first or second panel.

Over the course of 12 several years, Enco's evaluation criteria and the phases in the innovation program have remained almost identical. The program's goal was and is to provide a sheltered space for ideas that are of a radical nature and to develop these ideas further without a need to adhere to short- or midterm business strategies. The influx of ideas was constant over the years with some variation, due to occasional brainstorm sessions or promotions of the system by the committee. The innovation program was always based on proactive efforts of employees, which also meant that no financial rewards or bonuses were issued for people who took initiative. The reward was to work on an interesting idea for which the review committee would provide the necessary funding, if the idea reached the project status. Employees could expect a certain degree of recognition within the organization for successful ideas. To date, the innovation program and its committee have a yearly budget on the order of tens of millions of US Dollars. This money is mainly spent on funding ideas to reach a proof of concept status, as well as on the management of the system itself.

We extracted all information from the database in November 2008. This sample consists of a twelve-year archive of 2,352 ideas. A data cleaning procedure (taking out ideas that are still in progress, ideas that were generated in workshops and therefore stimulated by an external driver, and ideas not conceived by Enco staff) resulted in an overall sample consisting of 1,792 ideas generated by 908 initiators. We created two subsamples from this dataset, A and B. Dataset A was used to predict the probability of submitting an initiative idea in the future. For this dependent variable we looked over a time-frame of four years following the last submission to see whether the initiator submitted another idea. While this is consistent with former studies (e.g., Schwab & Miner, 2008), it had an impact on our use of the full dataset in creating dataset A. Specifically, we needed to exclude all ideas submitted in the last four years of our observation period, as initiators would not have the same allocated time-frame to submit another idea. Dataset B served to predict the probability of an initiative success. This subsample includes all ideas over all years, but because our study depends on initiators proposing their first idea with a clean slate – that is no previous success or failure experience – we excluded all first ideas.

TABLE 1
Examples of Positive and Negative Consequence Perceptions

Initiator	Prior sub-missions	Would it matter if your idea …were not accepted?	… were accepted?
Initiator 1	Yes	"I expect that the people who evaluate my idea have a much broader overview of what's worthwhile to pursue. I've got a lot of faith in the process and think there's probably some good reason behind a rejection. I also see it more as a form of evaluating the different possibilities and only a few of those will really be implemented. It's just part of the game that most ideas won't succeed."	"I can see there are positive consequences. However, for me this wasn't my main motivation."
Initiator 2	No	"It wouldn't matter to me and it won't stop me. I know that things can change but not every idea can be accepted."	"It's a real bonus if your idea is accepted I'm sure there'd be some link back to me. Of course, the problem is the implementation. However, you've lit the fire and it's nice when people recognize that you were involved in something. I want to make other people enthusiastic about my idea."
Initiator 3	No	"I can't imagine any negative consequences for me personally and it certainly won't stop me from submitting more ideas in the future. The process is very efficient, easy, and fair. I must say I'm pretty impressed by it and whenever I have a new idea, I'll approach the review committee again."	"Of course, I think it would matter. You've picked up on an idea and shown that you could bring it to the market. You go through a steep learning curve to be successful. It also enriches your normal job because you learn new skills you can apply there, too."
Initiator 4	Yes	"No, in fact, it can lead to many more new ideas and projects in the future because you get some useful feedback."	"Yeah, sure. It would be beneficial for me but also for the company. If my idea is funded, I get to decide how and where to spend the money and get to steer the idea. I can learn a lot from this."
Initiator 5	Yes	"No, not at all. What matters to me is that I can propose those ideas, that I can bounce around my ideas and potentially make a difference."	"It's really great if your ideas are accepted and implemented. With more successes, I feel that my ideas have also become much better. Now, I immediately think of the economic aspects of an initiative. It has taught me to think through the basic principles and calculations behind an idea more carefully."
Initiator 6	No	"I'd be lying if I didn't get a bit grumpy. However, if someone rejects my idea, I'd submit again in the future. In fact, I'd be even more determined because I want to be able to get around a problem. I can't let it go, I want to solve it."	"Yes, there's self-satisfaction. And you get your name out and justify your place here. But that wasn't necessarily the reason I did it. I simply thought the idea would be good and beneficial for Enco."
Initiator 7	No	"Ideas have to make money or be beneficial so I don't really care if it isn't successful because then there are probably good reasons for not pursuing it."	"It's really a challenge for me. It's not directly part of my job. If a few people think my idea is exciting, it adds to the routine of my normal job."
Initiator 8	Yes	"Certainly it would be a real pity. Maybe it's a missed opportunity. It wouldn't stop me but it wouldn't really encourage me either."	"It's a kind of combination of factors. It should bring something good to the company and something good to you."
Initiator 9	Yes	"No, doesn't matter at all. I keep coming up with ideas. It's great that someone acknowledges your ideas and gives you feedback. If people are interested and they give me a reason why the idea may or may not work out- that's great."	"Yes, I'd be very happy. The whole process brings extra satisfaction to my job. I like being entrepreneurial, I love solving issues- it's fantastic to see my idea become reality."
Initiator 10	Yes	"I want feedback about my idea, it's great if this happens. I always get constructive feedback from the review committee. So even if an idea isn't accepted I always get the chance to learn something and given my submission record, it certainly isn't stopping me from generating new ideas."	"Accepted ideas haven't really helped my career. But I just find it exciting to work on new developments and ideas. It's fun and also an intellectual challenge. I learn a lot when my ideas progress and are actually implemented ."

Dependent Variables

Repeat initiative taking. Our measure of repeat initiative taking was binary, taking a value of one under the circumstance that an idea initiator, who finished developing an idea, submitted another idea during the next four years.

Initiative success. We classified ideas as successful (i.e., we coded the variable with a value of one on a binary scale) if they passed the second screening when Enco reviewed the potential of the idea. Our observations revealed that managers often judged the success of an idea at this point in time. Passing this screening panel also meant that a substantial amount of resources was allocated to further the execution phase. At this stage, an idea would transform into a more formal project and responsibility of supervising the idea would partially be transferred from Enco's review committee to a business unit.

Independent Variable

For the analysis of repeat initiative taking we separately tallied all successes and failures that the initiator had experienced with both the focal initiative and any prior initiative *(initiators' success or failure experience)*. For the analysis of initiative success, we separately counted all successes and failures that the initiator had experienced in prior initiatives only *(initiators' prior success and failure experience)*. Similarly, for the contributor of an initiative, we counted the prior initiating success and failure experiences and tallied them if there were more than one contributor to an initiative *(contributors' prior success and failure experience)*.

Control Variables

Enco innovation managers described two different types of idea initiators: Those who rarely submit and pre-develop their initiative carefully before actually submitting it to the review committee and those who submit many ideas, but do not take very long from first inception to submission. Highly productive people could generate many low-quality ideas. We wanted to rule out explanations pertaining to such personal character types. Therefore, we included a proxy which measures the *productivity* of an initiator. We calculated productivity by $(n\text{-}1)/(t_2\text{-}t_1\text{+}1)$, where n is the total number of ideas a person initiated, t_1 the moment in time (in months) of initiating the very first idea and t_2 the time (in months) the very last idea was generated. We added one month to handle cases in which two ideas were submitted in the same month.

We controlled for the *number of contributors* related to an idea and for the cumulative number of *unique contributors* available. The latter refers to an initiator's unique contacts that were

involved in prior ideas. We used both these variables to capture the effect of a social net around an initiative. It could be influential not only as a social support instrument, encouraging initiators to continue generating ideas, but also as a mechanism bringing together different backgrounds; thereby enhancing the success chances of an initiative (Burt, 2004; Hargadon & Bechky, 2006; Kijkuit & Van den Ende, 2010; Perry-Smith, 2006).

Subsequent ideas that are similar to previous ones might trigger repeat initiative taking because idea initiators think that they should exploit their knowledge in a similar functional domain again (Schwab & Miner, 2008). On the other hand, if initiators submit ideas that are similar to previous ones, it could be that these are just refinements with little chance of being accepted. To capture the *similarity to previous ideas* of the same initiator, we examined the given titles and counted how many relevant words, in the respective heading, overlap with captions of any idea previously submitted by the same initiator.

We additionally controlled for several characteristics related to an idea which could influence an employee's inclination to take initiative repeatedly, as well as to generate initiatives that are better than previous ones. Ideas marked as *confidential* (dummy-coded 1) are of strategic value to the company and consequently appear to be ranked as more important by Enco. We also added a control for Enco's two *business units* from which ideas were submitted. Since the innovation program started in one of these units (dummy-coded 1), it could be that this unit was able to establish a higher image of strategic relevance, organizational power, or representation in the review committee which could influence their decision to accept ideas stemming from employees of this unit.

Recently submitted ideas are believed to be fresh in one's mind, more salient, and more easily recalled (Levitt & March, 1988). An employee who recently took initiative might therefore have a higher chance of generating another initiative, because he or she is still actively involved in creative thinking processes. It could also be that for initiatives that are taken to quickly, an employee has too little detachment to prior initiatives. He or she may not be able to step back and reflect upon possible implications of prior experiences, which could damage subsequent initiative performance. To control for this effect, we took the date an idea was submitted and

measured the number of months that passed between a prior and a current initiative submission by a single idea initiator. This procedure gave us a measure of *time elapsed since previous initiative*.

We also included a *time* variable indicating in which month the idea was submitted since the inception of the database. This variable is included as a control since the repertoire of ideas and their success chances may be higher if there is a new opportunity for people to submit their idea compared to a situation where a suggestion system has already been in place for a few years.

Finally, we measured an idea's *lifetime* by taking the differences (in months) between the date an idea was submitted and the date of the last activity or alteration pertaining to this idea. We include this variable because a long involvement in an initiative might prevent initiators from having the time and energy required to generate a new idea. Having more time to work on an idea might also increase the chances of that idea being a success. However, because ideas which turn out to be successful have to go through a process of stages and gates, they naturally have a longer lifetime. To correct for this, we divided lifetime by the number of gates the idea passed and included this *relative lifetime* variable for the analysis pertaining to subsample B.

Analysis

We used logistic regression to estimate both the likelihood that an idea initiator submits another idea in the future and the likelihood that this idea is a success. Since we find repeated observations for the same idea initiator across time, we correct for the non-independence of observations belonging to the same initiator and report robust standard errors adjusted for clustered observations of idea initiators (Audia & Goncalo, 2007; Hallen, 2008). Coefficients estimated through a logistic regression do no directly indicate effect size (Hoetker, 2007; Long & Freese, 2006). Therefore, we use a variety of methods to interpret the findings, including depicting predicted probabilities of key independent variables and calculating changes in predicted probabilities following procedures suggested by Long and Frese (2006).

RESULTS

Table 2 reports descriptive statistics for the full sample (n = 1,792). The average success rate of the full sample was 10% which confirms our claim that only a small number of personal initiatives generally succeed. An initiative was followed by a subsequent idea in 52% of the cases. There appeared to be no significant correlation between initiative success and repeat initiative taking.

TABLE 2
Descriptive Statistics and Correlation Matrix

Variable	Mean	S.D.	Min.	Max.	1	2	3	4	5
1. Repeat initiative taking	0.52	0.50	0	1					
2. Initiative success	0.10	0.30	0	1	-0.02				
3. Initiators' prior success experience	0.10	0.40	0	5	0.05 *	0.13 *			
4. Initiators' prior failure experience	2.68	6.20	0	46	0.30 *	-0.05	0.10 *		
5. Contributors' prior success experience	0.03	0.23	0	4	-0.05 *	0.21 *	0.03	-0.05	
6. Contributor's prior failure experience	0.44	2.25	0	43	0.00	0.07 *	0.03	0.08 *	0.17 *
7. Initiators' productivity	0.47	1.52	0	21	0.20 *	-0.04	0.25 *	0.11 *	-0.04
8. Number of contributors	0.66	1.20	0	12	-0.05 *	0.16 *	0.03	-0.09 *	0.20 *
9. Unique contributors	0.86	2.84	0	62	0.14 *	0.09 *	0.24 *	0.42 *	0.02
10. Similarity to previous initiatives	0.33	0.87	0	9	0.14 *	-0.01	0.21 *	0.28 *	-0.03
11. Initiative confidentiality	0.27	0.45	0	1	-0.02	0.22 *	0.03	-0.14 *	0.12 *
12. Business unit	0.59	0.49	0	1	-0.14 *	0.22 *	0.12 *	-0.28 *	0.10 *
13. Time elapsed since previous initiative	4.22	10.73	0	96	-0.03	0.13 *	0.15 *	-0.01	0.05 *
14. Time	63.78	32.94	1	145	-0.10 *	0.04	0.13 *	0.16 *	0.04
15. Lifetime	10.46	16.77	0	103	-0.01	0.54 *	0.09 *	-0.12 *	0.16 *

Variable	6	7	8	9	10	11	12	13	14
7. Initiators' productivity	-0.01								
8. Number of contributors	0.36 *	0.00							
9. Unique contributors	0.11 *	0.09 *	0.09 *						
10. Similarity to previous initiatives	0.01	0.12 *	-0.02	0.20 *					
11. Initiative confidentiality	0.01	0.05 *	0.02	-0.05 *	-0.01				
12. Business unit	0.01	0.02	0.30 *	-0.01	-0.02	0.30 *			
13. Time elapsed since previous initiative	0.07 *	-0.08 *	0.04	0.15 *	0.09 *	0.08 *	0.09 *		
14. Time	0.01	-0.04	-0.26 *	0.06 *	0.04	0.02	-0.28 *	0.18 *	
15. Lifetime	0.04	-0.05 *	0.19 *	0.02	0.01	0.19 *	0.25 *	0.06 *	-0.08 *

n = 1,792, clusters = 908. * $p < .05$; two-tailed tests.

TABLE 3
Results of Logistic Regression Analysis of Repeat Initiative Taking

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Initiators' productivity	0.84 *** (0.26)	0.84 *** (0.26)	0.59 *** (0.14)	0.59 *** (0.14)	0.56 *** (0.14)	1.27 *** (0.19)		
Number of contributors	-0.14 ** (0.05)	-0.14 ** (0.05)	-0.11 * (0.06)	-0.11 * (0.06)	-0.11 * (0.06)	-0.10 (0.06)	-0.12 ^ (0.07)	
Unique contributors	0.23 *** (0.07)	0.23 *** (0.07)	-0.02 (0.06)	-0.04 (0.06)	-0.03 (0.03)	-0.19 (0.13)	-0.13 (0.12)	
Similarity to previous initiatives	0.21 * (0.09)	0.21 * (0.09)	0.06 (0.08)	0.05 (0.08)	0.02 (0.08)	-0.03 (0.10)	0.00 (0.10)	
Initiative confidentiality	0.15 (0.17)	0.14 (0.17)	0.26 (0.16)	0.25 (0.16)	0.26 (0.16)	0.22 (0.18)	0.20 (0.20)	
Business unit	-0.85 *** (0.20)	-0.85 *** (0.20)	-0.52 ** (0.19)	-0.54 ** (0.19)	-0.51 ** (0.18)	-0.31 ^ (0.19)	-0.20 (0.20)	-0.23 (0.19)
Time elapsed since previous initiative	0.00 (0.01)	0.00 (0.01)	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	0.01 (0.01)	-0.01 (0.01)	
Time	-0.01 *** (0.00)	-0.01 *** (0.00)	-0.01 *** (0.00)	-0.01 *** (0.00)	-0.01 *** (0.00)	-0.01 *** (0.00)	-0.01 *** (0.00)	-0.01 *** (0.00)
Lifetime	0.01 ** (0.01)	0.01 * (0.01)	0.02 *** (0.01)	0.02 ** (0.01)	0.02 ** (0.01)	0.02 ** (0.01)	0.02 ** (0.01)	0.02 * (0.01)
Initiators' success experience		0.02 (0.22)		0.24 (0.20)	0.28 (0.19)	0.35 (0.30)	0.92 ** (0.33)	0.67 * (0.30)
Initiators' failure experience			0.26 *** (0.04)	0.27 *** (0.05)	0.38 *** (0.05)	0.52 *** (0.14)	1.09 *** (0.17)	0.90 *** (0.12)
Initiators' failure experience^2					-0.01 *** (0.00)			
Constant	0.74 ** (0.25)	0.74 ** (0.26)	0.17 (0.25)	0.21 (0.25)	0.06 (0.25)	-0.41 (0.30)	-1.11 *** (0.35)	-1.04 *** (0.30)
Wald χ^2	63.52 ***	63.52 ***	103.25 ***	102.42 ***	130.65 ***	81.48 ***	82.28 ***	78.99 ***
Pseudo R^2	0.11	0.11	0.16	0.16	0.17	0.10	0.08	0.08
Log pseudolikelihood	-848.10	-848.09	-801.71	-800.89	-796.43	-645.85	-540.21	-545.20
Wald test (variables added to base)		0.01	37.79 ***	36.40 ***	72.09 ***	15.08 ***	41.67 ***	56.54 ***
Wald test (quadratic term)					31.77 ***			
N	1,390	1,390	1,390	1,390	1,390	1,047	875	875
Clusters	706	706	706	706	706	706	635	635

Robust standard errors are in parentheses. ^ $p < .10$ * $p < .05$, ** $p < .01$, *** $p < .001$; two-tailed tests

TABLE 4
Changes in Predicted Probabilities

Variable	For repeat initiative taking (Table 3, Model 4)				For initiative success (Table 5, Model 8)			
	min > max	-+1/2	-+ s.d. /2	Marg. effect	min > max	-+1/2	-+ s.d. /2	Marg. effect
Initiators' productivity	0.42	0.13	0.21	0.13	-0.05	0.00	-0.01	0.00
Number of contributors	-0.33	-0.03	-0.03	-0.03	0.26	0.01	0.01	0.01
Unique contributors	-0.51	-0.01	-0.02	-0.01	0.47	0.00	0.01	0.00
Similarity to previous initiatives	0.10	0.01	0.01	0.01	-0.03	0.00	0.00	0.00
Initiative confidentiality	0.06	0.06	0.03	0.06	0.05	0.05	0.02	0.04
Business unit	-0.12	-0.12	-0.06	-0.12	0.08	0.08	0.04	0.08
Time elapsed since previous initiative	0.13	0.00	0.02	0.00	0.20	0.00	0.01	0.00
Time	-0.29	0.00	-0.08	0.00	0.08	0.00	0.02	0.00
Lifetime	0.25	0.00	0.05	0.00				
Relative lifetime					0.35	0.00	0.02	0.00
Initiators' success experience	0.15	0.06	0.02	0.06				
Initiators' failure experience	0.59	0.06	0.37	0.06				
Initiators' prior success experience					0.31	0.02	0.01	0.02
Initiators' prior failure experience					0.02	0.00	0.00	0.00
Contributors' prior success experience					0.55	0.04	0.01	0.04
Contributors' prior failure experience					0.02	0.00	0.00	0.00

TABLE 5
Results of Logistic Regression Analysis of Initiative Success

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Initiators' productivity	-0.05 (0.07)	-0.09 (0.06)	-0.05 (0.07)	-0.09 (0.06)	-0.05 (0.07)	-0.05 (0.07)	-0.05 (0.07)	-0.08 (0.06)
Number of contributors	0.26 *** (0.06)	0.26 *** (0.06)	0.26 *** (0.06)	0.26 *** (0.06)	0.21 *** (0.06)	0.24 ** (0.08)	0.20 * (0.08)	0.20 * (0.08)
Unique contributors	0.07 (0.05)	0.05 ^ (0.03)	0.07 (0.06)	0.05 (0.04)	0.07 (0.05)	0.07 (0.05)	0.07 (0.05)	0.05 (0.03)
Similarity to previous initiatives	-0.03 (0.12)	-0.07 (0.14)	-0.03 (0.12)	-0.08 (0.14)	-0.03 (0.12)	-0.03 (0.12)	-0.03 (0.12)	-0.07 (0.14)
Initiative confidentiality	0.87 *** (0.26)	0.92 *** (0.27)	0.87 *** (0.26)	0.93 *** (0.27)	0.82 ** (0.27)	0.87 *** (0.26)	0.82 ** (0.27)	0.88 *** (0.28)
Business unit	1.76 *** (0.37)	1.56 *** (0.37)	1.74 *** (0.40)	1.58 *** (0.40)	1.71 *** (0.37)	1.79 *** (0.39)	1.72 *** (0.39)	1.54 *** (0.41)
Time elapsed since previous initiative	0.02 * (0.01)	0.02 * (0.01)	0.02 * (0.01)	0.02 * (0.01)	0.02 * (0.01)	0.02 * (0.01)	0.02 * (0.01)	0.02 * (0.01)
Time	0.02 *** (0.00)	0.01 ** (0.00)	0.02 *** (0.00)	0.01 * (0.00)	0.01 ** (0.00)	0.01 *** (0.00)	0.01 ** (0.00)	0.01 * (0.00)
Relative lifetime	0.03 *** (0.01)	0.03 *** (0.01)	0.03 *** (0.01)	0.03 *** (0.01)	0.03 *** (0.01)	0.03 *** (0.01)	0.03 *** (0.01)	0.03 *** (0.01)
Initiators' prior success experience		0.47 * (0.19)		0.48 * (0.20)				0.48 * (0.20)
Initiators' prior failure experience			0.00 (0.03)	0.01 (0.02)				0.01 (0.02)
Contributors' prior success experience					0.86 ^ (0.49)		0.85 ^ (0.48)	0.82 ^ (0.46)
Contributors' prior failure experience						0.02 (0.03)	0.01 (0.04)	0.01 (0.04)
Constant	-5.59 *** (0.46)	-5.31 *** (0.45)	-5.57 *** (0.47)	-5.34 *** (0.46)	-5.42 *** (0.45)	-5.58 *** (0.46)	-5.42 *** (0.45)	-5.18 *** (0.45)
Wald χ^2	96.45 ***	106.81 ***	98.45 ***	106.82 ***	88.00 ***	98.08 ***	88.34 ***	101.25 ***
Pseudo R^2	0.21	0.22	0.21	0.22	0.22	0.21	0.22	0.23
Log pseudolikelihood	-229.75	-226.15	-229.73	-226.12	-227.49	-229.63	-227.46	-223.87
Wald test (variables added to base)		6.12 *	0.03	6.01 *	3.15 *	0.35	3.23	9.86 *
N	887	887	887	887	887	887	887	887
Clusters	310	310	310	310	310	310	310	310

Robust standard errors are in parentheses. ^ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; two-tailed tests.

TABLE 5
Continued

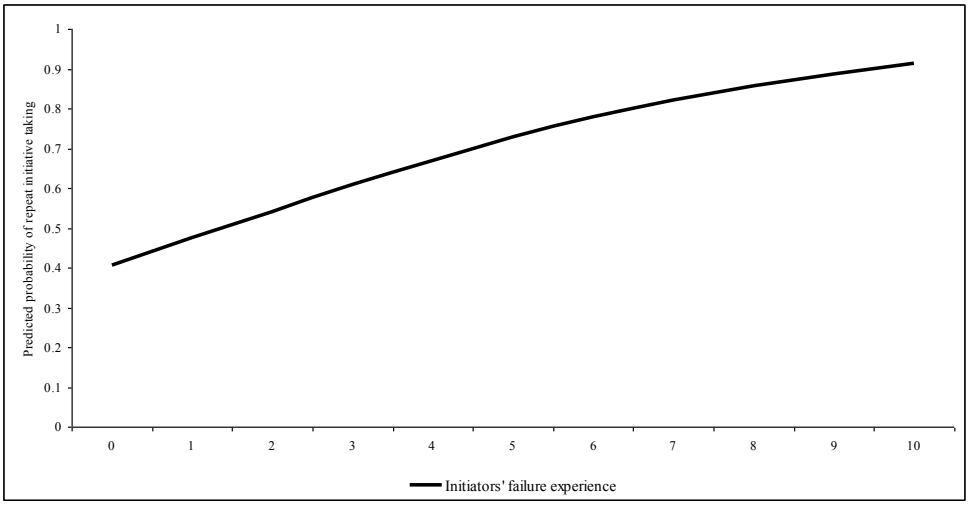
Variable	Model 9		Model 10		Model 11	
Initiators' productivity	0.05	(0.08)				
Number of contributors	0.27 **	(0.10)	0.30 **	(0.09)		
Unique contributors	0.07	(0.07)	0.07	(0.07)		
Similarity to previous initiatives	0.07	(0.13)	0.02	(0.15)		
Initiative confidentiality	1.05 ***	(0.31)	1.12 ***	(0.32)		
Business unit	1.85 **	(0.58)	2.05 ***	(0.62)	2.45 ***	(0.61)
Time elapsed since previous initiative	0.02 *	(0.01)	0.01	(0.01)		
Time	0.01 **	(0.01)	0.02 **	(0.01)	0.01 **	(0.00)
Relative lifetime	0.03 ***	(0.01)	0.02 *	(0.01)	0.02 *	(0.01)
Initiators' prior success experience	0.57 ^	(0.34)	0.48	(0.35)	0.58 ^	(0.33)
Initiators' prior failure experience	0.10	(0.19)	0.03	(0.20)	0.05	(0.19)
Contributors' prior success experience	0.69	(0.50)	0.50	(0.42)	0.89 *	(0.44)
Contributors' prior failure experience	-0.05	(0.05)	-0.05	(0.05)	-0.02	(0.05)
Constant	-6.12 ***	(0.71)	-6.01 ***	(0.77)	-5.09 ***	(0.69)
Wald χ^2	76.34 ***		62.30 ***		40.83 ***	
Pseudo R^2	0.22		0.22		0.16	
Log pseudolikelihood	-153.56		-135.74		-146.49	
Wald test (variables added to base)	4.94		3.81		7.50	
N	550		440		440	
Clusters	310		244		244	

We checked the variance inflation factors (VIFs) for all reported models and none appears to be higher than 1.91 (highest mean VIF was 1.49) and thus do not exceed the recommended value of 10 (Kennedy, 2003). As a linear relationship between independent variables and the logit form of the dependent variable is assumed when conducting logistic regressions, we performed the Box-Tidwell Transformation test and added interactions between independent variables and their natural logarithm to each model (Hilbe, 2009). Since no interaction term turned out to be significant, we can conclude that nonlinearity is not a problem. Moreover, as we used robust standard errors, adjusted for clustering, we applied Wald tests instead of the more conventional likelihood-ratio test (Sribney, 2007). The reported Wald chi-squared statistics indicate overall significance of the models. After fitting each model, we also tested the significance of coefficients that were added to the baseline model (Cameron & Trivedi, 2009).

Test of Hypothesis 1: Learning and Repeat Initiative Taking

Table 3 shows the results of the logistic regressions where repeat initiative taking is the dependent variable. We find no support for Hypothesis 1, which proposed that the success experience of an idea initiator has a positive impact on repeat initiative taking. The coefficient itself has a positive sign and therefore is in the direction we hypothesized, but a Wald test, conducted after the coefficient is added to the baseline model, turns out not to be significant. Also in a model with both success and failure experience, initiators' success experience remains non-significant. However, we do find a positive association between an initiator's failure experience and repeat initiative taking (Table 3, Model 4: $b = .27$, $p \leq .001$). A joint Wald test is significant, indicating improvement in model fit. To depict the net effect of an idea initiator's failure experience, we took the respective coefficients of Model 4 and plotted them against the predicted probabilities of repeat initiative taking, whereby all other variables are held constant at their mean value. Figure 1 shows the positive but diminishing effect of initiators' failure experience on the predicted probability of repeat initiative taking.

FIGURE 1
Effect of Initiators' Failure Experience on Repeat Initiative Taking



In Table 4, we provide additional detail to interpret the coefficients taken from Model 4, Table 3. Specifically, we report marginal effects as well as changes in predicted probability as the independent variable changes 1) from its minimum to its maximum, 2) from one half unit below base value to one half unit above, and 3) from one half of the standard deviation below base to one half of the standard deviation above. Please note that when the effect of one variable is calculated, all others are held constant at their mean value. For example, an additional unit of failure experience increases the probability of repeat initiative taking by six percent. To further explore the unexpected finding of a positive association between initiators' failure experience and repeat initiative taking, we also added a squared term of initiators' failure experience to Model 5, Table 3. We wanted to see whether there is some point at which failure experiences would damage repeat initiative taking. The squared term turns out to be significant (Table 3, Model 5: b = -.01, $p \leq .001$). The calculated inflection point appears when failure experiences reach a value of 29, after which it begins to have a negative effect on repeat initiative taking.

Some initial explanations for our finding that not success, but failure experience is positively associated with repeat initiative taking can be found in the qualitative data collected on site. In Table 1, we listed some exemplary statements of recent initiators who we asked whether it would

or would not matter if their idea were a success (accepted) or a failure (rejected). One initiator, for instance, indicated that non-acceptance of the idea *"can lead to many more new ideas and projects in the future".* Another person said: *"I'd be even more determined because I want to be able to get around a problem. I can't let it go, I want to solve it".*

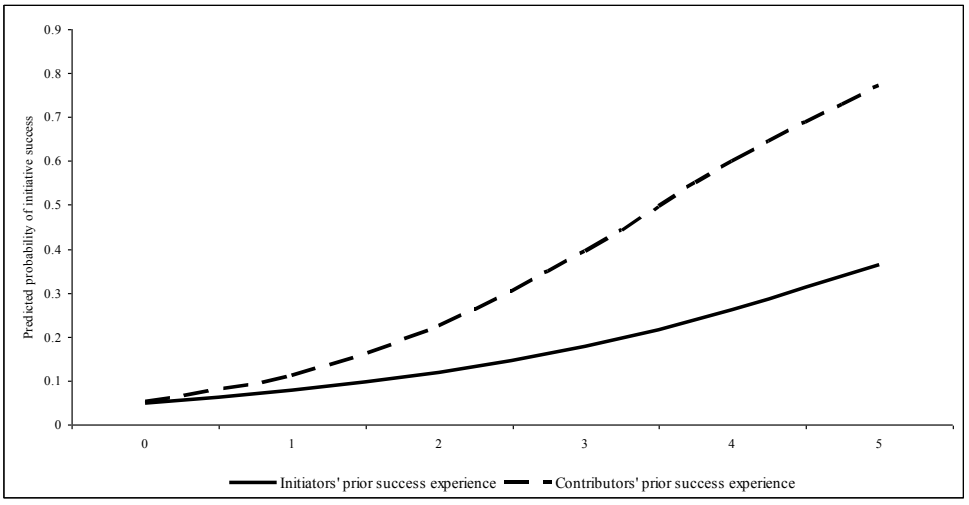
For robustness, we additionally checked whether analysis on a sample including only the first three ideas of an initiator would show different results. We report this complementary analysis in Table 3, Model 6. Here we find again that an initiator's prior failure experience is significantly related to an increased submission of subsequent initiatives. We also ran models where, in addition to including only the first three ideas of an initiator, we also excluded initiators with an above average (0.30) productivity score (Table 3, Model 7). Running such a model on a dataset without highly productive employees should illustrate whether there is a structural difference between employees who are very active, generating many ideas, and those who propose very few ideas and are not very productive. The reasoning behind this approach is that the small group of very active people could skew the analyses. The results, however, indicate that there is no support for such a difference. For the "typical" employee that only submits a few ideas in his or her career and is generally less productive, the positive effect of having experienced failure still holds. In Model 7, however, success experience also turns out to be significant. Nevertheless, the size of the coefficient remains larger for failure than for success experiences. For a final robustness check, we focused only on a limited number of control variables. Model 8 again confirms the higher positive effect of failure experiences as compared to an initiators' success experiences.

Test of Hypotheses 2 and 3: Learning and Initiative Success

We use subsample B for the hypotheses related to the effect of learning on initiative success. Our results do support Hypotheses 2 and 3. Hence, there is a positive effect of prior initiation success experience on the success of a current initiative for both potential holders of this experience, the current initiator (Table 5, Model 8: $b = .48$, $p \leq .05$) and the current contributors (Table 5, Model 8: $b = .82$, $p \leq .10$). Joint Wald tests of the respective experiences conducted after these coefficients have been added to the baseline model indicate statistical significance. While in most models, the coefficient of respective failure experiences is positive, it never appears to be

significant. Figure 2 depicts the net effect of an initiator's and contributor's prior success experience on the predicted probabilities of initiative success, with all other respective variables held constant at their mean value. Both figures show that the more initiating experiences current initiators or contributors have, the higher the positive impact on initiative success. The magnitude of the effect is higher for contributors.

FIGURE 2
Effect of Initiators' and Contributors' Prior Success Experience on Initiative Success



For Table 4 we recalculated marginal effects and changes in predicted probability based on Model 8 reported in Table 5. A change in an initiator's or contributor's prior success experience, from zero to its maximum value, increases the probability of the idea success by 31% or 55%, respectively, with all other variables measured at their mean value.

Anecdotal evidence from our interviews reported in Table 1 supports our quantitative findings. One employee said: *"With more successes, I feel that my ideas have also become much better. Now I immediately think of the economic aspects of an initiative"*. Another initiator argued that *"[i]t's fun and also an intellectual challenge. I learn a lot when my ideas progress and are actually implemented"*.

Again, we checked for robustness. First, for the analysis reported in Table 5, Model 9, we included only the first few ideas of initiators. As we already excluded the first ideas for the main analysis, we included here the second, third, and fourth idea of initiators. The results confirm the general tendencies observed with the full data of subsample B. An initiator's prior success experience is positively associated with future idea success. The effect of a contributor's prior success experience drops below significance when using a two-tailed test, but becomes significant if a one-tailed test is performed ($p \leq .10$). When we additionally excluded people with high productivity scores (above the mean of 0.57), the general pattern still holds, but now also an initiator's prior success experience drops below significance when using a two-tailed test (Model 10). Model 11 reports results of an analysis in which we used a limited set of control variables. Results indicate, again, a positive effect of an initiator's and a contributor's success experience on subsequent idea performance.

DISCUSSION

In this study we have found that, not as we expected, failure rather than an initiator's success experience stimulates future initiation of ideas. We did find confirmation for our hypotheses that initiators' and contributors' success experiences both help to generate successful ideas. Taking these findings together, we can conclude that while failure in initiating an idea stimulates people to take the initiative again, prior success in initiating an idea is related to better performance of a subsequent idea. These results offer opportunities and challenges for scholars and practitioners who are interested in both repeated and high quality personal initiative taking.

Theoretical Implications

Our research explored how learning and continued action unfold in initiative taking efforts and how organizations can maximize both to their advantage. As we disentangle success from failure experiences, our research continues efforts to take a finer-grained perspective on past experience (Madsen & Desai, 2010). The findings also shed first light on calls for more empirical work on the mechanisms of continuous creativity (Skilton & Dooley, 2010). More specifically, our study shows that inferences people make from experience in personal initiative can be counter intuitive

(Parker & Collins, 2010). We offer here two explanations for why learning to do something again may produce different results in voluntary activities, such as taking initiative, than what we expected.

First, in proactive activities, extrinsic motives are of less importance and instead intrinsic motivation is assumed to be high (Frese, Teng, & Wijnen, 1999; Morrison & Phelps, 1999). Given that employees experience failure, they will not so easily give up and might even seek increased risk (Sitkin, 1992). This is because failure might trigger a feeling of being positively challenged which is a key constituent of intrinsic motivation (Amabile, Barsade, Mueller, & Staw, 2005). Feeling challenged, in turn, might stimulate individuals to further experiment and come up with new proposals despite prior failures (Amabile & Khaire, 2008; Mikulincer, 1989; Sitkin, 1992). Initiators learn that there is a discrepancy between what is desired and what has been achieved so far. Assuming that people have positive outcome expectations, when they come up with a personal initiative, failure of this initiative will lead to increased persistence (Locke & Latham, 1990). Prior success, on the other hand, may instead signal the accomplishment of performance and learning goals (VandeWalle & Cummings, 1997). A feeling of challenge is not experienced. People who have success experience might, therefore, learn less about the need to be resilient which could decrease their inclination to take initiative again (Sitkin, 1992).

A second point could be that when people voluntarily take initiative and fail several times, they actually learn that it is safe to initiate new ideas and that there are indeed few, to no, serious consequences related to a negative outcome (Baer & Frese, 2003; Cannon & Edmondson, 2001; Edmondson, 1999). Prior initiative failure can also decrease the threshold to take initiative again because of lower expectations. This may be because the outcomes of a personal initiative are not visible to a broader audience, which reduces the need to cope with negative cognitive demands and the fear of trying again. It also decreases the need of employees to practice impression management, which is considered as a barrier to learning (Van de Ven & Polley, 1992). Employees can only, to a lesser degree, learn this from initiative success. They never experienced that it is fine to submit an initiative that will potentially fail. As a result, they could become more careful and only take initiative again once they are sure about the prospects. Similarly, previous success may raise the individual and collective expectations (Locke &

Latham, 1990) and thus undermine an initiator's freedom of action or scope of search (Skilton & Dooley, 2010).

In our additional analyses we found that employees in our sample have a very high resilience when it comes to dealing with failure. However, if the number of prior failures is too high (in our study the inflection point was at 29 failures), people might feel less challenged and less motivated to initiate another idea. They learn that they cannot achieve their goals. Instead, they could feel increasingly helpless, lose confidence in their abilities, and relate the activities to negative emotions. These responses can impair a person's inclination to continue coming up with personal initiatives. Entrepreneurship literature has found similar patterns. For example, research by Ucbasaran, Westhead, and Wright (2009) shows that while a small number of failure experiences encourages some entrepreneurs to identify more opportunities, too many prior failures decreases their motivation to start-up new businesses.

A context characterized by discretionary behavior may also offer further explanations for our hypothesized finding that success experience is more positively associated with subsequent initiative success than failure experience. It seems that experiencing failure does not offer the knowledge necessary to improve the quality of a future initiative. With failure experience, employees learn that it is safe to take initiative again and they accordingly do, but only success experience offers initiators the end-to-end, bigger picture knowledge that allows them to excel in a new effort (Kim, Kim, & Miner, 2009). Achieving success is a rare event but because it has a major impact on the organization and the initiator, there is a higher willingness to learn from those experiences (Lampel, Shamsie, & Shapira, 2009). In particular, for initiative taking, where managers evaluate and review ideas based on defined selection criteria, prior success experience may help initiators to contribute to a process of sensemaking in which both the initiative or the company requirements are adapted (Kijkuit & Van den Ende, 2007).

Our study it is one of the first to directly address learning behavior for non-required activities such as taking initiative. The findings have implications for other streams of research studying, for instance, organizational citizenship behavior (Podsakoff, MacKenzie, Paine, & Bachrach, 2000) where there is also the implicit assumption that people make voluntary contributions that

do not belong within the scope of their normal tasks and duties. Moreover, our findings can be applied in contexts where negative outcomes for activities are not disclosed. Initiative failure is usually not visible to anyone except the review committee and the initiators. Another context in which this is the case is an anonymous submission system for academic articles. The rejection of a paper might signal authors that further work is needed which could challenge them to revise their manuscript. People could have the perception that they learned something from the reviews and since the prior rejection is not visible to a broader audience, they are free to submit the manuscript to another journal.

Managerial Implications

Companies increasingly use proactivity scales to assess their job candidates, acknowledging the importance of initiative taking for change and innovation (Frese, Kring, Soose, & Zempel, 1996; Frese, Teng, & Wijnen, 1999; Morrison & Phelps, 1999; Parker, Williams, & Turner, 2006). Initiative taking, however, should not be a one-time-only effort at the beginning of a career, but rather should be continuously utilized and supported. As not all initiatives are equally worth developing, management may be afraid that initiative reviewing bodies of organizations can become a serious threat for repeat initiative taking. However, our research shows that the decision not to accept the majority of initiatives has a positive rather than a negative influence on the inclination of proactive individuals to submit another initiative. While prior initiating failure stimulates people to take initiative again, only prior initiating success experience is related to better performance. The managerial implication is severe: If failure reinforces more initiatives that are similar to prior ones, an assessment system of ideas will, at some point, be cluttered by bad initiatives. This places a heavy administrative burden on managers who need to go through and review all those initiatives. Moreover, companies cannot afford to have too many resources allocated to low quality initiatives.

One remedy that showed up in our results is to include previously successful contributors in a new personal initiative. Experienced organizational members can share lessons learned to help improve the success chances of an initiative. More generally, we also found a positive effect from the amount of contributors on initiative performance. These findings point towards the importance of social network size as a catalyst for collaborative learning and knowledge

exchange to improve creative outcomes (Burt, 2004; Hargadon & Bechky, 2006; Kijkuit & Van den Ende, 2010; Perry-Smith, 2006). Companies can steer network building and the systematic involvement of prior successful initiators by designing mentorship programs where initiators are assigned to previously successful initiators. This can also have the advantage that by being exposed to these new initiatives, previously successful people can identify novel opportunities in their own and the others' knowledge pools (Hargadon & Bechky, 2006).

Moreover, from the positive effect of time elapsed since a previous idea and from the positive effect of relative initiative lifetime, one can infer that taking time to come up with a new idea and to thoroughly develop it pays off in terms of the success chances of that initiative. Initiators should not be left alone in this process and our findings could imply that more attention needs to be paid to a targeted feedback strategy. With failed initiators, idea evaluators could elaborate more on why an initiative was not accepted and which general criteria have to be met before another idea is submitted. Initiators that succeeded should receive more motivational feedback so that they continue taking initiative.

Limitations and Future Research

There are some limitations in our study that present opportunities for future research. A first concern could be that a failure can also lead to subsequent successes or that a success later turns out to be a failure (Van de Ven & Polley, 1992). Although we could not trace such developments, future research needs to look more carefully into these grey zones of performance in the life of an idea. Additionally, one could argue that the stage we chose to mark success only provides the initiator with another green light in an even longer journey. The stage nevertheless marks an important point in the life of an idea because most useless or non-innovative ideas are sorted out before. It is therefore a major success to get more serious managerial and financial support when reviewing for 90% of the other ideas stopped.

Our observations at the study site also show that feedback plays a critical role in how success and failure is perceived. Interviews with initiators and Enco's innovation managers confirm that every initiative is taken seriously, no matter how often an initiator approaches the review committee and no matter how low-key the initiative seems to be at the beginning. The review

committee always wants to give constructive feedback to the initiators and many valued this, as indicated by some exemplary statements in Table 1. For instance, one interviewee said, *"I expect that the people who evaluate my idea have a much broader overview of what's worthwhile to pursue. I've got a lot of faith in the process and think there's probably some good reason behind a rejection"*. Nevertheless, in another setting, there could be differences to the degree to which constructive feedback is given. Future research could further investigate this issue by, for instance, conducting content analyses on the feedback that is provided.

Another possibility for future research is to explore more deeply the composition and evolution of the social network around a personal initiative. While research has started to investigate these issues (Burt, 2004; Hargadon & Bechky, 2006; Kijkuit & Van den Ende, 2010; Perry-Smith, 2006; Sosa, 2010), we need to learn more about why employees repeat collaboration with others, whether ideas become better with certain network configurations, and what influence the acceptance or rejection of an idea could exercise in this regards. Important factors to take into account could be the location of employees, their proximity to the review committee, prior established ties to reviewers, or their organizational centrality.

Unfortunately, we were not able to measure the antecedents of taking personal initiative and therefore could not disentangle the effect of personality or work environment on learning from initiative taking (Parker, Williams, & Turner, 2006; Parker, Bindl, & Strauss, 2010). Although we know that ability and desire to take initiative is an important selection criterion for new hires at Enco, we are limited to giving recommendations on what companies need to do to design a proactive, initiative taking workforce. We can, however, illustrate how initiative taking, if it is shown, can be channeled, improved, and best utilized on a continuous basis.

CHAPTER 5

DYNAMICS OF SOCIAL NETWORK STRUCTURES ACROSS MULTIPLE IDEA PROPOSALS[4]

ABSTRACT

Using longitudinal data from the radical-idea suggestion system of a multinational firm, we analyze the reciprocal dynamic between idea outcomes and the social structure of an idea initiator's network. This study reveals that prior idea success has a positive effect on the average tie strength and size of an ego's idea network. Tie strength (up to a certain level) and size also positively shape subsequent idea success and, in fact, mediate the relationship between prior and subsequent idea performance. Together, these findings offer a dynamic perspective about an idea originator's social network structure across multiple idea proposals. Our study helps managers to source good ideas from their employees as it advises them on which social structures and employee performance records they should consider when establishing idea suggestion programs.

[4] *with Jan van den Ende*

INTRODUCTION

Ideas put forth by employees represent proactive initiatives to improve existing processes and products, prevent anticipated problems, or take advantage of new opportunities (Frese, Teng, & Wijnen, 1999; Frese & Fay, 2001). Particularly good ideas evolve from people who have access to novel information or useful resources (Hargadon & Sutton, 1997; Perry-Smith & Shalley, 2003; Perry-Smith, 2006). Social interactions allow individuals or collections of people to leverage each other's experiences, get emotional support for their creative efforts, and exchange and bundle resources across contexts (Nebus, 2006). Thus, "[s]ocial networking and effective communication are critical for developing novel ideas and garnering support and sponsorship to move an idea forward to realization" (Ford, 1996: 1124).

While we have an increased understanding of how relationships impact the process of initiating and developing ideas, we know very little about how ideas, and particularly their performance outcomes, reshape the social network structures that produced those ideas, and how the altered structures help or hinder subsequent performance (Lee, 2010; Perry-Smith & Shalley, 2003). Research on network dynamics has mainly focused on exploring how certain network structures evolve (e.g., Sasovova, Mehra, Borgatti, & Schippers, 2010; Soda, Usai, & Zaheer, 2004; Zaheer & Soda, 2009) without considering both the performance antecedents and performance outcomes of this evolution. In order to predict how idea inventors can achieve or maintain beneficial network structures for generating and continually developing high quality ideas, we need to know how social network structures result from prior performance, shape subsequent performance, and serve as a lynch pin between prior and subsequent performance. This is particularly important for companies which do not just wish to have a single burst of creativity from their employees, but which want to create an environment of permanent and high quality outcomes, such as ideas.

Our study offers two main theoretical contributions. First, we answer the calls to look more intensively at the consequences of creativity and innovation (Anderson, De Dreu, & Nijstad, 2004; George, 2007). Specifically, we investigate changes in the social network structures of an idea inventor (ego) following different levels of idea performance. It is reasonable to assume that network structures do not remain stable and/or unaffected by prior ideas and their outcomes

(Lee, 2010). Going beyond the effect of outcomes on networks, our second contribution lies in illuminating how idea performance and an ego's social network structure co-evolve. Specifically, we depict how an idea inventor loses, gains, or maintains beneficial structures for future idea performance depending on the prior idea performance (Blatt, 2009; McPherson, Smith-Lovin, & Cook, 2001; Payne, Moore, Griffis, & Autry, 2011). The mediating effect of network structures between a prior and a subsequent idea illustrates the importance of those structures as a conduit to transfer lessons learned.

Our research helps managers decide about whom among their employees they should involve in creative tasks to develop high quality ideas. As Sosa and Marle (2010) point out, where and how to source for good ideas, is still one of the biggest challenges that innovation managers have to face and they often address it on an ad-hoc basis. For instance, personal friends or colleagues that have some spare time are invited to participate in brainstorming sessions. But there is often no structured approach for getting high potential employees involved in such processes. Passively sourcing ideas can waste money and/or does not utilize the full creative potential of employees. A more objective selection criterion for managers could be people's past performance (Schwab & Miner, 2008; Singh & Agrawal, 2011). Our study illustrates that prior performance is a useful indicator to solicit ideas from high potential employees, particularly when also considering their current social network. This research helps managers with the "where" and "how" of innovation management: where to source good ideas and how to take advantage of the social relationships that spur high quality idea generation and development.

The setting of this study is the radical-idea suggestion system of a multinational firm with archived data spanning 887 ideas suggested over the course of 12 years by 310 employees. In keeping with prior research, we use these ideas as the indicators or products of initiative taking behavior (Frese, Teng, & Wijnen, 1999; Frese & Fay, 2001). Idea inventors submitted ideas to the innovation program on a completely voluntary basis and the company practiced no active sourcing policy to select talented inventors. The dataset therefore provides a unique and undisturbed view on how such a sourcing strategy could be applied in the future. In our study, we focus on how prior success (i.e., the adoption of an idea by a management panel) drives the evolution of the ego's network structures, in particular the strength of ties (i.e., the depth of

interaction or whether persons in the current ego network collaborated previously) and network size (i.e., the breadth of interaction or how many people collaborate in the current ego network). Furthermore, we investigate how these two network structures influence subsequent idea performance. We focus on tie strength and network size as they are the two most fundamental social network structures and simple, but informative indicators for managers in their decision about which network structures to consider when sourcing ideas.

THEORETICAL BACKGROUND

Social Networking for Ideas

Our study builds on the concept of initiative taking defined as the process by which an individual or group of individuals takes a proactive approach towards work (Frese, Teng, & Wijnen, 1999; Frese & Fay, 2001). A salient example of a product resulting from such self-starting behavior by employees are ideas; ideas, for instance, to improve existing processes and products, to prevent anticipated problems, or to take advantage of new opportunities. The concept of initiative taking is closely related to constructs such as taking charge (e.g., Morrison & Phelps, 1999), proactivity (e.g., Grant & Ashford, 2008; Parker & Collins, 2010), voicing issues or types of organizational citizenship behavior (e.g., Detert & Treviño, 2010; Podsakoff, MacKenzie, Paine, & Bachrach, 2000), as well as internal corporate entrepreneurship (e.g., Jones & Butler, 1992). Taking initiative differs from organizational citizenship behavior as it focuses more on creativity (Frese, Teng, & Wijnen, 1999). In contrast to types of internal corporate entrepreneurship, taking initiative can result in, but is not limited to, the study of internal venture creations. Ideas can be more radical, for instance a concept about a new business model; or more incremental, for instance a suggestion to improve a work process.

Ideas can be generated in isolation, but often networks of relationships form around emerging ideas to improve the chances of success (Burt, 2004; Kijkuit & Van den Ende, 2010). We follow the social capital notion, which refers to the resources available to an individual through a fabric of social relations and interactions; resources that can be mobilized to steer or facilitate action and behavior (Adler & Kwon, 2002; Coleman, 1988; McFadyen & Cannella Jr., 2004). In applying this lens, we focus on the relationships that an ego maintains in order to generate and

develop ideas by means of discussions. Such an ego network depicts the channels through which knowledge and information is shared and is thereby "one of the most important objects to study in order to unravel the secrets of creativity" (Kratzer, Leenders, & Van Engelen, 2008: 282).

For the purpose of this study, we refer to the ego's idea network (or just idea network) as an entity comprising the relationships between the idea initiator (ego) and other contributors (alters), as well as between the contributors themselves that actively discuss and champion the idea of the ego. We follow the ego and his or her social network connections along several idea trajectories. Because idea generation and development is a voluntary activity, the networks around the ego form autonomously and are not formally prescribed by some organizational structure or command. An ego can get an idea off the ground alone, but can also have many contributors who sign up to an idea. We focus on tie strength and network size as the structures of interest in ego's idea network. Tie strength relates to the average depth of interactions in an ego's idea network and is operationalized as the average number of repeated ties between the ego and the idea contributors and among the idea contributors. The ego's idea network size captures the number of network members who contributed to the idea initiated by the ego and therefore refers to the breadth of interactions, because every network member brings different knowledge to the network.

The type of informal network that we are investigating shares characteristics with an advice network through which resources such as information, assistance, and guidance are exchanged to help individuals execute their work (Nebus, 2006). The notion of resource exchange in social networks is also critical for idea generation and development (Burt, 2004; Fleming, Mingo, & Chen, 2007; Obstfeld, 2005; Perry-Smith & Shalley, 2003; Perry-Smith, 2006; Uzzi & Spiro, 2005). Ideas become better when people discuss them with members of different groups, departments, or firms (Burt, 2004; Kijkuit & Van den Ende, 2010). By discussing creative ideas with others, people are able to leverage each other's experiences, gain support, and bundle their interests in the various tasks of a creative process (Nebus, 2006). Shalley, Zhou, and Oldham (2004: 947) have broadly summarized these tasks arguing that they include "(1) identifying a problem/opportunity, (2) gathering information or resources, (3) generating ideas and (4) evaluating, modifying, and communicating ideas". While we assume that a high degree of

discussion intensity among idea network members is present in all these stages, it might serve different purposes. In the generation phase of an idea (tasks one to three), communication might be related to creating information variance by sharing knowledge and using input from several sources to create an idea which is novel and useful. In the development phase (task four), on the other hand, information convergence might play a more important role. Complex, often more technical, knowledge needs to be exchanged and much communication goes into building support and overcoming potential conflict and doubt (Kijkuit & Van den Ende, 2007).

Interaction between Network Structures and Idea Performance

The fundamental hypothesis in this paper is that an ego's network structures evolve depending on the outcome of a prior idea. There is an interaction going on between network structures and idea performance. In their conceptual paper, Perry-Smith and Shalley (2003) argue that a cyclical relationship exists between creativity and network position. They suggest that an increase in creativity leads to an increase in centrality and the increase in centrality leads to a further increase in creativity up to some point where self-correcting forces kick in. While Perry-Smith and Shalley's (2003) theory has not been tested empirically, other recent research by Lee (2010) gives some indication about the reciprocal dynamic between performance outcomes and network structure. His findings illustrate that high-performing biotech inventors are more likely to obtain a brokering position and that there is a positive effect of a brokering position on subsequent performance. However, the heterogeneity of the actors' performance history takes away the latter effect, indicating that past performance explains the influence of a brokering position on future success. Unfortunately, it is not clear from Lee's (2010) study how actor-level heterogeneity in past patent performance can serve as a plausible mediator between an inventor's current brokering position and his or her future innovation performance. In our study, we follow a more natural order in time, studying the influence of past performance on present network structures and the (mediating) effect of present network structures on future performance.

Other research that did not investigate a creative or innovative outcome, but did take a co-evolutionary network perspective is Balkundi and Harrison's (2006) meta-analytic study of the dynamic relationship between integrative network structures and team performance. The authors show that a densely connected team and high leader centrality (referred to as integrative network

structures), are more of an antecedent of team performance than an outcome of it. Thus, according to this study, the magnitude of the effect of network structures on performance is larger than the effect of performance on network structures. They also report that network structures have a reduced effect on team performance over time (Balkundi & Harrison, 2006). Autry and Golicic's (2010) study, regarding buyer-supplier relationship spirals, provides another empirical example of a co-evolutionary network study. They provide support for the idea that tie strength is positively related to performance (i.e., the extent to which the supplier completed the task satisfactorily) and that performance has a positive effect on subsequent relationship strength. Hence, buyer-supplier relationship strength and performance co-evolve over time.

Despite the first conceptual notions and empirical tests of how network structures and outcomes interact, we still know little about the dynamics that stand at the front-end of any innovation process, that is, the socio-structural changes happening to the idea inventor's network. Similarly, we know little about how different levels of performance affect the social structure of the ego's idea network. And finally, to be able to advise managers on sourcing ideas from people based on these network structures, we also need to better understand optimal levels in tie strength and network size. In this paper, we take these concerns explicitly into account. In contrast to prior studies using patent data where there is no information about the patents that were not filed, our dataset includes both information about the ideas that were adopted by the company (i.e., idea success) and information about the ideas that were not adopted (i.e., idea failure).

HYPOTHESES

Success of a Prior Idea and the Effect on Subsequent Idea Success

First, we conjecture that there is a positive relationship between prior and subsequent idea success. Generally, people's expectations, which are based on past successes, can be a powerful trigger for future successful creative action (Ford, 1996). Prior research has also shown that experiencing success provides people with a frame of reference and knowledge of proven routines (Gersick & Hackman, 1990). An idea inventor that achieved success carried the idea through all development phases. Thus, he or she is able to compare and contrast different

elements of the idea generation and development process and obtain a feeling for successful strategies (Kim, Kim, & Miner, 2009). Successful idea inventors have also learned how to create a match between the idea and company requirements. This so called "sensemaking" (Kijkuit & Van den Ende, 2007) knowledge can be applied and re-used in a new idea effort. Thus, regarding the most recent idea success, we predict a positive effect on subsequent success.

Hypothesis 1: *Prior idea success of the ego's idea network is positively associated with subsequent idea success.*

Success of a Prior Idea and the Effect on the Ego's Idea Network Structures

Past performance outcomes can influence network structures in several ways. If relationships are repeated over several idea trajectories, people accumulate knowledge by being exposed to each contributor's views, opinions, and frames of references. As they spend more time with one another (McFadyen & Cannella Jr., 2004), these knowledge exchanges increasingly tie people together. Trust is another issue. It "provides the necessary social-psychological lubricant that makes it possible for all members to function together" (Madhavan & Grover, 1998: 8). Prior collaborations that turn out to be successful also confirm the network participants' beliefs that valuable routines and processes, useful in solving complex issues, were developed (Nebus, 2006; Schwab & Miner, 2008). When members are satisfied with previous output they are also more likely to work together on a new idea project (Taylor & Greve, 2006). Moreover, past successful experiences raise future expectations which function as additional driving mechanisms, recasting weak ties into strong ties (Perry-Smith & Shalley, 2003; Uzzi, 1996).

As a result, we expect that after an idea is selected (i.e., idea success), the relationships between people who worked on and developed this idea become stronger. On the other hand, ties that network actors had with their former idea network weaken, if those networks generated an idea which was not selected (i.e., idea failure). This means that idea network members choose people for new ideas with whom they were previously successful.

Hypothesis 2a: *Prior idea success is associated with an increase in the tie strength for the ego's idea network.*

The creative success of an idea network can also send a strong signal to new or old actors who

make certain inferences about the quality of an ego's idea network and consequently seek to connect to the nodes in the successful network (Hallen, 2008; Perry-Smith & Shalley, 2003). Idea success does not only mean that the idea is pushed further in the implementation process, but it is a clear signal that an organization, and its leaders, value, approve, and support a new concept (Axtell, Holman, Unsworth, Wall, & Waterson, 2000). For instance, Axtell et al. (2000) found that employees whose ideas were implemented had higher leader and management support. Moreover, successes are often published in internal corporate magazines, the intranet, or a company's idea suggestion system, which further boosts the status of employees that have worked on an idea because other people, peers, or managers see and react to the successful creative action (Amabile, Barsade, Mueller, & Staw, 2005).

Consequently, network actors that were not involved in the prior idea development may find that a successful ego idea network promises, for instance, higher recognition within a company and therefore fulfill a desire for success and a need to feel valued. A successful ego idea network also signals untapped skills and knowledge to others and they might try accessing these assets by forming relationships to the idea inventor (Payne, Moore, Griffis, & Autry, 2011). When the quality of work is difficult to verify, people prefer to join or migrate to an ego's idea network with some performance record in the hope that these networks produce more value for them (Lee, 2010). This implies that an ego's idea network grows in size following a success. On the other hand, if ideas turn out to be unsuccessful, the idea network size will decrease due to status anxiety stemming from "a concern about being devalued because other actors question the quality of one's partners" (Jensen, 2006: 98). No new actors are attracted and, in fact, the supporters of an idea network vanish.

Hypothesis 2b: *Prior idea success is associated with an increase in the network size for the ego's idea network.*

Consequences of the Ego's New Idea Network Structures on Subsequent Idea Success

There is conflicting evidence about whether strong or weak ties relate to innovation (Rost, 2011). Weak ties are often argued to provide access to non-redundant and diverse knowledge pools (Granovetter, 1973; Perry-Smith & Shalley, 2003; Perry-Smith, 2006). However, more recent studies have found that strong ties are more beneficial for idea generation (Sosa, 2010) and idea

development in the front-end (Kijkuit & Van den Ende, 2010). In knowledge intensive environments, people must know and trust each other (Reagans & McEvily, 2003) to handle and transfer complex and difficult to verify information. In these environments, strong ties play a more important role than weak ties (Hansen, 1999; Reagans & McEvily, 2003). In contrast to weak ties, strong ties make exchange processes more efficient and less risky as a result of shared understandings, habits, and experiences (McFadyen & Cannella Jr., 2004; Nebus, 2006; Uzzi & Spiro, 2005). Strong ties can motivate both nodes in a relationship to acquire and process knowledge from each other (Sosa, 2010). Finally, they can be sign of social support which has been shown to be positively related to creativity (Madjar, Oldham, & Pratt, 2002). As a result, it can be expected that stronger ties can increase idea success by creating an atmosphere of trust in which people are motivated and able to quickly exchange complex information and are more likely to take risks. Across a variety of studies, these features have been recognized to be related to creativity and innovation (Amabile, Barsade, Mueller, & Staw, 2005; Hargadon & Sutton, 1997; Obstfeld, 2005; Rost, 2011; Sosa, 2010; Uzzi & Spiro, 2005).

However, taken to the extreme, a very high strength of ties in an ego's idea network can also harm the future chances of idea success, because it restrains actors from engaging in other, potentially more knowledgeable relationships (Nebus, 2006). The pool of information homogenizes too much (Uzzi & Spiro, 2005). Very high tie strength locks people into the familiar, trusted, and immediately available relationships and new, weaker ties which bring novel, non-redundant, and diverse information, beneficial for creativity (Perry-Smith, 2006) diminish. As the same people repeatedly collaborate with each other, they become more similar (Brass & Labianca, 1999) and develop a "baggage of shared history" which further suppresses the inflow of new information. Together, this means that the likelihood that successful new ideas are developed decreases (Skilton & Dooley, 2010).

Hypothesis 3a: *The tie strength of the ego's idea network is at first positively, but under very high levels negatively, associated with idea success.*

Idea networks can also increase the breadth of interaction by scaling up the number of contributors. An increase in an ego's idea network size is argued to enlarge the pool of information, experiences, and resources that all network actors can draw on (McFadyen &

Cannella Jr., 2004; Zaheer & Soda, 2009). The principle is that two people can do more than one. A larger network size allows for more serendipitous moments in which knowledge can be accessed and innovatively combined (Baer, 2010; Hargadon & Sutton, 1997; Perry-Smith, 2006). Moreover, with more information and different opinions, idea inventors are confronted with a range of contingencies, in the early stages, which might help them in suggesting and developing a better idea (Kijkuit & Van den Ende, 2007).

However, with too many actors in an ego's idea network it becomes difficult to reach consensus and integrate all of the different views of the various people (McFadyen, Semadeni, & Cannella Jr., 2009). Without consensus, the groups remain in a brainstorming mood, endlessly generating more and more ideas, but not realizing one of them further because no collectively supported, concrete proposal can be formulated (Kijkuit & Van den Ende, 2007). Idea networks that are too large also make it difficult to have intensive one-on-one discussions and instead, these networks tend to be overloaded with too many perspectives (Zhou, Shin, Brass, Choi, & Zhang, 2009). Moreover, with network structures too far away from optimal levels, people are more likely to disclose and advocate ideas that conform to commonly held expectations (Skilton & Dooley, 2010). This has a negative effect on creativity and thus on the success of a subsequent idea.

Hypothesis 3b: *The network size of the ego's idea network is first positively, but under very high levels negatively, associated with idea success.*

Success of a Prior Idea and the Mediating Effect of the Ego's Idea Network Structures on Subsequent Idea Success

Next, we argue that high tie strength carries a positive influence from recent success experience to subsequent idea performance. This means that the earlier hypothesized effect of individual learning from a prior experience on subsequent performance becomes weaker or disappears when average tie strength as a mediator is considered. Instead of learning individually, with a group of trusted people, one can better reflect upon all aspects of a successful idea; even on the factors that might not have gone so well during the generation and development process. This means that strong ties in an idea network provide information depth to the analysis of a prior experience. On an individual basis or with new network members, an ego is less able to capture all of the lessons learned from prior idea success because there is less variance in opinions and

probably also a less critical view on what can be improved next time. In such a case, idea inventors might be too restricted in their own views and opinions about the success and are more likely to make systematic biases in interpreting experiences (Levitt & March, 1988). Moreover, they are not challenged enough by other insights from prior collaborators. Strongly tied people are better able to express their critical opinion, transfer complex knowledge (Hansen, 1999), and utilize diverse backgrounds (Taylor & Greve, 2006) due to the trust, stability, and efficient communication engendered by their bond.

When people work with known others again, they also develop a transactive memory system defined as "a collective memory system for encoding, storing, retrieving, and communicating group knowledge" (Lewis, Lange, & Gillis, 2005: 581). As Lewis, Lange, and Gilles (2005) show, by utilizing an established transactive memory system, network members are better able to transfer experiences from one to the next task. A transactive memory system specifically helps in the development of collective and abstract knowledge about a task domain which is beneficial for learning from prior experiences as it stimulates people to retrieve prior experiences and recognize functional similarities with the current task.

The shared experiences of network members also make these people good candidates for an effort to apply the gained insights. A lone inventor will hardly think through the advantages and disadvantages of a variety of ideas. With prior collaborators, it is easier to evaluate and consolidate different views and together find the best way forward by choosing from several alternatives. As such, strong ties can extract value from joint experiences, while being able to create new knowledge and make use of future opportunities (Carley, 1992; Inkpen & Tsang, 2005).

Hypothesis 4a: *The tie strength of the ego's idea network mediates the positive association between prior and subsequent idea success.*

Instead of capturing and learning from past lessons through repeated relationships, network size and interactive learning with a larger group of people is argued to be another mediator that could weaken or completely capture the effect of individual learning. In contrast to an individual approach, learning in a larger network offers greater information breadth (Taylor & Greve,

2006). As the ego talks with more people about a past successful experience, he or she is, together with the network, better able to detect why a past idea was successful. Larger networks can to a greater extent stimulate reflection processes and generally encourage the sharing of knowledge. This is related to the idea that a group of people is able to more rapidly accumulate knowledge as compared to a situation where the same number of people has worked alone (Reagans, Argote, & Brooks, 2005). Moreover, as the same outcomes are often evaluated differently by different people (Levitt & March, 1988), having more members in an ego's idea network might enrich or outperform an individual learning process, because new combinations of knowledge are leveraged (Hargadon & Sutton, 1997). Thus, network size offers a forum for collective learning in which members can share and compare their opinions which each other. For instance, Brown and Duguid (1991) cite research that has looked into how service technicians, by sharing and discussing their experiences, build new insights and create new options that help them do their work. While each of the technicians also had individual experiences, only by communicating with each other were they able to collaboratively make sense of them.

A large ego idea network also offers more resources that can be used to analyze a past success. Individuals could be inclined to only learn about their past performance in a superficial way due to, for instance, time constraints. However, with critical mass there is more leeway to associate experts with particular aspects of a past effort and subsequently uncover the lessons learned for future idea submission. By extending existing knowledge with novel information, experiences, and resources, network size can be considered another potential mediator.

Hypothesis 4b: *The network size of the ego's idea network mediates the positive association between prior and subsequent idea success.*

METHOD

Sample and Setting

Our research context is the innovation program of a multinational company which we call "Enco" for the purpose of anonymity. To develop a deep understanding of the research context,

we regularly visited and worked at the research site, sat in team meetings and idea assessment panels, and conducted interviews with various innovation group members and over 25 recent idea submitters.

Enco setup their innovation program to invest in novel, early stage ideas that might radically transform the landscape of the energy industry. The purpose of the program is to provide money, connections, and guidance to idea inventors. Ideas could be concepts for potential markets, new products and services, or fundamental changes in processes. The process of Enco's innovation program is structured as follows: after the submission of a short description of the idea, two main gates must be passed before funding is awarded. First, proponents have the opportunity to give a short pitch about their idea in front of two team members of the innovation program. If this first screening is passed successfully, the idea submitters get some time and, if necessary, some research money to develop their proposal further. Then, the idea is presented to a broader group of experts, the second panel, typically consisting of team members within the innovation program as well as other internal and external experts in the field. The panel assesses the potential, viability, and impact of the idea. A definite decision is made about whether and how to go ahead with and/or fund the implementation. If funding is awarded, the idea formally becomes a project.

Throughout the study, we classify a successful idea trajectory as one where the idea was selected after the second panel and an unsuccessful trajectory as one where an idea was not accepted after either the first or second panel. Passing the second screening panel meant that a serious amount of resources was allocated to further the execution of an idea. Moreover, it would be at this stage that an idea transforms into a more formal project. Given that only ten percent of all submitted ideas passed the second screening panel, it is reasonable to label these ideas as successes. Idea inventors also told us that idea success is important because one *"[...] can decide how to allocate the money and really make the idea happen in the business"*. While we cannot completely rule out that exertion of political influence might play a role in the decision to advance the idea in the first panel, it is very unlikely that it is decisive in the second screening, which is the marker for our success variable. Enco's innovation program is an independent unit in the company that is measured by their ability to execute a select number of ideas that are

outside the scope of the current business strategy. This means that they must confirm that the concept behind the idea works. Accomplishing this goal is only possible by sponsoring high quality ideas. The selection of ideas is also based on clear criteria (idea novelty, idea value, and a plan to go ahead) which are communicated to the idea originators before they submit their idea. When providing feedback, the innovation managers go through each of these criteria. Interviews with idea initiators and Enco's innovation managers also confirmed that every initiative is taken seriously. The review committee always wants to give constructive feedback to the initiators and many valued this, as was indicated by a statement by on of the interviewed recent idea originators: *"I expect that the people who evaluate my idea have a much broader overview of what's worthwhile to pursue. I've got a lot of faith in the process and think there's probably some good reason behind a rejection".* Thus, innovation managers are mainly concerned with the content and quality of an idea rather than the status of an idea initiator. Moreover, due to the features and structure of the innovation program which is accessible to everybody inside the company, the need for internal selling of an idea by an originator to a decision maker is less prevalent (De Clercq, Castañer, & Belausteguigoitia, in press).

Our unit of analysis is the ego idea network working on one specific idea. Such an idea network has at least one member – the ego who initiated the idea. In addition, contributors can be part of the ego's idea network. We assume that all members of an ego's idea network are connected to each other and that the relationships between people are symmetric since the discussion of an idea takes place regardless of whether a network actor sends or receives information (cf. Kratzer, Leenders, & Van Engelen, 2008). This assumption is similar to prior studies that have investigated the social structure of authors that worked on the same paper (McFadyen & Cannella Jr., 2004), people working for the same movie (Schwab & Miner, 2008), or artists playing in the same musical (Uzzi & Spiro, 2005). As described earlier, we follow the idea initiator and his or her social network connections along several idea trajectories.

Our interviews and observations at the study site confirmed that idea initiators mentioned contributors right away when the idea was put into the database. The contributors played a critical role in generating the creative thought before submitting it to Enco and during the first development phases in the innovation program. Further evidence from our interviews with

Enco's innovation managers confirmed that only relevant contributors were listed in an ego's idea network. We cannot rule out the possibility that some people might have been free-riders. However, in our interviews the idea initiators almost always mentioned that, if they had other people working with them, it was for their highly specialized and often very technical expertise and advice. We also specifically asked about other tasks that idea contributors could fulfill, for instance, providing political or managerial support or helping manage the idea's acceptance. For such roles, the contribution to the quality of the idea could have been doubtful, but none of our interviewees indicated that people listed on the idea were contacted for these reasons.

We extracted all information from the database in November 2008. This sample consists of a twelve year archival record of 2,352 ideas. Of these ideas, 692 were initially coded as being in progress, which meant that people were still working on developing the idea in the phase before the first or second panel. After consultation with Enco, we classified 386 of these ideas as "closed" since no progress had been documented on them for more than four years; we also excluded the other 306 ideas in progress, because we were interested in performance effects which could not yet be observed for these ideas and their respective initiators. Moreover, we excluded ideas which were initially conceived by people external to Enco and ideas that were generated in workshops, because in workshops participants were asked to quickly generate specific solutions to pre-defined problems. Finally, we excluded all of the very first ideas (905) from an ego's idea network in order to examine the effect of prior performance experience. This data cleaning procedure resulted in an overall sample consisting of 887 ideas proposed by 310 idea inventors and their idea networks.

Dependent and Independent Variables

Idea success. As described earlier, we classified ideas as successful (i.e., we coded the variable with a value of one) when they passed the second screening that is organized by Enco to review the potential of the idea. *Prior idea success* refers to the idea success of the previous idea submitted by the same ego.

Tie strength. Similar to McFadyen, Semadeni, and Cannella Jr. (2009) and Fleming, Mingo, and Chen (2007), we measure tie strength through the observed frequency of repeated interactions.

Average tie strength = $\frac{\Sigma_i \Sigma_j tie\ strength_{ij}}{network\ size^2}$

For every focal idea network member, we counted whether it was the first, second, third, etc. time he or she worked with each of the other members of the idea network. We totaled these individual scores and divided this value by the squared number of total members in the network. The measure shows a higher score when the same people work together across several ideas.

Network size. We operationalized network size by counting the number of nodes in a given ego's network (Baer, 2010; Kijkuit & Van den Ende, 2010).

Control Variables

Network density. Network density could negatively influence idea success. Prior research has found that sparse structures provide access to diverse and unfamiliar information which could spark the generation of new and high quality ideas (Burt, 2004; Fleming, Mingo, & Chen, 2007). Network density measures the extent by which ties in a given network overlap. Density is sensitive to network size, but we effectively alleviate this concern by including measures for tie strength and network size (Zhou, Shin, Brass, Choi, & Zhang, 2009). Similar to McFadyen, Semadeni, and Cannella Jr., (2009), in order to operationalize network density, we divide the number of actual ties in an idea network by the number of unique possible ties. Possible ties are former relationships between people that stem from participation in previous idea initiatives (which could relate to different egos). Network density thus refers to the degree of utilization of everybody's contacts; contacts accumulated by every individual in all prior idea initiatives.

Employee activity and involvement. The productivity of an ego network and the accumulated experiences of its members might be alternative performance- and talent indicators that people take into account when deciding whether or not to contribute to an idea of a particular ego idea network (Schwab & Miner, 2008; Uzzi & Spiro, 2005). Both productivity and experience could also relate to the knowledge base of an idea network (McFadyen, Semadeni, & Cannella Jr., 2009; McFadyen & Cannella Jr., 2004); a knowledge base that could enhance learning from experience (Levitt & March, 1988) which, in turn, can influence subsequent idea success. We included a proxy which measures the *idea network involvement productivity*. To calculate this

measure, we divided the total number of ideas that an idea network member was involved in (initiating or contributing to an idea) by the number of months this person was active (from very first to last idea involved). We summed all productivity scores for every idea network member and divided this number by the idea network size. Additionally, we counted the prior success and failure experiences of all members in an ego's idea network and averaged each value by dividing by the idea network size *(idea network success experience*, *idea network failure experience)*. These measures reflect the degree of cumulative success and failure experiences that all people bring to the current idea network.

We further controlled for several dynamics that occur between idea trajectories as well as dynamics that unfold while idea network members work on one idea. We include these controls because they give an indication about the degree of involvement and thus the attachment of network members in a specific idea network of an ego. The level of attachment could influence network structures and subsequent success (Cattani, Ferriani, Negro, & Perretti, 2008). While we define the core idea network by the ego (the initiator of the idea), this person could have been a member of another idea network, too. If employees did not initiate an idea by themselves, they never appeared as the ego in an idea network in our data. We defined their "home" idea network as the idea network in which they were most often involved; if this was not applicable, we allocated them to the first idea they contributed to. We then calculated for every person at a given time the number of ideas he or she was involved in that did not belong to the "home" ego idea network and divided this by the total number of involvements. We then summed these individual scores and averaged them across number of current idea network members *(other prior involvements)*. We also calculated the degree of *overlapping involvements* by counting the other ideas a contributor was involved in while development on the focal idea had already started. We then summed these individual values and averaged them across current idea network members. This measure is only relevant for contributors, because all initiators finished a prior idea before proposing a new one.

Idea characteristics. The ideas of an ego network that are similar to previous ideas might provide an alternative explanation for why network members reactivate or strengthen their previously established relationships (Schwab & Miner, 2008). Moreover, if an idea is similar to a

previous one from the same idea network, then the success chances of the subsequent idea could be lower. This could be due to the fact that the management of Enco's innovation program is looking for radical ideas; similarity could be a sign of incremental progress between two ideas. Enco defines radical ideas as breakthroughs that will change the game across the energy system. To capture the *similarity to previous ideas* of the same idea network, we examined the given titles and counted how many relevant words in the respective headings overlap with the captions of any idea previously submitted by the same ego and his or her idea network.

Moreover, it might be very motivating for initiators to work on an idea which is considered of vital importance for Enco's business strategy. The classification of an idea as important in its nascent phase could be a first indication for subsequent success. We control for this effect by including a proxy stemming from the database that measures *confidentiality* of an idea (dummy-coded 1 for a confidential idea). Users of the idea database have no access to detailed descriptions of ideas classified as confidential.

An additional dummy variable controls for Enco's two *business units* (dummy-coded 1) for which ideas were submitted. As both units operate in different markets with specific dynamics, it is likely that people of each unit also submit different ideas. This might influence idea success. Moreover, due to the different organizational structures, it could also be that the people form and maintain relationships in a different way, during different occasions, etc.

Ideas and time. Recently submitted ideas are believed to be fresher in one's mind, more salient, and easier recalled (Levitt & March, 1988), which could influence the idea network's composition (Schwab & Miner, 2008). To control for this effect, we took the date an idea was submitted and measured the number of months that passed between a prior and a current idea submission from a single idea initiator. This procedure gave us a measure of *time elapsed since previous idea*, the time span between consecutive ideas. As a longer period of time would allow for more reflection and could allow learning to take place, we also included this control in models with idea success as the dependent variable.

Additionally, we used a *time* variable indicating the month in which the idea was submitted

(numbered since inception of the database). This variable is included as a control, since the repertoire of ideas and their success chances may be higher at the inception of a new idea capture system as compared to a situation where an idea system has been in place for a few years. For consistency purposes, we also included this variable as a control in all other models.

Moreover, we included several dummies to control for the *sequence* of the idea suggested by an idea network. These could be important controls for all of our dependent variables because they give an indication of the knowledge base (McFadyen, Semadeni, & Cannella Jr., 2009; McFadyen & Cannella Jr., 2004) and experience which could have a signaling effect on current and prospective network actors. Moreover, with more experience, one could expect learning to take place, potentially influencing subsequent idea success (Levitt & March, 1988).

Finally, we measure an *idea's lifetime* by taking the differences (in months) between the date an idea was submitted and the date of the last activity or alteration pertaining to this idea. The idea's lifetime might influence the success of an idea because having more time to work out the details of an idea might increase the chances of that idea being a success. Ideas which turn out to be successful have to go through a process of stages and gates, thus, they naturally have a longer lifetime. To correct for this, we divided lifetime by the number of gates the idea passed.

Analysis

We test the effect of prior idea success on tie strength and network size by means of a negative binomial regression, as both network variables are count variables. For tests involving our binary dependent variable, idea success, we use logistic regressions. Tests for mediation in logistic regression must be modified because the variance of the residual in the equations is fixed. The scale is contingent on the prediction, which depends, in turn, on the independent variables that are included in the equation. To make the coefficients comparable across the equations, we multiplied each coefficient by the standard deviation of the predictor variable and then divided it by the standard deviation of the outcome variable (Herr, 2010; Mackinnon & Dwyer, 1993). Following suggestions by Baron and Kenny (1986) and Shrout and Bolger (2002), we used the Sobel test to assess the significance of the indirect effect and the effect ratio to construct the strength of mediation. To correct for non-independence of observations belonging to the same

ego, we report robust standard errors adjusted for clustered observations of idea networks (Audia & Goncalo, 2007; Hallen, 2008). Due to the use of robust standard errors adjusted for clustering, we applied the Wald test instead of the more conventional likelihood-ratio test (Sribney, 2007). Coefficients estimated through a logistic regression do not directly indicate effect size. Instead, magnitude is determined by the change in the particular independent variable and its starting value as well as the values of all other independent variables (Hoetker, 2007; Long & Freese, 2006). We use a variety of methods to interpret the findings, including deriving the predicted probabilities of key independent variables and calculating changes in predicted probabilities, following procedures suggested by Long and Frese (2006).

RESULTS

In Table 1, we report the means and standard deviations of the measures as well as a correlation matrix. Tie strength, network size, and prior idea success all correlate positively and significantly with idea success. We checked the variance inflation factors (VIF's) for all reported models. For the model in which we included the squared term of the network size, we found a slightly higher than recommended value stemming from a high correlation to the linear term. We therefore calculated the conditioning index following a procedure by Belsley, Kuh, and Welsch (1980). A number of 30 or higher suggests multicollinearity, but throughout this diagnostic check, we encountered values much lower than the threshold. Our interest in the squared term persuaded us to leave the variable in the models. We also conducted the Box-Tidwell Transformation test and found that nonlinearity is not a problem in our models (Hilbe, 2009).

Test of Hypothesis 1: The Relationship between Prior and Subsequent Idea Success

Our results confirm that there is a positive relationship between prior idea success and performance of a subsequent idea submitted by the ego and his or her idea network (Table 2, Model 4: $b = .63$, $p \leq .10$) . Our control variables, idea network success and failure experience, also show positive and significant coefficients. While, as we will show later, prior idea success will become insignificant as network variables are added to the model, the success and failure experiences, accumulated over time, of all network members remain positive and significant.

TABLE 1
Descriptive Statistics and Correlation Matrix

Variable	Mean	S.D.	Min.	Max.	1	2	3	4	5	6	7	8	9
1. Idea success	0.10	0.30	0	1									
2. Tie strength	0.44	0.80	0	7	0.12 *								
3. Network size	1.59	1.16	1	12	0.16 *	0.67 *							
4. Prior idea success	0.08	0.28	0	1	0.19 *	0.08 *	0.10 *						
5. Network density	0.56	0.37	0.03	1	-0.18 *	-0.20 *	-0.19 *	-0.17 *					
6. Idea network involvement productivity	0.72	1.17	0.02	9	-0.10 *	0.09 *	0.08 *	-0.05	0.19 *				
7. Idea network success experience	0.09	0.39	0	5	0.15 *	-0.04	-0.03	0.09 *	-0.22 *	-0.02			
8. Idea network failure experience	4.13	7.36	0	45	-0.08 *	-0.17 *	-0.18 *	-0.07 *	-0.03	0.00	0.07 *		
9. Other prior involvements	0.15	0.21	0	0.94	0.15 *	0.32 *	0.19 *	0.15 *	-0.60 *	-0.19 *	0.07 *	-0.19 *	
10. Overlapping involvements	3.66	4.12	0	20	-0.07	-0.12 *	-0.17 *	-0.10 *	0.00	0.14 *	0.10 *	0.44 *	-0.05
11. Similarity to previous ideas	0.66	1.13	0	9	-0.01	0.13 *	0.01	0.00	-0.10 *	0.01	0.14 *	0.14 *	0.06
12. Idea confidentiality	0.26	0.44	0	1	0.19 *	-0.01	-0.03	0.10 *	-0.10 *	0.00	0.04	-0.18 *	0.15 *
13. Business unit	0.52	0.50	0	1	0.24 *	0.31 *	0.29 *	0.21 *	-0.14 *	-0.02	0.13 *	-0.34 *	0.22 *
14. Time elapsed since previous idea	8.31	13.78	0	96	0.21 *	0.03	0.10 *	0.15 *	-0.17 *	-0.21 *	-0.01	-0.20 *	0.17 *
15. Time	66.82	29.60	1	144	0.07 *	-0.30 *	-0.24 *	0.09 *	0.05	-0.03	0.12 *	0.22 *	-0.15 *
16. 2nd idea	0.35	0.48	0	1	0.01	0.03	0.07 *	0.02	0.18 *	-0.01	-0.16 *	-0.39 *	0.03
17. 3rd idea	0.17	0.38	0	1	0.03	0.05	0.08 *	0.03	0.03	-0.04	-0.04	-0.20 *	0.07 *
18. 4th idea	0.10	0.30	0	1	0.06	0.03	-0.03	0.01	-0.03	-0.01	0.01	-0.11 *	0.03
19. 5th idea	0.07	0.26	0	1	0.04	0.05	0.02	0.07 *	-0.06	0.02	0.05	-0.06	0.03
20. 6th idea	0.05	0.22	0	1	0.01	0.01	0.00	0.02	-0.11 *	0.00	0.11 *	-0.03	0.08 *
21. 7th idea	0.03	0.18	0	1	0.02	0.02	-0.01	-0.03	-0.07	0.02	0.05	0.00	0.01
22. 8th or higher idea	0.23	0.42	0	1	-0.11 *	-0.15 *	-0.14 *	-0.10 *	-0.10 *	0.03	0.10 *	0.76 *	-0.19 *
23. Relative lifetime	6.22	10.88	0	86	0.13 *	0.07 *	0.08 *	0.05	0.02	-0.08 *	0.08 *	-0.16 *	0.06

Variable	10	11	12	13	14	15	16	17	18	19	20	21	22
11. Similarity to previous ideas	0.03												
12. Idea confidentiality	-0.04	0.01											
13. Business unit	-0.24 *	0.06	0.35 *										
14. Time elapsed since previous idea	-0.31 *	-0.07 *	0.15 *	0.22 *									
15. Time	-0.04	0.00	-0.03	-0.24 *	0.23 *								
16. 2nd idea	-0.34 *	-0.16 *	0.05	0.20 *	0.18 *	-0.13 *							
17. 3rd idea	-0.14 *	-0.01	0.07 *	0.12 *	0.02	-0.06	-0.33 *						
18. 4th idea	-0.03	0.04	0.10 *	0.06	0.03	-0.03	-0.25 *	-0.15 *					
19. 5th idea	0.02	0.01	0.00	0.03	-0.02	-0.04	-0.20 *	-0.13 *	-0.09 *				
20. 6th idea	0.02	0.06	-0.03	-0.03	0.01	0.01	-0.17 *	-0.10 *	-0.08 *	-0.06			
21. 7th idea	0.06	0.00	0.02	-0.05	-0.03	0.03	-0.13 *	-0.08 *	-0.06	-0.05	-0.04		
22. 8th or higher idea	0.48 *	0.12 *	-0.19 *	-0.36 *	-0.23 *	0.22 *	-0.39 *	-0.25 *	-0.18 *	-0.15 *	-0.12 *	-0.10 *	
23. Relative lifetime	0.10 *	-0.01	0.08 *	0.10 *	0.03	-0.07 *	0.07 *	0.04	0.04	0.06	-0.01	-0.01	-0.17 *

n = 887, clusters =310. * $p < .05$; two-tailed tests.

TABLE 2
Results of (Negative Binomial) Logistic Regression Analysis

Variable	Model 1 DV: Tie strength		Model 2 DV: Network Size		Model 3 DV: Idea Success (base)		Model 4 DV: Idea success		Model 5 DV: Idea success		Model 6 DV: Idea success		Model 7 DV: Idea success	
Constant	-1.21 ***	(0.23)	0.50 ***	(0.10)	-4.29 ***	(0.63)	-4.28 ***	(0.63)	-4.51 ***	(0.65)	-5.11 ***	(0.71)	-5.08 ***	(0.71)
Network density					-1.32 *	(0.57)	-1.22 *	(0.56)	-1.31 *	(0.57)	-1.04 ^	(0.59)	-1.12 ^	(0.59)
Idea network involvement productivity	0.20 *	(0.09)	0.09 *	(0.04)	-0.24	(0.19)	-0.25	(0.19)	-0.50 ^	(0.29)	-0.60 ^	(0.36)	-0.70 ^	(0.37)
Idea network success experience	-0.33 ^	(0.19)	-0.07	(0.05)	0.33	(0.20)	0.34 ^	(0.20)	0.39 *	(0.20)	0.37 ^	(0.20)	0.39 *	(0.20)
Idea network failure experience	-0.07 ^	(0.03)	-0.01 *	(0.01)	0.05 *	(0.02)	0.05 ^	(0.02)	0.05 *	(0.02)	0.06 *	(0.02)	0.06 *	(0.02)
Other prior involvements	1.86 ***	(0.25)	0.43 ***	(0.12)	0.03	(0.67)	0.04	(0.66)	-0.62	(0.76)	-0.08	(0.68)	-0.44	(0.78)
Overlapping involvements	-0.09 ***	(0.03)	-0.03 ***	(0.01)	0.01	(0.05)	0.01	(0.05)	0.03	(0.06)	0.03	(0.05)	0.04	(0.06)
Similarity to previous ideas	0.12 ***	(0.03)	0.00	(0.02)	-0.10	(0.14)	-0.11	(0.15)	-0.17	(0.15)	-0.10	(0.15)	-0.13	(0.15)
Idea confidentiality	-0.40 **	(0.15)	-0.22 ***	(0.06)	0.57 *	(0.26)	0.58 *	(0.27)	0.67 *	(0.27)	0.72 **	(0.27)	0.74 **	(0.27)
Business unit	0.84 ***	(0.19)	0.31 ***	(0.06)	1.80 ***	(0.40)	1.71 ***	(0.40)	1.55 ***	(0.41)	1.58 ***	(0.40)	1.52 ***	(0.41)
Time elapsed since previous idea	0.00	(0.00)	0.01 **	(0.00)	0.02 *	(0.01)	0.02 *	(0.01)	0.01 ^	(0.01)	0.01	(0.01)	0.01	(0.01)
Time	-0.01 ***	(0.00)	0.00 ***	(0.00)	0.01 *	(0.01)	0.01 *	(0.01)	0.02 **	(0.01)	0.02 **	(0.01)	0.02 ***	(0.01)
3rd idea	0.23 *	(0.10)	0.11 *	(0.05)	-0.08	(0.36)	-0.06	(0.38)	-0.07	(0.38)	-0.22	(0.39)	-0.19	(0.39)
4th idea	0.40 *	(0.18)	0.00	(0.07)	0.24	(0.38)	0.26	(0.39)	0.25	(0.39)	0.31	(0.39)	0.30	(0.39)
5th idea	0.56 **	(0.19)	0.11	(0.08)	0.04	(0.52)	-0.03	(0.53)	-0.09	(0.52)	-0.05	(0.52)	-0.07	(0.51)
6th idea	0.46 ^	(0.26)	0.11	(0.10)	-0.02	(0.61)	-0.04	(0.62)	-0.11	(0.64)	-0.06	(0.60)	-0.10	(0.61)
7th idea	0.99 ***	(0.30)	0.20 ^	(0.11)	0.10	(0.65)	0.19	(0.66)	-0.08	(0.71)	0.06	(0.66)	-0.05	(0.68)
8th or higher idea	1.12 ***	(0.20)	0.35 *	(0.16)	-0.88	(0.87)	-0.80	(0.87)	-1.01	(0.89)	-1.13	(0.88)	-1.16	(0.88)
Relative lifetime					0.03 ***	(0.01)	0.03 ***	(0.01)	0.03 ***	(0.01)	0.03 **	(0.01)	0.03 **	(0.01)
Prior idea success	0.25 ^	(0.14)	0.15 *	(0.07)			0.63 ^	(0.36)	0.59	(0.37)	0.58	(0.37)	0.56	(0.37)
Tie strength									0.54 ***	(0.16)			0.32 ^	(0.17)
Tie strength squared														
Network size											0.39 ***	(0.08)	0.32 ***	(0.09)
Network size squared														
Wald χ^2	242.72 ***		206.66 ***		104.15 ***		108.81 ***		120.55 ***		120.55 ***		129.27 ***	
Pseudo R^2					0.22		0.23		0.25		0.25		0.25	
Log pseudolikelihood	-646.64		-1203.47		-227.00		-225.12		-218.26		-218.26		-217.07	
Wald test (added to base)							3.06 ^		26.25 ***		26.25 ***		22.29 ***	
Wald test (quadratic term)														
Wald test (interaction term)														
N	887		887		887		887		887		887		887	
Clusters	310		310		310		310		310		310		310	

Robust standard errors are in parentheses. ^ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; two-tailed tests.

TABLE 2
Continued

Variable	Model 8 DV: Idea success		Model 9 DV: Idea success		Model 10 DV: Idea success		Model 11 DV: Idea success	
Constant	-4.98 ***	(0.71)	-5.20 ***	(0.73)	-5.35 ***	(0.75)	-5.43 ***	(0.78)
Network density	-1.12 ^	(0.59)	-0.99	(0.60)	-0.93	(0.61)	-1.08 ^	(0.60)
Idea network involvement productivity	-0.64 ^	(0.36)	-0.67 ^	(0.38)	-0.72 ^	(0.41)	-0.73 ^	(0.38)
Idea network success experience	0.46 *	(0.20)	0.46 *	(0.21)	0.43 *	(0.21)	0.39 *	(0.20)
Idea network failure experience	0.05	(0.03)	0.05	(0.03)	0.06 *	(0.03)	0.05 *	(0.03)
Other prior involvements	-0.41	(0.76)	-0.22	(0.78)	-0.16	(0.79)	-0.40	(0.79)
Overlapping involvements	0.05	(0.06)	0.06	(0.06)	0.06	(0.06)	0.04	(0.06)
Similarity to previous ideas	-0.15	(0.14)	-0.11	(0.15)	-0.10	(0.16)	-0.12	(0.15)
Idea confidentiality	0.76 **	(0.26)	0.76 **	(0.27)	0.77 **	(0.27)	0.75 **	(0.27)
Business unit	1.50 ***	(0.41)	1.45 ***	(0.41)	1.44 ***	(0.41)	1.49 ***	(0.41)
Time elapsed since previous idea	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)
Time	0.02 ***	(0.01)	0.02 ***	(0.01)	0.02 ***	(0.01)	0.02 ***	(0.01)
3rd idea	-0.09	(0.39)	-0.10	(0.39)	-0.15	(0.39)	-0.18	(0.39)
4th idea	0.30	(0.39)	0.34	(0.39)	0.37	(0.39)	0.34	(0.39)
5th idea	-0.09	(0.52)	-0.04	(0.51)	-0.02	(0.50)	-0.05	(0.51)
6th idea	0.01	(0.57)	-0.08	(0.58)	-0.14	(0.59)	-0.09	(0.59)
7th idea	0.02	(0.68)	0.17	(0.69)	0.17	(0.69)	0.00	(0.68)
8th or higher idea	-1.18	(0.92)	-1.14	(0.91)	-1.13	(0.89)	-1.07	(0.88)
Relative lifetime	0.03 **	(0.01)	0.03 **	(0.01)	0.03 **	(0.01)	0.03 **	(0.01)
Prior idea success	0.54	(0.37)	0.47	(0.38)	0.45	(0.38)	0.53	(0.37)
Tie strength	1.01 ***	(0.21)	1.67 ***	(0.37)	1.51 ***	(0.45)	0.19	(0.21)
Tie strength squared			-0.35 *	(0.15)	-0.42 **	(0.15)		
Network size					0.16	(0.13)	0.65 *	(0.29)
Network size squared							-0.04	(0.03)
Prior idea success x High tie strength	-2.80 **	(1.01)	-1.12	(0.89)				
Wald χ^2	129.87 ***		132.04 ***		128.85 ***		125.28 ***	
Pseudo R^2	0.26		0.27		0.27		0.26	
Log pseudolikelihood	-215.26		-213.40		-213.31		-216.44	
Wald test (added to base)	27.08 ***		32.85 ***		31.47 ***		21.55 ***	
Wald test (quadratic term)			5.28 *		7.69 **		1.42	
Wald test (interaction term)	7.64 **		1.60					
N	887		887		887		887	
Clusters	310		310		310		310	

Tests of Hypotheses 2a and 2b: The Relationship between Prior Idea Success and the Ego's Idea Network Structures

Table 2, Model 1 and 2 present our findings related to the impact of prior idea network success experience on tie strength and network size. Our hypotheses are confirmed. Prior idea network success is positively associated with tie strength (Table 2, Model 1: $b = .25$, $p \leq .10$) and network size (Table 2, Model 2: $b = .15$, $p \leq .05$). For both coefficients, we conducted Wald tests which were significant, indicating an improvement in model fit. In Table 3, we provide additional detail to interpret the coefficients. Specifically, we report marginal effects and factor change coefficients for both unit and standard deviation increases. Please note that when the effect of one variable is calculated, all others are held constant at their mean value.

TABLE 3
Changes in Predicted Probabilities

Variable	Tie strength (Table 2, Model 1)			Network size (Table 2, Model 2)			Idea success (Table 2, Model 10)		
	Marg. eff.	-+1/2	-+ s.d. /2	Marg. eff.	-+1/2	-+ s.d. /2	Marg. eff.	-+1/2	-+ s.d. /2
Network density							-0.03	-0.04	-0.01
Idea network involvement productivity	0.06	1.22	1.27	0.13	1.09	1.11	-0.03	-0.03	-0.03
Idea network success experience	-0.09	0.72	0.88	-0.10	0.94	0.97	0.02	0.02	0.01
Idea network failure experience	-0.02	0.94	0.62	-0.02	0.99	0.91	0.00	0.00	0.02
Other prior involvements	0.52	6.44	1.48	0.66	1.54	1.10	-0.01	-0.01	0.00
Overlapping involvements	-0.02	0.92	0.70	-0.04	0.97	0.89	0.00	0.00	0.01
Similarity to previous ideas	0.03	1.12	1.14	0.00	1.00	1.00	0.00	0.00	0.00
Idea confidentiality	-0.10 [+]	0.67	0.84	-0.32 [+]	0.80	0.91	0.03 [+]	0.03	0.01
Business unit	0.24 [+]	2.31	1.52	0.47 [+]	1.36	1.17	0.06 [+]	0.06	0.03
Time elapsed since previous idea	0.00	1.00	1.04	0.01	1.01	1.07	0.00	0.00	0.01
Time	0.00	0.99	0.72	-0.01	1.00	0.87	0.00	0.00	0.02
3rd idea	0.07 [+]	1.26	1.09	0.18 [+]	1.12	1.04	-0.01 [+]	-0.01	0.00
4th idea	0.13 [+]	1.49	1.13	0.00 [+]	1.00	1.00	0.02 [+]	0.01	0.00
5th idea	0.20 [+]	1.75	1.15	0.17 [+]	1.12	1.03	0.00 [+]	0.00	0.00
6th idea	0.16 [+]	1.58	1.10	0.17 [+]	1.11	1.02	-0.01 [+]	-0.01	0.00
7th idea	0.46 [+]	2.70	1.19	0.34 [+]	1.22	1.04	0.01 [+]	0.01	0.00
8th or higher idea	0.45 [+]	3.08	1.60	0.59 [+]	1.42	1.16	-0.03 [+]	-0.04	-0.02
Relative lifetime							0.00	0.00	0.01
Prior idea success	0.08 [+]	1.29	1.07	0.24 [+]	1.16	1.04	0.02 [+]	0.02	0.00
Tie strength							0.06	0.06	0.05
Tie strength squared							-0.02	-0.02	-0.05
Network size							0.01	0.01	0.01

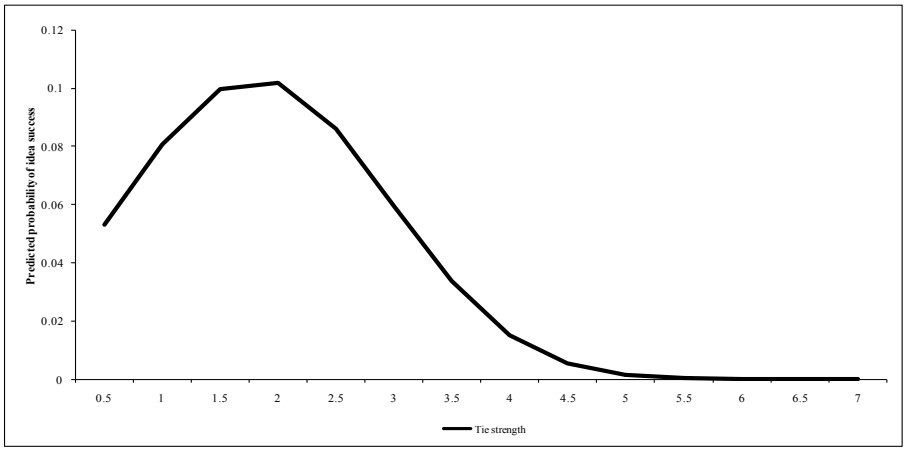
[+] Marginal effects are for discrete change of dummy variable from 0 to 1.

Tests of Hypotheses 3a and 3b: The Relationship between the Ego's Idea Network Structures and Subsequent Idea Success

Tie strength has a positive effect on idea performance (Table 2, Model 7: $b = .32$, $p \leq .10$). In Model 10, we also find confirmation for the inverted U-shaped effect of tie strength on idea success, confirming Hypothesis 3a (Table 2, Model 10: $b = -.42$, $p \leq .01$). Joint Wald tests were

again significant. Figure 1 illustrates the squared term related to the predicted probabilities of idea success. We only depict values that are in the range of our data. The inflection point appears when tie strength reaches a value of 2, after which it begins to have a negative effect on idea success.

FIGURE 1
Effect of Tie Strength on Idea Success



We find supporting evidence for the main effect of network size on subsequent performance (Table 2, Model 7: b = .32, $p \leq .001$). Joint Wald tests conducted after the coefficients were added to the baseline model turned out to be significant. However, we have to reject Hypothesis 3b, because there is no significant effect of the squared network size on idea success (Table 2, Model 11: b = -.04, not significant). In Table 3, we provide additional detail to interpret the coefficients taken from Model 10, Table 2.

Tests of Hypotheses 4a and 4b: The Relationship between Prior and Subsequent Idea Success Mediated by the Ego's Idea Network Structures

To investigate mediation, we tested the direct effect of prior idea success on focal idea success and reported a positive and significant relationship (Table 2, Model 4: b = .63, $p \leq .10$). As reported earlier, prior idea success significantly accounted for variation in tie strength (Table 2,

Model 1: $b = .25$, $p \leq .10$) and network size (Table 2, Model 2: $b = .15$, $p \leq .01$). We tested the effect of the mediators on idea success while controlling for our initial independent variable, prior idea success, and found a significant and positive association between tie strength and subsequent idea success (Table 2, Model 5: $b = .54$, $p \leq .001$) and between idea network size and subsequent idea success (Table 2, Model 6: $b = .39$, $p \leq .001$). Finally, we found complete mediation since prior idea success turns out to be insignificant when tie strength is added to the model (Table 2, Model 5: $b = .59$, non significant), as well as when the network size is added (Table 2, Model 6: $b = .58$, non significant). We used the rescaled values (see Table 4) in the Sobel test and found a significant score for both suggested mediators, meaning that they carry the influence of prior idea success to the dependent variable, focal idea success, thus confirming Hypothesis 4a and 4b. Model 7, in which we included both mediators simultaneously, shows similar results to the earlier analysis in which we separately tested the mediators. Both mediators have positive and significant coefficients whereas prior idea success becomes insignificant when both mediators are added.

TABLE 4
Mediation Results

Mediator	Path	Comparable *b*	Comparable s.e	
Tie strength	Prior idea success > Idea success	0.10	0.06	^
	Prior idea success > Tie strength	0.04	0.02	^
	Tie strength > Idea success (controlling for prior idea success)	0.23	0.07	***
	Prior idea success > Idea success (controlling for tie strength)	0.09	0.06	
	Sobel test: *z*-value: 1.71, s.e.: 0.01, ^			
Network size	Prior idea success > Idea success	0.10	0.06	^
	Prior idea success > Network size	0.02	0.01	*
	Network size > Idea success (controlling for prior idea success)	0.20	0.06	***
	Prior idea success > Idea success (controlling for network size)	0.08	0.06	
	Sobel test: *z*-value: 1.84, s.e.: 0.00, ^			

^ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$; two-tailed tests.

The above analysis was performed with linear mediators. However, as shown before, the tie strength of an ego's idea network turned out to be a curvilinear effect. The question is how the curvilinear effect of tie strength relates to the direct effect of prior idea success on subsequent idea success. The curvilinear effect of tie strength suggests that at high values of tie strength, the effect of prior idea success on focal idea success may not be positive any more. To test this assumption, we follow the reasoning of Langfred (2004) about different moderated mediation procedures and introduce a variable, dummy-coded one for tie strength values greater than two (which marks the inflection point as depicted in Figure 1). In Model 8, we inserted the

interaction term between prior idea success and this new variable. It appeared that the interaction term was negative and significant indicating that at high levels of tie strength, the effects of prior idea success on subsequent idea success diminishes. Apparently, prior idea success has a decreasing effect on subsequent idea success, if tie strength is high. Next, we added the squared tie strength term to Model 9. It appeared to be negative and significant, while the interaction term was not significant any more. The conclusion is that both the linear effect of tie strength and the decreasing effect of prior idea success on subsequent idea success are taken away by the square of tie strength. Thus, the positive indirect effect of prior idea success is accounted for by tie strength, but only at intermediate levels and not at very high or very low levels.

DISCUSSION

Our findings reveal that prior idea success is positively related to the reinforcement of network characteristics. Prior success experience strengthens repeat collaboration within the idea network of an ego and also has a positive influence on the network size. Both of these network structures are positively related to idea performance. However, for tie strength, we also find confirmation of a quadratic effect. Finally, we find that both tie strength and network size mediate the relationship between prior idea success and subsequent idea performance.

Theoretical Implications

This study presents an in-depth investigation of the dynamic changes in the social fabric of relatively small networks set-up to generate and develop radical ideas. We contribute to the social network and creativity literature by highlighting micro-sociological changes in the time between an employee's ideas.

The two mediators that we tested represent mechanisms of an increasing depth (tie strength) and breadth (network size) of interactions. The question then becomes: which of the two mechanisms is better for ensuring idea success? Repeating ties with prior idea network members is probably the most efficient option as it is less expensive, less time- and less energy-consuming than growing the network. This option also bears less uncertainty about how helpful a new tie will

actually be (Lee, 2010). Repeating ties can also carry the positive influence of prior idea success to new idea performance, because strong ties create the trust and stability which allow members to constructively elaborate on and use joint experiences for future action. However, repeating ties with known others can be a mixed blessing as confirmed in our study. When tie strength in an ego's idea network reaches a threshold of two, the influence of tie strength on subsequent idea success becomes negative. Moreover, at high values of tie strength, the effect of prior idea success on focal idea success is no longer positive. In that respect, increasing the breadth of interaction through a larger network size might be a safer bet. Indeed, for the squared effect of idea network size we do not find a statistically significant value. Network size carries the influence of a recent success experience to subsequent idea success by increasing the number of contributors to an idea. Network size therefore complements existing knowledge with novel information, experiences, and resources, which creates new opportunities to combine knowledge into an innovative idea. An explanation for why we did not find an inverted U-shaped relation for network size and idea success might be related to the fact that idea networks, in our context, were often rather small. Similar to the observation of Taylor and Greve (2006), there were also not many idea networks consisting of six or more members; this makes it difficult to detect a curvilinear relation.

Our study answers calls for research on the topic of the co-evolution of network characteristics and their outcomes (e.g., Blatt, 2009; George, 2007; McPherson, Smith-Lovin, & Cook, 2001; Payne, Moore, Griffis, & Autry, 2011). The findings reveal that without a study of prior performance outcomes, we are not fully able to capture the evolution of networks and therefore the benefits, drawbacks, or mediating roles that certain structures can exercise on subsequent performance. There is an opportunity for future research to further explore the reciprocal relationships in social networks by teasing apart the mechanisms that allow idea networks to take advantage of network characteristics, while not entering a negative spiral. Our results give some initial clues. For instance, idea network involvement and productivity is positively associated with tie strength and network size, but negatively with subsequent idea success. Working with people who have low productivity scores can therefore decrease the speed of reinforcement in network characteristics, while they can increase the success chances of ideas.

Recent findings by Lee (2010) indicate that brokerage does not have an effect on future performance when past performance is included. Contrary to his study, we found that two other network variables fully mediate the influence of past performance on future performance. Additional analysis of our proxy for brokerage, network density, shows that past performance is negatively related to this density measure and that density is also negatively associated with subsequent performance, even when past performance is controlled for. We were not able to measure brokerage in its classical form because members of an idea network are always fully connected to each other, but our results related to the proxy measure suggest that Lee's (2010) findings would not apply to our study. One explanation for these diverging results could be the context of the two studies. A brokerage role of U.S. biotech inventors (the empirical base of Lee (2010)) might mean something different than a brokerage role of idea initiators. For instance, one could expect that biotech inventors have a higher functional homogeneity (i.e., all are scientists) when they work together on a patent, even when they have a brokerage position. Brokerage in idea initiation, particularly if connecting people in a single firm, will usually mean that different functional backgrounds are brought together which, in turn, has a positive influence on idea performance. A next step for future research could be the further demarcation of network structure from network content which includes the background and different expertise of people, while studying the co-evolution of networks and their outcomes.

Some interesting results of this study also relate to the difference in short- and long term past performance experiences. While we used prior idea success and the most recent idea outcome as a driver for network changes, we also included long-term success and failure experiences of everybody involved in an idea as control variables in our models. In particular, the variable, idea network success experience, remains positive and significant in our models, even if tie strength and size are included. Following the classic learning curve literature, an explanation for this finding could be that people become more successful, the more experiences they have accumulated (Levitt & March, 1988). That the cumulated effect persisted and was not absorbed by the relational structures of an ego network could be a result of the volatile nature of the relationships in the ego's idea network. The accumulated experiences might serve as an independent asset which can be built upon, but they might not influence the decision of an old network member to repeat a relation and/or of a new network member to join an ego's idea

network. As such, the cumulated experiences are more of an indication of basic skills that are useful in every creative process (Taylor & Greve, 2006), whereas, to learn from the most recent outcome, one either needs, to some degree, old collaborators or a large network. In contrast to individual learning from a recent success, these network structures are particularly suited to transfer the recent lessons learned as they enable critical and reflective discussions with known others, provide access to the groups' transactional memory, and stimulate knowledge combination processes, which, together, foster the generation and development of better subsequent ideas.

Our findings also have general implications for creativity research. Ideas inject creative stimuli for much needed innovations in companies. Nevertheless, by putting a lens at the end of an idea trajectory, it seems that the focus of attention is still largely directed towards the best mechanism by which to harvest more and more ideas. The problem with this perspective is that a high number of low quality ideas is costly to administer and review (Kijkuit & Van den Ende, 2010). We show which network characteristics are conducive to high quality ideas. Moreover, we illustrate that approved or unapproved ideas can trigger "boomerang effects" which elicit changes in the social structure of an idea network; changes that can, in turn, influence prospective creative efforts. Our study provides socio-structural insights into how employees' creative efforts can be sustained so that enterprises can profit from them as long as possible (Skilton & Dooley, 2010). Specifically, this means that while some network stability can be desirable, the structures also need to be "refreshed". For instance, the problem of having a high tie strength in an idea network can be lowered by attracting new people to the network.

While our model and findings are limited to a specific form of network (those that revolve around a given ego and his or her creative idea), the uncovered patterns and the insights that this study generated are also applicable to project-based firms, who are organized around projects during which intensive knowledge exchange takes place (e.g., Hobday, 2000). Moreover, our study could have implications for the literature on experienced or serial entrepreneurs (e.g., Ucbasaran, Westhead, & Wright, 2009). Similar to our study, the question in these literature streams is also how social networks evolve between one project and the next project or new venture and how, together with the network, people learn from prior experiences. Our results

suggest that following a first recent success, project teams and serial entrepreneurs should work together again while also trying to attract new members to their network. When applying this strategy, they can learn the most from the prior success and have higher chances of successfully completing a subsequent project or new venture.

Managerial Implications

Our study instructs more powerful social resources management that aims to activate the right type of relationships in ever-changing networks and thereby trigger creativity in employees without exhausting their potential (Brass & Labianca, 1999). We focused on relationships that can be activated among employees (Balkundi & Harrison, 2006) as a means to foster ongoing creative input. When actively sourcing good ideas, managers are advised to contact people that have successfully worked on an idea before, with at least a few other people that also know each other. The optimal level is accomplished when people work together on an idea for a second time (on average). A quick look into the submission history of the employees in a department will be very informative in this respect.

Managers can also take more active measures to create incentives that stimulate collaboration in general. This means that one does not look for the most promising idea inventors, but creates conditions that foster social network structures among employees that are beneficial to idea generation and development. One measure, for instance, could be that initiators of an idea should always contact somebody from another department to team-up and proof-read the idea before submitting it. By stimulating a dialogue, before the submission of an idea to the innovation group, tie formation is encouraged through which potential problems can be mitigated and promising avenues exploited. Managers can also support the relationship formation process by making expertise more visible to everyone. When an ego and his or her idea network submits an idea to the innovation group, an algorithm based on keywords could identify other people who claim to have competencies in the areas the idea touches upon. Another policy could be to make the “work in progress” more visible to people outside of the innovation group or even outside of the company. To date, work is done in an isolated manner, behind closed curtains. Opening up the innovation agenda to more people could stimulate the formation of new relationships and hence a new inflow of knowledge into an idea network.

However, as our results show, repeat collaboration is only beneficial to some degree and managers need to strike a balance between network characteristics that, at lower levels, are conducive to creativity, but at higher levels do more damage than good. The recommendations about how to increase networking behavior, suggested previously, can also serve as guidelines on how to slow the reinforcement of network structures. For example, while opening up the innovation agenda could benefit networking, if managers make ideas less visible they can decrease growth of a network and slow the process of a spiral development. In fact, our results indicate that a confidentiality status for an idea has a negative impact on idea network size.

Limitations and Future Research

One of the assumptions we made was that idea discussions are carried out regardless of which network actor sends and which one receives the information. Thereby, we symmetrized the direction of ties (cf. Kratzer, Leenders, & Van Engelen, 2008). Future research could delineate the formation, stagnation, or deconstruction of relationships based on social exchange or similarity-attraction theories (e.g., Klein, Beng-Chong, Saltz, & Mayer, 2004). Such research could control for the socio-psychological behavior taking place in idea networks of different size, with varying degrees of tie strengths.

In our study, we focused only on network structures. Unfortunately, we were not able to collect demographic data for the people who initiated or contributed to an idea. This was due to the strict personal data policy applied in the company. However, it is reasonable to assume that aspects of network content, such as functional diversity in a network, might have positive implications for idea performance (e.g., Reagans & Zuckerman, 2001).

Another useful extension would be the investigation of network relationships beyond an idea. For our study, we could not gather data about the general professional network of a person and the influence of a success or failure of an idea on such network structures. Our observations and interviews at Enco suggest that through the act of generating an idea alone, people get in touch with new colleagues and these new connections most likely last longer than the development of an idea and are independent of the success or failure of an idea. On the other hand, younger employees indicated that successful ideas could give them recognition and help them building a

network in the company. For instance, one respondent said that with a successful idea *"you get your name out and justify your place"*. Future research could empirically test this observation and explore whether the performance of a temporal idea network influences the structure of the general professional network.

An assumption we made was that ideas are successful when they are selected or approved after development. However, what is seen as "success" naturally depends on the eye of the beholder. Recognition by peers, for example, could serve as a substitute to the acceptance by a management panel in terms of initiating network structural changes. Moreover, the content of an idea can spark network dynamics not described in this paper. For instance, an idea about decreasing the need for personnel could be appreciated by the management, but not by the colleagues affected by those job cuts. This, too, leaves room for researchers to explore how perceived idea success and idea content can interact with changes in network structure over time.

CHAPTER 6
GENERAL DISCUSSION

"All I desire is to be enriched by exciting new thoughts." (René Magritte)

We started the introduction of this dissertation inspired by a painting by René Magritte, "la Golconde". As a surrealist painter, Magritte's mission was to find novel relationships—to depict unusual associations of images and objects. Having presented four empirical studies, and in reference to the above quote, we hope to have enriched you, the dear reader of this dissertation, with new food for thought. May the findings of this dissertation and the juxtapositions of the results in various environments, unleash creative thoughts and solutions.

We often refer to ideas as the starting point for innovation (Mumford & Gustafson, 1988; Van de Ven, 1986). Ideas are defined as a "thought or suggestion to a possible course of action" (Oxford English Dictionary, 2000). In this dissertation, we investigated ideas that were voluntarily and proactively submitted by employees inside three company. It is a fairly established concept that novel ideas in an organizational context can generate new sources of income or secure established sources of income (Bower, 1930). By spotting and exploiting new opportunities, companies create options. These options allow organizations to become more flexible and increase their likelihood of survival (De Clercq, Castañer, & Belausteguigoitia, in press; Howell & Higgins, 1990; Teece, Pisano, & Shuen, 1997). Despite this straightforward insight, effectively managing and capitalizing on ideas and the creative potential of organizational members remains a challenge (e.g., Amabile, Conti, Coon, Lazenby, & Herron, 1996; George, 2007; Scott & Bruce, 1994; Van de Ven, 1986).

At the outset of this dissertation, we highlighted three particular issues that we considered most relevant. The first challenge was the quantity of ideas. Since good ideas are easily selected from

a wide variety of suggestions (Campbell, 1960; Simonton, 1999), the driving research question was how leaders can promote a large number of idea submissions from their employees. The second challenge focused more directly on improving the quality of ideas. Specifically, we argued that social network structures influence the success, and thus the quality of ideas, and that the outcome of an idea, in turn, reshapes social network structures. Finally, we suggested a sustainable idea-promotion process by which employees repeatedly generate ideas. This is particularly important in contexts where employees generate and develop ideas on a voluntary basis. We focused on individual learning behaviors that might predict why certain idea inventors repeatedly take the initiative and whether their ideas improve in quality or not with the experience they gain from prior submissions.

In four empirical papers we selected the idea management programs of three multinational companies as the research setting. Using various sources and methods, we investigated how human behavior and interactions among people can be utilized, supported, influenced, or changed, in order to drive the effectiveness of idea management programs in terms of the identified research challenges. Hence, we took a behavioral approach, viewing ideas as outcomes generated and developed by human beings working together in a complex social system (George, 2007; Shalley, Zhou, & Oldham, 2004; Woodman, Sawyer, & Griffin, 1993). For each paper, we focused on exploring specific mechanisms with varying theoretical underpinnings from the literature on leadership, learning, and social networks. In the following section, we provide a brief summary of the main findings of the four empirical studies of this dissertation and reflect upon how they answered some or parts of the identified research challenges.

SUMMARY OF MAIN FINDINGS

Study One - Leveraging Leadership to Cultivate Improvement Ideas: The Contingent Effect of Leader Mindsets

In the first empirical study, we examined the moderating role of leader mindsets to better explain the effects of transformational and transactional leadership on the generation of improvement ideas. To test our hypotheses we collected multilevel field data from 121 employees and 21

leaders in four German branches of a multinational logistics company. We found that the effect of transformational leadership is contingent on the leaders' organizational identification. The stronger the leaders' identification, the more positive the effects of transformational leadership were. We showed that this interaction on follower idea submissions is mediated by the employee's commitment to an idea management program. Confirming the scarce evidence from experimental studies about the positive effect of transactional leadership in a creative context (Jung, 2001; Kahai, Sosik, & Avolio, 2003), we found a direct, positive effect of transactional leadership on the quantity of idea submissions, which was further enhanced by the leader's commitment to the idea management program. Our findings contribute to the innovation management literature by extending research on improvement ideas and idea management programs in which people from all ranks and functions can participate (Axtell, Holman, Unsworth, Wall, & Waterson, 2000; Fairbank & Williams, 2001; Frese, Teng, & Wijnen, 1999; Oldham & Cummings, 1996). This study also illustrated that idea management and the number of idea submissions is significantly reliant on managers, their attitudes and behaviors. By shedding light on the importance of leader mindsets as moderators that activate the effect of a leadership style, we advanced leadership literature that previously only investigated moderators based on follower-level constructs, such as the psychological empowerment of followers (Nederveen Pieterse, Van Knippenberg, Schippers, & Stam, 2010) or conservation of followers (Shin & Zhou, 2003).

Study Two - Going with the Flow? Activating Work Ties For Idea Development

In the second study of this dissertation, we investigated how previous relationships influence the involvement of people in creative work. We specifically explored the intensity with which people discuss an idea between each other (termed- idea tie strength) and potential antecedents of idea tie strength related to aspects of network structure and network content. Subsequently, we also investigated how idea tie strength influenced the success of employees' new product ideas. We tested our hypotheses with data collected during a 14-month-long, longitudinal, on-site field study in a multinational company active in the fast-moving consumer goods industry. In the study, we mapped all 331 dyadic relationships regarding 17 new product ideas. Our findings revealed that only the structural aspects of the network such as joint friends, tie centrality, and general tie strength predicted idea tie strength. For network content aspects such as functional

and departmental co-membership or a similarity in either seniority or decision-making power, we did not find significant effects. However, we confirmed that idea tie strength mediates the relationship between general tie strength and idea success. Our findings shed light on the strength of relationships that are restricted to the time people work on an idea (Ashford, George, & Blatt, 2007; Starbuck, 1992). Our study also contributes to the current literature by demonstrating that these short-term and ad hoc relations evolve from and co-exist with stable work relations (general tie strength). Moreover, we showed that the idea development process, which we investigated in this study, is a critical phase in any idea trajectory. This is because at this point, people prepare their idea for a first official gate review and lay much of the groundwork that will define the concept behind an idea and, ultimately, its quality.

Study Three - Rising from Failure and Learning from Success: The Role of Past Experience in Personal Initiative Taking

In the third study, we investigated how accumulated success and failure experiences influence employees to repeatedly take the initiative to propose new ideas. Moreover, we explored the type of prior idea outcome (success or failure) from which inventors learn best how to improve the performance and quality of a subsequent idea submission. The setting of this study was the radical-idea suggestion system of a multinational firm with archived data spanning 1,792 ideas suggested over the course of 12 years by 908 employees. In contrast to what we expected, our results showed that prior experiences of failure, rather than an initiator's prior success, stimulated the future initiation of ideas. An explanation for this finding could be that people who proactively generate ideas are intrinsically motivated and feel challenged to submit another idea (Frese, Teng, & Wijnen, 1999; Morrison & Phelps, 1999; Sitkin, 1992). Over time, people may also experience that it is safe to submit ideas despite prior failures (Baer & Frese, 2003; Cannon & Edmondson, 2001; Edmondson, 1999). We confirmed our hypothesis of a positive effect associated with involving successful initiators on subsequent idea performance. Our study is one of the first to directly address learning behavior for non-required activities such as generating ideas. The results showed that the inferences people make from all their experiences can be counter intuitive (Parker & Collins, 2010), but they also provide new evidence for calls to conduct more empirical work on the mechanisms of continuous creativity (Skilton & Dooley,

2010). Moreover, this work identifies which experiences are pivotal for idea inventors to learn from and to improve the quality of their subsequent ideas.

Study Four - Dynamics of Social Network Structures across Multiple Idea Proposals

In the final study, we sought to increase our understanding of how the outcome of a prior idea (success or failure) influences change in the social network structures of the ego (tie strength and network size) that created the idea. Subsequently, we examined how altered social network structures impact future idea performance of the same person. We tested our hypotheses with similar data that we had used in study three. However, in this study we focused on the employee's most recent idea rather than the accumulated idea outcomes. Findings advance the network evolution and creativity literature by showing that experiences with idea success strengthened ties within an ego's network and allowed the network to grow. In turn, increased levels in both of these network structures (average tie strength and network size) had a positive influence on the performance of a subsequent idea. However, for tie strength, we also found confirmation of a quadratic effect. Thus, the positive effect of increased tie strength turned into a negative one beyond a certain threshold. Finally, we confirmed that both tie strength and network size mediate the relationship between prior idea success and subsequent idea performance. Our study addresses calls to look more intensively at the consequences of creativity and innovation (Anderson, De Dreu, & Nijstad, 2004; George, 2007) and contributes to a greater understanding of how idea-related social network structures dynamically evolve from one to the next (Lee, 2010; Perry-Smith & Shalley, 2003). It shows that employees need to continuously refresh their social network structures in order to continuously submit high-quality ideas. Our research also helps managers to decide who among their employees should be involved in the task of developing high-quality ideas (Sosa & Marle, 2010).

THEORETICAL IMPLICATIONS AND FUTURE DIRECTIONS

The findings of this dissertation sketch the contours of a more comprehensive model for idea management programs and, in particular, the behavior of organizational members who engage in such programs. Idea management programs are not self-starting (Fairbank & Williams, 2001;

Ohly, Sonnentag, & Pluntke, 2006) and more is needed than just a management process with particular selection stages and an appropriate reward structure for idea submitters (Fairbank & Williams, 2001). Given that the generation and development of ideas, as well as their management, is a most human endeavor with human motivations and judgments (Reuter, 1977), we adopted a behavioral perspective to explore what drives or inhibits organizational members to repeatedly come up with innovative ideas. We specifically focused on leader influence, individual learning behaviors, and the role of knowledge exchange and learning in networks. Taken together, the outcomes of this dissertation indicate that managers have a significantly influential role in managing ideas. For instance, they can stimulate followers directly through a combination of their leadership style and the mindset they adopt, but also indirectly by creating conditions for employees to network and therefore to build up relationships that might bring the right type of expertise for the development of an idea. The role of networks and specifically, the type of relationships employees people entertain, has been another theme in this dissertation. The findings show that there is a clear social side to creativity and the generation and development of ideas (Kijkuit & Van den Ende, 2007; Perry-Smith & Shalley, 2003; Perry-Smith, 2006). Thus, whether it is the manager, a particular co-worker, or a network of people, inventors of ideas are always part of a collective and not solitary individuals (Hargadon & Bechky, 2006). As such, the question is how employees continuously submit many ideas of high quality, together with others or influenced by others. We concentrated on three broad theoretical streams to shed further light on this question and to illustrate the multifaceted dynamics that are unfolding with respect to the idea quantity, idea quality, and the continued efforts of employees to submit ideas. In every study, we have focused on a specific theoretical anchoring to provide rich descriptions and detailed analyses of the hypothesized mechanisms. In the following paragraphs, we illustrate theoretical implications for each of these streams, as well as for the creativity and innovation management research area.

Leadership Theory

The first study specifically examined how leadership styles are activated and enhanced by leader mindsets. Although prior studies have investigated the contingent nature of leadership styles and focused entirely on follower characteristics as moderators (e.g., Nederveen Pieterse, Van Knippenberg, Schippers, & Stam, 2010; Shin & Zhou, 2003), we advance the research by

examining the role of leader mindsets. Our investigation on the effect of leadership styles reveals that it is important to distinguish between the commitment of an employee to an idea management program and the actual submission of ideas. Making this distinction, we found that transformational leaders have the potential to persuade employees to commit to an idea management program, but only if the same leaders deem the organization important (i.e., identify with the organization). A high employee commitment to the idea management program, in turn, is closely related to the actual submission of ideas. Transactional leaders, on the other hand, have far more potential to (extrinsically) motivate followers to submit ideas than transformational leaders, and this effect is stronger when the transactional leaders evaluate improvement idea submissions as their goal (i.e., are committed to the improvement idea generation system). Thus, in addition to illustrating the contingent nature of a particular leadership style, we also contribute to the ongoing debate over the level of effectiveness for either a transformational or a transactional leadership style. Our study shows that both are equally important. Transformational leaders encourage followers to internalize their values and therefore manage to stimulate the followers' subjective creative attitudes, i.e., inspire followers to commit to an idea management program. On the other hand, transactional leaders' focus on accomplishing and rewarding agreed-upon goals as an effective mechanism to drive the followers' objective creative actions, i.e., idea submissions.

In the first study, the ideas that were suggested by employees were incremental and the idea management program focused on small improvements. The three other studies had a more radical idea generation in programs that specifically addressed the challenges associated with these breakthrough ideas. Due to these distinct contexts, it remains speculative whether the findings of study one would apply to our other study contexts. Generally, we suspect that transactional leadership could play an equally important role in the three subsequent study settings. Research by Schriesheim et al. (2006) and Vecchio, Justin, and Pearce (2008) highlight the sometimes underestimated potential of a transactional leadership style for various contexts. Also, findings of a meta-analysis by Judge and Piccolo (2004) show that contingent rewards, our proxy for transactional leadership, had a higher validity in business compared to college or other academic settings. An explanation they offer for this finding is that "business leaders may be better able to tangibly reward followers in exchange for their efforts" (Judge & Piccolo, 2004:

763). Moreover, it seems that a tit-for-tat mentality still generally prevails in large organizations, despite all the research illustrating the benefits of a proactive, more intrinsically motivated workforce (e.g., Crant, 2000; Grant & Ashford, 2008; Grant & Parker, 2009; Parker, Bindl, & Strauss, 2010). As a result, transactional leaders, who clearly express their expectations for an exchange relationship with subordinates, might also be quite influential in encouraging employees (at least in large organizations) to submit radical ideas. However, one can also imagine that transformational leaders could play a more important role to directly influence the generation and development of more radical ideas, too. For people to develop radical ideas, they probably need to have more freedom to experiment, to try out new and unconventional ways and methods, and not have to comply with predefined goals. Transformational leaders are said to encourage these behaviors (Bass, 1985; Gong, Huang, & Farh, 2009; Shin & Zhou, 2003). Therefore, they might not only exercise an indirect effect, as for incremental improvement ideas, but also a direct one. We are inviting researchers to replicate our study in a context of radical ideas as the main point of interest. As the first study was also a cross-sectional examination, another opportunity for future research is to investigate how the relationship between leadership styles and idea submissions unfolds over time.

Social Network Theory

The studies in this dissertation also contribute to the literature on social networks and specifically on knowledge exchange through ties. Whereas prior literature often highlights the advantages of weak ties for information diversity (Baer, 2010; Perry-Smith & Shalley, 2003; Perry-Smith, 2006; Zhou, Shin, Brass, Choi, & Zhang, 2009), we find that strong ties (to a degree) play an instrumental role in an innovation context characterized by uncertainty, ambiguity, and tacit knowledge (Borgatti & Cross, 2003; Dougherty, 1992; Kim & Wilemon, 2002; Von Hippel, 1994). Please note that we used specific conceptualizations of tie strength in our studies. In the second study, we focused on the time people invested discussing an idea with another contributor (idea tie strength) and the frequency of previous work-related communication among people (tie strength). In the fourth study, we examined the degree of repeat collaboration of idea contributors. Although we used distinct conceptualizations and measurements for tie strength, they all reflect a higher intensity of collaboration and communication among people. As such, the findings show that strong ties, independent of how they are exactly conceptualized and

measured, can be useful to build feelings of trust (Granovetter, 2005; Reagans & McEvily, 2003). Trust, on the other hand, provides the safety for people to suggest radical and risky idea proposals (Baer & Frese, 2003; Edmondson, 1999). Strong bonds between people are also an important facilitator to make communication flows and exchange processes easier, and as a result, these exchanges become more efficient and less risky (McFadyen & Cannella Jr., 2004; Nebus, 2006). Again, this translates into a higher chance for idea success, because people understand each other's perspectives and viewpoints and are able to integrate them into the idea. We found in study four that there is a limit to the positive influence of tie strength on idea quality. However, our findings illustrate that when it comes to "building", discussing, and developing an idea, and thus when we refer to the actual work on an idea and not to sources of inspiration for an idea, strong ties play a pivotal role. We see promising directions for future research in the further study of the evolution of tie strength from idea generation to final implementation. In particular, the transition from idea generation to implementation has received scant attention. In our studies, too, we were only able to observe ideas to the point that they were accepted or rejected by the management, but not which social network structures or leadership styles were pivotal for having the ideas implemented.

In the second study we further explored the antecedents of strong bonds of employees people working together on an idea. Our investigation into the network structural antecedents of an idea-related bond (joint friends, tie centrality, and tie strength) and the network content aspects (functional and departmental co-membership, similarity in seniority and decision-making power) revealed that the content aspects could not explain a high discussion intensity between two people about an idea; the measurable aspect of this intensity we termed idea tie strength. A possible explanation for this finding is that network content aspects did not provide a combination of the core ability and motivational components that would encourage people to discuss an idea intensively with each other. The finding that the more temporal idea tie strength, which is limited to the discussion intensity of two people working on an idea, emerged from and mediated the more long-term, work-related tie strength and its relation to idea success. This finding also provides insights into how temporary relationships evolve from and co-exist with long-lasting interactions. So far, much of the creativity and social network literature has focused only on long-lasting relationships at work. However, short-term involvements in specific projects

are becoming an increasingly applied way of working for knowledge-intensive firms (Ashford, George, & Blatt, 2007; Starbuck, 1992). Building on the recent work of Murnieks, Haynie, Wiltbank, and Harting (in press) it would be interesting to investigate whether the interdependency between long established ties and short-term ties influences more cognitive mechanisms, for instance similarity in decision-making processes within a dyad. Another promising avenue for future research would be to investigate which roles people take across time in those varying short-term involvements and how the social network of an employee supports or hinders the effective fulfillment of that role. For instance, an idea-promoting role for a person could be to provide critical information for an idea or to be responsible for organizing management support for a particular suggestion.

In study four, we extended the research of study two on short-term idea involvements and shed more light on the changes in an idea originator's social network structure across multiple idea proposals. Study four also extends study three by examining the drivers of continuous idea quality. We specifically illuminated how idea performance and an ego's social network structure co-evolve, thereby addressing calls for research on this topic (e.g., Blatt, 2009; George, 2007; McPherson, Smith-Lovin, & Cook, 2001; Payne, Moore, Griffis, & Autry, 2011). We showed that prior idea success is positively related to the reinforcement of network structures (tie strength and network size) and that an increase in both network structures is positively related to idea quality. Both network structures also actually mediate the relationship between prior idea success and subsequent idea performance. The findings revealed that without a study of prior performance outcomes, we are not fully able to capture the evolution of networks or the benefits, drawbacks, or mediating roles that certain structures can exercise on subsequent performance. That the performance outcomes of ideas are changing the social network that created the very idea is an important insight and highlights the need for more research to investigate the consequences of creative performance. Future research could also investigate other dynamics; for instance, how the idea performance influences the relationship between a leader and a follower or how performance shapes employee motivation and organizational identification.

Learning Theory

In the third study we made a first attempt to understand the difference between the initiators of and the contributor to an idea and what both groups learn from their prior idea outcome experiences. As we have outlined in the study, research on what people learn from outcomes of their ideas is important, because submitting ideas is a discretionary activity and hence, employees could decide to stop submitting ideas without fear of negative consequences (Frese, Kring, Soose, & Zempel, 1996; Frese, Teng, & Wijnen, 1999; Morrison & Phelps, 1999; Parker, Williams, & Turner, 2006). We suggested that idea quality is critical and that learning from prior experiences should play an important role in this. In that chapter, we demonstrated that learning behavior unfolds differently in the context of voluntary idea submissions than one would expect from the literature. Specifically, we showed that people with a failed rather than successful experience are more likely to submit another idea, but that idea originators and idea contributors with successful experiences submit ideas that are generally of higher quality. These findings advance learning literature because they show that for non-required activities, such as submitting ideas, failure (at least if not experienced too often) does not hamper continued efforts. This may be because failure might lead to higher persistence (Locke & Latham, 1990) and trigger a feeling of being positively challenged, which, in turn, stimulates individuals to continue to experiment and come up with new idea proposals (Amabile & Khaire, 2008; Mikulincer, 1989; Sitkin, 1992). Moreover, when people voluntarily submit ideas and fail several times, they actually learn that it is safe to initiate new ideas and that there are indeed few serious consequences related to a negative outcome (Baer & Frese, 2003; Cannon & Edmondson, 2001; Edmondson, 1999).

On the other hand, it seems that experiencing failure does not offer the knowledge necessary to improve the quality of a future idea. Only successful experiences offer initiators the end-to-end, larger picture awareness that allows them to excel in a new effort (Kim, Kim, & Miner, 2009). Achieving success is a rare event, but because it has a major impact on the organization and the initiator, there is an increased willingness to learn from those experiences (Lampel, Shamsie, & Shapira, 2009). Future research should further investigate whether there are also ways for idea originators to learn from ideas without having to complete the entire development trajectory. Thus, how can people learn and improve when their idea fails at an earlier evaluation gate? It

would, for instance, be interesting to explore the various leadership styles or feedback mentorship strategies that are necessary in this respect.

Creativity and Innovation Research

Our findings also have general implications for creativity and innovation research. Ideas inject creative stimuli for much needed innovation in companies. Nevertheless, by putting a lens at the end of an idea trajectory, it appears that the focus is on the best mechanism by which to harvest more and more ideas. The problem with this perspective is that a high number of low quality ideas is costly to administer and review (Kijkuit & Van den Ende, 2010). We showed which network characteristics are conducive to high quality ideas. Moreover, we illustrated that approved or unapproved ideas can elicit changes in the social structure of an idea network-changes that can influence prospective creative efforts. Our study provided socio-structural insights into how employees' creative efforts can be sustained so that enterprises can profit from them as long as possible (Skilton & Dooley, 2010). Specifically, this means that while some network stability is desirable, the structures also need to be "refreshed". For instance, the problem of having high tie strength in an idea network can be lowered by attracting new people to the network. While our studies focused on internal idea generation programs, an interesting avenue for future research is to explore how organizations can combine such a program with an external approach, for example, a crowdsourcing platform. For organizations it might be interesting to use a crowdsourcing initiative, because often many ideas are generated in quite a short time within those programs. Interesting facets when exploring this hybrid of internal and external idea generation programs include either the characteristics of the idea that is generated (i.e., is there already related knowledge in the organization?) or the social network of the external idea originator (i.e., are there ties to internal employees of the organization?).

CHALLENGES IN IDEA MANAGEMENT AND PRACTICAL IMPLICATIONS

Reuter's reflections (1977: 89) highlight that idea management programs and suggestion systems involve "human beings, human judgments, and human motivations. Therefore, like any other managerial tool, the success […] depends largely upon the managers […]". Likewise, the notion

we followed in this dissertation was that the advantage of an idea management program does not stem from the system itself but rather from the way it is used. Therefore, we adopted a behavioral perspective and focused on three managerial challenges. In the following, we reflect upon those challenges and put forward managerial recommendations based on our findings.

Idea Quantity

Results of the first study pointed towards the importance of both transformational and transactional leadership for the number of ideas that were submitted by employees. As such, we recommend organizations should promote and raise awareness for both leadership styles and develop management programs for leaders to learn about and develop them (Dvir, Eden, Avolio, & Shamir, 2002). The two leader mindset that turned out to positively moderate a leadership style can be stimulated, as follows. To increase leader organizational identification we suggest companies make efforts to raise organizational prestige and distinctiveness by, for instance, internal branding initiatives or symbolic practices to emphasize external threats (Mael & Ashforth, 1992; Van Knippenberg & Sleebos, 2006). Similar to how employee commitment is accomplished, we also expect that influencing a leader's commitment to an idea management program requires the interaction of transformational leadership on the part of the leader's boss and that his or her organizational identification plays a pivotal role. Thus, we suspect that trickle-down effects of leadership behaviors (Yang, Zhang, & Tsui, 2010) would be important to train managers at the top of the pyramid on the effect of their behavior, provided that leadership styles on the highest level actually influence the style of a leader on the next hierarchical level. The first study also raises the question of whether and how managers should reward their employees for their creative ideas. While speculative, it could be that financial rewards would be especially motivating for employees to submit many incremental improvement ideas. On the other hand, in our other studies, in which we investigated idea management programs aimed at the generation and development of radical ideas, we saw that people had strong intrinsic motivations. Working on ideas at the technological forefront challenged them and being involved in such efforts was a satisfactory addition to their regular job. Thus when dealing with radical breakthrough ideas, it might be detrimental to implement financial rewards because these incentives might undermine the intrinsic motives while costing the company unnecessary money.

Idea Quality

Our second and fourth study recommended the relationships between idea originators and co-workers that managers should encourage to achieve increased levels of interaction on an idea and thus increased levels of idea success (Sosa & Marle, 2010). It is important to activate the right type of relationships in ever-changing networks and thereby trigger creativity in employees without exhausting their potential (Brass & Labianca, 1999). In study two, we showed that a long discussion time between two people about an idea is beneficial for idea success and that the length of idea discussions is driven by prior work-related ties. Thus, to facilitate employee networking and the formation of work-related bonds in general, managers should create opportunities for people to meet and interact with each other. As we have shown in study four and partially in study three, a large network size and repeated ties are also beneficial to increase idea success. Managers can support the relationship formation process by making expertise more visible to everyone. When an idea initiator submits an idea, an algorithm based on keywords could identify other people who claim to have competencies in the areas the idea touches upon. In large organizations in particular, this would make it easier for an idea originator to search for advice in the company and get other people on board for the idea proposal, thus furthering the development of the proposal. For employees to find another person to collaborate on the ideas he or she is working on, an idea might be to make the "work in progress" more visible by publishing ideas on the intranet or even on the internet, for example. Of course, this radical step would require an assessment of the downsides of a potential information leakage and whether this leakage is bearable for ideas that may not have significant strategic importance. Moreover, as study four has shown, strong bonds between people are only beneficial to a degree and managers need to strike a balance between network characteristics that are conducive to creativity at lower levels, but do more damage than good at higher levels. When managers actively source people to generate good ideas, they can take this balance into consideration. Specifically, they are advised to contact employees who have successfully worked on an idea before with at least a few other people who are known to each other. A look into the submission history of the employees in a department would be informative in this respect.

Study three and four also showed that prior successful experiences of idea inventors were most beneficial to increase the chances of subsequent idea success. It seems that success experience

provides employees with a frame of reference and proven routines (Gersick & Hackman, 1990). Successful initiators witness the development of their idea from its inception to implementation and therefore can see the larger picture behind a new initiative. Various elements of the initiative-taking process can be contrasted with one another, allowing employees to gain a feeling for strategies that lead to success (Kim, Kim, & Miner, 2009). However, we also found that idea inventors, who had failed earlier, tend to come up with more low quality ideas. The problem is that if failure reinforces more ideas that are similar to prior ones, an assessment system of ideas will, at some point, be cluttered by bad ideas. This places a significant administrative burden on managers who need to review all initiatives. Moreover, companies cannot afford to have too many resources allocated to low quality ideas. Therefore, we advise managers to make sure that previously successful employees are included in the development of a new idea because experienced organizational members can share the lessons learned to help improve the success of an idea. For instance, companies can steer their involvement by designing mentorship programs where new idea initiators are assigned to previously successful idea initiators. Moreover, managers should make success stories more visible across the organization by using a range of communication channels. Organizational members should be encouraged to contact previously successful idea inventors. For instance, this can be achieved if informal sessions are organized where former successful idea inventors are invited to talk about their experiences and other employees have an opportunity to be in touch with these successful inventors.

Continued Ideation

Considering the issue of repeat initiative taking, our third study points towards some important implications. Not adopting a radical idea has a positive rather than a negative influence on the inclination of proactive individuals to submit another idea. However, as we argued earlier, only idea originators who submitted ideas that were adopted seem to learn from their experiences and manage to remain successful. For managers this could point towards the value of a targeted feedback strategy. With failed idea inventors, idea evaluators and supervisors could further elaborate on why an idea was not accepted and which general criteria must be met before another idea is submitted. Idea initiators who have succeeded should receive motivational feedback so they continue taking initiative. Moreover, the finding that idea inventors continued to submit

additional ideas despite prior failure illustrates the importance of a management culture that accepts or even stimulates people to take risks and make errors. Only when employees feel it is safe to initiate new, maybe controversial, ideas and when there are no serious personal consequences from failing with an idea, will they continue to come up with innovative suggestions time and time again. The context of study three and four depicted how this can be done as the company established an independent "safe haven" idea management unit equipped with funds and staff that could make decisions about ideas independently of other business units or line managers. Rejection of ideas in this context has no negative consequences on career, salary, or status of the idea initiator. This is so because the independent unit absorbs and takes responsibility for the potential risks. Moreover, line managers or the business unit where the idea originator works also suffer no consequences. Instead, they continue making independent decisions about the performance of an employee, apart from their engagement in the idea management program.

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SUMMARY

Increased competitive pressure coupled with tighter financial constraints challenges firms to use every available resource and talent effectively in order to continuously create innovations from creative ideas. In this dissertation, we focus on how leadership styles, individual learning behaviors, and social network structures drive or inhibit organizational members to repeatedly generate and develop innovative ideas. Taking the idea management programs of three multinational companies as the research setting, we investigate, in four empirical papers using different sources and methods, how innovative behavior can be supported, influenced, or changed. Within this context, we concentrate on a) the quantity of ideas, b) the quality of ideas, and c) the continuous participation of employees.

The findings of this dissertation sketch the contours of a more comprehensive model for employee behavior in the context of idea management programs. We demonstrate that managers can stimulate followers to submit more ideas through a combination of their leadership style and the organizational mindset they are embracing (study 1). Furthermore, the findings show that the embeddedness of ties in a network predicts how much time people invest in the development of an idea. This investment, in turn, shapes idea quality (study 2). We also find that people whose prior ideas were rejected are more inclined to initiate new ideas, but that these new ideas are also of low quality. Only people who successfully initiated ideas in the past are be able to improve or maintain a consistent quality for their subsequent ideas (study 3). Moreover, we illustrate that social network structures dynamically evolve between one idea and the next. In particular, strong ties and a larger network size influence the quality of ideas and vice versa: the quality of a prior idea increases tie strength and the size of the contributor network for a subsequent idea (study 4).

Together, the insights of the studies illustrate how through leadership, learning, and networks, idea inventors exchange knowledge, build on each other's expertise, make sense of experiences, and become motivated to constantly generate ideas that move the organization forward.

ZUSAMMENFASSUNG (SUMMARY IN GERMAN)

Erhöhter Wettbewerbsdruck und größere finanzielle Einschränkungen stellen Firmen vor die Herausforderung, ihre verfügbaren Ressourcen und die Talente von ihren Mitarbeitern effektiver zu nutzen, um kontinuierlich Innovationen aus kreativen Ideen zu entwickeln. In dieser Dissertation erforschen wir, wie der Stil von Führungskräften, individuelles Lernverhalten und soziale Netzwerkstrukturen Mitarbeiter anregen oder hemmen, wiederholt innovative Ideen zu generieren und weiter zu entwickeln. In vier empirischen Artikeln, basierend auf unterschiedlichen Datenquellen und Arbeitsmethoden, untersuchen wir im Kontext des Ideenmanagements von drei multinationalen Unternehmen, wie innovatives Verhalten unterstützt, beeinflusst und verändert werden kann. In diesem Zusammenhang konzentrieren wir uns auf a) die Quantität von Ideen, b) die Qualität von Ideen und c) die kontinuierliche Mitarbeiterpartizipation.

Die Ergebnisse dieser Dissertation führen zu einem umfassenderen Verständnis zum Verhalten von Mitarbeitern im Kontext von Ideenmanagement Programmen. Wir zeigen, dass Manager durch eine Kombination von ihrem Führungstil und ihrer Einstellung zum Unternehmen, Mitarbeiter zu mehr Ideeneinreichungen anregen können (Studie 1). Die Ergebnisse legen zudem dar, dass die Einbindung von Beziehungen in einem Netzwerk entscheidend dafür ist, wie viel Zeit Menschen in die Entwicklung von Ideen investieren. Dieses Investment beeinflusst wiederum maßgeblich die Qualität von Ideen (Studie 2). Außerdem zeigen wir auf, dass Mitarbeiter, deren Ideen abgelehnt wurden, geneigt sind, trotzdem neue Ideen zu initiieren; dass diese Ideen jedoch wieder von geringer Qualität sind. Lediglich Mitarbeiter, die erfolgreich mit vorherigen Ideen waren, lernen, die Qualität ihrer nachfolgenden Ideen zu verbessern beziehungsweise auf einem hohen Niveau zu halten (Studie 3). Des Weiteren veranschaulichen wir, dass soziale Netzwerkstrukturen sich von einer zur nächsten Idee dynamisch weiterentwickeln. So beeinflussen feste Bindungen zwischen Menschen und ein großes

Netzwerk die Qualität von Ideen und umgekehrt, die Qualität von einer vorangegangenen Idee erhöht den Bindungsgrad von Beziehungen und die Größe des Netzwerks von Menschen, die an einer nachfolgenden Idee mitwirken (Studie 4).

Die Erkenntnisse der Studien illustrieren in ihrer Gesamtheit, wie Ideenerfinder durch Führung, Lernverhalten und in sozialen Netzwerken, Wissen austauschen, auf der Expertise von anderen aufbauen, Erfahrungen übertragen und sich motivieren, kontinuierlich Ideen zu kreieren, die das Unternehmen voranbringen.

SAMENVATTING (SUMMARY IN DUTCH)

De toegenomen druk om competitief te zijn, gepaard met beperkte financiële middelen, daagt bedrijven uit om effectiever gebruik te maken van alle beschikbare bronnen en talent om continu innovaties te creëren op basis van creatieve ideeën. In dit proefschrift focussen we op hoe leiderschapsstijlen, individueel leergedrag en sociale netwerkstructuren van leden binnen de organisatie het herhaaldelijk generen en ontwikkelen van innovatieve ideeën stimuleren of juist belemmeren. De onderzoek-setting bestaat uit ideemanagementprogramma's van drie multinationals. In vier empirische papers, gebruikmakend van verschillende bronnen en methoden, onderzoeken we hoe innovatiegedrag kan worden ondersteund, beïnvloed, of veranderd. In deze context concentreren we ons op a) de kwantiteit van ideeën, b) de kwaliteit van ideeën, en c) de aanhoudende participatie van werknemers.

De bevindingen van dit proefschrift schetsen de contouren van een meer omvattend model voor werknemersgedrag in de context van ideemanagementprogramma's. We demonstreren dat managers hun ondergeschikte kunnen stimuleren om meer ideeën aan te leveren door een combinatie van hun leiderschapsstijl en organisatorische mindset (studie 1). Verder laten de bevindingen zien dat in hoeverre de banden in een netwerk zijn ingebed voorspelt hoeveel tijd mensen investeren in de ontwikkeling van een idee. Deze investering bevordert de kwaliteit van het idee (studie 2). Uit het onderzoek kwam tevens naar voren dat mensen waarvan eerdere ideeën afgewezen waren, sneller geneigd zijn nieuwe ideeën te initiëren maar dat deze nieuwe ideeën wederom van lage kwaliteit zijn. Enkel mensen die in het verleden succesvolle ideeën initieerden, zijn bekwaam om de kwaliteit van hun opvolgende ideeën te verbeteren of constant te houden (studie 3). Verder illustreren we dat sociale netwerken dynamisch ontwikkelen tussen twee opvolgende ideeën. In het bijzonder, sterke banden en de grootte van het netwerk beïnvloeden de kwaliteit van ideeën en visa versa, de kwaliteit van een vorig idee verhoogt de

sterkte van de band en de grootte van het netwerk van inzenders van een erop volgend idee (studie 4).

Samen illustreren de inzichten van de studies hoe door leiderschap, leren en in netwerken, ideebedenkers kennis uitwisselen, verder bouwen op elkaars ervaring, ervaringen overdragen en gemotiveerd raken om constant ideeën te generen die de organisatie vooruit helpen.

ABOUT THE AUTHOR

Dirk Deichmann was born on 9 December 1981 in Walsrode, Germany. After finishing his secondary education in Walsrode in 2001, he started his undergraduate studies in Business Administration at the Hanzehogeschool Groningen, The Netherlands. Before graduating (cum laude) in 2005, Dirk was selected for an exchange semester at the Western University of Sydney, Australia. In the same year, he started the Pre-master's program in International Business Administration at the Rotterdam School of Management, Erasmus University, The Netherlands. In 2007, he obtained his Master's degree (cum laude) in Business Administration at the same university with a specialization in Innovation Management. As part of his study, Dirk spent one exchange semester in the MBA program at the Nanyang Technological University, Singapore. Subsequently, he started as a Ph.D. candidate in the Department of Management of Technology and Innovation at the Rotterdam School of Management, Erasmus University in 2007.

Dirk's research interests cover the broad spectrum of entrepreneurial and innovative behavior by people including the antecedents, characteristics, and direct and indirect outcomes of this behavior. Specifically, he focuses on how social network structures, leadership styles, and individual learning behaviors drive or inhibit organizational members to generate and develop innovative ideas. His work in this field has been supported by data collection at a variety of multinational companies. Dirk's work has also been presented at numerous international conferences. In addition to his research, he taught in various Master's courses and mentored several students in the completion of their Master's thesis projects. Currently, Dirk holds a position as Assistant Professor in the Department of Organization Sciences at Vrije Universiteit Amsterdam, The Netherlands.

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IDEA MANAGEMENT
PERSPECTIVES FROM LEADERSHIP, LEARNING, AND NETWORK THEORY

In this dissertation, we focus on how leadership styles, individual learning behaviors, and social network structures drive or inhibit organizational members to repeatedly generate and develop innovative ideas. Taking the idea management programs of three multinational companies as the research setting, we investigate, in four empirical papers using different sources and methods, how innovative behavior can be supported, influenced, or changed. Within this context, we concentrate on a) the quantity of ideas, b) the quality of ideas, and c) the repeated participation of employees in idea management programs.

The findings demonstrate that managers can stimulate employees to submit more ideas through a combination of their leadership style and the organizational mindset they embrace. We also find that people whose prior ideas were rejected in the past are more inclined to initiate new ideas. However, only employees who successfully initiated ideas in the past learn to improve or demonstrate consistency in the quality of their subsequent ideas. We further show that the embeddedness of ties in a network predicts how much time people invest in the development of an idea. Moreover, we find that social network structures dynamically evolve between one idea to the next. In particular, strong ties and a higher network size influence the quality of ideas and vice versa.

Together, the insights of the studies illustrate how through leadership, learning, and social networks idea inventors exchange knowledge, build on each other's expertise, make sense of experiences, and become motivated to constantly generate ideas that move the organization forward.

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