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A MULTILEVEL APPROACH IN EXAMINING NON-TECHNOLOGICAL INNOVATION

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VEČNIVOJSKI PRISTOP K RAZISKOVANJU NETEHNOLOŠKIH INOVACIJ

Povzetek

Glavni namen moje disertacije je z uporabo večnivojskega pristopa na štirih ravneh raziskovanja (posameznik, skupina, organizacija in država) prispevati k poglobljenemu razumevanju področja netehnoloških inovacij. Z namenom prispevati k širšemu raziskovalnemu področju inovativnosti sem svoje raziskovanje gradil na večnivojski teoriji (Kozlowski & Klein, 2000) in se osredotočil na neotipljivo vsebino inovativnosti, njen kontekst ter najpomembnejše dejavnike. Ob tem sem še posebej poudaril vlogo izmenjave znanja in družbenega vidika inovativnosti.

Netehnološki tipi inovativnosti niso jasno opredeljeni, prav tako niso jasno razmejeni drug od drugega, od ostalih tipov in oblik tehnološkega inoviranja, niti od inovativnosti na splošno ter od ustvarjalnosti. Zato sem v prvem poglavju uporabil metodo kreiranja znanosti, ki temelji na bibliometriji (kvantificiranju bibliografskih podatkov), in tako pripravil kvantitativni pregled literature. Rezultat dela je bilo odkritje ključnih področij raziskovanja znotraj literature netehnoloških inovacij in analiza njihovega razvoja. Poleg tega sem rezultate analize sosklicevanja in kreiranja znanosti trianguliral s kvalitativnim pregledom literature dejavnikov in rezultatov netehnoloških inovacij. S kombinacijo navedenih metod sem lahko odkril izvor znanja v posameznih podpodročjih raziskovanja. Z uporabo člankov kot enoto analize in vključitvijo vseh citatov, ki so na voljo na ISI Web of Science, sem sledil razvoju intelektualne strukture področja netehnoloških inovacij v obdobju 1975–2011. S tem sem prispeval k pojasnjevanju izvora posamezne teme, kar zagotavlja podrobnejši vpogled v njihovo vsebino in predstavlja temelj za boljše razločevanje med različnimi tipi netehnoloških inovacij.

V drugem poglavju sem oblikoval in s strukturnim modeliranjem (SEM) ter hierarhično moderacijsko regresijo preveril model dejavnikov inovacij v managementu. Poleg tega sem s strukturnim modeliranjem preveril tudi dva konkurenčna modela za raziskovanje rezultatov inovacij v managementu. To sem storil na podatkih, zbranih v 604-ih podjetjih iz treh držav: Slovenije, Španije in Južni Koreje. Rezultati so izpostavili ključno vlogo izmenjave znanja pri spodbujanju inovacij v managementu. Poleg tega je moja raziskava pokazala, da izmenjava znanja vpliva na inovacije v managementu preko razvitih IT sistemov, ki omogočijo pretok informacij in znanja znotraj organizacije. Na razmerje med izmenjavo znanja in inovacijami v managementu pa negativno vpliva velikost podjetij. Rezultati so pokazali, da inovacije v managementu pozitivno vplivajo na tehnološke inovacije v podjetjih iz vseh treh držav. Prav tako lahko na podlagi rezultatov trdim, da so inovacije v managementu relativno pomembnejše za izboljšanje finančnih rezultatov organizacij od tehnoloških. Tehnološke inovacije so še vedno pomembne, vendar pa je med preučevanimi državami moč zaslediti kulturne in institucionalne razlike, ki pomembno vplivajo na procese in rezultate inoviranja. Hkrati je konkurenčni mediacijski model pokazal, da inovacije v managementu omogočajo podjetjem, da v popolnosti izkoristijo svoja tehnološka odkritja in tako povečajo svojo finančno uspešnost.

V tretjem poglavju sem predstavil in razložil nasprotujoče si rezultate predhodnih raziskav o razmerju med individualizmom/kolektivizmom (dimenzijo nacionalne kulture) ter

inovativnostjo. Raziskoval sem vpliv omenjene dimenzije na spodbujanje različnih tipov inovativnosti (inovacij v managementu in tehnoloških inovacij), ob tem pa upošteval različne stopnje procesa tehnoloških inovacij (nagnjenost k inoviranju in uspešnost inoviranja). Hkrati sem s ponovnim raziskovanjem vpliva notranjih virov znanja na inovacije v managementu prispeval k močnejši potrditvi ugotovitev iz tretjega poglavja. Opazoval sem tudi moderacijski vpliv individualizma/kolektivizma na razmerje med izrabo notranjih virov znanja in inovacijami v managementu. Uporabil sem mikro podatke s Popisa inovacijske dejavnosti 2006 za inovativnost na ravni organizacij v 13-ih državah in podatke Hofstedeja (1980, 2001), raziskave GLOBE (2005) ter Schwartza (2006) za oceno individualizma/kolektivizma. Podatke sem analiziral s hierarhičnim linearnim modeliranjem (HLM). Rezultati so pokazali, da je individualizem pozitivno povezan z nagnjenostjo k inoviranju zaradi poudarka osebne svobode in individualnosti, ki posameznikom omogoča, da razmišljajo in delujejo ustvarjalno. Kolektivizem, po drugi strani, je bil pozitivno povezan z uspešnostjo inoviranja, saj je v tej fazi za komercializacijo idej pomembnejše družbeno povezovanje in sodelovanje. Hkrati so interakcijski vplivi pokazali, da v kolektivističnih kulturah inovacije v managementu igrajo pomembnejšo vlogo pri spodbujanju tehnoloških inovacij kot v individualističnih.

V četrtem poglavju sem preučeval mikro temelje inovativnosti na ravni posameznika. To poglavje je sestavljeno iz dveh raziskav v podjetjih in treh eksperimentalnih študij ter se vsebinsko deli na dve podpoglavji. V prvem podpoglavju sem raziskoval delovno okolje, ki spodbuja ustvarjalnost posameznikov in v raziskovanje uvedel nov dejavnik - skrivanje znanja. Pri tem sem raziskoval vlogo osebnih in kontekstualnih dejavnikov v razmerju med skrivanjem znanja in ustvarjalnostjo. Prva raziskava na 240-ih zaposlenih, ki so bili razdeljeni v 34 delovnih skupin, je odkrila negativno razmerje med skrivanjem znanja in lastno ustvarjalnostjo. To razmerje konceptualno temelji na vzajemni zanki nezaupanja znotraj dvojic zaposlenih. Moderacijska analiza je pokazala, da mojstrska motivacijska klima zmanjša negativen vpliv skrivanja znanja, medtem ko ga uspešnostna klima še poveča. V drugi, eksperimentalni študiji sem preveril vzajemno zanko nezaupanja in jo primerjal z alternativnimi družbenimi in psihološkimi mediatorji. V drugem podpoglavju sem skušal doprinesti k združevanju relativno ločenih raziskovalnih področij inovativnosti in ustvarjalnosti ter se osredotočil na pogosto prezrto razmerje med njima na individualnem nivoju. Oblikoval in testiral sem nelinearno razmerje med ustvarjanjem ter udejanjanjem idej. Navezujoč se na teorijo samodoločanja sem raziskoval tudi, kako naj bi managerji ravnali z visoko ustvarjalnimi idejami zaposlenih, da bi imeli od njih kar največ. V raziskavi v dveh podjetjih sem odkril v obliki narobe obrnjene črke U ukrivljeno obliko krivulje razmerja med ustvarjalnostjo in inovativnostjo zaposlenih. Na podlagi teorije samodoločanja sem predpostavil moderacijski vpliv podpore nadzornika in avtonomije pri delu. Pokazal sem, da ta dva dejavnika ublažita krivuljasto obliko in pretvorita preučevano razmerje v pozitivno in linearno. Rezultate sem repliciral v dveh eksperimentalnih študijah.

Ključne besede: Netehnološke inovacije, večnivojski pristop, ustvarjalnost, izmenjava znanja, družbena plat inovativnosti

A MULTILEVEL APPROACH IN EXAMINING NON-TECHNOLOGICAL INNOVATION

Summary

The main overall research purpose of my dissertation was to clarify the field of non-technological innovation by using a multilevel approach at and across four levels of research: individual, group, organization, and country/economy. In order to contribute to the broader field of innovation, I derived from multilevel theory (cf. Kozlowski & Klein, 2000) and focused on the "soft", intangible content of innovation, its context and the most important determinants, emphasizing the imperative role of knowledge exchange and the social side of innovation.

The non-technological forms of innovation are neither clearly defined, nor differentiated from each other, other forms of innovation, innovation in general, and creativity. Hence, in Chapter 1, I used science mapping based on bibliometrics (quantitative analysis of bibliographic data) to provide a quantitative literature review that results in identification of key research areas within the non-technological innovation literature and analysis of its development. Moreover, I triangulated co-citation and science mapping results with a qualitative review of the antecedents and outcomes of non-technological innovation. This approach enabled me to discover the knowledge base origin in each area. Considering articles as the units of analysis and incorporating all the citations that are included in the ISI Web of Science, I traced the evolution of the intellectual structure of the non-technological innovation field for the period from 1975 to 2011. I contributed to clarification of each topic's origin, which provides detailed insight into their contents and serves as a foundation for a clearer distinction among different types of non-technological innovation.

In Chapter 2, I designed and tested a model of management innovation antecedents using structural equation modeling (SEM) and hierarchical moderated regression analysis. Moreover, I tested two competing models in examining management innovation outcomes via structural equation modeling on data gathered from 604 firms in three countries: Slovenia, Spain, and South Korea. The results indicated a crucial role of knowledge exchange for management innovation. In addition, my study showed that knowledge exchange results in management innovation through developed IT systems that enable the information and knowledge flow within an organization. Furthermore, I ascertained that the relationship between knowledge exchange and management innovation was hindered by a firm's size. The results also showed that management innovation contributed to technological innovation in all three countries, as well as that management innovation was relatively more important for enhancing firms' financial performance than technological innovation. Although technological innovation remains important, my findings indicate cultural and institutional differences, which greatly influence the aforementioned innovation processes and outcomes. In addition, a competing mediating model showed that management innovation enables firms to fully benefit from their technological discoveries, resulting in improved financial performance.

Chapter 3 aimed to unveil previous contradictory research findings on the relationship between individualism–collectivism (national culture dimension) and innovation. I examined the role of the dimension in enhancing different innovation types (management and technological innovation) at different stages of the technological innovation process (propensity to innovate and innovative performance). In addition, I contributed to strengthening inferences of Chapter 2 by reexamining the relationship between the internal knowledge sources and management innovation. I also investigated the moderating role of individualism-collectivism in this relationship. I used Community Innovation Survey 2006 micro data for innovation at the organizational level in 13 countries and Hofstede (1980, 2001), GLOBE (2005) and Schwartz (2006) data for individualism–collectivism, and applied hierarchical linear modeling (HLM). The results indicated that individualism was positively related to propensity to innovate, possibly because an emphasis on personal freedom and individuality allows individuals to think and act creatively. On the other hand, collectivism, was positively associated with innovative performance, since social interaction and collaboration are more important for the commercialization of innovative ideas. Furthermore, the interaction effects demonstrated that, in collectivistic cultures, management innovation plays a more important stimulating role in enhancing technological innovation than in individualistic ones.

In Chapter 4, I studied the micro-level foundations of innovation at the individual level. My research consisted of two field and three experimental studies, and was content-wise separated into two sub-chapters. The first one analyzed the work environment conducive to individual creativity, examined a novel contingency, knowledge hiding, and investigated the role of personal and contextual factors in the aforementioned relationship. A field study of 240 employees, nested into 34 groups, revealed a negative relationship between knowledge hiding and one's own creativity that is conceptually based on the reciprocal distrust loop within dyads of employees. Furthermore, the moderation analysis indicated that perceived mastery climate weakens the association between knowledge hiding and creativity, whereas perceived performance climate strengthens this relationship. Study 2 replicated these findings in an experimental study. I tested a reciprocal distrust loop and compared it to the alternative social and intrapsychic explanatory processes. The second sub-chapter aimed to unite separated research streams of creativity and innovation, and engaged into the often overlooked relationship between the two constructs at the individual level. I proposed and tested a non-monotonic relationship between the generation and implementation if ideas. Referring to the self-determination theory (SDT), I examined how managers should deal with employees' highly creative ideas in order to optimally capitalize on them. Field Study 1 resulted in a curvilinear inverse U-shaped relationship between employee creativity and innovation. On the basis of SDT, I proposed a moderating effect of supportive supervision and autonomy. I found that these could buffer the curvilinearity in the relationship between creativity and innovation, transforming it to a positive and linear one. I replicated my findings in the experimental Studies 2 and 3.

Keywords: Non-technological innovation, multilevel approach, creativity, knowledge exchange, social side of innovation

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INTRODUCTION

“Understand the whole and keep an eye on the parts” (Kozlowski & Klein, 2000, p. 53).

Description of the dissertation topic area and the issues it addresses

Innovation and non-technological innovation

Since the early work of Schumpeter (1934), innovation has been recognized as a key element of competitiveness (Mansury & Love, 2008). It is the critical source of competitive advantage in an increasingly changing environment (Crossan & Apaydin, 2010). Therefore, it is not surprising that innovations are in the center of policy discussions and are also increasingly gaining wind in academic research. This can be applied to both technical and social sciences, particularly in business, management, and organizational studies.

In the past, innovation was inevitably linked to technological breakthroughs with little attention given to the dynamics of management and other forms of non-technological innovation (Freeman & Soete, 1997; Alänge, Jacobsson, & Jaryehammar, 1998; Chenhall, 2003; Birkinshaw, Hamel, & Mol, 2008; Damanpour & Aravind, 2012). However, such technological view on innovation has been criticized for ignoring a number of important non-technological elements of innovative organizational activities (Avlonitis, Papastathopoulou, & Gounaris, 2001). A broader concept of innovation is needed in order to integrate non-technological and technological innovations.

Non-technological or non-technical innovations are frequently used (and also misused) as a synonym for organizational, management, or administrative innovations. However, these three represent subsets of the parent term non-technological innovations (Schmidt & Rammer, 2007; Mothe & Thi, 2010). They are antecedents and facilitators of an efficient use of technical product and process innovations as their success depends on how the organizational structures and processes respond to the use of new technologies (Armbruster, Bikfalvi, Kinkel, & Lay, 2008). Technological innovation by itself does not automatically guarantee business or economic success (Teece, 2010). Furthermore, since they have a significant impact on business performance with regard to productivity, lead times, quality, and flexibility (Goldman, Nagel, & Preiss, 1995; Womack, Jones, & Roos, 2007), types of non-technological innovations, such as management or organizational innovations, represent an immediate source of competitive advantage.

Management innovation and the social side of innovation

Management innovation is a term that has recently overtaken other terms for describing non-technological innovations in scientific literature (e.g. Birkinshaw et al., 2008; Walker, Damanpour, & Devece, 2011; Damanpour & Aravind, 2012). Damanpour and Aravind (2012, p. 12) define management innovation as “new approaches in knowledge for performing the work of management and new processes that produce changes in the organization’s strategy, structure, administrative processes, and systems”. They play an important role in developing strategies for growth, facilitating employment, social change and renewal, as well as enabling continuous performance (Edquist, Hommen, & McKelvey, 2001; Hamel, 2006). Therefore, it is necessary to understand both non-technological and technological aspects of innovation to improve the likelihood of success in innovating (Damanpour & Aravind, 2012).

When describing innovation, one cannot get past the importance of knowledge, its combination and exchange for the innovation process. A large stream in innovation literature (e.g. Nonaka, 1994; Nonaka & Takeuchi, 1995; Tsai, 2001) in fact defines innovation at the organizational level as the creation of new knowledge. As such, it is inevitably linked to knowledge management and its elements. In this case, it is inevitably linked to knowledge management and its elements. This can be even firmly applied to non-technological innovation, where scholars from sub-disciplines of management and organizational innovation base their theories and conceptualizations for achieving competitive advantage on resource- (Barney, 1991) and knowledge-based view (Grant, 1996).

Related to knowledge acquisition, exchange, and combination, the importance of the “soft”, social side of innovation is becoming increasingly emphasized (Kanter, 1988; Abrahamson & Rosenkopf, 1997; den Hertog, Bilderbeek, & Maltha, 1997; Dawson & Daniel, 2010). Networks, relationships, the social context and its interpretation are being linked to innovation at multiple levels, either in the form of inter- (e.g. Byosiere, Luethge, Vas, & Paz Salmador, 2010; Vaccaro, Parente, & Veloso, 2010) or intra- (e.g. Ohly, Kaše, & Škerlavaj, 2010; Wallin & Von Krogh, 2010) organizational linkages, or both (e.g. Zheng, 2010). As already stated, this may be even firmly applied to non-technological types of innovation, where particular forms of relationships and connections have been made into innovations on their own (e.g. open innovation, self-managing teams, or molecular organizational structures).

Knowledge management constructs and innovation facets derived from the relational perspective can be studied at multiple levels, accounting for the context at group, organizational, or country/economy level. However, thinking at multiple levels in terms of innovation draws on many diverse issues and views. Regrettably, this is why many rather independent research (sub-) streams have developed over the years. They tend to investigate similar issues at various levels of analysis, but draw on different backgrounds, and are frequently unaware of findings of other disciplines. They also deal with different levels of analysis as a result of researchers’ diverse backgrounds.

Multilevel paradigm and non-technological innovation

Initially spawned through the meso movement in organizational behavior, the multilevel paradigm has permeated virtually every sub-discipline of management (Mathieu & Chen, 2011). Its primary goal was to identify principles that enable a more integrated understanding of phenomena unfolded across levels in organizations (Kozlowski & Klein, 2000). Before the paradigm shift about a quarter of a century ago, after Rousseau’s (1985) work, it was common for management research to be either micro (individuals) or macro (organizational systems).

Despite the historical tradition and contemporary relevance of organizational systems theory rooted in general systems theory (Von Bertalanffy, 1968, 1972), which accounts for organizations as complex multilevel systems, its influence remains merely metaphorical (Kozlowski & Klein, 2000). The system of research is usually divided into organization, group, and individual levels, each level representing a domain of different disciplines, theories, and approaches. Researchers with a psychological orientation master micro research, whereas scholars with a systems perspective, who applied sociological or economic approaches to the study of firms as organizational systems, adopt the macro approach (Mathieu & Chen, 2011). The middle ground was traditionally and primarily the domain of social psychologists, who acknowledged that every phenomenon of interest was influenced by the factors stated above and below where it resides (e.g. Yammarino & Dansereau, 2011).

As described by Mathieu and Chen (2011), anomalies began to accumulate as a result of such divided approach, which is also true for the innovation and non-technological innovation fields. A micro-macro divide within the organizational studies of innovation is evident even without the in-depth quantitative literature review. Different disciplines explain the same criterion variable from different perspectives. This is even more apparent in the field of non-technological innovation, where micro research is stronger than in innovation research in general and draws more influxes from additional disciplines (e.g. psychology). On one hand, there is the macro strategy view, with either resource- (individual, e.g. Kimberly & Evanisko, 1981; Galunic & Rodan, 1998) or capability- (collective, e.g. Teece, Pisano, & Shuen, 1997; Lawson & Lorenz, 1999; Calantone, Cavusgil, & Zhao, 2002) based perspective at the organizational level. These studies suggest that innovation is a descriptive feature, a process, or an outcome of organizations.

On the other hand, there is organizational behavior and psychology literature that mostly attempt to contribute to the innovation research by examining creativity, motivation, ability, and opportunity for innovation at individual or team levels (e.g. Amabile, 1988; Amabile, Conti, Coon, Lazenby, & Herron, 1996; Hulsheger, Anderson, & Salgado, 2009; Baer, 2012). In line with this perspective, innovation is inherently an individual-level phenomenon that might be suitable for aggregation to higher levels under appropriate conditions. Boundaries and limitations of single-level views of complex business phenomena became increasingly evident (Short, Palmer, & Ketchen, 2003). It is therefore not surprising that scholars have noticed the deficiency of separated micro and macro research streams within the non-technological innovation field and called upon its amendment (e.g. Damanpour & Aravind, 2012). This is why multi-level research offers golden opportunities for advancement of the field of non-technological innovation.

Advancements in multi-level research require simultaneous and corresponding developments in theory (definition), measurement, design, and analysis (Mathieu & Chen, 2011). The three facets for investigating constructs at different levels (level of theory, measurement, and analysis, cf. Rousseau, 1985) must be aligned to minimize the level-related confounds or fallacies at the incorrect level. Any framework for guiding multilevel research must start with theory, in other words the definition. The definitions of innovation in general at various levels are strikingly similar – they all mention generation (or adoption) and implementation of new and useful ideas (Zaltman, Duncan, & Holbek, 1973; Amabile, 1983; Amabile, 1988). However, the actual process of innovation includes different actors and processes, using diverse factors and outcomes at play (Van de Ven & Poole, 1995; Van de Ven & Sun, 2011). This is why, even with the similar wording of the definition, innovation is not completely isomorphic, i.e. identical or of similar form or structure (cf. Kozlowski & Klein, 2000) across levels.

It is similar in the case of non-technological innovation. However, the divide among various levels of research and the subsequent definitions is even more apparent in this case. The organization may be an integrated system, but the non-technological innovation discipline is not. This may be the case because of perhaps a more crucial importance of the individual-level research and psychology in this field than in the field of innovation in general. Therefore, there are in fact two divides: one regarding the levels of analysis and the other in terms of the discipline (cf. Rousseau, Sitkin, Burt, & Camerer, 1998; Klein, Tosi, & Cannella, 1999). While it may be claimed that significant progress has been achieved in the last couple of years within each area, the potential for further advancement exists in looking across areas.

Crossan and Apaydin (2010) suggest multilevel analysis as essential in examining internal and external factors influencing innovation. Individuals and organizations, or organizations and countries depend upon each other, even if they do not lie on the same level of research (House, Rousseau, & Thomas-Hunt, 1995). Beside the within-group variance, the between-group variance is also present. Therefore, it is crucial to study the relations and dependencies across different levels of research. Now is the perfect timing to study non-technological innovation using a multi-level approach, because this rather novel field is developing, as witnessed by a recent (first) qualitative literature review of this research area (Damanpour & Aravind, 2012). Nonetheless, the field is still rather new and fast-growing, with a lot of ambiguity, definition issues, and inconsistent results (e.g. in terms of the relationship between non-technological innovation and technological innovation, or between non-technological innovation and firm performance). Furthermore, multi-level approach is necessary if central phenomena of interest are influenced by higher-level organizational units, or if they reflect actions or cognitions of lower-level organizational units (Kozlowski & Klein, 2000). Both conditions are met in the case of non-technological innovation.

Contextualizing innovation at the organizational level

The basic unit of analysis for most non-technological innovation studies lies at the organizational level, thus it is important to contextualize innovation by accounting for its country- or economy- level context. Firms are nested within nations, and tend to develop and evolve in ways that are compatible with the surrounding national culture (Sagiv, Schwartz, & Arieli, 2010). The innovation process is driven and constrained by not only the demographics of employees, but also its organizational, social, and national contexts (Crossan & Apaydin, 2010). Therefore, institutional characteristics and national innovation systems shaped within particular political country arrangements can impact on organizational-level innovation. However, no country-level factor is more in line with the intangible theme of this dissertation and reflects the importance of human nature and cognition than national culture.

National culture, which presents shared values of people within a particular national environment (Hofstede, 1980), is been related to various aspects of innovation (e.g. Shane, 1993). Cultural differences, a "soft" factor at the national level, may not only account for cross-national variations in innovation, but also influence the relationship between different types of innovation. Cultural characteristics affect innovation input, process, and output (Rosenbusch, Brinckmann, & Bausch, 2011). However, empirical research has produced contradictory results regarding the influence of various national culture dimensions, with the most vivid discrepancy present in terms of individualism-collectivism effect. In addition to the achievement of the most equivocal results, this is the one dimension that might be the most critical in explaining managerial phenomena such as innovation (Shenkar, 2001; Tung & Verbeke, 2010). Because of its inside-outside focus (ego - person or others - social), it corresponds closely with the emphasis on the social side of innovation (cf. Amabile, 1983; Kanter, 1988; Abrahamson & Rosenkopf, 1997; den Hertog, Bilderbeek, & Maltha, 1997; Dawson & Daniel, 2010; Perry-Smith, 2006; Dionne, 2008; Taylor & Wilson, 2012), which is prevalent in this dissertation, and with the comparison between the context role and the individual's role.

Micro-level foundations of innovation

If institutional and country-wise differences are at times being considered in predominantly strategic and business-level oriented innovation studies, micro research that would examine specific sub-units (including groups and individuals) within the companies is rare in this field. Nevertheless, creation and selection mechanisms for high-quality innovations, which might be commercialized, unfold within firms. In order to obtain a deeper understanding of the mechanisms and the basic foundations for individual innovation outcomes, as well as group and organizational innovation, the research domain needs to move down a level and examine within-group dynamics and individual-level phenomena. Examining, measuring, and analyzing only higher levels of innovation within organizations as well as making inferences at lower levels would result in ecological fallacy – when lower levels of analysis are presumed to be mere disaggregations of higher-level entities (cf. Morgenstern, 1982; Yammarino & Dansereau, 2011). Micro-level foundations of innovation thus need to be investigated. Nevertheless, this fact continues to be a significant difficulty (Kozlowski & Klein, 2000) for a macro-oriented policy discipline, such as innovation.

Innovation at any of the studied levels (country/economy, organization, team, individual) cannot occur without its single most important determinant at the individual level, that is creativity (Mohr, 1969; Amabile, 1988; Amabile, 1996). This construct encompasses generation of novel and useful ideas (Amabile, 1996; Amabile et al., 1996). The model of Amabile (1998), which presents three individual components of creativity (a person's expertise, creative thinking skills, and motivation) demonstrates the factors of creativity at the individual level. However, individual characteristics are not the only determining factor of an individual's creative behaviors, since the context at higher levels of research also needs to be taken into account as well (Oldham & Cummings, 1996). Group and organization factors represent contexts for individual perceptions, attitudes, and behaviors, and need to be explicitly incorporated into meaningful models of organizational behavior (Kozlowski & Klein, 2000). Creativity is a social construct involving social interactions, collaboration, creative requirements, and creative tensions that lead to novel ideas (Perry-Smith & Shalley, 2003; Unsworth, Wall, & Carter, 2005; Perry-Smith, 2006). Organizations need to create a climate that supports and enables creative thinking of employees in order to encourage creativity (Amabile, 1988).

Another important contextual factor of creativity, which is also connected closely to psychological environment at work, presents the relations with peers, other employees, and the supervisors (Amabile, 1983). Therefore, constructs such as social support (Oldham & Cummings, 1996; Madjar, Oldham, & Pratt, 2002) or supervisor support (Amabile et al., 1996; Ramus & Steger, 2000) are increasingly linked with the creativity enhancement. Furthermore, it is often suggested that creativity and innovation at the individual level cannot occur without information and knowledge sharing (Amabile, 1997). Creative and innovative processes involve interactions with peers, collaboration, and communication (Perry-Smith & Shalley, 2003; Perry-Smith, 2006). However, empirical studies that would examine these relationships are lacking, which is especially true for multilevel research (Agars, Kaufman, & Locke, 2008).

Creativity and innovation are complex phenomena, crucially influenced by contextual social influences at higher levels (Agars et al., 2008). Moreover, social influences may differ by level. This is why it is crucial to study the relations, dependencies, and interactions across different levels of research. The lack of consideration for such relations may lead to methodologically and content-wise incorrect conclusions that have not taken into account all the necessary factors and have tested the associations under false assumptions (Du Toit & Du Toit, 2007; Hox, 2010). A multilevel perspective allows us to explore the context where creativity and innovation management achieve best results. Furthermore, Agars et al. (2008) argue that even what creativity *is* should be viewed from a complex, multilevel perspective. It should be defined within the context of a particular domain, as something might be viewed as creative in one setting but disruptive in another (Agars et al., 2008).

There is a wide gap and confusion in research caused by the independence of the research streams of creativity and innovation. The study of creativity, rooted in the historic traditions of psychology (e.g. Guilford, 1950), typically demands an effort to understand why some individuals are more creative than others. These studies focus on the cognitive and motivational processes that might help explain this discrepancy (Perry-Smith, 2006). Previous research on creativity at work focused either on examining the antecedents of creativity or on investigating the drivers of implementation. The first part was mostly covered within the behavioral research on individual creativity, whereas the second presented the domain of organizational research on innovation (Woodman, Sawyer, & Griffin, 1993). Innovation research, however, was mostly conducted at the organization level with a focus on understanding the adoption or diffusion of certain innovations (Perry-Smith, 2006). Both research streams are strong and somewhat self-sufficient, with (too) little recognition of the fact that they could benefit from the findings of the other group (West, 2002; Agars & Kaufman, 2008).

The distinction between creativity/invention and innovation/implementation at any level reflects the main difference between exploration and exploitation (cf. Tushman & O'Reilly III, 1996). It is also a convenient parallel to the relationship between management and technological innovation at higher levels. It has to be acknowledged, however, that the parallel outlined above does not necessarily hold true. For example, technological innovation can be either explorative or exploitative. Moreover, management innovations were shown to facilitate exploitation more commonly than exploration (radical breakthroughs, Jansen, Van den Bosch, & Volberda, 2006).

The issue of a divide between creativity and innovation also deals with the distinction between the generation and the adoption of innovations. When Tushman and O'Reilly (1996) advocate for the separation of two activities (exploration and exploitation), Leten et al. (2007) argue for their integration or simultaneous existence. Exploitation of established ideas (incremental innovations) and exploration of emerging ideas (radical innovations) is the interplay of these at times very contrasting activities. An ambidextrous organization should be capable of simultaneously pursuing both incremental and discontinuous innovation. Despite this notion of interplay between the two perspectives, different research streams have emerged that share a disciplinary divide in addition to a divide of being connected with particular levels of research. The difference between invention and implementation is traditionally recognized and considered in the innovation literature. However, this distinction frequently takes place at higher (organizational) levels of research, with individual-level foundations and dynamics overlooked.

Creativity is a necessary, but insufficient antecedent of innovation, which also includes the finalizing step, i.e. the implementation of creative ideas (Amabile, 1988; Scott & Bruce, 1994; Amabile et al., 1996). Therefore, it is imperative for managers to know how to stimulate individual innovation from creativity, as innovation is the final step that provides a tangible value for the firm (Baer, 2012). Individual innovation, in turn, is the basic foundation for group and organizational innovation.

Authors have provided some discussions on how to bring creative ideas to their implementation. Thus, knowledge sharing (Liu & Phillips, 2011), stimulating climate or culture (Mueller & Thomas, 2001), or leadership (Gumusluoglu & Ilsev, 2009) have been conceptualized to influence the final implementing step of innovative behavior. Yet predominantly, innovation has been researched at higher levels (Reiter-Palmon, Herman, & Yammarino, 2008), and there is a lack of research targeting contextual and personal factors that influence implementation at the individual level (Naglieri & Kaufman, 2001). Separated research streams of creativity and innovation (Dionne, 2008) do little favor to the field in terms of providing a comprehensive understanding of the "black box" of the innovation process that encompasses both creativity and implementation. Nevertheless, examining these facets only at the individual level without accounting for the context may result in fallacy of composition (atomistic or individual fallacy), which occurs when one applies a statement to the whole on the basis of one part of the whole – that high levels are mere aggregations of lower-level entities (cf. Kozlowski & Klein, 2000; Mayer, 2002; Yammarino & Dansereau, 2011). It is important to keep in mind that the whole is greater than the sum of its parts. Micro phenomena are embedded in macro contexts, whereas macro phenomena often emerge through the interaction and dynamics of lower-level elements (Kozlowski & Klein, 2000).

Thus, the *main research purpose* of my dissertation as a whole is to clarify the field of non-technological innovation by using a multilevel approach. Attempting to contribute to the broader field of innovation, I derive from multilevel theory (cf. Kozlowski & Klein, 2000) and focus on the "soft", intangible content of innovation, its context and the most important determinants, emphasizing the imperative role of knowledge exchange and the social side of innovation.

Research questions addressed in this dissertation

Types and forms of non-technological innovation

One of the reasons some firms might fail to achieve superior innovation performance is that many managers are unaware of what constitutes the complex construct of innovation, especially the "soft" part of innovation activities. Many confusing typologies and conceptualizations (Damanpour & Aravind, 2012) are not helping at all. This is why the researchers should delve deeper into the content of innovation to provide a more comprehensive understanding of innovation as a complex and multi-dimensional phenomenon (Adams, 2003). Some innovation types may be artificial distinctions and are conceptually and operationally alike (Edquist et al., 2001), overlap (Damanpour & Gopalakrishnan, 1998; Damanpour & Aravind, 2012), or mutually dependent (Walker, 2008).

There is no single coherent conceptual framework that would bring together all types and forms of innovation. This is particularly true for non-technological innovation (Lam, 2004). Since innovation is based on continuous incremental activity, it is necessary to consider the complementary relationships between different types of innovation. Fragmentation of the field prevents us from seeing the relations between these facets, which ultimately impedes consolidation of the field (Crossan & Apaydin, 2010). This is why I try to provide, in Chapter 1, a clearer distinction between various innovation types and a more concise idea of what constitutes each type. I also explore the intellectual structure of the field and its development. The first research question of my dissertation is – *RQ1: What are the intellectual structure and the development of the non-technological field like?* I answer this question in a form of a quantitative literature review using bibliometric techniques (co-citation analysis and science mapping), triangulated by a traditional qualitative literature review. Such analytical review enables the identification of the most important contributions and contributors. Using secondary citation and co-citation data, and articles and co-citations as a unit of analysis, the completeness of the presentation of a particular scientific field is facilitated and is more objective.

Antecedents and outcomes of management innovation

Management innovation, a term that has recently become the most popular when describing non-technological innovation, represents a relatively novel field of research. As empirical research regarding non-technological types of innovation is at its early stages, which is particularly true for management innovation, we know little about their individual drivers. This is why I provide, in Chapter 2, an empirical examination of the antecedents and outcomes of management innovation that has previously been lacking (Hamel, 2006; Damanpour & Aravind, 2012). First, I take the cultural perspective (cf. Zbaracki, 1998), which examines how management innovations get shaped by conditions inside an organization, and investigate its antecedents.

The knowledge and capabilities-based views have extended resource-based logic by suggesting that knowledge is the primary resource underlying new value creation and competitive advantage (Barney, 1991; Grant, 1996; Kogut & Zander, 2003). Management innovation is a social construct, dependent on collaboration and information sharing, as well as on combining diverse knowledge to come up with novel ideas that become implemented (Hage & Hollingsworth, 2000; Taylor & Greve, 2006; Liao, Fei, & Chen, 2007). Nevertheless, it also depends on other, more tangible factors within the firm that could influence it (Walker et al., 2011). Specifically, I focus on knowledge exchange, organizational size, and IT system development as predictors of management innovation. This enables me to compare the role of one of the most important intangible predictors of non-technological innovation to two tangible factors, identified as essential in fostering management innovations. Thus, the first part of the second research question of my dissertation is as follows – *RQ2a: How is knowledge exchange related to management innovation?* An important contribution of this chapter is the theoretical conceptualization and empirical investigation of the role of knowledge exchange in facilitating management innovation through explanatory mediators and moderators.

Second, I take the rational perspective (cf. Chandler, 1962) that focuses on how management innovations deliver improvements on organizational performance. Technological innovation by itself does not automatically guarantee business or economic success (Teece, 2010). Having a significant impact on business performance with regard to productivity, lead times, quality, and flexibility (Goldman et al., 1995; Womack et al., 2007), non-technological innovations by themselves may represent an immediate source of competitive advantage. However, literature, specifically empirical research, on whether adopted types of non-technological innovation are able to deliver positive outcomes, is still in its infancy (Walker et al., 2011).

When many researchers have considered management innovation both economically and socially important (e.g. Sanidas, 2004), only a few have empirically explored its relationship with firm performance. Hence, the second part of this research question – *RQ2b: What is the relationship between management innovation, technological innovation, and financial performance?* With this research, I provide new insights into the innovation-performance relationship, as well as examine the relationship between management innovation and its important outcome, technological innovation. I contribute to shifting the view in innovation theory that has long presumed that only technological innovations are crucial to organizations' performance (e.g. Ahuja & Katila, 2001) by providing a piece of empirical evidence that depicts management innovations as a key concept within the innovation-performance relationship.

Relationship between individualism-collectivism and knowledge exchange, management innovation, and technological innovation

As the innovation process is driven and constrained by its organizational, social, and national contexts (Crossan & Apaydin, 2010), it is imperative to explore how different forms of firm-level innovations are carried out within specific institutional and cultural settings. Albeit I am aware that other (institutional) dimensions of the national environment also matter, this chapter focuses only on cultural factors. Contextualizing innovation by investigating how specific national cultural characteristics influence innovation processes is relevant for both managers and researchers. It puts research on innovation in context by pointing out the differences in innovation processes at the organizational level within the influence of country-specific national culture characteristics. Cultural differences, a "soft" factor at the national level, may not only account for cross-national variations in innovation, but also influence the relationship between different types of innovations, as cultural differences affect the innovation input, process, and output (Rosenbusch et al., 2011).

Using various national culture scores (e.g. Hofstede, 1980; House, Hanges, Javidan, Dorfman, & Gupta, 2004; Schwartz, 2006) and linking them to innovation, empirical research has produced contradictory results regarding the influence of several dimensions. The most vivid discrepancy is present in terms of the effect of individualism–collectivism on innovation (e.g. Rosenbusch et al., 2011; Taylor & Wilson, 2012). Therefore, I focus on this dimension of national culture models. In addition to producing the most equivocal results, it is the one dimension that might be the most critical in explaining managerial phenomena such as innovation (Shenkar, 2001; Tung & Verbeke, 2010).

My approach contextualizes innovation by investigating how specific national cultural characteristics could influence innovation processes in Chapter 3 and includes multilevel (organization and country level) analysis. Empirical cross-level study focuses on examining the third research question of my dissertation - *RQ3*: *What is the relationship between individualism-collectivism and innovation at the organizational level*? The results show whether cultural characteristics influence organizational innovation processes and provide the basis for future research, as well as the context for research at lower levels that needs to be accounted for when discussing and interpreting its results.

Work setting conducive to individual creativity and innovation

To delve deeper into the roots of innovation, in Chapter 4, I focus on its single most important determinant at the individual level (Amabile et al., 1996), that is employee creativity. I attempt to contribute to the understanding of the work setting best suited to engage the employees in creative behaviors. Creativity is a complex phenomenon that is subject to numerous individual, broad contextual and social influences (Agars et al., 2008). Unlike previous research that focused on knowledge sharing as an antecedent of creativity (e.g. Oldham & Cummings, 1996; Perry-Smith, 2006; Schepers & van den Berg, 2007), I focus on intentional withholding of information by employees and investigate the relationship between knowledge hiding and creativity.

My approach extends previous research on creativity by specifying how to achieve good results given the individual-level contingency of employee knowledge hiding. This factor might be a crucial but neglected predictor of failure of creativity enhancement initiatives in organizations, because it is conducted under different motivational cues than the lack of knowledge sharing, which is an already discussed predictor in the creativity literature (Perry-Smith, 2006). I delve deep into explaining the mechanisms underlying the knowledge hiding-creativity relationship by empirically examining the role of interpersonal and intrapsychic mechanisms and propose and conceptualize an important mediator: reciprocal distrust loop, which draws on the norm of reciprocity (cf. Gouldner, 1960) and social exchange theory (cf. Blau, 1964). I also supplement the previous research on situational cues salient for employee motivation, which constitute a suitable work environment for creativity. Drawing on achievement goal theory (AGT; Nicholls, 1984; Ames, 1992a) and investigating the role of the perceived motivational climate, I contribute to the motivational aspect of creativity and argue that it is likely that the motivational climate employees perceive at work is a crucial contingency, which influences the knowledge hiding-creativity relationship.

I therefore concentrate on the study of the influence of the motivational climate, knowledge hiding, and achievement goals (*RQ4a: What is the influence of knowledge hiding on employee creativity within the context of motivational climate?*), and then take the research one step further to investigate managerial remedies and explore the role of job-related factors and perceived supervisor support (*RQ4b: What are the interrelationships between motivational climate, knowledge hiding, and perceived supervisor support in stimulating employee creativity?*).

I also focus on ways to stimulate innovation from creativity. Creativity at the individual level provides the foundation for individuals, groups, and organizations to pursue innovative efforts. The managers gain a lot from understanding how to stimulate innovation from creativity, because implementation of creative ideas is the final step that provides a tangible value for the firm (Baer, 2012). However, literature on creativity and innovation provides little effort to differentiate between the two stages of the innovation process and include them in their research models simultaneously.

I examine both contextual and individual factors that might shape this relationship and focus on the individual and team levels in doing so. Thus, the third part of the fourth research question of my dissertation is – *RQ4c: What is the influence of motivational climate and perceived supervisor support in stimulating innovation from creative behaviors?* With the empirical examination of different effects influencing two separate stages of the innovation process (creativity and implementation), I contribute to filling the gap caused by the separation of the two research streams of creativity and innovation. This has important implications both for research and practice. If we ignore a different influence of factors that should stimulate creativity or innovation, and fail to acknowledge two separate stages of the innovation process and their interrelationship, our conceptualizations might have limited value in predicting innovation performance.

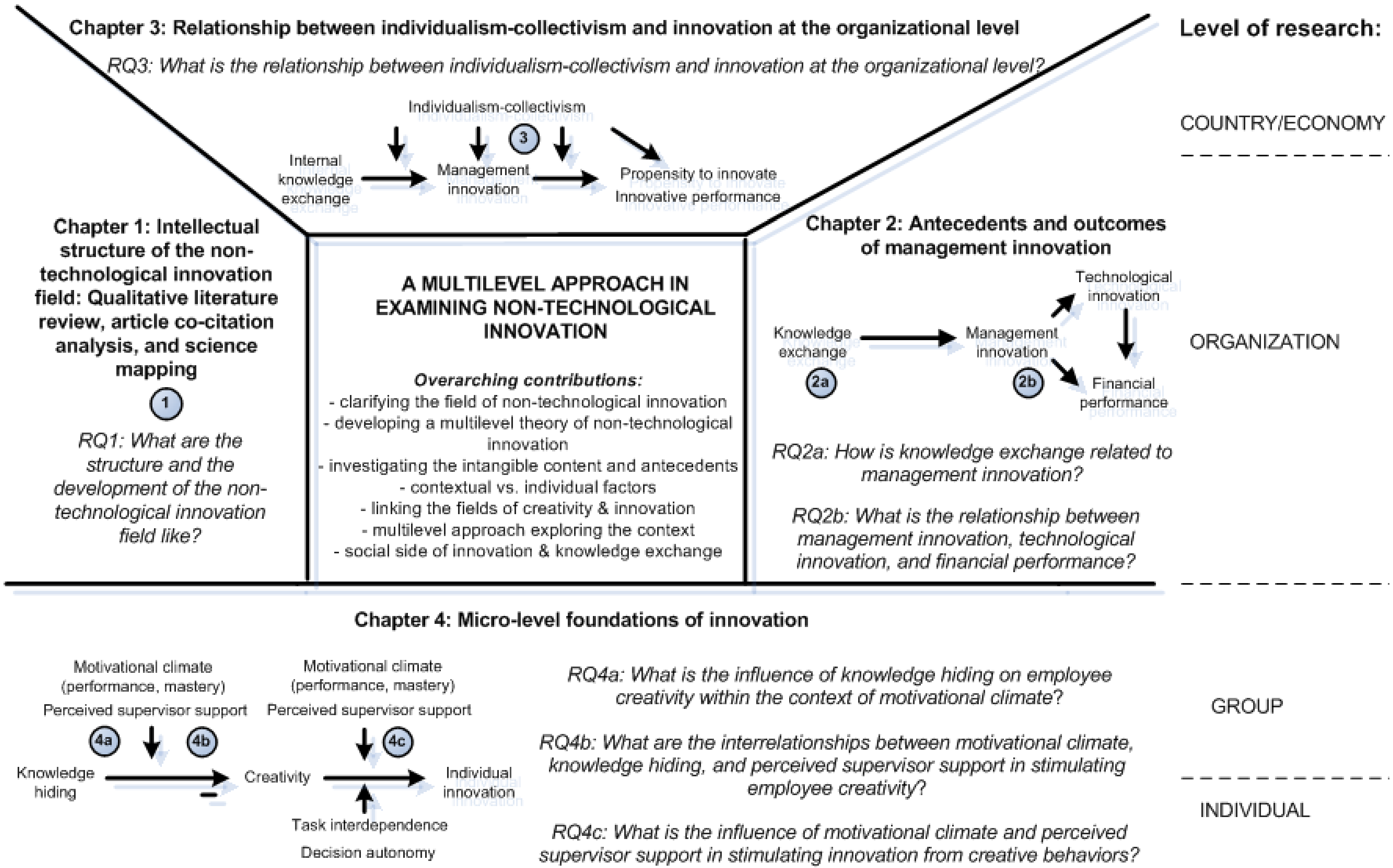
Structure and contents of the dissertation

The *aim of my research* is to explore the non-technological aspects of innovation at four levels of research: individual, group, organization, and country/economy. I prepare four content-wise chapters (placed in separate frames at different levels of research), as shown in Figure I.1. I use a multilevel approach to investigate the "soft" content of innovation, as well as the antecedents of intangible (fuzzy) nature that influence innovation at each of the levels, and examine the role they play across levels.

Chapter 1 serves as a literature review that deals with the content and forms of non-technological innovation mostly at the organizational level. I triangulate qualitative and quantitative (co-citation analysis and science mapping) literature reviews in order to clarify the field and provide basis for other chapters. In Chapter 2, staying at the organizational level, I contribute to the fast-growing field of management innovation and empirically examine its antecedents and outcomes, including knowledge exchange and technological innovation. Chapter 3 puts results from Chapters 1 and 2 in context at the country level with an examination of the role of individualism-collectivism in stimulating innovation at the organizational level. I also provide additional validity to findings in Chapter 2 by examining the same organizational-level relationships with a different data source.

Chapter 4 goes deeper where others could not be as specific and aims to bring together previously very separated research on creativity and innovation (West, 2002; Agars & Kaufman, 2008). It deals with their relationship and respective antecedents at the individual and group levels. All in all, the following underlying research threads link together my dissertation as a whole: the "soft" content and antecedents of innovation, a multilevel approach to examining non-technological innovation and exploring its context, and the social side of innovation with a particularly important role of knowledge exchange.

Figure I.1: Dissertation framework



Chapter 1: INTELLECTUAL STRUCTURE OF THE NON-TECHNOLOGICAL INNOVATION FIELD: QUALITATIVE LITERATURE REVIEW, ARTICLE CO-CITATION ANALYSIS, AND SCIENCE MAPPING

The non-technological types of innovation are neither clearly defined nor differentiated from each other, other forms of innovation, innovation in general, and creativity. Therefore, I use science mapping based on bibliometrics to produce a quantitative literature review that results in identification of key areas of research within the non-technological innovation literature and analyzes its development. I also triangulate co-citation and science mapping results with a qualitative review of antecedents and outcomes of non-technological innovation. My approach enables me to find out where the knowledge base comes from in each of the areas. By using articles as the units of analysis and incorporating all the citations that are included in the ISI Web of Science, I trace the evolution of the intellectual structure of the non-technological innovation field for the period from 1975 to 2011.

Using data analytic techniques such as pathfinder analysis with island algorithm (Batagelj & Mrvar, 1998; de Nooy, Mrvar, & Batagelj, 2011) in triangulation with a traditional qualitative review, I (1) delineate the subfields that constitute the intellectual structure of non-technological innovation and contribute to differentiation between various types and forms of non-technological innovation; (2) determine the relationships between the subfields; (3) identify authors and documents that play a pivotal role in bridging two or more conceptual domains of research; and (4) graphically map the intellectual structure in two-dimensional space in order to visualize spatial distances between intellectual themes. I contribute to the clarification of each topic's origin, which provides insight into the content and the development of the non-technological innovation field.

1.1 Introduction: Importance of non-technological innovation and the issues within the field

In the last couple of years, non-technological innovation has become increasingly recognized as a previously often overlooked factor in the innovation literature that may serve as a promising component for enhancing business performance. Firms are to organize the innovation process efficiently by combining technological capabilities with skills in marketing, management, as well as organizational competencies (Mothe & Thi, 2010). It was shown that firms which introduce non-technological in addition to technological innovations outperformed those firms that introduced a new process without any organizational or marketing innovation (Schmidt & Rammer, 2007). Therefore, understanding both non-technological and technological aspects of innovation is necessary to ensure successful innovation.

In practice, many managers are unaware of what constitutes the complex construct of innovation, especially the intangible part of innovation activities. Many confusing typologies and conceptualizations (Damanpour & Aravind, 2012) do little to help. Understanding innovation as a complex and multi-dimensional phenomenon remains a significant agenda for the researchers (Adams, 2003). Since innovation is based on continuous incremental activity, it is necessary to consider the complementary relationships between different types of innovation. By understanding innovation as a dynamic and multifaceted process, a more comprehensive account of organizational innovativeness will be obtained (Walker, 2008).

Some innovation scholars argue that innovation types may be artificial distinctions and are conceptually and operationally alike (Edquist et al., 2001). The dimensions of innovation, such as type, stage or radicalness of innovation overlap (Damanpour & Gopalakrishnan, 1998; Damanpour & Aravind, 2012) or are mutually dependent (Walker, 2008). There is not a single coherent conceptual framework that would bring together all types and forms of innovation, especially non-technological innovation (Lam, 2004). Fragmentation of the field prevents us from seeing the relations between these facets, which ultimately impedes consolidation of the field (Crossan & Apaydin, 2010). Although several forms of non-technological innovation exist, non-technological innovation and its content are not clearly defined in the innovation literature.

This study aims to provide a clearer distinction between various non-technological innovation types and a more concise idea of what constitutes each type and where the knowledge that informs its development comes from. In the first stage, I present a brief qualitative literature review of the field that enables me to get a grasp of the existing different types and forms of non-technological innovation that are out there, which serves as a basis for the documents search part of the co-citation analysis and science mapping. Then I examine how domains of knowledge on which the field of non-technological innovation drew from have been changing through time and what prospects current domains of knowledge bring to the stream. My bibliometric analysis covering an extended period of time can help to pinpoint the most influential schools of thought and the interrelationships among them (Nerur, Rasheed, & Natarajan, 2008).

I aim to present not only a snapshot of the current state-of-the-art in this field, but also to explore its development over time. In addition to the traditional qualitative review, I use a bibliometric quantitative technique called co-citation analysis (White, 2003). Such analytical review enables the identification of the most important contributions and contributors. It also facilitates better completeness of the presentation of a particular scientific field and is more objective (White, 2011), thus complementing the qualitative review. Similar co-citations in literatures denoting different types of innovation would basically mean that the knowledge informing those research streams comes from similar sources. This implies that the differentiation between them or their cores might be seen as questionable.

Social science should be seen as an evolving structure, constantly challenged by new problems and the consequent need for new knowledge (Fagerberg, Fosaas, & Sapprasert, 2012). One important way of how it renews itself is by responding to the emergence of new "problems", pointing to the insufficiency or lack of relevance of existing knowledge (Fagerberg et al., 2012). Such challenges attract researchers from a wide variety of backgrounds and scientific fields and may eventually lead to the creation of new research communities. By using articles as the units of analysis and incorporating all the citations that are included in the ISI Web of Science, I trace the evolution of the intellectual structure of the non-technological innovation field for the period from 1975 to 2011.

I chose a starting point in the year 1975. Two important articles for the development of this field were published that year. The first is an Administrative Science Quarterly piece by Baldridge and Burnham (1975) "Organizational Innovation: Individual, Organizational, and Environmental Impacts", where authors derive on previous individual-level work on innovative behavior to shift this view to include organizational and environmental factors that shape innovation. This study, although not explicitly discussing non-technological innovation, adopts the view of innovative individuals that both complement technological breakthroughs and present a form of innovation themselves. This view was later adopted by management innovation scholars (e.g. Birkinshaw & Mol, 2006; Birkinshaw et al., 2008).

The second article from 1975 that is relevant to the development of the field is a piece in Omega by Utterback and Abernathy (1975). Authors delineate between product and process innovation, allowing for a non-technological aspect of process innovations. This article is greatly influenced by economics literature and thus comes from the field of technological innovation or innovation in general. However, their view is later adopted by many scholars examining organizational innovation (e.g. Daft, 1978; Kimberly & Evanisko, 1981) that view it as a separated part from technical activities. This resulted in numerous different typologies, conceptualizations and empirical studies attempting to capture relations among them and their association with beneficial outcomes, such as technological innovation or organizational performance (e.g. Damanpour & Evan, 1984). However, there was the lack of a thorough investigation and even conceptualization that would include the majority of different proposed types of non-technological innovation activities.

To provide a thorough examination of the development of the non-technological innovation field, I delineate the whole period (1975-2011) in four time periods: 1975-1990, 1991-1997, 1998-2004, and 2005-2011. Delineating the whole time stamp into shorter periods is common in co-citation research (e.g. Nerur et al., 2008; Fernandez-Alles & Ramos-Rodríguez, 2009). Decision on the number of periods is in the researchers' hands and related to optimal illustration of the field development. In my case, the beginning period is longer (16 years) that other time frames (7 years each), because the field has grown exponentially and was relatively less active at the beginning. Especially the last couple of years witnessed a rapid growth of this field.

By applying co-citation analysis (a technique that uses co-citations of article pairs as the variable that indicates their distances from each other, White & Griffith, 1981; Eom, 2008) and science mapping (a technique that uses direct citations among primary authors to find representations of intellectual connections within the field, Small & Griffith, 1974) in the aforementioned periods, I attempt to identify key areas of research within the non-technological innovation literature. This enables me to find out where the knowledge base comes from in each of the areas and provide insight into their development.

Using pathfinder analysis (a graph-theoretic approach for portraying most important units of analysis and their interrelationships, Nerur et al., 2008) with island algorithm (Batagelj & Mrvar, 1998; de Nooy et al., 2011) in triangulation with a traditional qualitative literature review, I (1) delineate the subfields that constitute the intellectual structure of non-technological innovation and contribute to the differentiatoin between various types of non-technological innovation; (2) determine the relationships between the subfields; (3) identify authors who play a pivotal role in bridging two or more conceptual domains of research; and (4) graphically map the intellectual structure in two-dimensional space in order to visualize spatial distances between intellectual themes. I contribute to overcoming the ambiguity in the field by clarifying where each topic originates. This provides insight into the content, its origins, and development, but also serves as a foundation for a better distinction among various types of non-technological innovation.

By using co-citation analysis and science mapping techniques, I am able to single out more objectively the most important authors and their work and see whether the knowledge comes from the same literatures to studies describing particular types of non-technological innovation. At the beginning of this field, the existence of non-technological forms of innovation was only implied. After the dual-core model of innovation (Daft, 1978), administrative innovation became a regular feature in innovation studies. The distinction between administrative and technical innovation relates to the general distinction between technology and social structure (Evan, 1966). Administrative innovations are only indirectly related to the organization's primary work activity and mainly affect its management systems (Damanpour & Evan, 1984). Nevertheless, many scholars preferred the term organizational innovation, be it for describing all innovation types at the firm level, or only the non-technological ones. Recently, management innovation has presented a term that overtook other labels for describing non-technological innovations in the scientific literature (e.g. Birkinshaw et al., 2008; Walker et al., 2011; Damanpour & Aravind, 2012). It is a natural extension of administrative innovation that incorporates a more individual-based view ("what the managers do differently", Birkinshaw et al., 2008). Nevertheless, studies examining management innovation are predominantly based on the organizational level.

Based on a recent qualitative review article of Damanpour & Aravind (2012), one can assume that non-technological innovation has become mature enough to treat the literature generated by the field as a research topic in its own right. Their study does go further into describing different forms of non-technological innovation, but it does little to differentiate between them. Furthermore, their review is purely qualitative, whereas I attempt to shed light onto the field by using a more objective and quantifiable approach. In the discussion, I compare my findings to that review paper. Thus, the bibliometric methods I use can avoid some of the potential subjective biases and perhaps provide validation to qualitative review papers. I also compare my findings to other narrative reviews of the field of innovation in general (e.g. Anderson, De Dreu, & Nijstad, 2004; Crossan & Apaydin, 2010) to provide more insight into the similarities and differences of the two fields that are undoubtedly connected to each other.

I also want to discuss, compare, and contrast my findings with the results of two recent knowledge base explorations by Fagerberg, Fosaas, & Sapprasert (2012) and Martin (2012). The authors of the first study examined the whole scientific field of innovation (cf. Fagerberg & Verspagen, 2009) with a different methodology. They focused on handbooks of that particular field as representative of the most important knowledge and concentrated on works these handbooks cite. Moreover, they only conducted a citation analysis, not a co-citation analysis. By doing so, they have conducted a cluster analysis to draw inferences about the structure of the knowledge base on innovation and analyzed the changing character of the field (Fagerberg et al., 2012). Therefore, their study provides an interesting basis for comparison with my findings that center on the sub-field of innovation, non-technological innovation, and the whole field. This would enable me to contribute to the field by exploring whether the knowledge base of both fields is any different, as well as has the knowledge come from different theories and research streams, and thus help to further establish differences between non-technological and technological innovation. It also reveals if the field is only growing quantitatively, or is it really contributing content-wise to the field of innovation in general.

Martin (2012), as opposed to Fagerberg et al. (2012), did not consult the handbooks to construct the list of most influential authors. He rather applied a snowball technique to identify key authors of the field as well as searched journals for articles using relevant keywords. In relation with this, his approach is similar to mine. However, his findings of the citation analysis may be slightly less representative, because his field of interest included both innovation studies and science policy. Nevertheless, as innovation studies do represent most of his field of interest, I will compare my findings with his.

1.2 Types and forms of non-technological innovation

There are many types of innovation that authors understand within the term of non-technological innovation. I first had to prepare a qualitative literature review to identify these types and forms that would serve as search terms for the co-citation analysis and science mapping. I identified several of them, such as non-technological product innovation (Hammer, 2004), operational innovation (Hamel, 2007; Dobni, 2008), management innovation (Kimberly & Evanisko, 1981; Phillips, 1997; Hamel, 2007; Birkinshaw et al., 2008; Bodas Freitas, 2008), strategic innovation, including new marketing strategies – usually closely related to business model innovation (Phillips, 1997; Hamel, 2007), organizational innovation, including changes to organizational structures (Kimberly & Evanisko, 1981; Damanpour & Evan, 1984; Phillips, 1997), and marketing innovation (Rust, Ambler, Carpenter, Kumar, & Srivastava, 2004; Mothe & Thi, 2010). It is this diverse situation that makes the bibliometric analyses presented later on potentially interesting. In Tables 1.1 and 1.2, I summarize some of the most common notions (terms) for describing different types of non-technological innovation and their meaning, along with authors that have adopted this view. For additional definitions and examples of particular types of innovation, see Damanpour and Aravind (2012). It is interesting to note that almost all studies dealing with defining non-technological types of innovation do so at the organizational level.

Chuang et al. (2010) constructed a multidimensional model of innovation measurement, further dividing technical innovation to product/service and process innovation. Information relevant for my dissertation is that they provide five distinct types of administrative or non-technological innovation; internal organizational innovation, value creation innovation, management innovation, strategic innovation, and customer relation innovation. The last two constitute external relational innovation.

As mentioned in the introduction, management innovation is a term that has recently overtaken other labels for describing non-technological innovations in the scientific literature (e.g. Birkinshaw et al., 2008; Walker et al., 2011; Damanpour & Aravind, 2012). Damanpour and Aravind (2012, p. 12) define management innovation as "new approaches in knowledge for performing the work of management and new processes that produce changes in the organization's strategy, structure, administrative processes, and systems".

In order to systematically address the forms of non-technological innovation, different innovation typologies need to be explained first. According to Han, Kim, and Srivastava (1998), there are numerous typologies of innovation. However, the most frequently used ones distinguish between product versus process innovation, incremental versus radical, and technical versus administrative innovations (Gopalakrishnan & Damanpour, 1997; Santos-Vijande & Álvarez-González, 2007).

Product and process innovation are often called technological innovations (Schmidt & Rammer, 2007), even if process innovation also consists of a non-technological component (Dodgson, Gann, & Salter, 2008). Lee (2000) identifies three innovation types: product or service innovation, process innovation, and strategic innovation, which is content-wise closely related to business model innovation.

The categorization of innovations either as *technical or administrative* reflects a general distinction between social and technological sides (Crossan & Apaydin, 2010). Technical innovations pertain to products, services, processes, and technologies; they are related to the primary work activity of the organization and can be either product or process innovations (Daft, 1978; Damanpour & Evan, 1984). Administrative innovations involve organizational structure, human resources, and administrative processes; they are indirectly related to the primary work activity of the organization and more directly related to its management (Daft, 1978; Damanpour & Evan, 1984). According to Sanidas (2004), administrative innovation is a synonym for organizational innovation; disembodied, not technical. It represents the extent to which organizations incorporate and routinely use innovations; fresh rules and procedures, changes in roles and structures, and the establishment of new relationships (Kostova & Roth, 2002; Naveh, Meilich, & Marcus, 2006).

After a comprehensive literature review, it is interesting to note that one cannot be completely certain about the meaning of the expression “organizational innovation”, a term frequently used by the authors. Confusingly, this label is often mentioned to imply any type of innovation generated by organizations (e.g. Cummings & O'Connell, 1978; Wolfe, 1994; Xu, McCarthy, & Yang, 2006; Santos-Vijande & Álvarez-González, 2007; Chen & Lin, 2009; Gumusluoglu & Ilsev, 2009; Byosiere et al., 2010; Schubert, 2010). By these authors’ definitions, the term organizational innovation encompasses both technological and non-technological forms of innovation at the organizational level.

However, equally often and perhaps more appropriately, *organizational innovation* is added to the two basic types, product and process innovation (Liao, Fei, & Liu, 2008; Un & Montoro-Sanchez, 2010). Process innovation refers to the development of new ways of managing the primary value-adding activities of the firm in order to make them more efficient or effective. On the contrary, management or organizational innovation focuses on the supporting activities that surround the resource transformation process and add value. Organizational innovations can be structural or procedural; intra or inter-organizational and; innovations in business processes or in organizational structures (Lam, 2004; Armbruster et al., 2008).

Lam (2004) follows the Damanpour and Evan’s (1984) understanding of organizational innovation as non-technical process innovations, e.g. the implementation of innovative organizational concepts, such as business processes or organizational structures. Sanidas (2004), as mentioned, understands organizational innovation as a synonym for administrative innovation, thus distinguishing between organizational and technical innovation.

Table 1.1: Brief summary of definitions of different types of non-technological innovation along with their authors (Part 1)

TERM	AUTHOR	MEANING OR DEFINITION	LEVEL OF ANALYSIS	AUTHORS ADOPTING THIS VIEW
Administrative innovation	Evan (1966)	Technical (new products, processes or services) vs. administrative innovation (new policies)	Organizational level	Daft (1978): administrative innovation = policies of recruitment, allocation of resources, and the structuring of tasks, authority and rewards – *organizational level*, but content-wise related to administrative practices at lower levels Kimberly & Evanisko (1981): distinction between technical and administrative innovations is not so much in the fact that they serve different functions but that they imply potentially different decision making processes
Organizational innovation	Baldridge & Burnham (1975)	Individual characteristics, such as gender, age, and personal attitudes, administrative positions and roles, structural characteristics of the organization, such as size and complexity, environmental input from the community and other organizations -	Organizational level, but accounting for higher (economy) and lower (individual) levels	
Organizational innovation	Damanpour & Evan (1984)	non-technical process innovations (not non-technical service innovations)	Organizational level	Damanpour (1991); Anderson & King (1993); Toterdell et al (2002); Lam (2005); Armbruster et al (2008) - organizational innovation as a change process or as the result of adoption Empirical: Damanpour et al. (1989); Caroli and Van Reenen (2001); Piva and Vivarelli (2002) - the effect on business performance; Greenan (2003)
Administrative innovation	Nutt (1986); Nutt (1989)	The extent to which organizations incorporate and routinely use the following innovations: fresh rules and procedures, changes in roles and structures, and establishment of new relationships	Organizational level	Cooper and Zmud (1990), Kostova (1999) and Klein et al. (2001) Empirical: Naveh et al (2006) : influence on performance
Organizational, management, and business model innovation	Hamel (1991)	How companies organize, lead, allocate resources, plan, hire, and motivate – a holistic view	Organizational level	
Organizational innovation	Nonaka (1994)	A key form of organizational knowledge creation	Organizational level	Damanpour (1996) - innovation as a process of organizational learning and knowledge creation with an emphasis on organizational capacity for change and adaptation; all innovation studies adopting a knowledge-based view
Market innovation	Johne (1998)	As opposed to product and process innovation	Organizational level	
Organizational innovation	Staropoli (1998)	Network as an organizational innovation	Organizational level	Open innovation and supply chain management literature – *organizational and economy level*
Non-technological process innovation	Papinniemi (1999)	Focused on *how* (a form of innovation, not a type) – process innovation = a set of activities to produce output	Organizational level	Krause et al (2007); Li et al (2007); Lambertini & Mantovani (2009)

Table 1.2: A brief summary of definitions of different types of non-technological innovation along with their authors (Part 2)

TERM	AUTHOR	MEANING OR DEFINITION	LEVEL OF ANALYSIS	AUTHORS ADOPTING THIS VIEW
Management innovation	Mol & Birkinshaw (2009)	Organizational structures, management techniques and marketing concepts / strategies - in line with CIS	Organizational level	Vaccaro et al. (2010)
Organizational innovation	Boer & During (2001)	Organizational vs. process innovation (vs. product innovation) – mixing the innovation form and type typologies	Organizational level	Annique & Montoro-Sanchez (2010)
Open innovation	Chesbrough (2003, 2006)	The use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively	Organizational level	Open innovation literature (e.g. Chesbrough, 2007, 2010; Vanhaverbeke, Van de Vrande, & Chesbrough, 2008)
Organizational innovation	Sanidas (2004)	Disembodied, not technical	Organizational level	
Strategic innovation	Kodama (2004)	Business process improvement	Organizational level	
Strategic innovation	Filson & Gretz (2004)	Marketing, licensing, adoption / generation	Organizational level	
Business model innovation	Shafer (2005)	Innovation in strategic choices, value network, creating value, and capturing value	Organizational level	
Non-technological innovation	OECD (Oslo Manual, 2005)	Non-technical product and process innovation: organizational (implementation of innovative organizational concepts: structural vs. procedural; intra vs. inter-organizational; business processes or organizational structures) and marketing	Organizational level	Baranano (2003), Wu (2009), Community Innovation Survey (CIS)
				Empirical: Mothe & Thi (2010) - impact on capacity to innovate, not on innovative performance; Schmidt & Rammer (2007)- the relationship between non-technological and technological innovation using German CIS data
Technological process innovation	OECD (Oslo Manual, 2005)	Also includes the production organization and/or organizational, financial and commercial activities	Organizational level	Community Innovation Survey (CIS)
Management innovation	Hamel (2006)	What managers are and do	Organizational and individual (managerial) level	Vaccaro et al. (2012)
Business model innovation	Zott & Amit (2008)	Innovation in the company's manner of doing business, what is its source of competitive advantage, and how it transcends traditional firm boundaries	Organizational level	Sosna (2010)
Organizational and managerial innovations	Bodas Freitas (2008)	Quality circles and business process re-engineering	Organizational and group levels	
Business model innovation	Lindgardt et al (2009, BCG)	Innovation in the value proposition (target segments, product or service offerings, revenue model) and the operating model (value chain, cost model, organization)	Organizational level	
Innovation as a process	Baregheh (2009)	Process as a type of innovation (not a procedure or a set of routines – thus a type of innovation, not a form)	Organizational level	
Business model innovation	Teece (2010)	Innovation in five business model elements: capture value, technologies & features, benefit for the customer, target segments, revenue streams)	Organizational level	
Strategic innovation	Afuah (2010)	Strategic management (closely related to business model innovation)	Organizational level	Doganova (2010)

Damanpour and Evan (1984) define organizational innovation as non-technical process innovations; the implementation of innovative organizational concepts. Organizational innovation is a process of organizational learning, knowledge creation (Damanpour, 1996), and changes in the social system - networking (Staropoli, 1998; Walker, 2008). Organizational process innovations affect management and organization. They change relationships among organizational members and affect rules, roles, procedures and structures, communication and exchange among organizational members, and between the environment and organizational members (Edquist et al., 2001).

An essential part of organizational innovation is the shift to the work organization (Mothe & Thi, 2010). New work practices are related to lean and just-in-time production, decentralized decision making, teamwork and shared rewards (OECD, 2005). This type of innovation has been described as essential in today's unstable, rapidly changing environment (Hamel, 2007; Birkinshaw et al., 2008). Organizational innovation also deals with introduction of knowledge management systems. Firms have opportunities for higher innovation capabilities when they are able to expand, disseminate, and exploit organizational knowledge internally, as well as to share, transfer, and receive knowledge from external partners (Mothe & Thi, 2010).

Mol and Birkinshaw (2009) advance research on administrative innovation and in their conceptualization of *management innovation* follow the Oslo Manual definition (OECD, 2005): the innovation in organizational structures, management techniques and marketing concepts or strategies. It is defined as the implementation of a new management practice, process or structure that significantly alters the way in which the work of management is performed, and is intended to further organizational goals (Kimberly & Evanisko, 1981; Damanpour & Evan, 1984). It includes everything that substantially alters the way in which management work is carried out, or significantly modifies customary organizational forms, and, by doing so, advances organizational goals (Hamel, 2007).

A series of studies was made to examine the diffusion of a particular management innovation across a population of firms and across country boundaries. Another major area of prior research has examined the conditions under which management innovation takes place. However, a systematic description of the process of management innovation and its relationship with other types of innovation is still lacking (Birkinshaw et al., 2008).

Rust et al. (2004) view *marketing innovation* in terms of three dimensions: product strategy, price strategy, and promotion strategy. They lead to tactical marketing actions such as changes in design or packaging, sales or distribution methods, advertising, or permanent exhibitions (Mothe & Thi, 2010). The Oslo Manual clearly distinguishes marketing innovation from product innovation, as the latter includes technical specifications and functional characteristics, while the first is defined as "the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing" (OECD, 2005, p. 49).

Giesen et al. (2010) identify four elements of *operational innovation*, which deal with how innovation is implemented. The first element includes lean and transparent processes. They build elements of continuous improvement into the operational process, allowing the organization to change and adapt the model based on new business model requirements. The second presents flexible and scalable technology. This way, organization can shift and adapt its business model, and be able to scale and grow rapidly. The third are globally optimized operations. Processes need to be replicable and repeatable across different geographies, and extensive partnering needs to take place. This provides organizations with access to the right skills at the right cost and at the right time, which supports the successful delivery of business model innovation. The fourth element is asset and cost flexibility. A shift from fixed to variable assets enables faster response to changes in market conditions (Giesen et al., 2010).

Ancillary innovations differentiate from other innovations as they are concerned with working across boundaries with other partners, such as service providers, users, or other public agencies. Their successful implementation relies upon other factors outside the organization’s control. Ancillary innovations are “organization-environment boundary innovations” (Damanpour, 1987, p. 678).

Ancillary innovations are linked to other innovation types. For example, a new service could develop in partnership with other actors, including users or other public, voluntary, or private organizations. Ancillary innovations are a separate type of innovation, but may in practice overlap with other innovation types (Walker, 2008). However, a new field of research has recently emerged regarding ancillary innovation. It has become known as *open innovation*, as named by the beginner of this field, Henry Chesbrough (2003b).

In a world of widely distributed knowledge, companies cannot afford to rely entirely on their own research, but should instead buy or license processes or inventions from other actors, such as institutes, suppliers, or customers. In addition, internal inventions not being used in a firm's business should be taken outside the company, for example through licensing, joint ventures, or spin-offs (Chesbrough, 2003a). A lot of these issues have been discussed within the value chain literature and are closely connected to the strategic decisions.

The essence of a firm’s strategy presents its business system (activity set) for controlling the resources and adapting them over time to ensure their continuing relevance in achieving the firm’s goals (Itami & Nishino, 2010). Thus, the *strategic innovation* perspective projects the possibility of creativity and innovative change within the organization (Lam, 2004). In this view, strategic foresight is critical for organizations in a complex and fast changing environment to understand new opportunities and the potential impact of new technologies, emerging customer segments, or a new set of product or service capabilities (Giesen et al., 2010). Modern innovation processes are strategic and driven by strategy, with high level of organizational and technological integration; internally and with customers, suppliers, innovation communities, and networks – not only ad-hoc (Dodgson et al., 2008).

Strategic innovation involves innovating new business models (Lee, Olson, & Trimi, 2010). It deals with strategic management (Afuah, 2009), redefining the customer base (Lee et al., 2010), business process improvement (Kodama, 2004), marketing and licensing (Filson & Gretz, 2004), strategy analysis (Giesen et al., 2010; Teece, 2010) and development (Dodgson et al., 2008), as well as strategic adaptation to external changes (Lam, 2004). Taking into account all the aforementioned characteristics, it is very similar to business model innovation. However, it encompasses not only strategic planning, but also the implementation of changes at all organizational levels.

Innovation is tightly coupled to change, as organizations use innovation as a tool in order to influence an environment or due to their changing environments (internal and external) (Damanpour, 1991). However, innovation may involve a wide range of different types of change depending on the organization’s resources, capabilities, strategies, and requirements (Baregheh, Rowley, & Sambrook, 2009), thus all the company’s efforts that can be described with a business model. Nevertheless, the concept of a business model lacks theoretical grounding in economics or in business studies. There is simply no established place in economic theory for business models nor a single scientific paper in the mainstream economics journals that analyses or discusses business models in the broadest sense with regard to innovation (Teece, 2010).

Business model innovation represents an often overlooked (and therefore underutilized) source of future income, an opportunity to create new business or enhanced revenues and profits at relatively low cost (Johnson, Christensen, & Kagermann, 2008). Furthermore, these economic advantages could translate into a sustainable competitive advantage, given that competitors might find it difficult to imitate or replicate an entirely novel activity system (as opposed to copying a single novel product or process). Moreover, because business model innovation can be such a powerful competitive tool, managers must be aware of competitors’ efforts in this area (Zott & Amit, 2009). Business model innovation occurs when a firm adopts a novel approach to commercializing its underlying assets (Gambardella & McGahan, 2010). This happens when a company makes business model replacements that provide previously unavailable product or service offerings (Mitchell & Coles, 2003). The capacity of a firm (or a nation) to capture value will be deeply compromised unless the capacity to create new business models exists (Teece, 2010).

1.3 Methods

My effort at delineating the intellectual structure of the non-technological innovation discipline involves author co-citation analysis. Formal and informal connections that authors engage in are systematically chronicled in journals that publish their works. Authors working in a stream of research often cite one another and draw on common sources of knowledge. This is why their works are likely to be frequently co-cited (i.e. cited together) by other authors working on intellectually similar themes (Nerur et al., 2008). A web of relationships between authors or documents is established during this process through the creation and dissemination of knowledge. By examining citations of seminal authors or their works, one can begin to unravel the complex patterns of associations that exist among them as well as to trace the changes in intellectual currents over time (Nerur et al., 2008).

Co-citation analysis is a bibliometric technique that usually uses a matrix of co-citation frequencies between authors or documents as its input (McCain, 1990). This matrix can be the basis for various types of analyses, such as factor analysis, multidimensional scaling, and hierarchical clustering. Instead of conducting all these analyses separately, I follow White's (2003) suggestion and only perform the graph-theoretic approach called pathfinder or exploratory network analysis in Pajek (de Nooy et al., 2011). This enables me to gain insights into the network relationships of the authors and identify boundary spanners within each field. Consequently, I can extract key conceptual themes in the non-technological innovation field, describe the protagonists of the subfields and the pervasiveness of their influence, as well as finally graphically represent author proximities.

The references (i.e. citations) made to scholarly works of seminal authors in a discipline may be formally analyzed to delineate a network structure highlighting prominent relationships between authors and identify the "boundary-spanning" authors who serve to bridge research streams (Nerur et al., 2008). The pathfinder analysis generates a network structure which emphasizes the strongest relationships between the concepts of interest in the domain (Schvaneveldt, 1990). The nodes in such a network represent the authors, with the co-citation frequency between authors being a measure of their conceptual similarity. The input to the Pathfinder analysis is a matrix of raw counts (White, 2003). Such a dataset results in an undirected graph (Nerur et al., 2008). The data were then analyzed with island algorithm in Pajek (Batagelj & Mrvar, 1998; de Nooy et al., 2011), which produced different domains of knowledge for various time segments. Consequently, I was able to focus on new domains as they develop in every time frame.

This approach has considerable advantages over traditional author co-citation analysis that uses multiple techniques (e.g. factor analysis, multidimensional scaling, and hierarchical clustering). In pathfinder networks, nodes represent authors or documents, and particular links represent weighted paths between nodes, with the weights being co-citation counts (White, 2003). The strength of co-citation is defined as the number of times two documents have been cited together. This provides an objective and quantitative way to group or cluster the cited documents (Small & Griffith, 1974). By including only the highest counts for author or document pairs, only the most salient relationships can be mapped. Dominant authors (e.g. with high degree centrality that are focal to particular disciplines) and those that serve as boundary spanners between particular disciplines can be easily identified.

As pathfinder networks are generated from matrices of raw counts, such approach removes a computational step associated with traditional co-citation analysis, as well as eliminates the need to use additional software and apply multiple computer and drawing operations. Moreover, it simplifies the approach by not focusing on complicated Pearson *r* correlations, but creating a field out of the linked nodes in one pass instead (White, 2003). The limitation of using pathfinder analysis only is that the author needs to be familiar with the field in order to adequately interpret the links and disciplines. Furthermore, it cannot map multiple factor loadings (cross-loadings) as author- or document-nodes appear in one place only (White, 2003). Another limitation is that the maps cannot capture all the relations among authors or documents that give a field its complexity (White, 2003). However, as the aim of co-citation analysis and its mapping is to simplify a particular field, these limitations are not that severe.

I also perform direct citation analysis, which results in science mapping that shows how dynamically knowledge on the primary field (non-technological innovation) gets generated and transferred over time (Osareh, 1996). This evaluation includes citing behaviors among the primary articles, origins of the references cited, and characteristics of the key references (Backhaus, Lügger, & Koch, 2011). It results in a snapshot of the field that portrays key authors of primary articles and reveals how they cite each other.

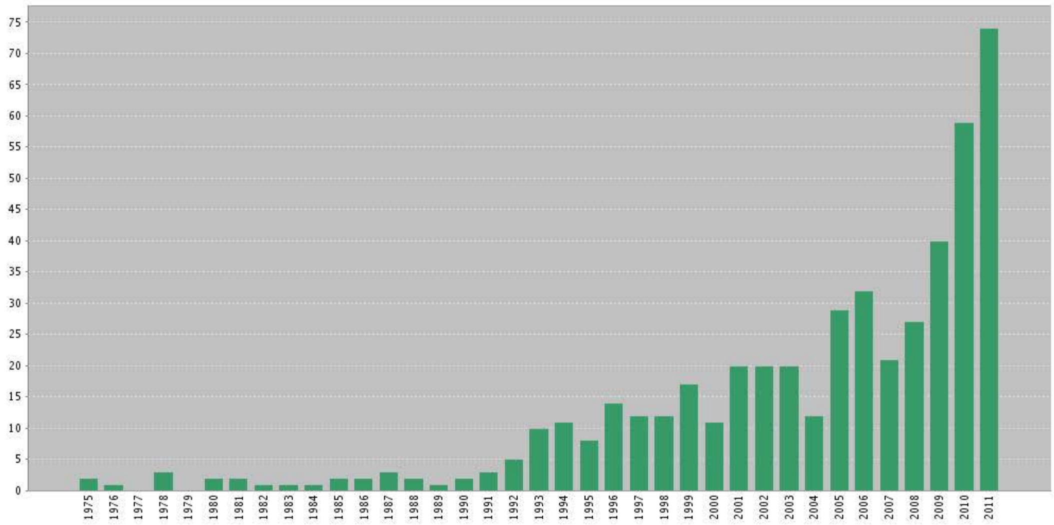
1.3.1 Retrieval of co-citation and citation data

As mentioned I chose the period from 1975 to 2011 for the examined timeframe. I obtained secondary data through ISI Web of Science. This database is used in the majority of similar bibliometric studies (e.g. White, 2003; Nerur et al., 2008).). I searched the database using the search term "OR". The following keywords were used: "non-technological innovation", "non-technical innovation", "management innovation", "marketing innovation", "organizational innovation", "strategic innovation", "business model innovation", "administrative innovation", "open innovation", "green innovation", and "ancillary innovation".

The search was refined by key areas (Web of Science Categories): MANAGEMENT or BUSINESS or PSYCHOLOGY EDUCATIONAL or PSYCHOLOGY EXPERIMENTAL or OPERATIONS RESEARCH MANAGEMENT SCIENCE or PUBLIC ADMINISTRATION or BUSINESS FINANCE or ECONOMICS or PSYCHOLOGY APPLIED or SOCIOLOGY or INDUSTRIAL RELATIONS & LABOR or SOCIAL WORK or PSYCHOLOGY or PSYCHOLOGY SOCIAL or PSYCHOLOGY MULTIDISCIPLINARY or SOCIAL SCIENCES INTERDISCIPLINARY. I searched in all three databases offered by ISI: SCI-EXPANDED (Science Citation Index Expanded), SSCI (Social Sciences Citation Index), and A&HCI (Arts & Humanities Citation Index).

From this search, I obtained a database containing 538 units of literature (documents). Afterwards, I manually reviewed the abstracts and excluded the articles that were not relevant for my topic, even if they had passed the first filtering by keywords. In this way, I reduced the number of articles to 482 units. The sample of primary articles (citations of these primary articles are used in the analyses) thus includes 482 documents from the ISI Web of Knowledge from the 1975–2011 periods that fit the keywords relevant for non-technological innovation field. They cited 11,036 papers (average citations per article: 31.90). In turn, they were later cited by others 15,375 times. Figure 1.1 demonstrates how the primary articles were published in terms of the actual publication dates within the period.

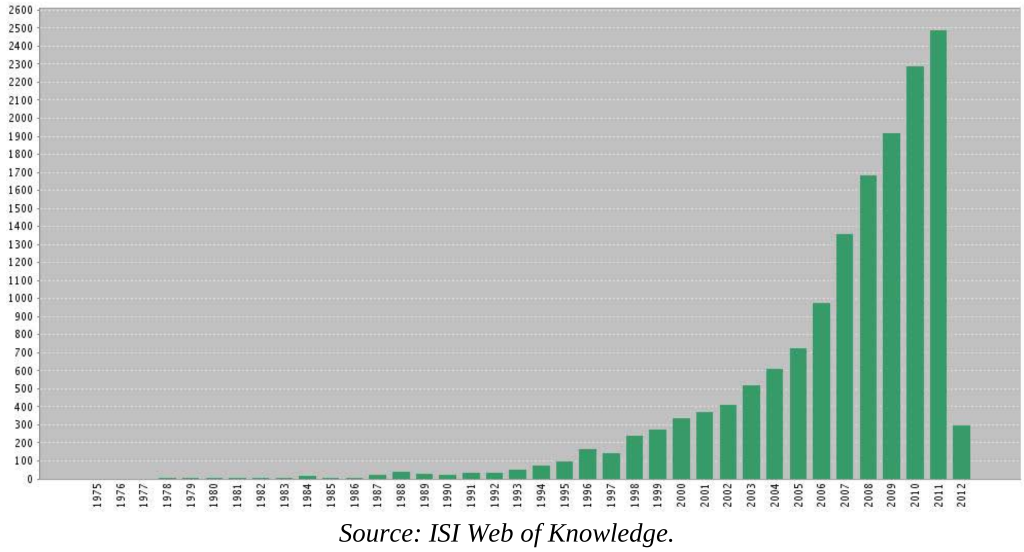
Figure 1.1: Distribution of primary articles per year during 1975-2011



Source: ISI Web of Knowledge.

As attested by Figure 1.1, a relatively low amount of papers were published in the earlier years of the 1975-2011 periods. Considering numerous new journals that were established and accepted into SCI or SSCI rankings in the last couple of years, this is characteristic for many fields, but an exponential growth is even more present on the field of non-technological innovation. Figure 1.2 reveals when these primary articles were later on cited and how often did the citation occur, indicating their influence (not only in the non-technological innovation field, but also in general). Table 1.3 reveals primary documents that were cited the most often. In terms of the co-citation analysis, not primary articles, but target articles are important (that are referred to in the primary articles). I obtained these through the cited references search.

Figure 1.2: Years of primary articles' citations



Source: ISI Web of Knowledge.

The cited references search allows me to retrieve all the articles indexed in three ISS databases in a given period that cite at least one work of the author. Nerur et al. (2008, p. 324) offer an illustrative description of this process: "Cited references for an author would include any scholarly publication appearing in any journal that cites at least one work of the author. Each cited reference has a unique identifier that forms the basis for getting the co-citations between a pair of authors. A co-citation occurs between two authors, say A and B, when a cited reference to A's work also cites some work of B. A co-citation means that two references are cited together in the same paper. That is, the number of cited references of A that match the cited references of B gives the frequency of co-citations between A and B. More co-citations would indicate that the primary papers draw from the same domain of knowledge."

I exported the database of target articles into Bibexcel (Persson, Danell, & Schneider, 2009) and first normalized the articles. I did so by merging the first author's name, surname, and year of publication. As a large number of references usually has to be handled in the co-citation analysis, there must be a cutoff point, or citation threshold, which is applied to the references that exceed a preset number of citations (Eom, 2008; Fernandez-Alles & Ramos-Rodríguez, 2009). I applied different thresholds in each time stamp to provide as insightful presentation of the field and its origins at each period as possible. I used Bibexcel for counting frequencies and co-occurrences, and generating the raw co-citation matrix.

Table 1.3: Highest cited primary articles

Title	Authors	Source Title	Year	Citations	Citations per Year
A dynamic theory of organizational knowledge creation	Nonaka, I	Organization Science	1994	2190	115.26
Organizational innovation - a meta-analysis of effects of determinants and moderators	Damanpour, F	Academy of Management Journal	1991	1004	45.64
Assessing the work environment for creativity	Amabile, TM; Conti, R; Coon, H; Lazenby, J; Herron, M	Academy of Management Journal	1996	548	32.24
Organizational innovation - the influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations	Kimberly, JR; Evanisko, MJ	Academy of Management Journal	1981	522	16.31
Toward a theory of organizational creativity	Woodman, RW; Sawyer, JE; Griffin, RW	Academy of Management Review	1993	476	23.80
Bridging epistemologies: The generative dance between organizational knowledge and organizational knowing	Cook, SDN; Brown, JS	Organization Science	1999	403	28.79
Institutional and competitive bandwagons - using mathematical-modeling as a tool to explore innovation diffusion	Abrahamson, E; Rosenkopf, L	Academy of Management Review	1993	260	13.00
Entrepreneurship in the large corporation: A longitudinal study of how established firms create breakthrough inventions	Ahuja, G; Lampert, CM	Strategic Management Journal	2001	249	20.75
Disrupted routines: Team learning and new technology implementation in hospitals	Edmondson, AC; Bohmer, RM; Pisano, GP	Administrative Science Quarterly	2001	247	20.58
Aging, obsolescence, and organizational innovation	Sorensen, JB; Stuart, TE	Administrative Science Quarterly	2000	242	18.62

Source: ISI Web of Knowledge.

First, I present some descriptive statistics for the whole period 1975-2011. Focusing on citations, Table 1.4 reveals articles that most frequently cited in the target articles (that were in the references of the primary articles). The article by Damanpour (1991) was the most often cited piece, cited 140 times in 482 articles that constitute the database of primary articles.

Table 1.4: Target articles with the highest citation frequencies (1975-2011)

Citation frequency	**First author, year, and publication**
140	Damanpour F, 1991, V34, P555, Acad Manage J
105	Kimberly J, 1981, V24, P689, Acad Manage J
67	Daft R, 1978, V21, P193, Acad Manage J
60	Rogers E, 1983, Diffusion Innovation
60	Zaltman G, 1973, Innovations Org
54	Cohen W, 1990, V35, P128, Admin Sci Quart
48	Damanpour F, 1984, V29, P392, Admin Sci Quart
44	Downs G, 1976, V21, P700, Admin Sci Quart
43	Rogers E, 1995, Diffusion Innovation
41	Wolfe R, 1994, V31, P405, J Manage Stud
40	Dewar R, 1986, V32, P1422, Manage Sci
39	Damanpour F, 1987, V13, P675, J Manage
37	Meyer A, 1988, V31, P897, Acad Manage J
36	Burns T, 1961, Management Innovatio
36	Tushman M, 1986, V31, P439, Admin Sci Quart
36	Dimaggio P, 1983, V48, P147, Am Sociol Rev
34	Vandeven A, 1986, V32, P590, Manage Sci
34	Barney J, 1991, V17, P99, J Manage
33	Nonaka I, 1995, Knowledge Creating C
32	Aiken M, 1971, V5, P63, Sociology
31	Nunnally J, 1978, Psychometric Theory
31	Schumpeter J, 1934, Theory Ec Dev
30	Nelson R, 1982, Evolutionary Theory
30	Baldridge J, 1975, V20, P165, Admin Sci Quart

Table 1.5 reveals the articles that were most often cited together (co-occurences). This is the basis for the co-citation analysis and subsequent pathfinder analysis. Articles by Daft (1978) and Kimberly and Evanisko (1981) were most often cited together in 482 primary articles – 34 times.

Table 1.5: Target articles with the highest co-citation frequencies (1975-2011)

Co-occurrence frequency	Cited reference 1 (First author, year, and publication)	Cited reference 2 (First author, year, and publication)
34	Daft RL, 1978, Acad Manage J	Kimberly JR, 1981, Acad Manage J
33	Kimberly JR, 1981, Acad Manage J	Zaltman G, 1973, Innovations Org
29	Kimberly JR, 1981, Acad Manage J	Rogers EM, 1983, Diffusion Innovation
27	Kimberly JR, 1981, Acad Manage J	Meyer AD, 1988, Acad Manage J
26	Dewar RD, 1986, Manage Sci	Kimberly JR, 1981, Acad Manage J
26	Rogers EM, 1983, Diffusion Innovation	Zaltman G, 1973, Innovations Org
25	Damanpour F, 1987, J Manage	Kimberly JR, 1981, Acad Manage J
24	Daft RL, 1978, Acad Manage J	Zaltman G, 1973, Innovations Org
23	Daft RL, 1978, Acad Manage J	Damanpour F, 1984, ASQ
22	Downs GW, 1976, ASQ	Kimberly JR, 1981, Acad Manage J
22	Daft RL, 1978, Acad Manage J	Rogers Em, 1983, Diffusion Innovation
22	Damanpour F, 1984, ASQ	Kimberly JR, 1981, Acad Manage J
21	Downs GW, 1976, ASQ	Zaltman G, 1973, Innovations Org
20	Aiken M, 1971, Sociology	Kimberly JR, 1981, Acad Manage J
20	Damanpour F, 1984, ASQ	Rogers EM, 1983, Diffusion Innovation
20	Baldridge JV, 1975, ASQ	Kimberly JR, 1981, Acad Manage J

Following the procedure outlined above, a frequency of co-citations was obtained for each pair of authors. I used objective modeling procedure without subjective weighting of authors or studies. For each period of analysis, only documents that had a threshold of co-citations that was designed for each period separately were retained for analysis. I used two co-citation thresholds in each period in order to obtain more interpretable and robust results. It must be noted that not all target documents appear in every analyzed time period.

1.4 Co-citation analysis results

To facilitate the data visualization and improve the interpretation of results I segmented the 1975-2011 periods into four segments. I created four separate files in Bibexcel that I could transfer to Pajek, where I would visualize the network using social network analysis with Kamada-Kawai algorithm. The data were then analyzed with island algorithm in Pajek (Batagelj & Mrvar, 1998), which produced different domains of knowledge for various time segments using line weights. I then compared results of analyses with findings of a recent qualitative review study on management innovation that also deals with the broader issue of non-technological innovation (Damanpour & Aravind, 2012) and discussed differences and similarities in findings. I also compared my results with other qualitative (e.g. Crossan & Apaydin, 2010) or quantitative reviews of the field of innovation in general (e.g. Fagerberg et al., 2012; Martin, 2012).

Island algorithm enables to look only at the tops of the clusters formed by target co-citation articles. This is provided by choosing a number of bottom and top components using line weights. I decided to use an approach that looked at all the tops, even if they had different altitude. There is a content-wise argument for this decision; otherwise there would be too much of organizational innovation that actually denotes innovation in organizations - technological included - within the database. Moreover, I was able to focus on new domains as they develop over time and appear anew in each of the time frames. This way, I am also able to provide a better basis for differentiating among various types of innovation. I portray and interpret results for each of the smaller periods separately for better illustration and then altogether for the whole period 1975-2011. The results showed many insights into the evolution of the intellectual structure of the non-technological innovation field.

1.4.1 First interval (1975-1990): The foundations

Focusing on citations, Table 1.6 reveals articles that were most often cited in target articles (that were in the references of the primary articles during 1975-1990). By identifying most frequently cited studies, I will be able to identify key topics of research within the discipline in each period. The book by Rogers and Shoemaker (1971) "Communication of Innovations; A Cross-Cultural Approach" that was the most often cited piece, that is cited 6 times by the primary articles in 1975-1990).

Table 1.6: Target articles with the highest citation frequencies (1975-1990)

Citation frequency	**First author, year, and publication**
6	Rogers E, 1971, Communication Innova
6	March JG, 1958, Organizations
5	Zaltman G, 1973, Innovations Org
5	Sapolsky HM, 1967, V40, P497, J Bus
5	Baldridge JV, 1975, V20, P165, Admin Sci Quart
5	Downs GW, 1976, V21, P700, Admin Sci Quart
5	Mohr LB, 1969, V63, P111, Am Polit Sci Rev
4	Aiken M, 1971, V5, P63, Sociology
4	Hage J, 1967, V72, P503, Am J Sociol
4	Corwin RG, 1972, V37, P441, Am Sociol Rev
3	Knight KE, 1967, V40, P478, J Bus
3	Evan WM, 1967, V40, P519, J Bus
3	Becker SW, 1967, V40, P462, J Bus
3	Hage J, 1970, Social Change Comple
3	Hage J, 1973, V18, P279, Admin Sci Quart

Table 1.7 lists articles that were most often cited together (co-occurences). Articles by Baldridge and Burnham (1975) and Mohr (1969) were most often cited together by the primary articles in 1975-1990 – 5 times. The same applies to co-occurrence of March and Simon (1958), and Sapolsky (1967), and Rogers and Shoemaker (1971), respectively.

Table 1.7: Target articles with the highest co-citation frequencies (1975-1990)

Co-occurrence frequency	Cited reference 1 (First author, year, and publication)	Cited reference 2 (First author, year, and publication)
5	Baldridge JV, 1975, V20, P165, Admin Sci Quart	Mohr LB, 1969, V63, P111, Am Polit Sci Rev
5	March JG, 1958, Organizations	Sapolsky HM, 1967, V40, P497, J Bus
5	March JG, 1958, Organizations	Rogers E, 1971, Communication Innova
4	Downs GW, 1976, V21, P700, Admin Sci Quart	March JG, 1958, Organizations
4	Corwin RG, 1972, V37, P441, Am Sociol Rev	Sapolsky HM, 1967, V40, P497, J Bus
4	Mohr LB, 1969, V63, P111, Am Polit Sci Rev	Rogers E, 1971, Communication Innova
4	Downs GW, 1976, V21, P700, Admin Sci Quart	Mohr LB, 1969, V63, P111, Am Polit Sci Rev
4	Baldridge JV, 1975, V20, P165, Admin Sci Quart	Downs GW, 1976, V21, P700, Admin Sci Quart
4	Baldridge JV, 1975, V20, P165, Admin Sci Quart	Sapolsky HM, 1967, V40, P497, J Bus
4	Baldridge JV, 1975, V20, P165, Admin Sci Quart	Zaltman G, 1973, Innovations Org
4	Baldridge JV, 1975, V20, P165, Admin Sci Quart	Rogers E, 1971, Communication Innova
4	March JG, 1958, Organizations	Mohr LB, 1969, V63, P111, Am Polit Sci Rev
4	Baldridge JV, 1975, V20, P165, Admin Sci Quart	March JG, 1958, Organizations
4	Corwin RG, 1972, V37, P441, Am Sociol Rev	March JG, 1958, Organizations
4	Mohr LB, 1969, V63, P111, Am Polit Sci Rev	Zaltman G, 1973, Innovations Org
4	Rogers E, 1971, Communication Innova	Sapolsky HM, 1967, V40, P497, J Bus
4	Hage J, 1967, V72, P503, Am J Sociol	March JG, 1958, Organizations
4	Mohr LB, 1969, V63, P111, Am Polit Sci Rev	Sapolsky HM, 1967, V40, P497, J Bus
4	Aiken M, 1971, V5, P63, Sociology	Baldridge JV, 1975, V20, P165, Admin Sci Quart
4	Downs GW, 1976, V21, P700, Admin Sci Quart	Sapolsky HM, 1967, V40, P497, J Bus
4	Hage J, 1967, V72, P503, Am J Sociol	Sapolsky HM, 1967, V40, P497, J Bus
4	Aiken M, 1971, V5, P63, Sociology	Mohr LB, 1969, V63, P111, Am Polit Sci Rev

To portray a network of co-citations for the first period, I chose a cutoff point of at least three co-citations in the first stage. This resulted in two graphs. The first one (Figure 1.3) reveals all islands. This period comprises the smallest number of authors of all periods. It consists of four clusters. I then removed the first (largest) island, and so the graph (Figure 1.4) only portrays the most important authors and the relationships among them. Unit (circle) sizes reflect the number of links they hold. Three islands remain, and they are very well connected with each other without any authors serving as particular boundary-spanners. Analysis of the first co-citation network reveals theoretical foundations on which the non-technological innovation discipline has been built. It is obvious that the works of Baldridge and Burnham (1975) and Rogers and

Shoemakers (1971) are central to the network. These studies are apparently the most important for the development of the non-technological innovation field in the first examined period. Both studies (that are in separate clusters) are also connected with two other clusters.

The Administrative Science Quarterly piece by Baldridge and Burnham (1975): “Organizational Innovation: Individual, Organizational, and Environmental Impacts” seems to be the first to argue that research on diffusion of innovation should shift from individuals to organizational structure and environmental factors. When examining innovative behavior at the individual level, they discovered that personal characteristics did not seem to be as important in complex organizations as administrative and structural factors, and even environmental input from the community and other organizations.

In addition to this study, the first cluster (that is actually a dyad – marked with red circles in Figure 1.4) also includes a study by Mohr (1969) published in The American Political Science Review. As this article also deals with antecedents of innovation, I label this cluster “determinants of innovation”. What is interesting, however, is that both of these studies derive from individual-level factors for innovation and draw a lot from psychology, especially Baldridge and Burnham (1975). This indicates that individual-level innovation research has been of great importance for the development of the non-technological innovation field.

The second cluster (green circles) is labeled “organization studies”. It is in fact a triplet of Rogers and Shoemakers (1971), Sapolsky (1967), and March and Simon (1958). These studies deal with the organizational-level factors and the dynamics of problem solving and consequently innovation, as well as with diffusion of innovation within the social system of an organization.

The third cluster (a dyad denoted by yellow circles) is labeled “industrial economics”. It includes two studies: Mansfield (1968), and Galbraith and Nathanson (1978). Their approach is related to the perspective of evolutionary economics and is more focused at the level of an industry, with organizations being considered as the ‘black box’. This cluster indicates an important discipline that was even more salient for innovation research in general, but has also influenced the field of non-technological innovation. However, this influence was less strong than the influence of organization studies or individual-level innovation research. This is also attested by the book of Galbraith and Nathanson (1978), which is content-wise closely connected with the strategic organization studies research.

Figure 1.3: Co-citation network (1975-1990) – all islands, cutoff = 3 co-citations

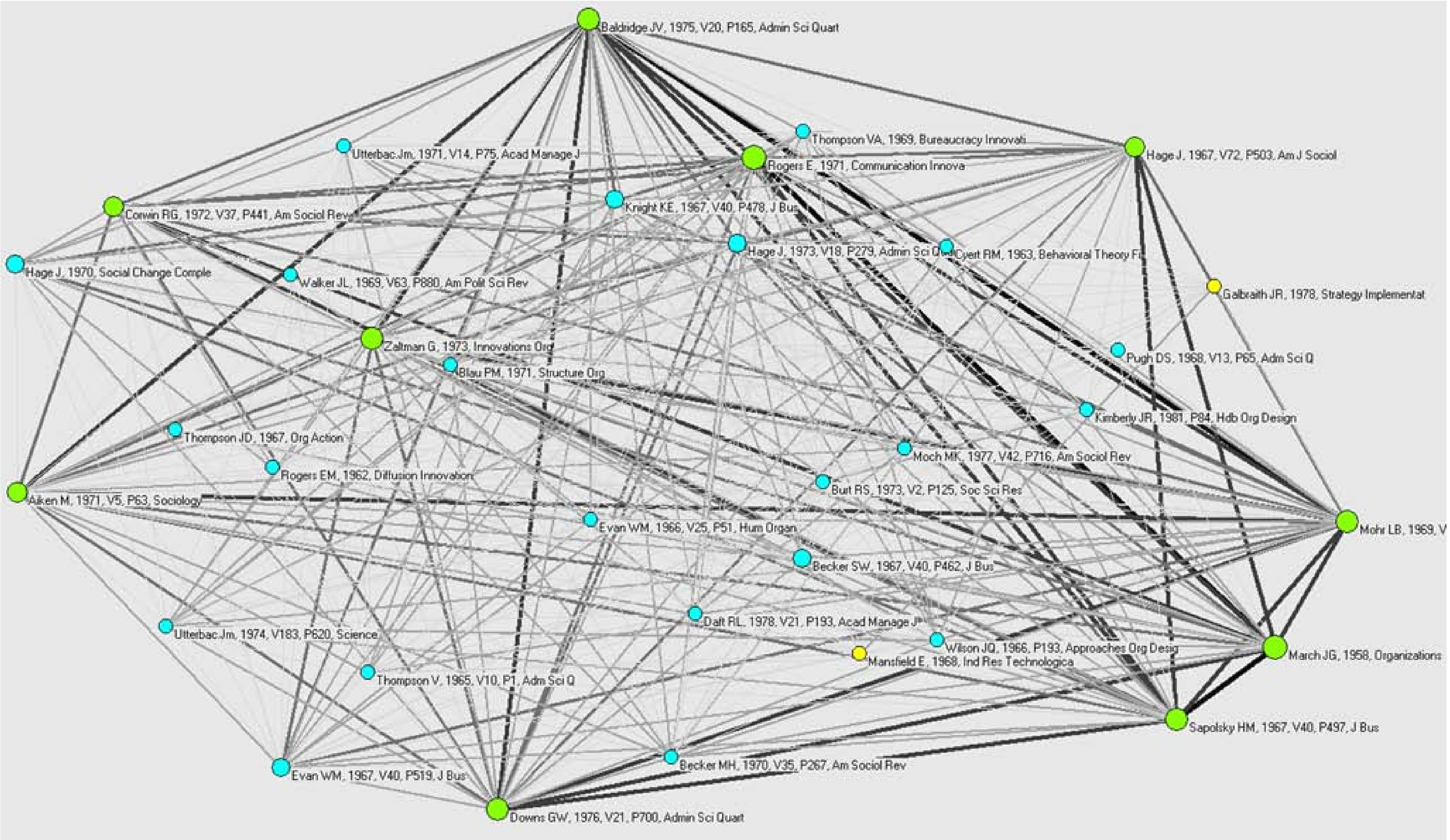


Figure 1.4: Co-citation network (1975-1990) – without the first island, cutoff = 3 co-citations

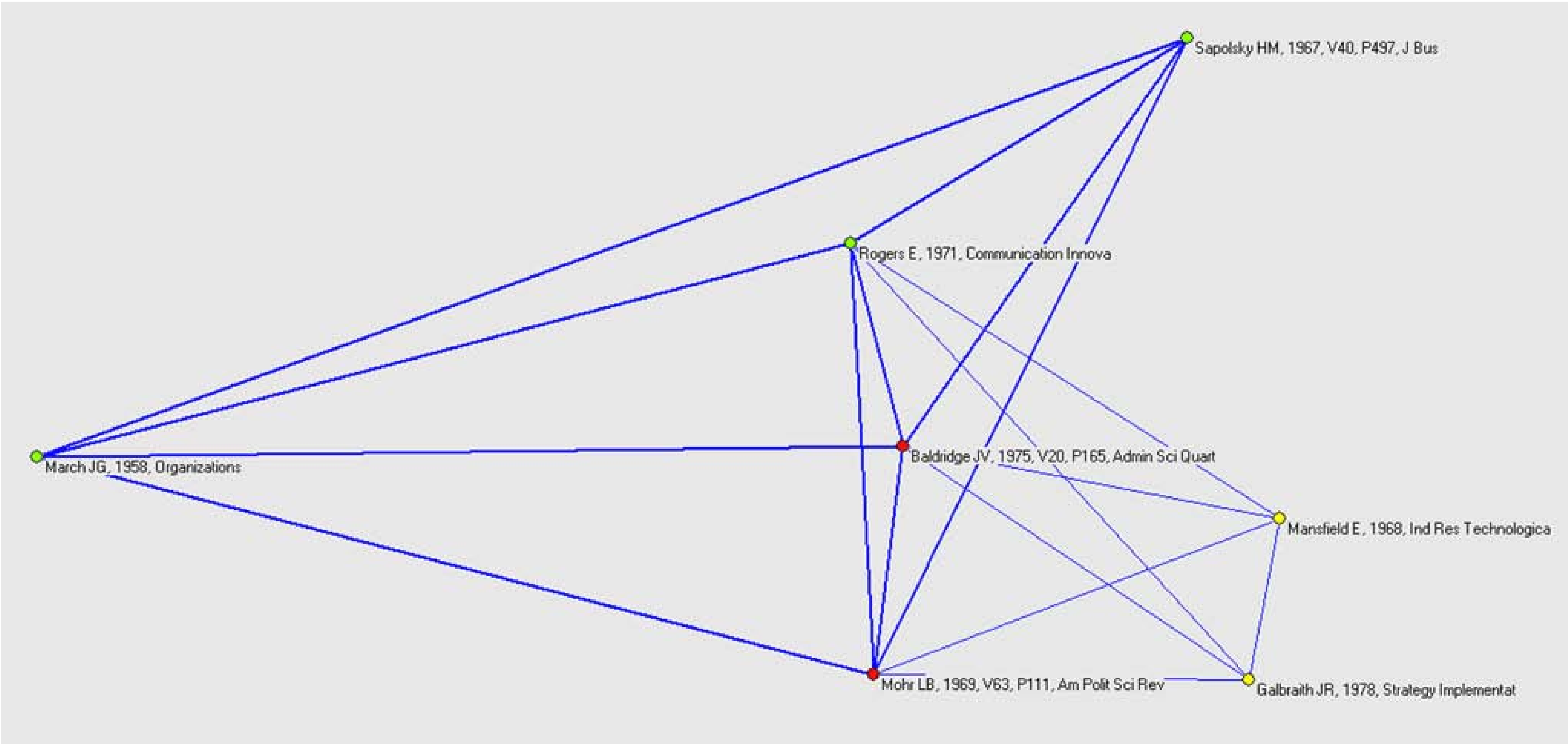


Figure 1.5: Co-citation network (1975-1990) – all islands, cutoff = 4 co-citations

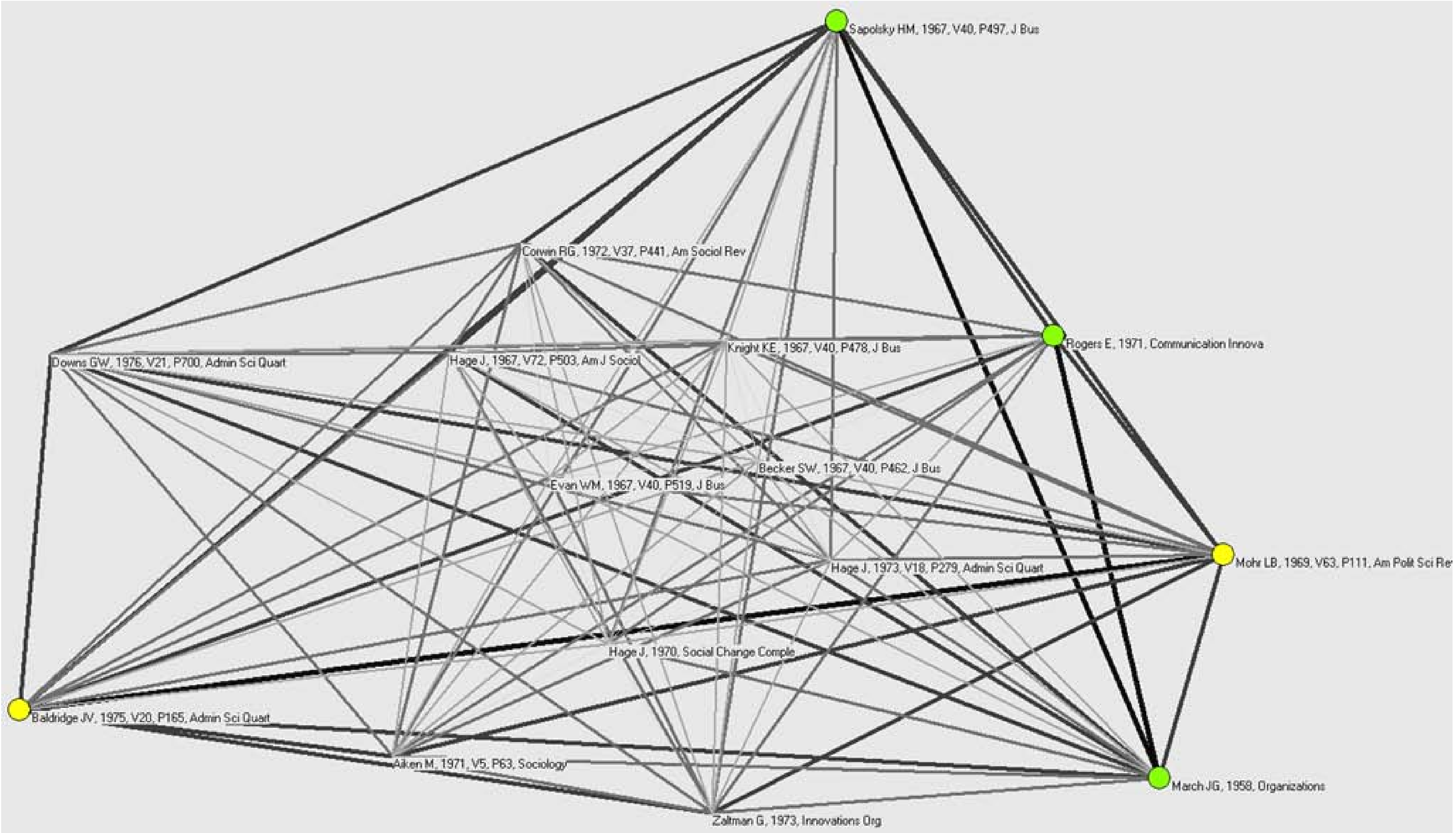
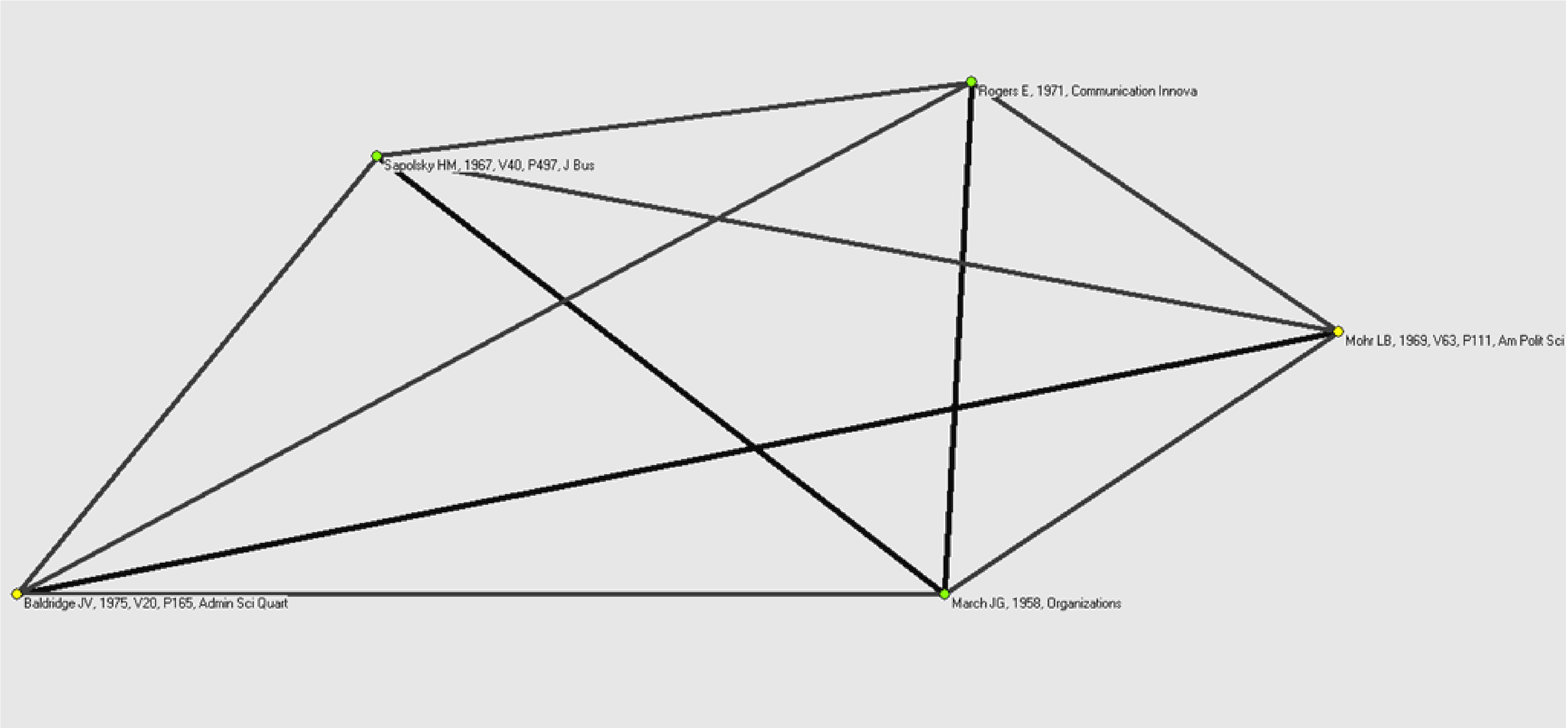


Figure 1.6: Co-citation network (1975-1990) – without the first island, cutoff = 4 co-citations



In the second stage, I present two figures (Figures 1.5 and 1.6) that portray a co-citation network for the period 1975-1990 with a citation threshold at four citations. Thus, there are fewer studies in these Figures. The examination of Figure 1.6 without the largest island further supports the notion of a very-well connected network. All of the most important authors for the development of the field in this period are connected to each other. The “industrial economics” cluster that was present with the milder threshold (Figures 1.3 and 1.4) did not make the cut, leaving only five documents that appear to sit firmly on the knowledge base that emerges out of the organization studies and individual-level innovation studies. These serve as the very core or foundation for the later development of the field of non-technological innovation.

1.4.2 Second interval (1991-1997): The formation of the dominant domain

Table 1.8 reveals articles that were most frequently cited in target articles (that were in the references of the primary articles during 1991-1997). The book by Rogers (1983) was the most often cited piece, that is 24 times in primary articles during 1991-1997, followed by the article of Kimberly and Evanisko (1981) that was cited 23 times.

Table 1.8: Target articles with the highest citation frequencies (1991-1997)

Citation frequency	First author, year, and publication
24	Rogers E, 1983, Diffusion Innovation
23	Kimberly J, 1981, V24, P689, Acad Manage J
22	Zaltman G, 1973, Innovations Org
20	Damanpour F, 1991, V34, P555, Acad Manage J
17	Daft R, 1978, V21, P193, Acad Manage J
14	Downs G, 1976, V21, P700, Admin Sci Quart
14	Van de Ven A, 1986, V32, P590, Manage Sci
12	Damanpour F, 1984, V29, P392, Admin Sci Quart
12	Dewar R, 1986, V32, P1422, Manage Sci
11	Meyer A, 1988, V31, P897, Acad Manage J
11	Kanter R, 1983, Change Masters
10	Tushman M, 1986, V31, P439, Admin Sci Quart
10	Baldridge J, 1975, V20, P165, Admin Sci Quart
10	Kanter R, 1988, V10, P169, Res Organ Behav
10	Burns T, 1961, Management Innovatio
10	Ettlie J, 1984, V30, P682, Manage Sci
10	Damanpour F, 1987, V13, P675, J Manage
10	Aiken M, 1971, V5, P63, Sociology
9	Nord W, 1987, Implementing Routine
9	Mohr L, 1969, V63, P111, Am Polit Sci Rev
9	Hage J, 1973, V18, P279, Admin Sci Quart
9	Dimaggio P, 1983, V48, P147, Am Sociol Rev

Table 1.9 reveals articles that were most often cited together. Article by Kimberly and Evanisko (1981) was the most often cited together with the book by Zaltman et al. (1973) in the primary articles in 1991-1997– 14 times.

Table 1.9: Target articles with the highest co-citation frequencies (1991-1997)

Co-occurrence frequency	Cited reference 1 (First author, year, and publication)	Cited reference 2 (First author, year, and publication)
14	Kimberly J, 1981, V24, P689, Acad Manage J	Zaltman G, 1973, Innovations Org
13	Damanpour F, 1991, V34, P555, Acad Manage J	Kimberly J, 1981, V24, P689, Acad Manage J
13	Rogers E, 1983, Diffusion Innovation	Zaltman G, 1973, Innovations Org
12	Kimberly J, 1981, V24, P689, Acad Manage J	Rogers E, 1983, Diffusion Innovation
12	Downs G, 1976, V21, P700, Admin Sci Quart	Kimberly J, 1981, V24, P689, Acad Manage J
11	Damanpour F, 1991, V34, P555, Acad Manage J	Dewar R, 1986, V32, P1422, Manage Sci
11	Daft R, 1978, V21, P193, Acad Manage J	Zaltman G, 1973, Innovations Org
11	Daft R, 1978, V21, P193, Acad Manage J	Downs G, 1976, V21, P700, Admin Sci Quart
11	Daft R, 1978, V21, P193, Acad Manage J	Rogers E, 1983, Diffusion Innovation
11	Damanpour F, 1991, V34, P555, Acad Manage J	Zaltman G, 1973, Innovations Org
10	Downs G, 1976, V21, P700, Admin Sci Quart	Zaltman G, 1973, Innovations Org
10	Damanpour F, 1991, V34, P555, Acad Manage J	Van de Ven A, 1986, V32, P590, Manage Sci
10	Daft R, 1978, V21, P193, Acad Manage J	Kimberly J, 1981, V24, P689, Acad Manage J
10	Kimberly J, 1981, V24, P689, Acad Manage J	Van de Ven A, 1986, V32, P590, Manage Sci
10	Damanpour F, 1984, V29, P392, Admin Sci Quart	Rogers E, 1983, Diffusion Innovation
9	Damanpour F, 1991, V34, P555, Acad Manage J	Rogers E, 1983, Diffusion Innovation
9	Damanpour F, 1991, V34, P555, Acad Manage J	Ettlie J, 1984, V30, P682, Manage Sci
9	Damanpour F, 1984, V29, P392, Admin Sci Quart	Zaltman G, 1973, Innovations Org
9	Daft R, 1978, V21, P193, Acad Manage J	Damanpour F, 1991, V34, P555, Acad Manage J
9	Baldridge J, 1975, V20, P165, Admin Sci Quart	Zaltman G, 1973, Innovations Org
9	Damanpour F, 1987, V13, P675, J Manage	Kimberly J, 1981, V24, P689, Acad Manage J
9	Rogers E, 1983, Diffusion Innovation	Van de Ven A, 1986, V32, P590, Manage Sci
9	Kimberly J, 1981, V24, P689, Acad Manage J	Meyer A, 1988, V31, P897, Acad Manage J

An overview of size and composition of the research network arising from co-citation relations among the most cited authors in the period 1991-1997 reveals only one large cluster. This indicates that the field of non-technological innovation in this period was very well connected – authors (co-)cited very similar studies.

A very influential work of Baldridge and Burnham (1975) is the only one from the previous era that remains in the network with a milder threshold (Figure 1.7). A network with a stricter citation threshold (Figure 1.8), however, reveals that none of the influential works in the first period were among the most important ones in the second period. Moreover, we can observe a large influx of works based on organizational studies that emerge in this period and are apparently very influential for the development of the field in the second period. This is the period when organizational innovation effectively became a discipline of its own. The most notable studies in this component from the organization studies of innovation discipline that emerge in the field of non-technological innovation are articles by Damanpour and Evan (1984), and Downs Jr and Mohr (1976) in The Administrative Science Quarterly, by Kimberly and Evanisko (1981) and Damanpour (1991) in The Academy of Management Journal, and by Dewar and Dutton (1986), and Van de Ven (1986) in Management Science. These studies were crucially affected by Daft's (1978) work on dual-core model of innovation (administrative and technical, which is actually based on Evan, 1966), Zaltman et al.'s (1973) book on innovation in organizations, and Rogers' (1983) new book on diffusion of innovations.

On the basis of this evidence, I can conclude that organizational studies became a predominant research stream driving new research on the field of non-technological innovation during 1991-1997, overtaking individual-based innovation research. It is not arguable that industrial economics influenced the field of organization studies. However, industrial economics did not seem to have a major direct influence on the field of non-technological innovation. Another important lesson learned from this analysis is related to the labeling of non-technological innovation. It is in this period that a clear distinction was made apparent by Daft (1978) between administrative (non-technological) and technical (technological) innovation. Authors following his footsteps use the notion of organizational innovation, both to denote innovation in organizations as well as to label only non-technological forms of innovation. Thus, even if the delineation was first made very explicit by Daft (1978), it did not hold for long as confusion regarding the labeling soon started to ooze into the field.

Figure 1.7: Co-citation network (1991-1997), cutoff = 10 co-citations

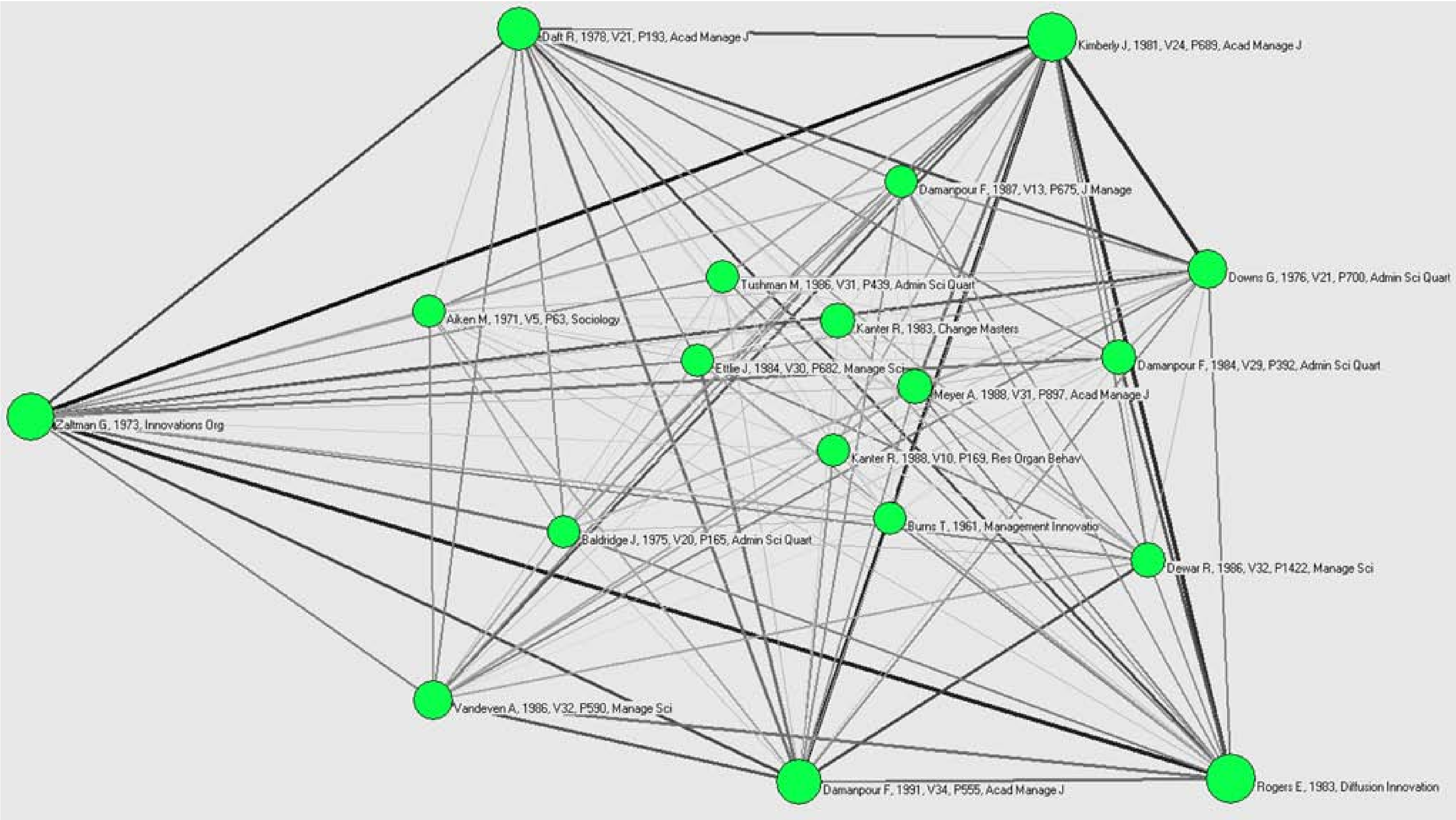
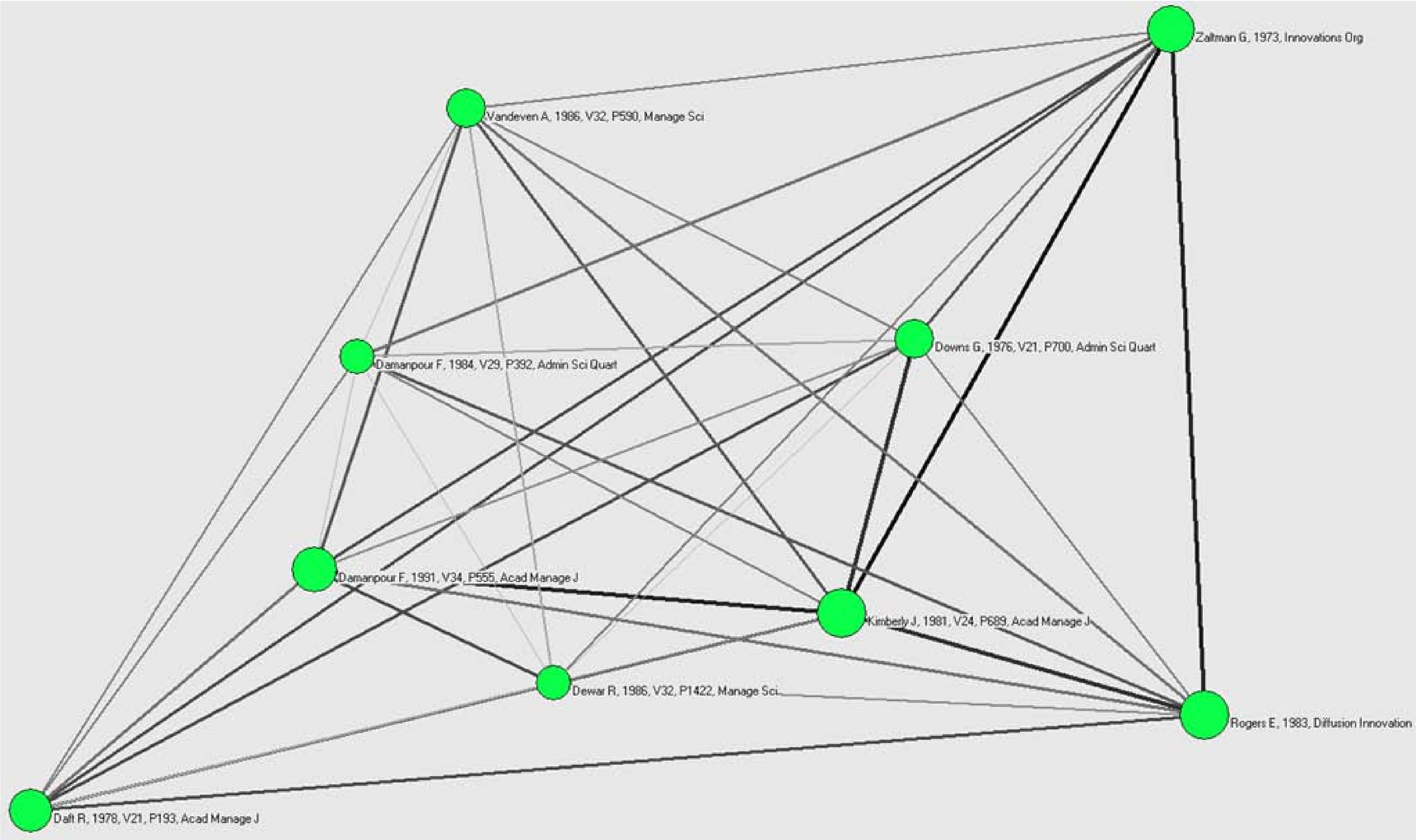


Figure 1.8: Co-citation network (1991-1997), cutoff = 12 co-citations



1.4.3 Third interval (1998-2004): Influxes from other literatures

Focusing on citations, Table 1.10 reveals articles that were most frequently cited in the target articles. The article by Damanpour (1991) was by far the most often cited piece, that is 43 times in primary articles during 1998-2004, followed by Kimberly and Evanisko (1981). Damanpour (1991) conducted a meta-analysis of the relationships between organizational innovation and its determinants, including technical knowledge resources. In one of the earliest works which contains the term organizational innovation in the title, Kimberly and Evanisko (1981) analyzed the influence of individual, organizational and contextual factors on hospitals' adoption of technological and administrative innovations.

Table 1.10: Target articles with the highest citation frequencies (1998-2004)

Citation frequency	First author, year, and publication
43	Damanpour F, 1991, V34, P555, Acad Manage J
21	Kimberly J, 1981, V24, P689, Acad Manage J
19	Rogers E, 1995, Diffusion Innovation
18	Wolfe R, 1994, V31, P405, J Manage Stud
17	Rogers E, 1983, Diffusion Innovation
16	Daft R, 1978, V21, P193, Acad Manage J
13	Cohen W, 1990, V35, P128, Admin Sci Quart
12	Dimaggio P, 1983, V48, P147, Am Sociol Rev
12	Burns T, 1961, Management Innovatio
12	Downs G, 1976, V21, P700, Admin Sci Quart
12	Zaltman G, 1973, Innovations Org
11	Damanpour F, 1984, V29, P392, Admin Sci Quart
11	Nonaka I, 1995, Knowledge Creating C
10	Thompson J, 1967, Org Action
10	Tornatzky L, 1982, V29, P28, Ieee T Eng Manage
10	Damanpour F, 1987, V13, P675, J Manage
10	Leonardbarton D, 1992, V13, P111, Strategic Manage J
9	Fiol C, 1996, V21, P1012, Acad Manage Rev
9	Zmud R, 1984, V30, P727, Manage Sci

Table 1.11 focuses on the articles that were most often cited together (co-occurences) in primary articles during 1998-2004. It is unsurprising that the first two pairs are linked with Damanpour's (1991) meta-analysis on organizational innovation: the aforementioned piece by Kimberly and Evanisko (1981) and a review by Wolfe (1994) in JMS entitled "Organizational innovation: Review, critique, and suggested research directions".

Table 1.11: Target articles with the highest co-citation frequencies (1998-2004)

Co-occurence frequency	Cited reference 1 (First author, year, and publication)	Cited reference 2 (First author, year, and publication)
15	Damanpour F, 1991, V34, P555, Acad Manage J	Wolfe R, 1994, V31, P405, J Manage Stud
15	Damanpour F, 1991, V34, P555, Acad Manage J	Kimberly J, 1981, V24, P689, Acad Manage J
13	Damanpour F, 1991, V34, P555, Acad Manage J	Rogers E, 1995, Diffusion Innovation
11	Daft R, 1978, V21, P193, Acad Manage J	Damanpour F, 1991, V34, P555, Acad Manage J
11	Damanpour F, 1991, V34, P555, Acad Manage J	Downs G, 1976, V21, P700, Admin Sci Quart
11	Damanpour F, 1991, V34, P555, Acad Manage J	Zaltman G, 1973, Innovations Org
11	Damanpour F, 1991, V34, P555, Acad Manage J	Rogers E, 1983, Diffusion Innovation
9	Damanpour F, 1987, V13, P675, J Manage	Damanpour F, 1991, V34, P555, Acad Manage J
9	Damanpour F, 1991, V34, P555, Acad Manage J	Tornatzky L, 1982, V29, P28, Ieee T Eng Manage
9	Damanpour F, 1991, V34, P555, Acad Manage J	Zmud R, 1984, V30, P727, Manage Sci
8	Kimberly J, 1981, V24, P689, Acad Manage J	Rogers E, 1995, Diffusion Innovation
8	Kimberly J, 1981, V24, P689, Acad Manage J	Rogers E, 1983, Diffusion Innovation
8	Damanpour F, 1991, V34, P555, Acad Manage J	Fiol C, 1996, V21, P1012, Acad Manage Rev
8	Rogers E, 1983, Diffusion Innovation	Zaltman G, 1973, Innovations Org
8	Cohen W, 1990, V35, P128, Admin Sci Quart	Damanpour F, 1991, V34, P555, Acad Manage J
8	Damanpour F, 1991, V34, P555, Acad Manage J	Dewar R, 1986, V32, P1422, Manage Sci
8	Damanpour F, 1991, V34, P555, Acad Manage J	Dimaggio P, 1983, V48, P147, Am Sociol Rev

Co-citation networks (Figures 1.9 and 1.10) again only reveal one cluster. The network of the period 1998-2004 is quite similar to the one from the previous period. Like before, organization studies present the main domain of knowledge where organizational innovation studies, which are still predominant on the field of non-technological innovation during 1998-2004, draw their knowledge. This is when the meta-analysis on determinants and outcomes of organizational innovation by Damanpour (1991) became the most influential piece.

Even though the main domain of knowledge remains very dense, well connected, and coherent, we can observe three interesting influxes to this homogenous cluster. One is the appearance of sociological studies that consider DiMaggio and Powell’s (1983) article as one of the most influential in this era (Figure 1.10). Another is the occurrence of an earlier study on management of innovation (Burns & Stalker, 1961), which indicates a future development of management innovation that is extremely popular at the present time. Connected to these are studies on knowledge and learning (Nonaka, 1991) and absorptive capacity (Cohen & Levinthal, 1990) that together indicate a different approach, which emphasizes people, their knowledge and skills, and the relationships among them.

Figure 1.9: Co-citation network (1998-2004), cutoff = 8 co-citations

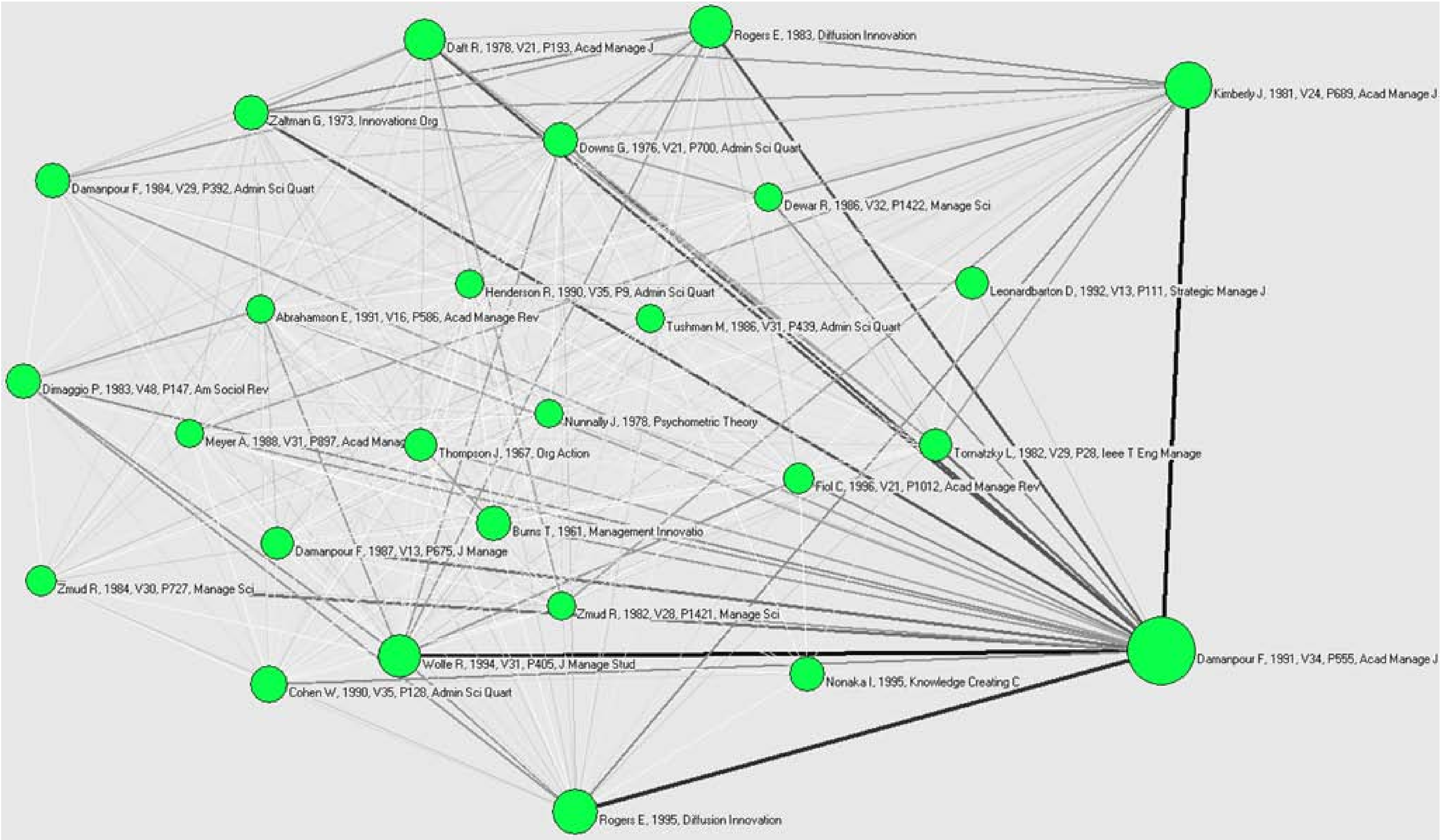
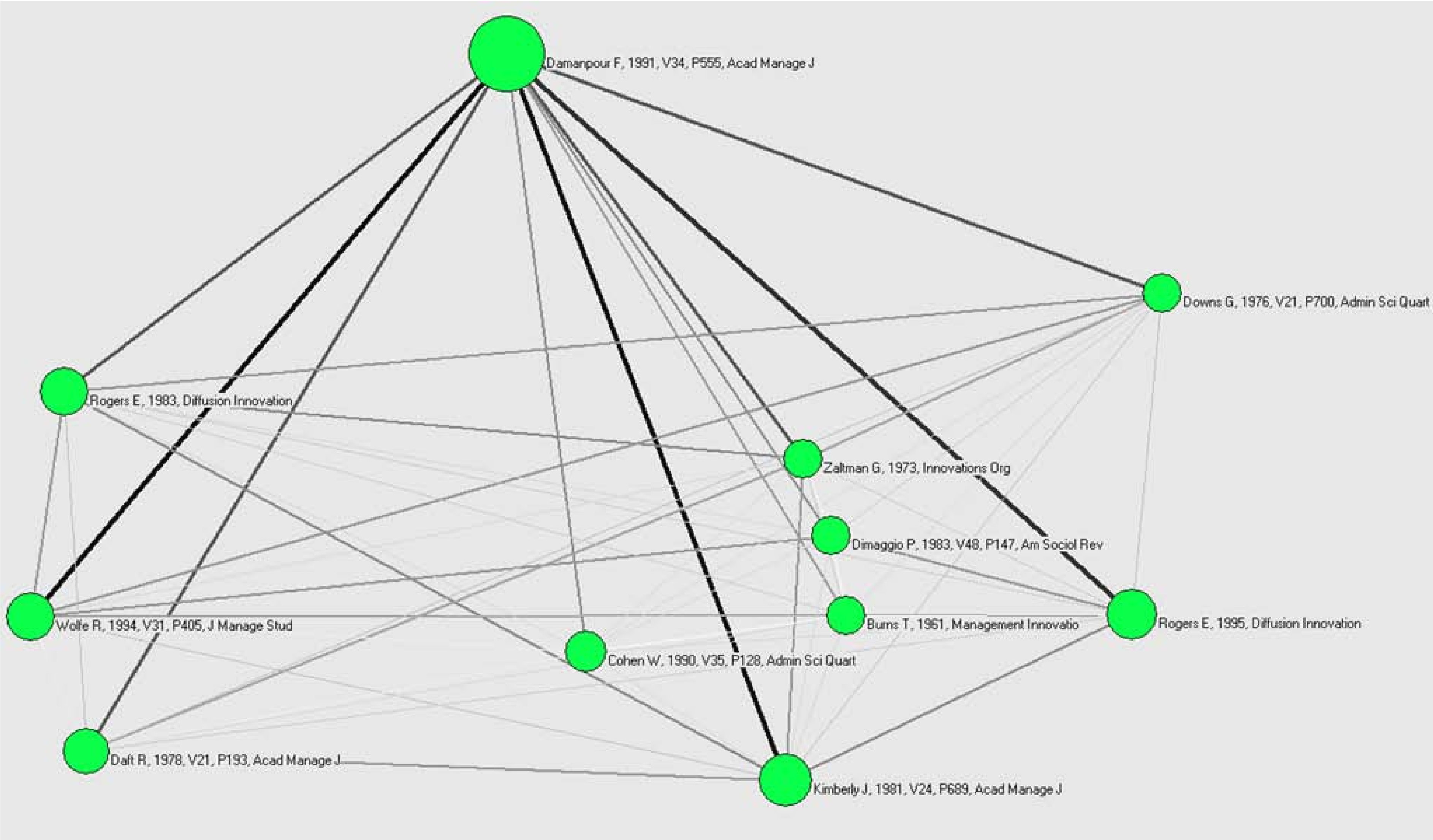


Figure 1.10: Co-citation network (1998-2004), cutoff = 12 co-citations



Therefore, the period 1998-2004 saw an important decline from using merely organizational studies as the knowledge domain. In this era, studies on non-technological innovation in this era have started to draw from sociology and resource-dependence theory, particularly organizational learning and absorptive capacity. Other than that, as mentioned, organizational studies still dominate this field. Once again, it has to be pointed out that all these studies are very well connected together (they were frequently cited together), which means they do not represent separate clusters, but one well-connected network.

1.4.4 Fourth interval (2005-2011): New developments and emerging domains

Focusing on citations, Table 1.12 reveals articles that were most frequently cited in the target articles in 2005-2011. As in the previous period, the article by Damanpour (1991) was by far the most often cited piece, referenced to 80 times in the primary articles during 2005-2011.

Table 1.12: Target articles with the highest citation frequencies (2005-2011)

Citation frequency	First author, year, and publication
80	Damanpour F, 1991, V34, P555, Acad Manage J
50	Kimberly J, 1981, V24, P689, Acad Manage J
49	Cohen W, 1990, V35, P128, Admin Sci Quart
34	Daft R, 1978, V21, P193, Acad Manage J
33	Barney J, 1991, V17, P99, J Manage
29	Teece D, 1997, V18, P509, Strategic Manage J
25	March J, 1991, V2, P71, Organ Sci
24	Wolfe R, 1994, V31, P405, J Manage Stud
23	Amabile T, 1996, V39, P1154, Acad Manage J
23	Chesbrough H, 2003, Open Innovation New
23	Hurley R, 1998, V62, P42, J Marketing
23	Damanpour F, 1984, V29, P392, Admin Sci Quart
22	Nonaka I, 1995, Knowledge Creating C
22	Fornell C, 1981, V18, P39, J Marketing Res
21	Eisenhardt K, 1989, V14, P532, Acad Manage Rev
21	Schumpeter J, 1934, Theory Ec Dev
21	Rogers E, 1995, Diffusion Innovation
21	Nelson R, 1982, Evolutionary Theory
20	Zaltman G, 1973, Innovations Org
19	Anderson J, 1988, V103, P411, Psychol Bull
19	Dewar R, 1986, V32, P1422, Manage Sci
19	Damanpour F, 1987, V13, P675, J Manage
19	Teece D, 1986, V15, P285, Res Policy
19	Tushman M, 1986, V31, P439, Admin Sci Quart

Table 1.13 lists articles that were most often cited together (co-occurences) during 2005-2011. Again, first two pairs are connections with the highest cited article by Damanpour (1991) – Kimberly and Evanisko (1981) and Daft (1978).

Table 1.13: Target articles with the highest co-citation frequencies (2005-2011)

Co-occurrence frequency	Cited reference 1 (First author, year, and publication)	Cited reference 2 (First author, year, and publication)
26	Damanpour F, 1991, V34, P555, Acad Manage J	Kimberly J, 1981, V24, P689, Acad Manage J
19	Daft R, 1978, V21, P193, Acad Manage J	Damanpour F, 1991, V34, P555, Acad Manage J
17	Daft R, 1978, V21, P193, Acad Manage J	Kimberly J, 1981, V24, P689, Acad Manage J
16	Cohen W, 1990, V35, P128, Admin Sci Quart	Damanpour F, 1991, V34, P555, Acad Manage J
16	Damanpour F, 1991, V34, P555, Acad Manage J	Wolfe R, 1994, V31, P405, J Manage Stud
16	Amabile T, 1996, V39, P1154, Acad Manage J	Damanpour F, 1991, V34, P555, Acad Manage J
13	Cohen W, 1990, V35, P128, Admin Sci Quart	Zahra S, 2002, V27, P185, Acad Manage Rev
13	Chesbrough H, 2003, Open Innovation New	Cohen W, 1990, V35, P128, Admin Sci Quart
13	Damanpour F, 1991, V34, P555, Acad Manage J	Teece D, 1997, V18, P509, Strategic Manage J
13	Barney J, 1991, V17, P99, J Manage	Wernerfelt B, 1984, V5, P171, Strategic Manage J
13	Barney J, 1991, V17, P99, J Manage	Teece D, 1997, V18, P509, Strategic Manage J
12	Barney J, 1991, V17, P99, J Manage	Damanpour F, 1991, V34, P555, Acad Manage J
11	Nelson R, 1982, Evolutionary Theory	Teece D, 1997, V18, P509, Strategic Manage J
11	Damanpour F, 1996, V42, P693, Manage Sci	Kimberly J, 1981, V24, P689, Acad Manage J
11	Cohen W, 1990, V35, P128, Admin Sci Quart	March J, 1991, V2, P71, Organ Sci
11	Damanpour F, 1991, V34, P555, Acad Manage J	Hurley R, 1998, V62, P42, J Marketing
11	Damanpour F, 1984, V29, P392, Admin Sci Quart	Kimberly J, 1981, V24, P689, Acad Manage J
10	Cohen W, 1990, V35, P128, Admin Sci Quart	Hurley R, 1998, V62, P42, J Marketing
10	Kimberly J, 1981, V24, P689, Acad Manage J	Wolfe R, 1994, V31, P405, J Manage Stud
10	Damanpour F, 1991, V34, P555, Acad Manage J	Thompson V, 1965, V10, P1, Adm Sci Q
10	Damanpour F, 1991, V34, P555, Acad Manage J	Zaltman G, 1973, Innovations Org
10	Damanpour F, 1991, V34, P555, Acad Manage J	Scott S, 1994, V37, P580, Acad Manage J
10	Chesbrough H, 2003, Open Innovation New	Christensen J, 2005, V34, P1533, Res Policy
10	Damanpour F, 1991, V34, P555, Acad Manage J	Nunnally J, 1978, Psychometric Theory

Figure 1.11: Co-citation network (2005-2011), cutoff = 20 co-citations

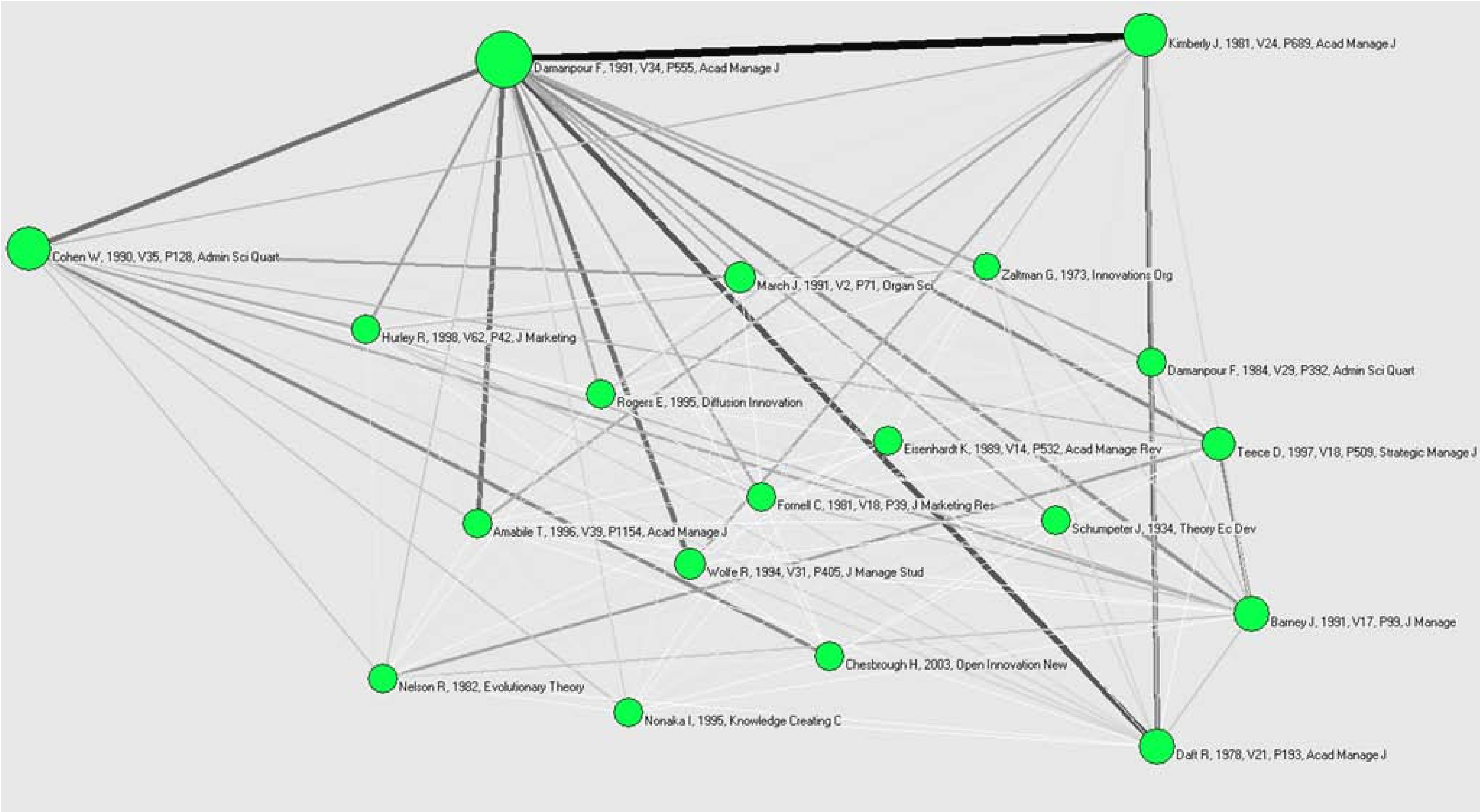
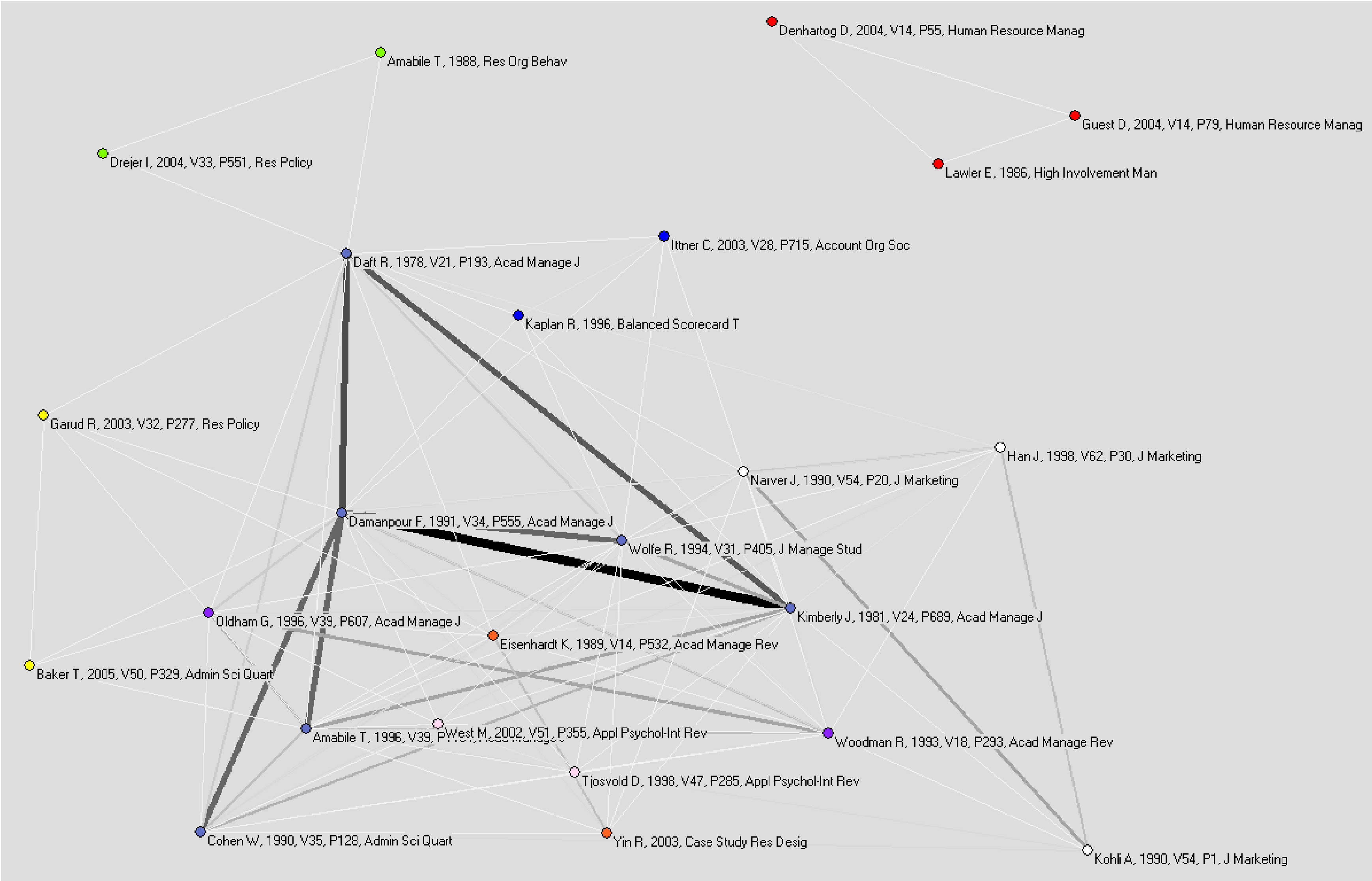


Figure 1.12: Co-citation network (2005-2011) – without the first island, cutoff = 20 co-citations



Figures 1.11 (citation threshold at 20) and 1.12 (citation threshold at 20, without the first island and with different islands marked) reveal the co-citation networks of the final examined period. Compared with the previous networks, there are more authors and clusters in this era, which is in line with the general growth of the non-technological innovation research activity. There is also quite a lot of fluctuation, which indicates the research dynamic that was in play during this time period. Figure 1.12 in particular reveals the main knowledge domains that influenced the research fronts within the field of non-technological innovation during 2005-2011. I also summarize these components in Table 1.14.

The first component (labeled with light blue circles in Figure 1.12) is an extension of the most influential studies in the previous period and will thus be labeled “organizational innovation”. Organizational studies had a steady impact on non-technological innovation and still appear to be central to the network. This cluster includes studies such as Daft, 1978; Damanpour, 1991; Kimberly & Evanisko, 1981; and Wolfe, 1994, as well as the piece by Cohen and Levinthal (1990) on absorptive capacity, indicating that this learning perspective has become embodied within the mainstream of the non-technological innovation field. Another interesting study dealing with research on organizational creativity (Amabile et al., 1996) serves as evidence for the importance of creativity research based on psychology for the field of non-technological innovation. It is in this period that the fields of creativity and innovation became more tightly connected.

There are three components (dyads) that appear to be very central to the co-citation network. The second component (labeled with light pink circles in Figure 1.12) can be described as “group decision-making and creativity” and includes two studies published in Applied Psychology-an International Review (Tjosvold, 1998; West, 2002). The authors deal with conflict and group decision-making for creativity and goal achievement. The studies draw a lot from psychology, indicating an intertwining between the field of non-technological innovation and individual-level psychology work on creativity. The interconnection became apparent in this period.

The third component (labeled with purple circles in Figure 1.12) has a lot in common with the previous one and will be termed “creativity at work”. It includes Woodman et al.’s (1993) Academy of Management Review conceptualization of organizational creativity and Oldham and Cummings’ (1996) Academy of Management Journal study on personal and contextual factors of creativity at work.

The fourth component (labeled with orange circles in Figure 1.12) comprises studies of a more methodological orientation. Specifically, it consists of two pieces on case study research (Eisenhardt, 1989; Yin, 2003). This finding indicates that case study research became quite popular in the field of non-technological innovation during 2005-2011.

Table 1.14: Components of the co-citation network (2005-2011)

Component # and label	Color (Figure 1.12)	Characteristic authors	Content
1) Organizational innovation	Light blue	Daft, 1978; Damanpour, 1991; Kimberly & Evanisko, 1981; and Wolfe, 1994	Organizational studies, absorptive capacity, creativity
2) Group decision-making and creativity	Light pink	Tjosvold, 1998; West, 2002	Conflict and group decision-making for creativity and goal achievement
3) Creativity at work	Purple	Woodman et al., 1993; Oldham & Cummings, 1996	Organizational creativity, personal and contextual factors of creativity
4) Case study research	Orange	Eisenhardt, 1989; Yin, 2003	Methodological orientation
5) Innovation and entrepreneurship	Yellow	Garud & Karnře, 2003; Baker & Nelson, 2005	Creating new businesses on the basis of creating something new
6) Marketing innovation	White	Narver & Slater, 1990	Marketing innovation
7) Cost and performance management	Dark blue	Kaplan & Norton, 1996; Ittner, Larcker, & Randall, 2003	Balanced scorecard as an example of organizational, administrative, or management innovation
8) Organizational innovation modeling	Green	Amabile, 1988; Drejer, 2004	Creativity and innovation in organizations, service innovation
9) Human resource management	Red	Den Hartog & Verburg, 2004	The importance of high-performance work systems, organizational culture, job design, and other HRM practices for innovation

There are five more components in the network, all on the edge of the network with weak linkages with the more homogenous cluster and with no direct linkages among them; one of them is not even connected to other components at all. Component number five (labeled with yellow circles in Figure 1.12) consists of two studies and is termed “innovation and entrepreneurship”. It deals with the creation of new businesses on the basis of creating something new (Garud & Karnře, 2003; Baker & Nelson, 2005). It is connected both with creativity literature and organizational innovation research. Component number six (labeled with white circles in Figure 1.12) consists of a triplet of studies published in the Journal of Marketing (e.g. Narver & Slater, 1990) and is labeled “marketing innovation”. This component is much more loosely linked to other studies in the network; there are some connections through the methodological component, and to some of the earlier work on organizational innovation (e.g. Kimberly & Evanisko, 1981).

The seventh component (labeled with dark blue circles in Figure 1.12) is also a dyad (Kaplan & Norton, 1996; Ittner, Larcker, & Randall, 2003) of studies associated with “cost and performance management”. For example, balanced scorecard is often used as an example of organizational, administrative, or management innovation, which is why these studies are associated to the field of non-technological innovation.

The eighth component (labeled with green circles in Figure 1.12) is also a dyad of studies written by influential women (Amabile, 1988; Drejer, 2004). One study focuses primarily on creativity and innovation in organizations (Amabile, 1988) and the other concentrates predominantly on service innovation (Drejer, 2004). They both emphasize the non-technological part of innovation process and try to delineate it from the technological efforts. Therefore, I label this component “organizational innovation modeling” as both studies attempt to simplify and provide a clearer picture of what goes on in terms of non-technological innovation, although one takes a more individual, creativity-based perspective and the other a more service-based organizational-level approach.

The final, ninth component (labeled with red circles in Figure 1.12) is in fact not connected with any other component of the network. It is a triplet of studies that focus on “human resource management” (e.g. Den Hartog & Verburg, 2004) and the importance of high-performance work systems, organizational culture, job design, and other human resource management practices for innovation.

The period 2005-2011 presented a more differentiated structure with plenty of new lines of research that influenced the field of non-technological innovation. There are many new authors, and only the most important authors from the previous cluster reappeared (e.g. Daft, 1978; Damanpour, 1991; Kimberly & Evanisko, 1981). Due to the heterogeneity, it is unsurprising that the components constituting the network are not as well connected with each other as in the previous time frames. This provides an opportunity to observe brokerage of particular studies.

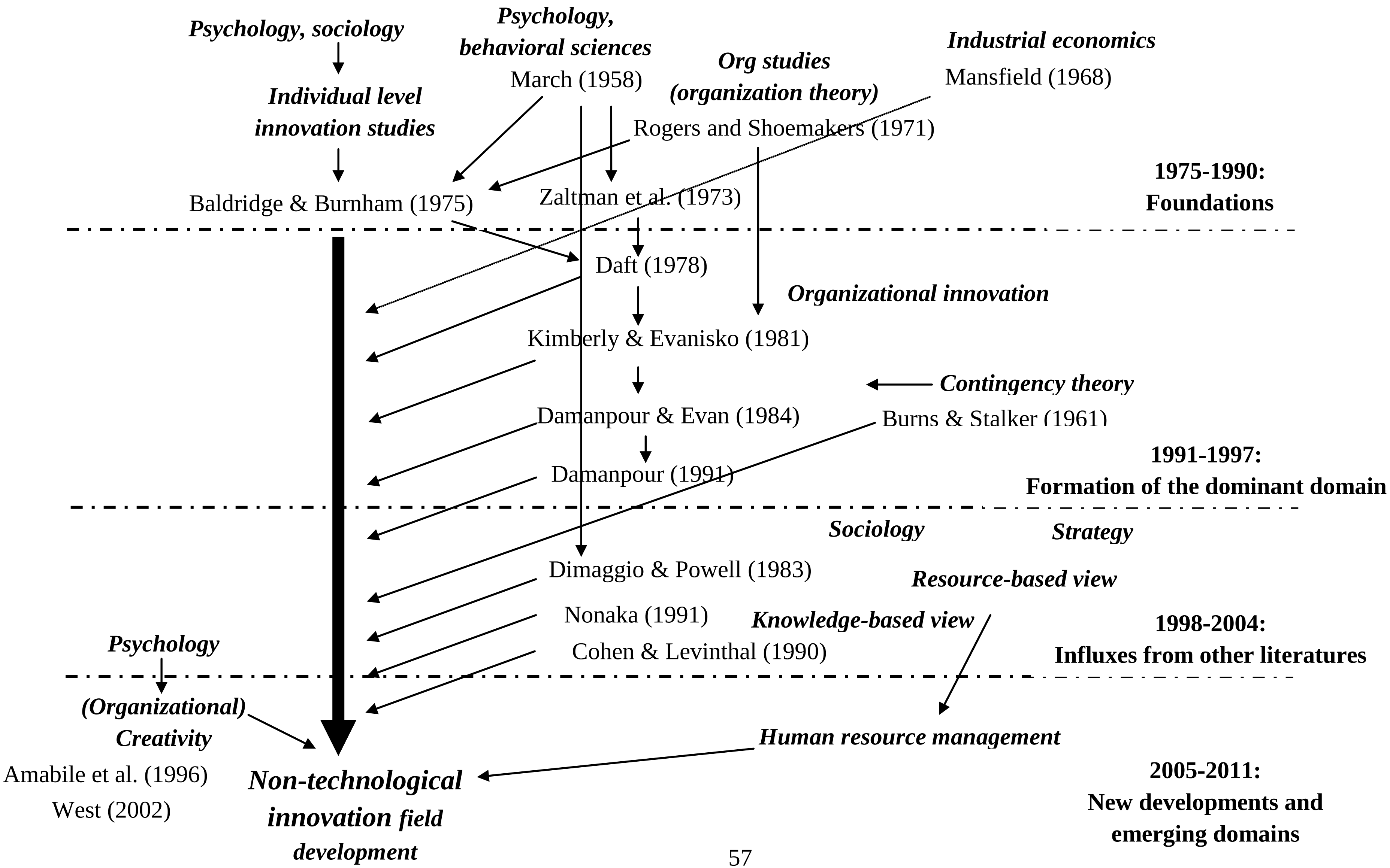
Figure 1.12 shows the network diagram for the set of authors that were co-cited in the period 2005-2011. In addition to emphasizing the most critical paths between authors, the figure also helps us to discern authors who play a pivotal role in bridging otherwise separate components.

Three pieces in particular, all nodes constituting the first component (Daft, 1978; Kimberly & Evanisko, 1981; Damanpour, 1991) are critical to the stability of this network of authors because they are central nodes that connect distinct clusters. These studies are not only central to the network, but also act as brokers (Burt, 2007) and serve as bridges between distinct subgroups or sub-disciplines. On the basis of this evidence, I can conclude that the most influential investigations in the area of non-technological innovation have been related to organizational innovation, and that other subfields are tightly connected to this research.

Figure 1.13 summarizes the development of the field presented in detail in the aforementioned co-citation networks. It illustrates where the knowledge came from (in terms of other disciplines) to the field of non-technological innovation, through which studies and authors, and during which period.

It is important that individual-level innovation studies and organizational creativity studies are relatively unconnected. Even if both provided the field of non-technological innovation with important insights from individual-level psychology studies, it is important to note that these were relatively independent. Moreover, it might be a common belief that creativity is the discipline which was the first to provide innovation studies an individual level-based perspective, but there are other individual level-based studies that had an impact first. Furthermore, these individual-level innovation studies are much more important for the field of non-technological innovation than for the field of innovation in general. I discuss these comparisons in more detail later on.

Figure 1.13: Illustrative simplification of the knowledge emergence for the field of non-technological innovation



1.4.5 Total period (1975-2011)

A comparison of four periods revealed some interesting patterns about the evolution of the domains that influenced the intellectual structure of the field. I focus on the whole timeframe and try to make sense of the co-citation networks that denote the field during this period. In the previous sections, I pointed out that subsequent periods show greater fragmentation arising from exogenous theoretical influences and endogenous developments. In Figures 1.14 and 1.15, these are portrayed together to provide an overview of the field.

Figure 1.14 includes all islands (after the cutoff of 20 citations) that had at least two nodes. I will try to interpret four largest, rather heterogeneous components as well. However, I will present Figure 1.15 without these factors that are very complex and add little illustrative and simplifying value as such. The pathfinder analysis results provide many interesting insights about the network structure of the intellectual community in non-technological innovation. A large number of factors persist (i.e. 19, in addition to four largest ones).

Four largest factors identify the influence of the organizational theory, with a couple of influxes from industrial organization economics (e.g. Porter, 1985) and power/resource dependence school (e.g. Blau, 1964; Pfeffer & Salancik, 1978) in the first component; psychological safety and support in the second component (e.g. Siegel & Kaemmerer, 1978; Edmondson, 1999); knowledge-based view with organizational learning (e.g. Argyris & Schon, 1978), leadership for innovation (e.g. Mumford, Scott, Gaddis, & Strange, 2002), and behavioral theory of the firm (Cyert & March, 1963) in the third component; and marketing of innovation in the fourth (e.g. Gatignon & Robertson, 1989).

The examination of the following six components reveals some other more dominant perspectives that delineate the field. Component five (1st in Figure 1.15, red circles) reveals the influence of behavioral theory and organization studies (e.g. March & Simon, 1958), as well as the importance of resource and knowledge-based view (e.g. Kogut & Zander, 1992; Grant, 1996). I thus labeled it “organization studies and knowledge-based view”. Some highly cited works on non-technological organizational innovation have been carried out by researchers in organizational studies. I again point to a potential source of confusion – in many cases, organizational innovation is defined as “innovation in organizations”, thus also including a technological perspective, whereas in others, it only stands for non-technological innovation. I delve deeper into these issues later on.

Component six (2nd in Figure 1.15, green circles) is strongly dominated by marketing innovation and top management role in technological innovation (e.g. Howell & Higgins, 1990). It is thus termed “top management and marketing innovation”.

Component seven (3rd in Figure 1.15, orange circles) includes works on “behavioral theory” of the firm (Cyert & March, 1963), and other topics that adopt this perspective or are informed by it and study the diffusion of innovations (Cooper & Zmud, 1990), innovations in strategy, structure, and organizational process (Miles, Snow, Meyer, & Coleman Jr, 1978), or organizational creativity (Woodman et al., 1993).

Next homogenous group is component eight (4th in Figure 1.15, light blue circles). This factor is also predominantly informed by “organization studies” (e.g. Hage, 1980; Sørensen & Stuart, 2000). Factor nine (5th in Figure 1.15, yellow circles) deals predominantly with the “determinants of innovation” (Mohr, 1969; Tornatzky & Klein, 1982). These studies are, however, still very much based on organizational theory (e.g. Hage, 1980).

Factor ten (6th in Figure 1.15, grey circles) consists of studies of capacity-based nature that deal with core strategic “capabilities” (e.g. Leonard-Barton, 1992). They were heavily influenced by the book written by Rogers and Shoemaker (1971). This domain informs dynamic capabilities and absorptive capacity literature that is closely connected with knowledge management and management innovation discipline.

Component number eleven (7th in Figure 1.15, dark red circles) denotes studies connected with “technological innovation” and its exploitation (e.g. Teece, 1986; Tushman & Anderson, 1986). Technological innovation, which was for a long time a predominant perspective in innovation studies, is inherently connected with its technological counterpart. There are two perspectives on *the relationship between non-technological and technological innovation*. The first one regards technological innovation as an antecedent of novel non-technological solutions. This implies that new technological products or processes drive the organizations to find some new management, organizational, or marketing approaches that would help to exploit technological breakthroughs (e.g. Barañano, 2003; Osterwalder, 2004; Schmidt & Rammer, 2007; Armbruster et al., 2008). Furthermore, there is a predominant perspective that non-technological innovations of any sort (e.g. new management approaches, different organizational structures etc.) enhance and improve the firms’ abilities to innovate technologically (e.g. Read, 2000; Sanidas, 2004; Damanpour, Walker, & Avellaneda, 2009; Mothe & Thi, 2010). However, these are predominantly mere conceptualizations, and a lack of empirical research on the relationship between non-technological and technological innovation is evident.

The twelfth component (8th in Figure 1.15, purple circles) includes studies of a more strategic nature. Similar to factor ten, they deal with “dynamic capabilities and innovation exploitation” (e.g. Ettlie, 1988; Teece et al., 1997). In line with this view, Thompson’s (1967) notion of interdependence between sectors within the company and outside its boundaries is the basis for supply chain management and open innovation movement (e.g. Chesbrough, 2003b) that has become very popular in the last couple of years.

The thirteenth component (9th in Figure 1.15, light pink circles) is termed “sociology and management of innovation”. It includes studies such as DiMaggio and Powell (1983), and Burns and Stalker (1961). This component illustrates the importance of human social activity for the development of the non-technological innovation field.

The fourteenth factor (10th in Figure 1.15, teal circles) is a fusion of organizational studies and “competitive advantage” (e.g. Porter, 1980; Hage, 1980). It again calls to attention about the importance of a resource-based view perspective in non-technological innovation. This cluster also includes Abrahamson’s (1991) Academy of Management Review piece in which the author attempts to delineate between the managerial fads and actual lasting non-technological innovations. To no surprise, management innovation literature finds this piece very influential and bases some validations of management innovations upon its logic.

The last triplet, factor fifteen (11th in Figure 1.15, light yellow circles) includes quite varied studies that nonetheless have a couple of things in common. These are “qualitative studies of innovation” that base their sense making on case study research (e.g. Nord, Tucker, Brief, & Schneider, 1987; Eisenhardt, 1989). Even the marketing-oriented article by Churchill Jr. (1979) deals with methodological issues of defining and measuring constructs of research.

There are seven more dyads that can be established from the co-citation analysis of the whole time frame 1975-2011. Component number sixteen (12th in Figure 1.15, pink circles) includes two very “basic studies”. One is a foundation for all kinds of innovation research (Schumpeter, 1934), whereas the other involves Nunnally’s (1978) seminal work on psychometric theory. The authors of target articles citing both of these studies apparently chose to go very far back in revealing influences that affected their works.

Component number seventeen (13th in Figure 1.15, dark blue circles) is termed “organizational behavior and conditions for innovation” as it deals with the context suitable for fostering innovation in organizations and how conditional cues affect the employees and organizations as a whole (e.g. 1988). Component eighteen (14th in Figure 1.15, light green circles) deals with “creativity and organizational learning” (e.g. March, 1991; Amabile et al., 1996). Knowledge management and organizational learning thus did not only influence the non-technological innovation field via the knowledge-based view of the firm at the organizational level, but is also closely linked to individual-level creativity and innovation research.

Knowledge management is inherent part of any innovation activity at any of the examined levels. This is attested, for instance, by the presence of the term “knowledge” in the very definition of management innovation, currently accepted as a representative for non-technological forms of innovation (Birkinshaw et al., 2008). Knowledge creation, knowledge management, knowledge exchange, and use of knowledge sources are inherently connected to non-technological innovation, either as parts of innovation activities or as antecedents.

Linked to this notion is organizational learning, a central concept emerging from organizational studies that was first put forward by Argyris and Schön (1978). It is connected with the resource-based view of the firm . Once more, it was organizational studies scholars who were the most involved in its development and its influx into the field of non-technological innovation, although they often paid considerable attention to technology and innovation (Martin, 2012). More recently, the majority of researchers’ attention has focused on knowledge management within organizations. Key authors include Drucker (1993), who argued that in the “post-capitalist society” the primary resource of creating wealth was knowledge, and Nonaka (1994), who put forward a theory of organizational knowledge creation and developed the notion of “the knowledge-creating company”, in which knowledge management is crucial (Nonaka & Takeuchi, 1995). Knowledge management was also the focus of Gupta and Govindarajan’s (1991) examination of knowledge flows within multinational companies, and of Tsai’s (2001) study of knowledge transfer (exchange) in intra-organizational networks within multinationals.

Factor nineteen (15th in Figure 1.15, dark teal circles) is termed “foundations of change” and includes both economic change perspective (Nelson & Winter, 1982) and individual basis for innovation (Baldridge & Burnham, 1975). This factor illustrates nicely what the intellectual structure of non-technological innovation field is like; having an inherent connection with economics and innovation literature, as well as including individual-based, behavioral, social, and psychological perspectives.

I labeled component twenty (16th in Figure 1.15, white circles) “modeling creativity and innovation”. It includes theoretical perspectives on creativity and innovation at work, as well as a methodological lesson on the use of structural equation modeling (Fornell & Larcker, 1981). Factor twenty-one (17th in Figure 1.15, black circles) is termed “resource-based view” (Barney, 1991). It highlights the importance of this perspective on management of innovation and achieving competitive advantage. The final component twenty-two (18th in Figure 1.15, green circles) is labeled “diffusion of innovation in organizations” and again affirms the importance of organizational studies for non-technological innovation field.

After interpreting each component, I return to four largest clusters that are harder to interpret because of their heterogeneity. A pretty safe assumption is that target studies co-citing the first four clusters, which include many perspectives, are in fact recent studies on management innovation. This is a perfect example of how a dominant domain overrides other promising domains. Namely, management innovation includes many of the abovementioned perspectives and makes them its own. This could deepen even more in the future in the hands of management innovation that has incorporated many new influxes to the field, particularly if the scholars fail to recognize different types and definitions of non-technological innovation and label any kind of non-technical innovation as management innovation. This may not be optimal as the field would rest on consensus building instead of on critical reflection, which is the primary driver for the evolution of any field.

Figure 1.14: Co-citation network (1975-2011) – all islands (low = 2), cutoff = 20 co-citations

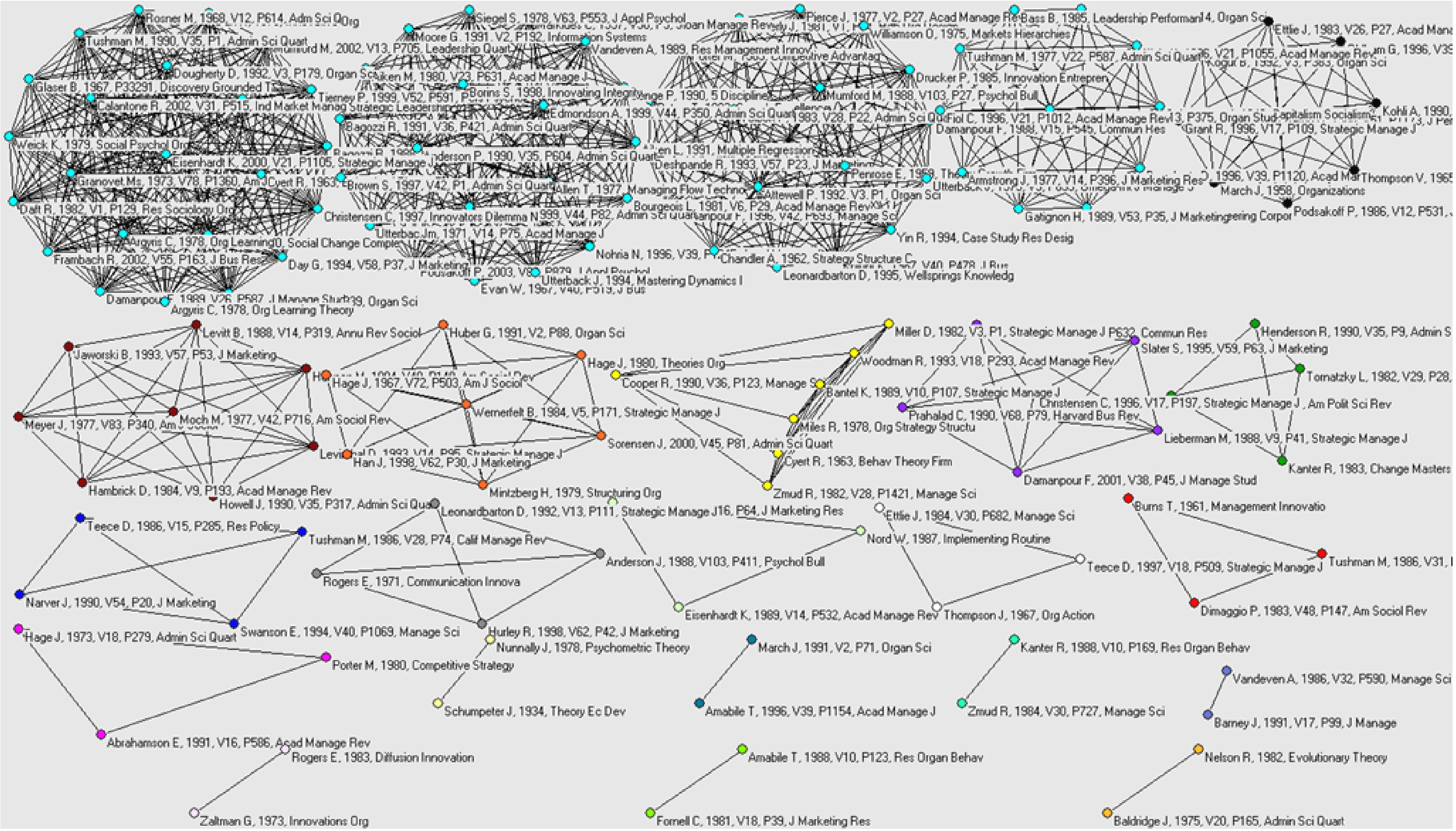
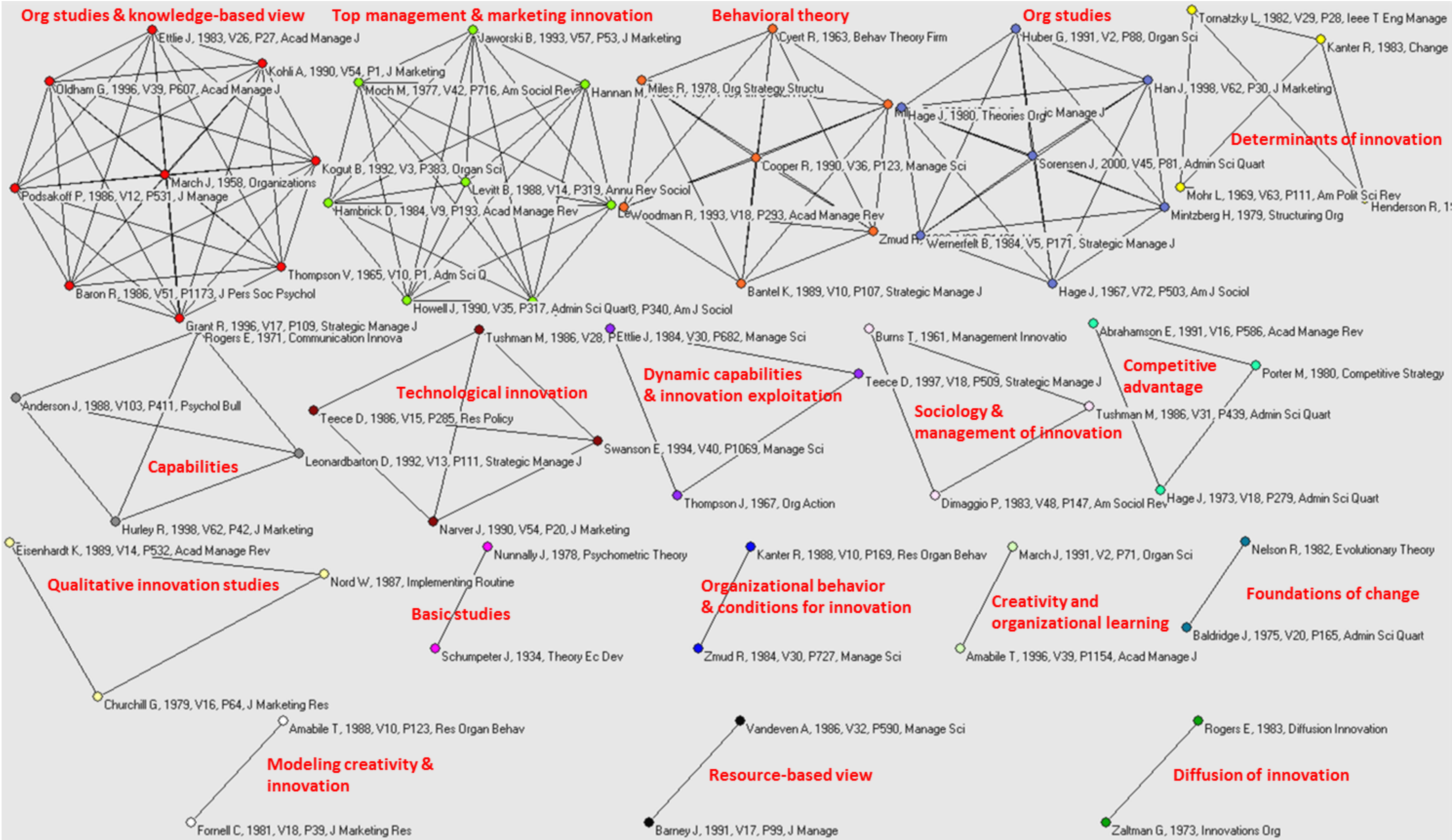


Figure 1.15: Co-citation network (1975-2011) – without the first four islands (low = 2), cutoff = 20 co-citations



1.5 Comparative discussion of co-citation analysis results

Up to this point, I discussed and interpreted the findings of each period and altogether within the results section, while also focusing on the content of each island in terms of differentiating between different forms of non-technological innovation. I use this section to compare my findings to quantitative (e.g. Fagerberg et al., 2012; Martin, 2012) reviews of the field of innovation in general in order to provide more insight into the similarities and differences of the two fields that are undoubtedly connected to each other.

The comparison of my results with the study on knowledge sources in the innovation literature by Fagerberg et al. (2012) reveals some insightful information. “An Evolutionary Theory of Economic Change” (Nelson & Winter, 1982) appears to be the most crucial influence in the field of innovation, besides Schumpeter (1934). In their work, Nelson and Winter combine Schumpeterian and evolutionary perspectives with theories on organizations and human behavior (Cyert & March, 1963) in order to produce a theory of the way firm-level knowledge and its outcomes are shaped (Fagerberg et al., 2012). In my study, this book is only on the 22nd place of most influential pieces in terms of times cited by the primary articles of my analysis. Although it was written by two economists, it has found a large audience among business and management scholars. Other 17 pieces on the top 20 contributions list by Fagerberg et al. (2012) cannot be traced among the top 30 contributions in my study. The only other two exceptions to this rule are the book by Rogers (1983) “Diffusion of Innovations”, which is recognized as a seminal work to the diffusion scholarship within innovation studies, and Cohen and Levinthal’s (1990) Administrative Science Quarterly piece “Absorptive capacity: a new perspective on learning and innovation”.

In contrast to the list of Fagerberg et al. (2012), where articles and books by economists (e.g. Schumpeter, 1934; Freeman, 1974), and institutional and strategic business scholars (e.g. Porter, 1990; Saxenian, 1996) are mostly present, my top contributions list is dominated by management and organization scholars (Daft, 1978; Kimberly & Evanisko, 1981; Damanpour, 1991). This indicates that organizational studies and a more in-box perspective have always driven research on non-technological innovation, unlike innovation studies in general that are much more macro- and economy-oriented. This serves as additional evidence to the fact that a multilevel approach, which could contribute to bridge the two perspectives, is beneficial in examining this field.

Another difference between the knowledge base of the two fields is related to the temporal component; studies that form the knowledge base of innovation are, in general, much older than studies that represent the knowledge core of non-technological innovation. A rather straightforward explanation is that the field of non-technological innovation in itself has started to develop at a later stage, which naturally causes this effect. In comparison with the evolution of the field, it is apparent that the field of non-technological innovation has grown a lot more in the last couple of years with a pattern that resembles an exponential curve, whereas the field of innovation in general, although also growing, has done so at a much steadier pace. Given that the field of innovation also encompasses non-technological innovation as a subfield, we could make a conclusion that it has grown predominantly on the basis of the increasing popularity of non-technological innovation among the researchers.

The differences in top contributions aside, Fagerberg et al.(2012) were also able to draw a graphical representation of the content-wise clusters in their sample of contributions. Based on the number of pieces in each cluster, two main polar groups arise: economics of R&D that emphasizes the role of technology and innovation in economics in social change, and organizing innovation, which focuses on innovation in firms and is popular among scholars in business and management (Fagerberg et al., 2012). The former had significantly less influence in the field of non-technological innovation, whereas the latter is also crucial for my studied field. The third branch of research can also be distinguished from their drawing: innovation systems. They keep the other two parts of the knowledge base connected, which also has importantly influenced the field of non-technological innovation.

It appears that individual-level innovation studies are much more important for the field of non-technological innovation than innovation in general. As Shafique (in press) observes, psychology made very little contribution and influence in the field of innovation. On the other hand, the influence of psychology that has penetrated the field of non-technological innovation through the work of Baldridge and Burnham (1975) is crucial for its development. Such occurrence is not apparent in the field of innovation in general. For example, one manifestation of this influence is related to two different definitions of management innovation, which are tightly related to multilevel issues. On the one hand, there is a person-centric definition of Hamel (2006) – what managers are and how they do something differently, but on the other hand, a more organization studies -based perspective offers an organizational-level definition: new approaches to devise strategy and structure of tasks and units, modify the organization's management processes and administrative systems, motivate and reward organizational members, and enable organizational adaptation and change (Damanpour & Aravind, 2012).

It is thus not surprising that the review of Damanpour and Aravind (2012), with the organizational studies background of the authors, focuses on the firm level. The definition of management innovation by Birkinshaw et al. (2008) goes across more levels; these are innovations in organizational form, practices, processes, or techniques, and constitute the rules and routines that describe how work gets done inside organizations (Birkinshaw et al., 2008). However, even if, "for parsimony", the authors intend to conceptualize management innovation as an overarching construct of all types of non-technological innovation (Damanpour & Aravind, 2012), they do not include, for example open or marketing innovations, nor any notion of non-technological innovation carried out by the employees (other than the managers).

Creativity is another interesting and influential topic within the non-technological innovation literature. Co-citation analyses reveal some crucial insights. First, creativity is not the only psychological and individual-level influence in the field, as individual innovation is in fact the one perspective that is at the very core of the field development. Second, creativity and its influx in the second part of the examined time frame had a crucial impact on the field of non-technological innovation, which is not true for the field of innovation in general. Third, creativity itself had two major paths within the field: the first one came straight from psychology and focused more on the individual level (Amabile et al., 1996), whereas the second domain mostly derived from the innovation literature (based on disciplines such as industrial economics, strategy, organizational studies, etc.) and was also more organization level-based (e.g. Woodman et al., 1993). This results in many multilevel issues and even more confusion, caused by a relative independence of research streams of creativity and innovation. Fourthly, creativity is often listed as an antecedent of innovation, with little attention paid to how, through which mechanisms, and under which conditions the two processes are related.

I also compared my results with Martin's (2012) citation analysis of the field of innovation studies and science policy. Nelson and Winter (1982), and Rogers (1983) were also present, as in the study by Fagerberg et al. (2012). In contrast with the latter study, Martin (2012) discovered another piece that I found to be of crucial importance for the field of non-technological innovation - Nonaka and Takeuchi (1995): "The knowledge-creating company". Other top contributions reveal similar results as Fagerberg et al. (2012) in terms of the differences from non-technological innovation. Martin (2012) also found that the field is mostly influenced by economic, institutional, and social change scholars, with the exception of a couple of "outside" influences that are, however, not on the list of the most important contributors in the field of non-technological innovation (e.g. Kuhn, 1970).

In terms of the sources of influence on the field of innovation studies and science policy, Martin (2012) discovered that during the earlier years of the field (before 1980), many different disciplines influenced it after the work of Schumpeter (1934), for instance economics (authors such as Arrow and Sollow) that was probably the most influential, sociology (e.g. Rogers, 1983), management (e.g. Utterback & Abernathy, 1975), and organizational studies (e.g. Cyert & March, 1963; Woodward, 1965). It is also interesting to note that whereas Shafique (in press) observes that the contribution of sociology from the beginning of the innovation field in general has increased slightly over time, its relative influence has been consistently decreasing. The same cannot be said for the field of non-technological innovation, where sociology is still very much present through the subfield of management innovation.

Martin (2012) also found that separated parts of the field started to coalesce into a more coherent group centered on the adoption of an evolutionary (or neo-Schumpeterian) economics framework (e.g. Nelson & Winter, 1982; Rosenberg, 1982), an interactive model of the innovation process (encompassing management of technology, e.g. Porter, 1985; Cohen & Levin, 1989, and accounting for organizational innovation, Kimberly & Evanisko, 1981, resource-based view, e.g. Barney, 1991; Hamel, 1991, organizational learning and knowledge management, e.g. Nonaka & Takeuchi, 1995; Argyris & Schön, 1996, as well as inter-organizational collaboration and open innovation, e.g. Chesbrough, 2003b), and (a few years later) the concept of "systems of innovation" (Freeman, 1992; Lundvall, 1992; Saxenian, 1996). Thus, after 1980, we can see that there was quite an overlap in terms of the key areas of influence for innovation studies and for non-technological innovation studies (with the exception of the evolutionary economics framework which, apart from the work of Nelson and Winter, 1982, did not influence the field as much). This further depicts non-technological innovation as an important driver of the scientific growth of innovation studies.

1.6 Science mapping of the non-technological innovation field

Citation and co-citation analyses concentrate on where the origin of knowledge in a particular discipline or field. Science mapping (i.e. direct citation analysis), on the other hand, portrays a cross-sectional snapshot of the field using primary articles and examining how they cite each other (Small & Griffith, 1974; Boyack & Klavans, 2010). Drawing conclusions from both tools, I can make strong inferences about the sub-fields in the scientific area of non-technological innovation.

I used the same time frames as in the co-citation analysis. The most revealing is the time stamp for the whole time frame (1975–2011). However, before discussing that frame, I present each time frame separately to reveal how the field and its subfields have evolved over time. There are two important factors to consider when interpreting science mapping results. Firstly and most apparently, the central position of an actor is important. Secondly, how many times each work has been cited by other primary pieces also needs to be taken into account, even if it is not apparent from the portrayal.

I first concentrate on the first time stamp (1975-1990) that has a relatively low number of primary articles. Examining only the most heavily cited works among the primary articles, Figure 1.16 reveals six most important actors. Most of them come as no surprise as they are also present in the co-citation analysis. In particular, the majority seem to relate to the Administrative Science Quarterly article by Baldridge and Burnham (1975): "Organizational Innovation: Individual, Organizational, and Environmental Impacts", which argues that research on diffusion of innovation should shift from individuals to organizational structure and environmental factors. Kimberly and Evanisko (1981) found similar results: organizational-level variables were more important than individual characteristics for both administrative and technical innovation.

One of them, however, is a bit surprising as it has not appeared before nor is it on the list of the most frequently cited articles. That is the article by Kim (1980) entitled "Organizational Innovation and Structure", which also appears to be the basis for primary articles about organizational innovation in the following time frames, as discussed in the following paragraphs. Taken together, these most important pieces of primary articles only support my observation of the co-citation analysis that non-technological innovation field has evolved from sociology and even more so from psychology (following the question: "what can people do?") rather than the economics. The basic level of analysis in many of these studies was the individual one.

It was in the era 1975-1990 (Figure 1.16), however, when knowledge that came from the fields of sociology (behavioral studies) and psychology in terms of non-technological innovation began to be combined with innovation literature, which was based on economics, business and organizational studies, and adopted a broader perspective. This is one stream of primary articles that discuss shifting their view from individual characteristics in order to encompass contextual factors, and bottom-up and top-down influences (e.g. Baldridge & Burnham, 1975; Daft, 1978). Another research stream, albeit relying heavily on findings of the first, more individual level-based one, focuses on organizational innovation at the company level (e.g. Kimberly &

Evanisko, 1981; Damanpour & Evan, 1984), bringing the literature of business and organizational studies into the mix.

Next, I examine primary articles and how they cite each other during the time frame 1991-1997 (Figure 1.17). The piece by Millar et al. (1997) “Trans-organizational innovation: a framework for research” appears to be central as they have cited most of other influential primary articles in this era (e.g. Woodman et al., 1993; Gopalakrishnan & Damanpour, 1994). They focus on technology diffusion and the transition towards a knowledge-based economy as a basis for innovation, indicating that the inter-organizational collaboration is crucial for successful innovation and accounting both for the technological characteristics of the product and the context.

One can observe that Damanpour (1991, 1996) had great influence on the field with his management and organization-based perspective at the company level of research. However, one can also still see that previous influence of psychology that I discovered in examining previous time stamp was able to manifest itself in influencing Woodman et al. (1993) conceptual Academy of Management Review piece “Toward a theory of organizational creativity”. The authors focus on individual creativity as defined in a complex social setting, later to be recognized as an interactional perspective, allowing for the interplay between a person and the context. Antecedent conditions, cognitive styles and abilities, personality, motivational factors, and knowledge interact with each other in shaping creativity within organizations at the individual level (Woodman et al., 1993). This theory was later mostly adopted by creativity researchers at the individual level, but was not as influential in the innovation literature.

Thus, observing focal primary articles during this time stamp also reveals a particular type of interaction. One can see that there are still two topics present during this time. One of them is the firm-level organizational innovation studies that attempts to unveil the mysteries of organizational innovation, still very much based on individual factors of employees within firms, but in interaction with organizational-level characteristics that influence innovation processes. One can also classify attempts, which have tried to bridge the gap towards a more macro perspective that accounts for inter-organizational connections and institutional factors in this processes (Millar et al., 1997), into that same category.

Figure 1.16: Science mapping of the non-technological innovation field (time stamp: 1975-1990)

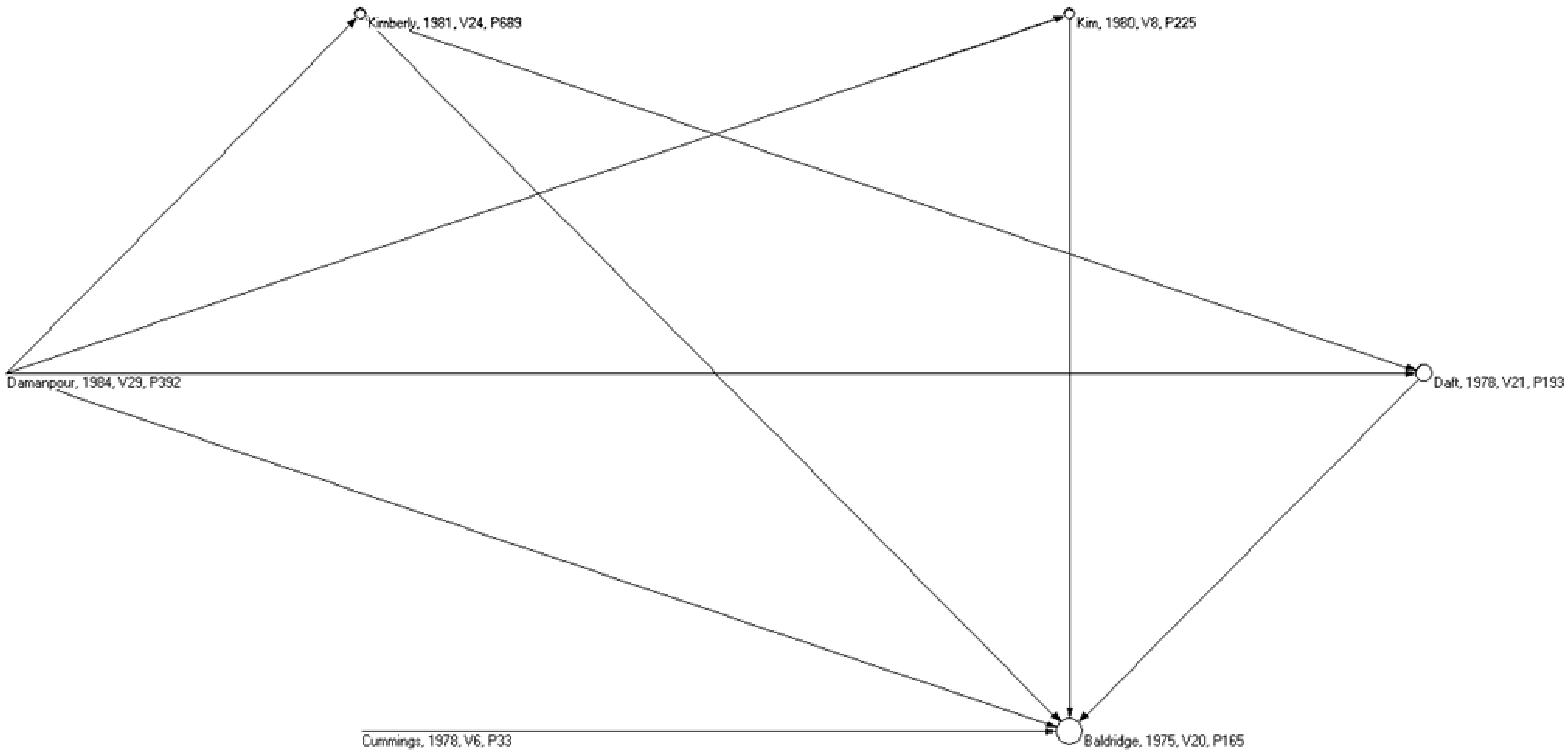
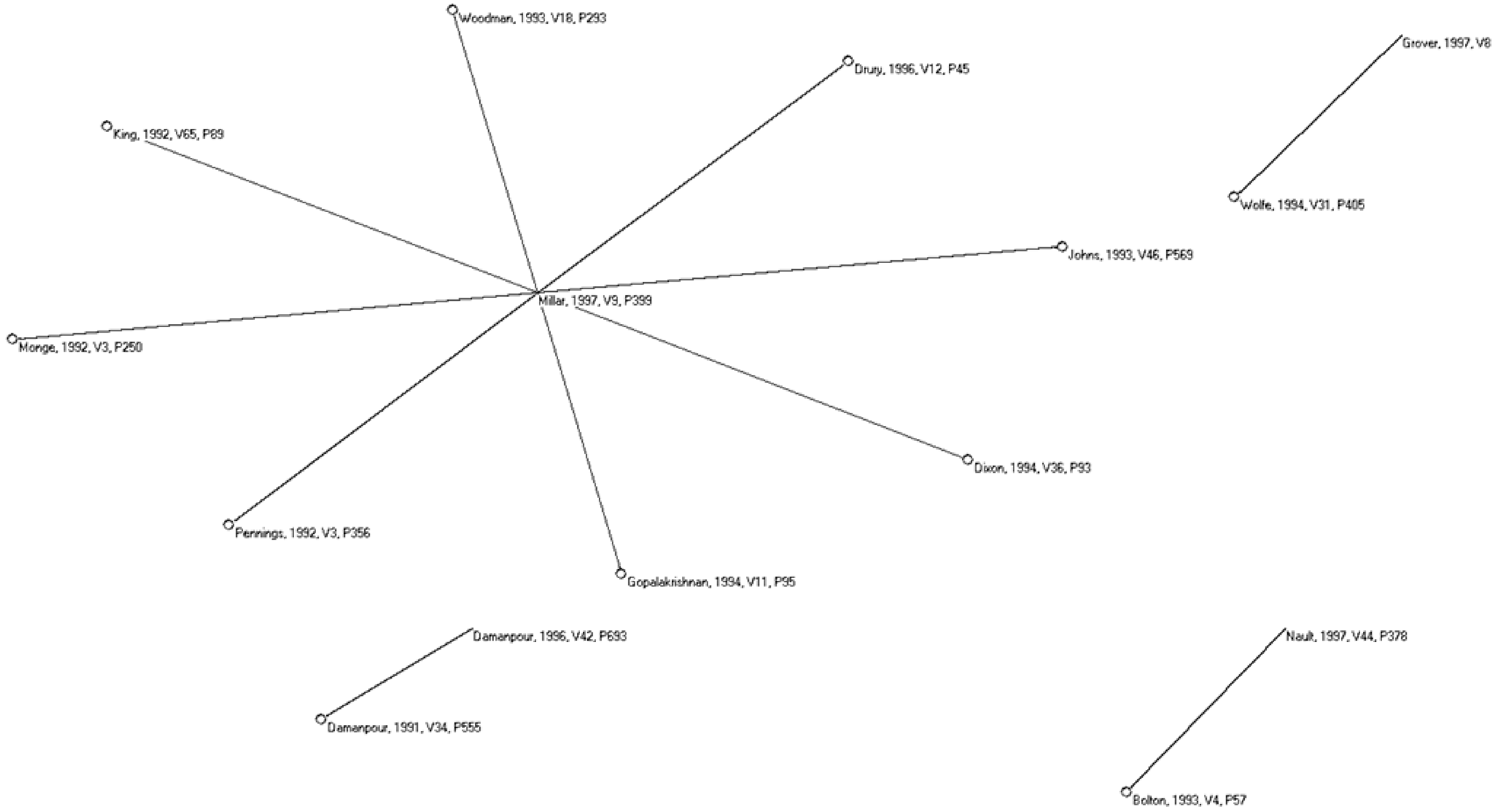


Figure 1.17: Science mapping of the non-technological innovation field (time stamp: 1991-1997)

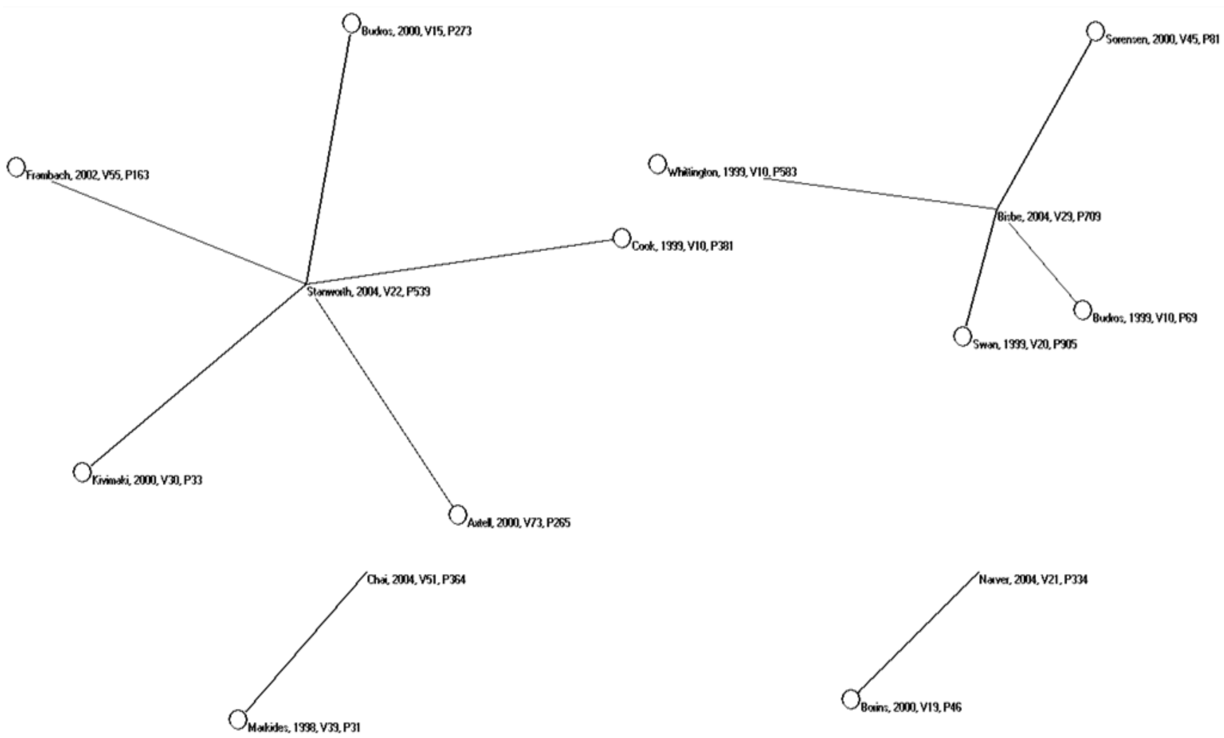


Another key literature is organizational creativity (Woodman et al., 1993) that perhaps somewhat unintentionally (or possibly deliberately) uses the word “organizational” in the title, connecting creativity with more organization-based studies on innovation. This allowed for the beginning of the connection of creativity literature, which derives mostly from psychology and was already rather developed together with innovation at the time. However, as I pointed out when describing the previous time stamp, this is only a substitute for more individual-level based studies on individual innovation within organizations, i.e. one of the roots from which the field of non-technological innovation has evolved.

Next, I examine direct citations between the primary articles during the time frame 1998-2004. Articles on the science map that cite each other were somewhat less influential, indicating that other papers that have evolved independently (not cited each other, but perhaps cited work from previous time stamps) contributed more to the field (e.g. Ahuja & Morris Lampert, 2001; Edmondson, Bohmer, & Pisano, 2001).

Figure 1.18 reveals two large islands. The first one is connected with the central position of Stanworth et al. (2004): “Franchising as a Small Business Growth Strategy: A Resource-Based View of Organizational Development”. This piece indicates the connection of the field with entrepreneurship, but staying well within the safe resource-based view boundaries.

Figure 1.18: Science mapping of the non-technological innovation field (time stamp: 1998-2004)



The second is shaped around Bisbe and Ottlieb's (2004) “The effects of the interactive use of management control systems on product innovation”. This piece exhibits a connection with an important literature for management innovation – management control systems. It also reveals how total quality management, six-sigma, and other ways of controlling began to be associated with management innovation. Within this circle, another, more influential literature that was previously driven by Damanpour and Kimberly continued to focus on organizational factors in enhancing organizational innovation. An example of this is Sørensen and Stuart's (2000) Administrative Science Quarterly article entitled “Aging, obsolescence, and organizational innovation”.

The last time stamp (2005-2011) reveals current state-of-the-art in relation to the sub-fields of the non-technological innovation field. This one is perhaps the most informative in terms of differentiating between different types and forms of innovation researched at the moment. Figure 1.19 reveals two large clusters of authors citing each other and 15 smaller ones. Each one is denoted with a different color.

The largest cluster (yellow circles) encompasses the latest works on management innovation (e.g. Hamel, 2006; Birkinshaw et al., 2008; Damanpour et al., 2009) and organizational innovation (e.g. Armbruster et al., 2008; Liao et al., 2008). These studies appear to be quite well connected with each other. Complementing two streams in the same cluster are a couple of studies that point to the importance of leadership and creativity (e.g. Gumusluoglu & Ilsev, 2009) or knowledge exchange and knowledge creation (e.g. Smith, Collins, & Clark, 2005) for technological innovation. It is not surprising that these two are connected to management innovation because this type of innovation entails combining knowledge in its definition (Birkinshaw et al., 2008), and is closely connected with individual creativity and leadership as it denotes everything the managers are or do differently (Birkinshaw et al., 2008).

The second large cluster, on the other hand, denotes a completely different literature. Gathered around the work of Chesbrough and colleagues (e.g. Chesbrough, Vanhaverbeke, & West, 2006; 2007), it describes a recently popular field of open innovation that has also become closely connected with business model innovation. The latter is precisely the topic of the next, a bit smaller cluster (black circles). Most influential pieces here include: Johnson et al., 2008; Chesbrough, 2010; Sosna, Trevinyo-Rodríguez, & Velamuri, 2010.

Other smaller clusters with at least three important actors during 2005-2011 include individual factors for firm behavior (purple, e.g. Beckman, 2006), total quality management (blue, e.g. Abrunhosa & Sá, 2008), top management characteristics and innovation (light green, e.g. Elenkov & Manev, 2009), innovation management that also deals with different types of innovation (red, e.g. Francis & Bessant, 2005; Baregheh et al., 2009), organizational learning and innovation (orange, e.g. Montes, Moreno, & Morales, 2005), and market structure for innovation (white, e.g. Damanpour, 2010; Gambardella & McGahan, 2010).

Figure 1.19: Science mapping of the non-technological innovation field (time stamp: 2005-2011)

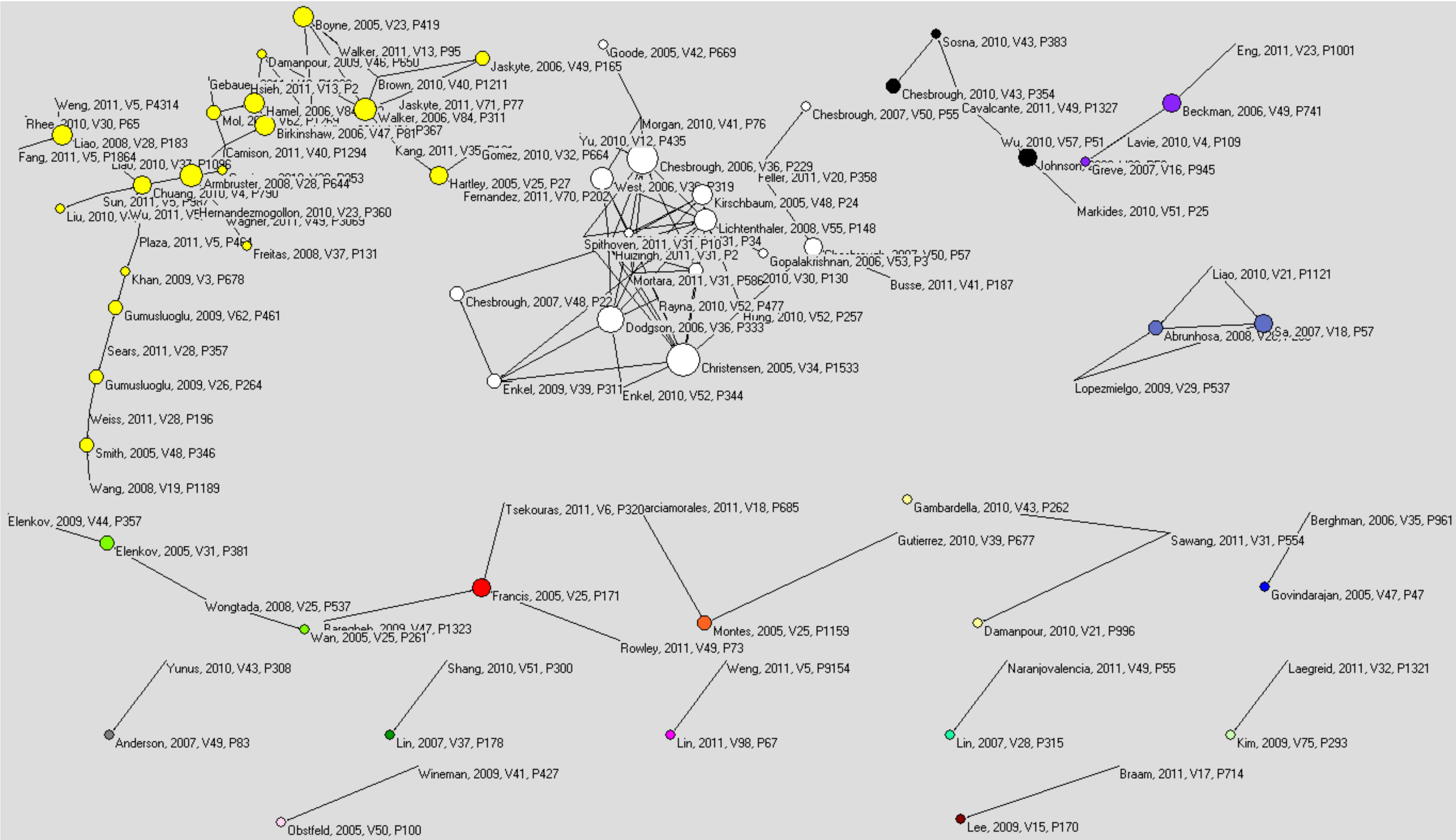


Figure 1.20 portrays the science map of the whole time frame (1975-2011) and reveals three large clusters that are well connected through their centers (light blue). Two central actors are well established from the first time frame (Baldridge & Burnham, 1975; Cummings & O'Connell, 1978). The third, however, is a bit surprising: the work of Kim (1980) entitled "Organizational Innovation and Structure", which appears to be the basis for future stream dealing with organizational and later management innovation (e.g. Kimberly & Evanisko, 1981; Damanpour, 1991). This is one stream of management innovation that has evolved from firm-level studies on internal and external factors shaping organizational innovation. In these cases, the border between understanding organizational innovation as "all innovation at the company level" and "non-technological innovation" is frequently blurred.

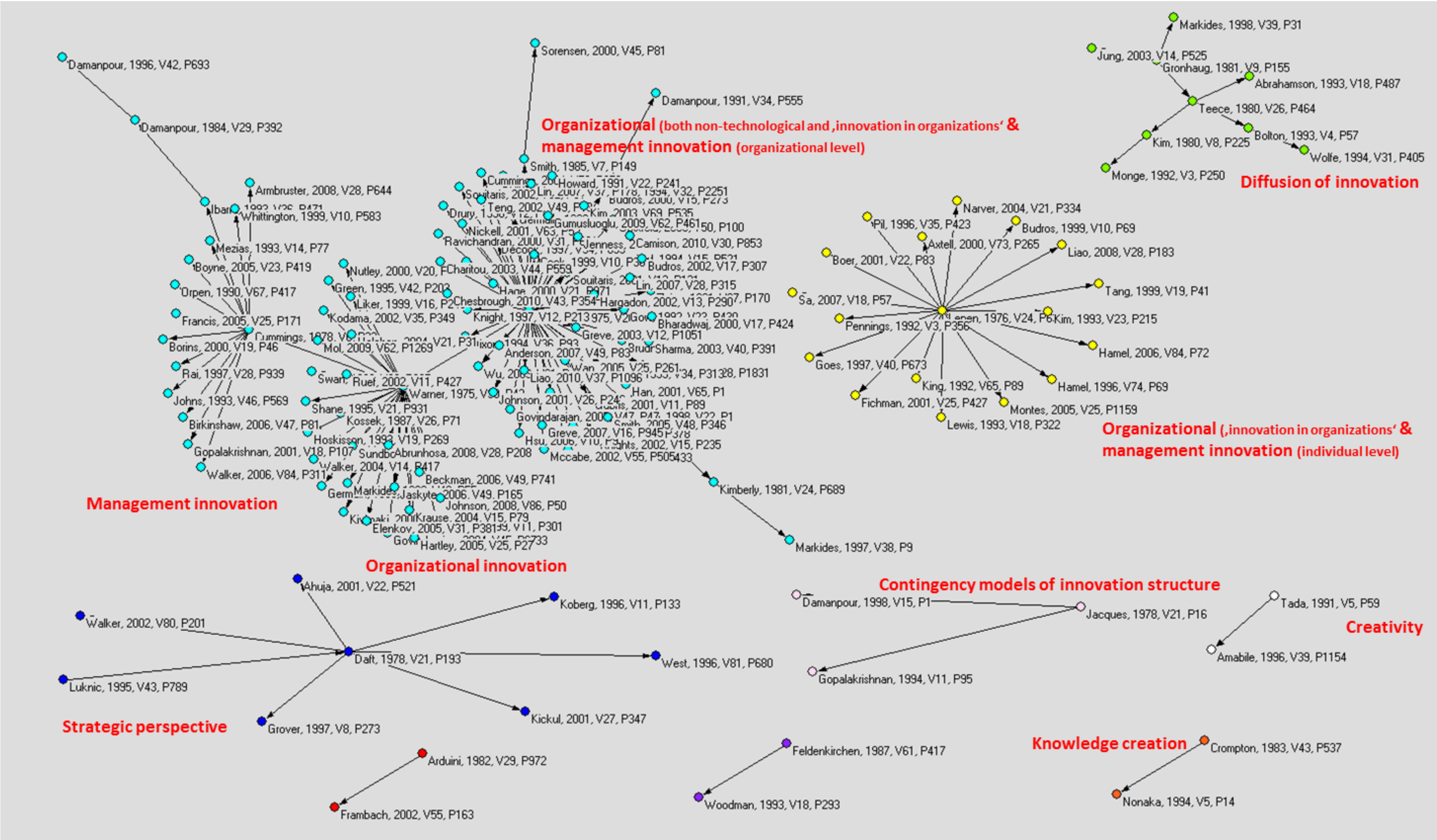
It is interesting to note that the aforementioned work on management and organizational innovation is overall disconnected from studies (yellow cluster) of, for example, Liao et al. (2008) and Tang (1999) that deal with organizational innovation on one hand, and Hamel (2006) on the other, dealing with management innovation. In terms of organizational innovation, it is a mostly technologically-based view of organizational innovation (the aforementioned "innovation in organizations" perspective). This is attested by co-citation analyses results. They support the fact that the knowledge, which served as a foundation for these studies, originates mostly from business and economics studies. This is more characteristic for innovation in general than for non-technological innovation.

In terms of the particular stream of management innovation (e.g. Hamel, 2006), however, the foundation is mostly based on the individual level, with personal characteristics being the focal point of these studies. One of such studies is Axtell et al. (2000), which looks at individual innovation implementation. It is interesting that although such individual-level studies have a lot in common with creativity literature, the two are in this case very disconnected, with Axtell et al. (2000) drawing predominantly from innovation literature. This is why science mapping results put it within the same cluster as the one management innovation stream that has been focused on individual characteristics, and other organizational-level studies (e.g. Montes et al., 2005; Liao et al., 2008) that also originated from the same knowledge.

Next cluster (green) is mapped around Teece (1980). Based on its most important author, one would expect this cluster to perhaps deal with business model innovation. This is only true to some extent, as these studies (e.g. Kim, 1980; Abrahamson, 1991; Jung, Chow, & Wu, 2003) mostly deal with diffusion of innovations, and internal and external factors affecting it. Nevertheless, this is the knowledge base from which business model innovation has evolved.

Next cluster (dark blue) is based heavily on Daft's (1978) dual-core model of organizational innovation, thus finding foundation in the core differentiation between administrative and technical innovation. This is a more strategic-based organizational-level perspective (e.g. Ahuja & Katila, 2001; Walker, Jeanes, & Rowlands, 2002), consistent with notions of strategic innovation and top management team characteristics (West & Anderson, 1996).

Figure 1.20: Science mapping of the non-technological innovation field (the whole time frame: 1975-2011)



The next cluster (light pink) deals with contingency models of innovation structure (e.g. Damanpour & Gopalakrishnan, 1998). It is content-wise related to the largest cluster dealing with internal and external factors driving innovation. However, the authors deal more with innovation adoption. More precisely, they deal with adoption of innovations in general and not only the non-technological forms. Thus, we can see some differentiation in terms of different clusters within the science map between studies that understand "organizational innovation" as a non-technological form or simply as "innovation in organizations".

The white cluster (e.g. Amabile et al., 1996) deals mostly with creativity and not innovation. It does, however, touch upon the issue of differentiating between the two and defining them properly. Within this cluster, one can finally claim that some connections have been made between the creativity and innovation literatures. This can also serve as an argument for the individual-level basis of innovation. Nevertheless, I have shown that other literatures, in addition to creativity, have informed non-technological innovation literature in that way.

Another interesting cluster (orange) deals with knowledge creation. It denotes an important dependency of non-technological innovation studies on knowledge management literature. This is heavily present in the management innovation field, and expressed within the science map of the whole time frame (1975-2011) as an independent cluster with influential studies such as Nonaka (1994), which is apparently tightly connected with earlier studies on administrative innovation (e.g. Crompton, 1983).

1.7 Delineation of different types and forms of innovation

On the basis of the qualitative literature review, science mapping, and co-citation analyses results, I can make some insightful and in-depth observations regarding the content of different types of innovation, as well as the origin of knowledge that has informed these particular subfields. I compare my findings related to the content of innovation to the qualitative review articles by Damanpour and Aravind (2012) and Crossan and Apaydin (2010).

In terms of differentiating among different types of innovation, science mapping could not provide a crystal clear distinction among them. Overlap exists to some extent. Co-citation analysis was informational, as we can clearly see some evidence of different knowledge domains being more important for different forms of non-technological innovation. However, on the basis of the results of both analyses, it is obvious that administrative, management, and organizational innovation are types of non-technological innovation that were informed by more or less the same literatures. In the last couple of years, management innovation is a term predominantly used (Damanpour & Aravind, 2012), and these studies mostly adopt a more knowledge-based as well as behavioral and psychological perspective ("what the managers do and how they do it").

It has to be pointed out that organizational innovation was used (particularly at the beginning of the field development) as a term denoting all types of non-technological innovation. It is a term, as Damanpour and Aravind (2012) describe it, borrowed by the economists (e.g. Chandler, 1962; Lam, 2004; Sanidas, 2004) and attributed to Schumpeter's (1983) work (for elaboration on different perspectives – entrepreneurial and corporate - see Damanpour & Aravind, 2012).

However, according to Williamson (1975), organizational innovation also includes changes in organizational systems and processes such as accounting, work scheduling, etc. Thus, comparisons between these bodies of literature need to be done with caution.

It is also true that many studies follow the basic Daft's (1978) dual-core model of innovation and use the term administrative innovation in a broader manner – to denote any kind of non-technological innovations, including strategic and open innovations. As the co-citation analysis and science mapping have shown, these two types are distinct from organizational/management innovations, and draw knowledge from different bodies of literature. Similar to beginnings of non-technological innovation in the hands of organizational innovation is a relative consensus in the last couple of years to use the term management innovations (Damanpour & Aravind, 2012) to denote any kind of non-technological innovation. Nevertheless, using one term for describing any non-technological innovation is problematic, because it is evident that marketing and open (ancillary) innovations are a part of non-technological innovation types, but do not have much to do with management innovations and even draw from different bodies of literature.

There are differences between administrative, management, and organizational innovations, which are even more frequently used as synonyms. Administrative innovations, as derived from the dual-core model of innovation in organizations (Evan, 1966; Daft, 1978), are a broader term, and can also include marketing, strategic, and open (ancillary) innovations. They are not technical nor related to the firms' primary work activities (Damanpour & Evan, 1984). As such, they are mostly in line with the non-technological innovation label, as well as with management and organizational innovations, which can really be used interchangeably as attested by the co-citation analysis, acting as more narrow terms.

Final conclusions can be made, however, about differentiating these types from other types and forms of innovation. First, it is obvious that Crossan and Apaydin's (2010) perspective in terms of delineation of between types (organizational, administrative, etc.) and forms (product, process, business model innovation etc.) of innovation is rooted in the literature. These are two distinct processes – similar to comparing apples and oranges. Process innovation, for example, can be either non-technological or technological (Edquist et al., 2001). Although I focused on multiple types of innovation, my findings support the notion that distinction between administrative and technical innovation (used by Crossan and Apaydin, 2010) is sufficient. Despite similar influxes, particularly in terms of management/organizational/administrative differential, clusters do exist within these types and especially when considering additional types of non-technological innovation, such as innovations in marketing or open innovations.

In terms of business model innovation, science mapping has shown that this form of innovation has been closely connected to strategic and open innovation. However, business model innovation can be based on any type of innovation, non-technological (organizational/management, marketing, strategic, or open/ancillary) or technological. This is true as long as it provides a change in one of the business model elements. Therefore, business model innovation is actually an innovation by form, and not by type. Crossan and Apaydin (2010) make and effectively articulate this distinction.

1.8 Antecedents and outcomes of non-technological innovation

In this section, I focus on different antecedents and outcomes of non-technological innovation. I intend to examine whether some topics that were identified within the co-citation analysis and science mapping merely represent antecedents or outcomes of different types of innovation, or are they inherent parts of innovative activities. Moreover, after listing and briefly describing them, I compare their role (based on both qualitative literature review and the co-citation analysis) with the factors of innovation in general. More specifically, I again compare my findings to the literature review of Crossan and Apaydin (2010), as well as other narrative literature reviews (e.g. van der Panne, van Beers, & Kleinknecht, 2003; Anderson et al., 2004; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004) from the field of innovation. I present an in-depth study of unique antecedents of non-technological innovation (that are not found in innovation literature or play a different role there). I compare my findings to the qualitative literature review of the management innovation field that was conducted by Damanpour and Aravind (2012).

1.8.1 Internal determinants of non-technological innovation

What determines the success of innovation is a very important and frequently investigated research question. There are many internal and external determinants that influence the innovation process. Three main internal determinants turned out to be management support for an innovative culture, a customer/market focus, and a high level of internal and external communication/networking (Read, 2000). However, Lam (2004) defines three other elements that influence innovation in organizations: organizational structure, strategy, and organizational learning.

Ashkarany and Smith (2004) reviewed the literature and found a number of contextual factors of innovation, such as organizational culture, institutional pressure, employee awareness of the benefits of an innovation, a recognized need for change, and the degree of uncertainty associated with the outcomes of the innovation. The findings of their study suggest that the most important internal factors are the awareness of the benefits of innovation and its availability of innovation, management commitment on implementation of innovation, and confidence in the ability of the new technique.

Baranano (2003) claims management techniques (planning, leadership, and the will to innovate) are the most crucial. He adds the quality of management, personnel policy, and management style. Read (2000) agrees – he discovered that two most important determinants are management support for innovation and the innovative *organizational culture*.

A true innovative firm must be embedded of a strong culture that stimulates the engagement in innovative behavior (Škerlavaj, Song, & Lee, 2010a; Černe, Jaklič, Škerlavaj, Aydinlik, & Donmez Polat, 2012). Culture can serve to supplement the organization's capability for innovation in various ways. Thus, it is a commanding force in determining human behavior. Establishing a culture of innovation is essential to provide organizations with the necessary support for their innovation process (Tushman, 1993). This way, organizational culture goes hand in hand with management support for innovation. However, a supportive culture is much more difficult to achieve, as it is under the influence of informal factors, common to the firm's employees, such as creative climate (Barañano, 2003), and shared values and beliefs. Thus, internal informal structure needs to emerge among the employees (Teece, 1998). Culture does start with leadership, but it is reinforced with the accumulated learning of the organizational members.

Several studies (e.g. Teece, 1998; Lam, 2004) have shown how certain *organizational structures* facilitate the creation of new products and processes, especially in relation to fast changing environments. Teece (1998) investigates the internal formal structure, which needs to be flexible (Read, 2000). Structure should be appropriate to design a learning organization (Barañano, 2003). Damanpour (1991) claims several structural determinants positively influence innovation, especially low formalization and decentralization, as well as larger organizational size (Damanpour & Schneider, 2009). On the other hand, organizational complexity results in less bureaucratic control, thus supposedly diminishing non-technological innovation (Zmud, 1982).

Many authors (e.g. Read, 2000; Barañano, 2003) identify creative, continuing and extending individual development as essential for innovation. Therefore, *HR systems and strategies, and knowledge management*, play an important role. The role of cognition and organizational learning in fostering or inhibiting innovation is crucially important. Organizations need to develop mental models, belief systems, and knowledge structures towards organizational learning (Lam, 2004; Hernaus, Škerlavaj, & Dimovski, 2008). Moreover, knowledge is an inherent part of any innovation activity. For example, it is actually present in the definition of management innovation, currently accepted as a representative of non-technological forms of innovation (Birkinshaw et al., 2008). The crucial importance by organizational learning, knowledge management, knowledge transfer and exchange, and the use of knowledge sources were pointed out by the co-citation analysis as well. This applies even more to the non-technological innovation field than innovation field in general.

Leadership, along with the selection of the right personnel, has an important role in enhancing appropriate *individual determinants* for innovation among the employees. Individual determinants, such as personality, motivation, cognitive ability, job characteristics, and mood states all need to be taken into account when stimulating risky, bold behavior, creativity and inventiveness, and initiative taking. Once again, mental models need to be changed, which is best done if the leaders get to know their employees, their cause, purpose, goals, meaning, and moral imperative. This way, they can influence the employees' intrinsic motivation to engage into non-technological innovations, particularly in their implementation. However, the majority of attention in this topic is devoted to top management team characteristics (e.g. Mihalache, Jansen, Van Den Bosch, & Volberda, in press), or characteristics of managers in general (Damanpour & Aravind, 2012), such as supervisor support, and not to leadership styles or employees in general.

Strategic posture and customer/market focus are the following determinants mentioned in the innovation literature. Planning the continuous improvement with constant adaptation to external changes can only take place with proactive environment analysis (Barañano, 2003) and marketing orientation. Taking user needs into account is essential for successful marketing of innovation driven by customer focus (Barañano, 2003).

New *technology* and corresponding technological innovation activities induce marketing and organizational innovations. Organizational innovations are particularly affected by product and process innovation activities. If a company makes an effort to stimulate technological innovations, this manifests as non-technological innovation (Schmidt & Rammer, 2007). *Size*, on the other hand, negatively affects innovation (Damanpour, 1996; Barañano, 2003).

Internal communication is much more difficult to achieve in larger firms. Teamwork is very important for innovation, which is a social process that cannot be done effectively in solitude (Barañano, 2003; Hamel, 2007). Collective knowledge exists between individuals rather than within them (Lam, 2004). Besides formal networks, tacit knowledge embodied and embedded in social practices is also significant for innovation. However, not only internal connections, but also external linkages, *external networking*, are important, since new ideas often come from customers or other partners (Teece, 1998).

1.8.2 External determinants of non-technological innovation

External determinants of innovation are covered extensively in the national innovation systems approach, which was introduced in the late 1980s. It investigates innovative activity in a broader sense, and adopts a broader and interdisciplinary perspective, in which it tries to encompass a wide array of the determinants of innovation that are important for organizational, social, and political factors (Lundvall, 2010). National systems of innovation are defined as the set of organizations, institutions, and linkages for generation, diffusion, and application of scientific and technological knowledge operating in a specific country (Galli & Teubal, 1997). Literature related to national innovation systems mainly emphasizes the active role played by government policy and specific institutions (Lin, Shen, & Chou, 2010). Among the organizations, one can identify political, administrative, regulatory, and economic actors (Galli & Teubal, 1997). Drawing on this concept, Barañano (2003) provided a review of studies on the non-technological factors for success of technological innovation until the year 2000. One can learn from the revised studies that a single factor cannot determine on its own technological success nor failure (Barañano, 2003).

Companies need different models of innovation by opening to external sources of ideas and routes to market, as well as collaborating with a large number and wider range of partners. Innovation process is becoming increasingly complex as it involves a great number of actors to realize the commercial potential of their ideas (Chesbrough, 2003b). They become connected in *open innovation networks*. There are several external factors influencing firms’ idea and information acquisition, such as intensity and proximity of networking, and institutional support (Romijn & Albaladejo, 2002).

Innovation is too important to be left to private sector alone to decide on (Dodgson et al., 2008). Thus, *institutions, and national and regional innovation systems*, such as regional clusters (Zagoršek, Cotič Svetina, & Jaklič, 2008), have a crucial role in stimulating innovative activities.

It is the function of a government to open up previously closed societies and markets to international competition. Funders of basic research, seek international collaboration to support it. Governments have several tasks in order to enhance innovation of firms (Dodgson et al., 2008): stimulating interaction between individuals, firms, and institutions; expanding efforts to support interaction within innovation systems in order to make them more sophisticated and targeted; creating new mechanisms that help firms, research organizations, and individuals to find ways to build useful relationships with one another. Thus, a government should mostly serve as a creator of connections.

Innovative activities of enterprises not only depend upon intra-firm organizational capacities, but are fundamentally shaped by the organization’s institutional environment and through specific patterns in which innovation processes are embedded (Kaiser & Prange, 2004). Hence, national or regional differences in technological performance can be attributed, at least to a significant extent, to variations in the institutional environment (Lundvall, Johnson, Andersen, & Dalum, 2002). Dimensions such as high autonomy, risk-taking, tolerance of mistakes and low bureaucracy were found to be the most prevalent characteristics of an organizational culture of innovation (Scott & Bruce, 1994; Van de Ven, 1999).

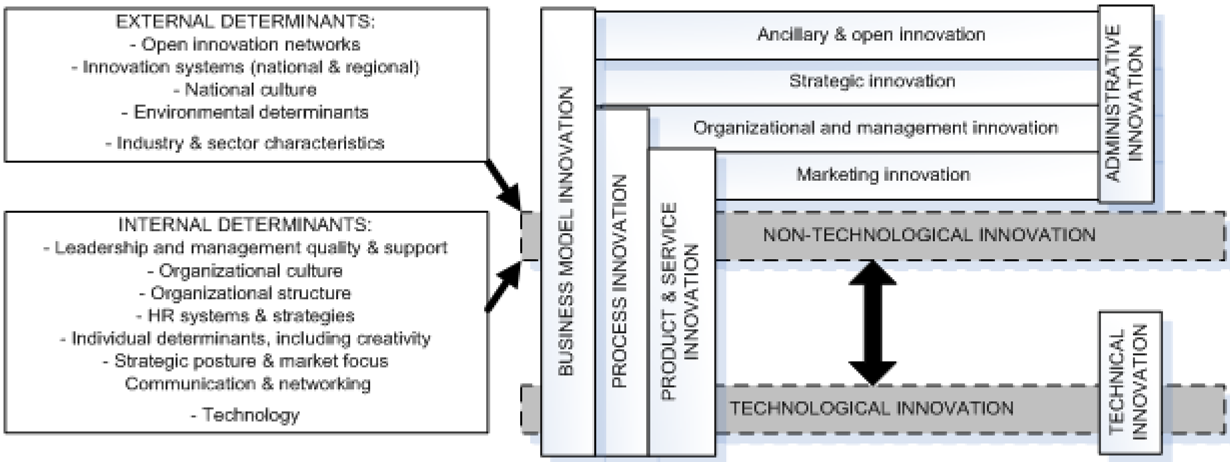
National culture is a set of collective beliefs and values that distinguishes people of one nationality from those of another in a relatively stable, unchanging manner (Hofstede, 2001). Culture guides, influences, or co-determines behavior. As Rosenbusch et al. (2011) pointed out, national culture is related to various aspects of innovation, such as national differences in invention and innovation rates (Shane, 1993), cross-national product innovation diffusion (Dwyer, Mesak, & Hsu, 2005), R&D activity and productivity (Couto & Vieira, 2004), technology alliance formation by entrepreneurs (Steensma, Marino, Weaver, & Dickson, 2000), and entrepreneurship (Zacharakis, McMullen, & Shepherd, 2007).

In addition to national systems of innovation, regional systems of innovation also need to be taken into account as a determinant of innovation. Local availability of distinctive technological and research capabilities, and particular local labor market factors can provide a source of advantage (Dodgson et al., 2008). To be even more specific, several authors list *sector* (Barañano, 2003), market structure and *industry* characteristics (Cohen & Levin, 1989), and market type (Balachandra & Friar, 2002) as determinants of innovation. Managers need to adapt their innovation approach to industry and culture in their organizational context (Ortt & van der Duin, 2008).

1.8.3 Interrelationships between different types of non-technological innovation and a comparative discussion

Figure 1.21 illustrates findings on the interrelationships between different types of non-technological innovation, technological innovation, and various factors for successful non-technological innovation. The antecedents and interrelationships are based on both qualitative literature review, and the co-citation and direct citation analyses results. The factors of non-technological innovation have not been previously specified in the literature. It has to be conceded, however, that a number of them overlaps heavily with some antecedents of innovation in general (e.g. van der Panne et al., 2003; Crossan & Apaydin, 2010). In the previous description and Figure 1.21, I focus mostly on differences between the factors in stimulating non-technological and technological innovations, and the interrelationships between different forms and types of innovation.

Figure 1.21: Relationship between different types of non-technological innovation and technological innovation, and the most important antecedents of non-technological innovation



The most relevant piece to compare the antecedents that I found is a study by Damanpour and Aravind (2012). It is a qualitative literature review of the management innovation field (equated with the field of non-technological innovation in general), where the authors list the most frequently cited antecedents of management innovation. Most of them are internal and related either to organizational characteristics at the firm level (structure, complexity, *size*) or management characteristics (managers' tenure or education, Damanpour & Aravind, 2012). These were all identified as imperative in my review as well. The only external factor the authors (Damanpour & Aravind, 2012) discuss is market competition (e.g. Kimberly & Evanisko, 1981; Damanpour & Schneider, 2009), also revealed in my study. However, they appear to have missed on a number of other salient factors that I listed.

Furthermore, I focus on qualitative literature reviews of the field of innovation in general. Van der Panne et al. (2003), in their literature review of innovation antecedents, conclude that evidence on success factors or determinants of innovation remains inconclusive. This identifies promising avenues for future research. On the basis of my study, I argue that clarification is possible by differentiating between different forms of innovation. A basic distinction between non-technological and technological innovation is a logical first step and should contribute to the illumination of research findings. For example, *firm culture* (both contextual and in teams) is an important factor for non-technological and technological innovation, whereas experience with innovation and multidisciplinary R&D teams is described in technological innovation literature only. Failing to differentiate between different forms of innovation leads to confusion and inaccurate results.

Van der Panne et al. (2003) only look at innovation in general and conclude that there is ambiguity on factors such as top management and leadership support, organizational structure, technological viability, or R&D intensity. Based on the literature review and the co-citation analysis results, it seems that *top management and leadership support*, as well as organizational structure, play an important role in non-technological forms of innovation (or can even represent a type of innovation), whereas R&D intensity and technological capability are much more important for technological innovation. A further, more detailed examination could be valuable for shedding light on contradictory past research findings on the relationship between leadership support and innovation.

This finding serves as an important argument for my choice of *supervisor support* as a leadership-related variable in examining its influence on individual creativity and innovation in Chapter 4. The literature review showed that support is the one leadership characteristic which is most often (however, at times with contradictory results) related to innovation. Apart from that, supervisor support is a trait that leaders can to some degree obtain through training or practice, or simply by deciding to exhibit it. Thus, supervisor support is more generic and does not necessarily involve personality traits or a holistic package of leader behaviors that some leadership styles (which at times almost appear to be "cults") prescribe. In this way, some of them seem to neglect both the individual specifics and contextual factors.

As a supervisor's analogy of perceived organizational support, perceived supervisor support is also most in line with the social side of innovation that is prevalent in my dissertation. To be exact, supervisors are the ones (besides co-workers) that are involved in the closest relations with employees at work. Through these linkages, supervisors act as agents of an organization (Eisenberger, Stinglhamber, Vandenberghe, Sucharski, & Rhoades, 2002). Via these interactions, employees interpret organizational support, as well. Perceived organizational support is one of the theories (besides resource allocation framework and self-determination theory) that is the basis for the curvilinear relationship between creativity and innovation, which I propose in Chapter 4. Supervisor support as a behavioral trait is likely to facilitate two self-determination theory's optimal psychological states of engagement: perceptions of competence and relatedness. In contrast, other leadership styles tell us little about the extent of an organization's support for individual creative and innovative behavior. One exception to this rule might be the leader-member exchange (LMX, Graen & Scandura, 1987; Graen & Uhl-Bien, 1995). However, Settoon and colleagues (1996) argued that LMX is more suitable for capturing in-role behavior, whereas perceived supervisor support represents a broader notion and influences employee commitment in extra-role activities, as well.

In terms of the organizational structure, the literature review has shown that a more organic, flexible team organization emphasizing *autonomy* seems to be crucial for non-technological innovation. On the other hand, a certain degree of structure may be beneficial for technological innovation (van der Panne et al., 2003). However, as Greenhalgh et al. (2004) observe, these factors need to be interpreted carefully and separately for adoption, creation, diffusion, or implementation of innovation. For this reason, I focus on autonomy as a job design-related variable that could be important for micro-level foundations of innovation in Chapter 4.

Greenhalgh et al. (2004) identified system (internal) and outer context (external) antecedents of innovation in general. *National culture* is the only external determinant that can be found in my model (Figure 1.21), but not in their study, and indicating this factor might be more important for non-technological innovation. This makes sense due to the intangible nature of both constructs: national culture and non-technological innovation. However, sociopolitical climate that the authors list (Greenhalgh et al., 2004) is very close to national culture, lthough it can also be equated with a determinant I label national systems. In terms of internal determinants, individual factors and HR practices cannot be found in the literature review of Greenhalgh et al. (2004), but play a major role as antecedents of non-technological innovation.

When comparing my results to perhaps the most comprehensive literature review of innovation by Crossan and Apaydin (2010), one can notice that they predominantly focused on internal determinants of innovation and its processes and types. Leadership, structure, resources, knowledge management, organizational learning, and organizational culture are identified as particularly crucial for innovation in organizations (Crossan & Apaydin, 2010). *Knowledge management*, knowledge exchange and transfer, and organizational learning thus play an important role in innovation studies as well (although this might be related to author bias in this particular study), whereas their importance in the non-technological innovation field is not questionable on the basis of the co-citation analysis results.

As I have already noticed and pointed out in the co-citation analyses discussion, individual determinants and HR strategies and practices are not commonly identified as major factors of innovation in general, which usually adopts a technological view. This is also completely supported in innovation field literature reviews (e.g. van der Panne et al., 2003; Anderson et al., 2004; Greenhalgh et al., 2004; Crossan & Apaydin, 2010). Thus, the bottom-up perspective where *individual-level determinants of creativity and innovation* are crucial is mostly neglected in innovation research. On the other hand, non-technological innovation is a field, as apparent from the co-citation analysis, heavily influenced by individual-level (psychological) studies, and in order to stimulate it, the aspects of individual determinants seem to be very important, but they are also (empirically) under-researched.

An important role in terms of individual characteristics salient for non-technological innovation can be attributed to *creativity*. Co-citation analysis results serve as evidence for the importance of creativity research based on psychology for the field of non-technological innovation. There are, however, issues related to the level of analysis in terms of creativity (individual or organizational creativity?), and its relationship (and separation of research streams) with innovation (exploration vs. exploitation; idea generation vs. implementation). Creativity is commonly understood as an antecedent of innovation, but can also be comprehended as an inherent part of innovation activities. More research is needed, particularly at the individual level, where creativity and individual employee innovation originate from, and have apparently been injected into the non-technological innovation field from two different bodies of literature (Figure 1.13). This separation is still evident (Baer, 2012).

I dedicated a lot of time and space to the description of the antecedents of non-technological innovation, but provided little discussion about its outcomes until now. How non-technological innovation enhances firms' performance remains an under-researched topic, which is particularly true for empirical investigation (Damanpour & Aravind, 2012). However, a potentially very interesting outcome of non-technological innovation is its “twin brother”, technological innovation, as discussed before. This was also pointed out in the co-citation analysis.

Technological viability and availability of producing advanced products are important factors of innovation (van der Panne et al., 2003). Naturally, this is not so true for non-technological innovation, where studies that mention technology and technological innovation can be divided into two categories. The first section deals with non-technological types of innovation and examines their relationship (be it in the form of an antecedent or outcome) with technological innovation. These studies (e.g. Van de Ven, 1986; Damanpour, 1991) are relatively scattered throughout the islands. Other studies attempt to differentiate between different forms of non-technological and technological innovation. They do so conceptually (e.g. Sanidas, 2004) or empirically (e.g. Kimberly & Evanisko, 1981), by demonstrating different effects of various types of innovation.

Innovation management literature suggests that direct economic success of product and process depends not only upon the product and process innovation itself, but also on the accompaniment of adjustment in the organization of a firm and in marketing methods (Schmidt & Rammer, 2007). There are two perspectives on *the relationship between non-technological and technological innovation*. The first one regards technological innovation as an antecedent of novel non-technological solutions (e.g. Barañano, 2003; Osterwalder, 2004; Schmidt & Rammer, 2007; Armbruster et al., 2008), whereas the second claims that non-technological innovations enhance technological innovation (e.g. Read, 2000; Sanidas, 2004; Damanpour et al., 2009; Mothe & Thi, 2010; Camisón & Villar-López, in press).

However, the aforementioned studies are predominantly merely conceptualizations or cross-sectional studies limited to single-country samples. The lack of rigorous empirical research of the relationship between non-technological and technological innovation is evident. In line with the actor-network theory (cf. Latour, 1987, 2005), separation between social and technological is not possible. Therefore, it is necessary to have a holistic view that would enable research and assessment of different interactions and effects between different innovation types, and to include them in the same research models.

1.9 Contributions

The “soft” aspect of innovation, non-technological innovation, consists of multiple sub-fields of research that are becoming increasingly important. This is reflected by numerous articles recently published in influential journals (e.g. Armbruster et al., 2008; Mothe & Thi, 2010; Teece, 2010; Birkinshaw et al., 2008; Damanpour & Aravind, 2012), and by the quantitative growth of the number of studies from this field. Since such innovation does not require enormous investments, this area of research has important practical implications. Furthermore, the majority of new entrants into the Fortune 500 owe their success to non-technological or business model innovations, as opposed to only technological innovations (Johnson et al., 2008).

My research goes beyond a traditional qualitative review, which has been more or less rigorously conducted on a large part of this field (cf. Damanpour & Aravind, 2012). Co-citation analysis is useful because it provides an objective and “aerial” view. It shows how citers, often numbering in hundreds, jointly perceive the relationships among key writers and contributions in the field (White & Griffith, 1981). A map based on co-citation data thus sheds light on the social construction of the non-technological innovation field by its members. A longitudinal comparison of the maps from the era 1975-2011, a significant slice of the history of the field of non-technological innovation, also informs us about the changes occurring in the social construction of the field and the evolving consensus about the domain of the field.

Spatial maps illustrate the network of studies that provide insight into the themes that constitute the nucleus of the non-technological innovation field and the origin of knowledge. I used pathfinder analysis with island procedure in order to present the networks of relationships among the most-cited studies in the field of non-technological innovation and group them under common themes. Thus, I produced an illustrative description of the knowledge base constituted by accumulated works of research in the non-technological innovation field. This provides important insights into the intellectual structure of the field and the origin of its subtopics. The identification of structural holes in the intellectual network of the non-technological innovation field suggests both opportunities for closure and brokerage that could contribute to the future development of the field.

I was also able to identify from which parts new ideas emerged. This has important implications for the field, because it provides further insight and understanding of the knowledge that the field has produced. It also serves as a delineation from the field of innovation in general. My approach and the results represent important means for cementing the status of non-technological innovation as a scientific field of its own, helping it become independent from the field of innovation in general. In addition, I was able to identify the sub-disciplines of the field. As these overlap with several types and forms of non-technological innovation, my study serves as a mean to provide better distinction between them.

In addition to being less subjected to subjective biases inherent to narrative literatures, my research was also much more comprehensive than the qualitative literature review of Damanpour and Aravind (2012). This study goes beyond their contribution in terms of the examination of the field’s intellectual structure, attempting to delineate between different forms of non-technological innovation and present their interrelationships, as well as investigating a larger number of both internal and external antecedents.

1.10 Practical implications

Techno-centric research on innovation, the non-technological, “soft” side of innovation was usually mostly neglected (Birkinshaw, Mol & Hamel, 2008; Lam, 2005; Damanpour & Aravind, 2012). The identification of non-technological innovation elements is an important issue for managers as well. They require a more detailed benchmark tool to help them with non-technological innovation implementation.

My quantitative literature review attempts to clear the confusions and overlapping types of innovation and provides managers with explicit descriptions of what constitutes each type of non-technological innovation, knowledge that was previously lacking. In this way, managers can analyze systematically and enhance the innovative efforts in their firms. Since both aspects of innovation are affected by internal and external determinants, their identification and description enables managers to pay attention and try to balance their effects. The distinction between innovation types is thus useful (Walker, 2007) for future research on this topic and managerial practice. Nonetheless, managers need to be aware of the fact that this is not a competition among different types of innovation, but rather that technological and non-technological types of innovation must go hand in hand for optimal firm performance.

1.11 Limitations and future research suggestions

My study is not without limitations inherent to any article co-citation analysis (cf. Nerur et al., 2008). The interpretation of the results is somewhat subjective. This is particularly true for the interpretation of the resulting maps (clusters). A deep understanding of the field and a consultation with other experts (multiple raters) is needed to interpret the results objectively. However, the clusters reveal the existence of a group of researchers who share the same interests and coincide in citing the same references (Fernandez-Alles & Ramos-Rodríguez, 2009).

Another issue of the co-citation analysis is the matter of all citations being treated alike when in reality they are not. When compiling citations, it is impossible to distinguish between the motives for which they were made (Fernandez-Alles & Ramos-Rodríguez, 2009). The rationale for citing a study can vary considerably, ranging from a reference that supports one’s works, through personal connections an author has with the authors he or she is citing, to a criticism of research that is poorly done (cf. Baumgartner & Pieters, 2003). The approach of co-citation analysis does not account for the time that it takes for a publication to appear and for it to build up a citation history. This might result in recent but influential authors being underrepresented (Nerur et al., 2008; Fernandez-Alles & Ramos-Rodríguez, 2009). Works published towards the end of the examined period have not been exposed to scientific community for as long as those published earlier and are thus less likely to be cited. However, it has been demonstrated that the large volume of the involved data alleviates these problems to a significant extent (White, 1990).

Another limitation is related to the notion of citations as a measure of influence of a particular work. In reality, citations may not be perfect representations of the influence of a particular author or work. Although the number of citations accumulated by a particular published research paper is an imperfect measure of quality or influence of that paper, citation counts have their advantages (Kim, Morse, & Zingales, 2006): they are not subject; they are widely used in studies of academic performance; and they are reasonably comprehensive across subject areas in a particular field (which is also true for innovation).

When examining the outcomes and antecedents of non-technological innovation, my conclusions are only partially based on co-citation and science mapping results. I only used these to some extent, and drew conclusions from a (potentially subjective) comprehensive qualitative literature review. The results of all methods used together, however, have only clarified the field of non-technological innovation and its sub-disciplines to some extent. Further conceptual and empirical work will be needed to achieve consensus on various types and forms of non-technological innovation. Research could benefit from the adoption of a more qualitative or action research approach, which would enable further insight into the actual content or specific activities of particular types of non-technological innovation. This would enable a content-wise, more appropriate basis for the distinction between them. In addition, one particular shortcoming of the non-technological literature in the last couple of years was the failure to include non-technological innovations by employees (other than managers). This would provide an individual-level perspective on non-technological innovation that could draw from particular, relatively developed research fields of job crafting (Wrzesniewski & Dutton, 2001), proactive behavior (cf. Crant, 2000; Seibert, Kraimer, & Crant, 2001), or even creative bootlegging (cf. Augsdorfer, 2005).

1.12 Conclusion

From my co-citation and science mapping analyses, and the qualitative literature review, it is evident that non-technological innovation has been lacking a single identity thus far. This fact is linked with conceptual confusion and ambiguous overlapping definitions. It is intertwined with innovation in general and also (naturally) heavily influenced by innovation studies, which usually adopt an organizational-level or even more macro/strategic perspective. However, it differs from this basic general field of innovation due to the fact that it has been heavily influenced by psychology and sociology (behavioral theory), and has been adopting a multilevel perspective from the beginning (e.g. top-down and bottom-up processes in Daft, 1978, and the individual-level psychological foundation in Baldridge and Burnham, 1975), which is still reflected in various sub-fields (e.g. creativity and management innovation) that focuse on different levels of research. The non-technological innovation field also received important and influential influxes in the last two examined periods from resource- and knowledge-based perspectives, as well as from creativity literature that is also based on psychology. Nevertheless, it has predominantly progressed by means of organic growth, and was mostly dominated by organization (innovation) studies.

Chapter 2: ANTECEDENTS AND OUTCOMES OF MANAGEMENT INNOVATION

This chapter aims to design and test a model examining the antecedents of management innovation at the organizational level. I propose internal knowledge exchange as a crucial predictor of management innovation and examine the mediating effect of IT system development, as well as the moderating effect of organizational size in the examined relationship. I also investigate the innovation - performance relationship at the organizational level by empirically examining the role of management innovation in the link between technological innovation and financial performance. I test the model of the antecedents of management innovation using structural equation modeling and hierarchical moderated regression analysis. Moreover, I test two competing models in examining the outcomes of management innovation via structural equation modeling on data gathered from 604 firms in three countries: Slovenia, Spain, and South Korea.

The results indicate a crucial role of knowledge exchange for management innovation, as this link is positive, very strong, and significant in all three countries. In addition, my study provides evidence that knowledge exchange results in management innovation through developed IT systems that enable the information and knowledge to flow within an organization, as well as that the relationship between knowledge exchange and management innovation is hindered by the firm's size. The results also show that management innovation positively contributes to technological innovation in all three countries, as well as that management innovation is relatively more important in enhancing firms' financial performance than technological innovation. Although technological innovation is still important, my findings indicate that there are culturally and institutionally based differences in these innovation processes and outcomes. Furthermore, a competing mediating model has shown that management innovation enables the firms to fully benefit from their technological discoveries in order to result in improved financial performance.

2.1 Introduction

2.1.1 Predicting management innovation

The reason for firms' engagements in innovative activities has drawn the researchers' and practitioners' attention for decades. For a long period of time, literature focused predominantly on technological innovation and its drivers, but in the last couple of years, non-technological forms of innovation started to receive the deserved attention (Alänge et al., 1998; Avlonitis et al., 2001). However, the empirical research regarding non-technological types of innovation is at its early stages, and thus we know little about their particular drivers.

Management innovation is a type of non-technological innovation that has recently gained a lot of wind in the literature (e.g. Birkinshaw et al., 2008; Walker et al., 2011; Damanpour & Aravind, 2012). It is defined as "new approaches in knowledge for performing the work of management and new processes that produce changes in the organization's strategy, structure, administrative processes, and systems" (Damanpour & Aravind, 2012, p. 12). It deals with the questions of who managers are, what they do, and how they do it (Birkinshaw et al., 2008), and is conceptualized or empirically linked to outcomes beneficial to firms' success (e.g. Hamel, 2006; Walker et al., 2011). It is thus highly relevant to examine what facilitates management innovation.

However, there has been very little empirical research that would examine the relationships between management innovation and its antecedents (Mol & Birkinshaw, 2009; Vaccaro, 2010; Damanpour & Aravind, 2012). The first main idea of this chapter is that knowledge exchange within organizations is related to management innovation, thus proposing knowledge exchange as its crucial predictor. Knowledge and capabilities-based perspectives may potentially represent viable additions to the resource-based logic by suggesting that knowledge is the primary source of new value creation, combination, and finally achieving competitive advantage (Barney, 1991; Grant, 1996; Kogut & Zander, 2003). Innovation is closely linked to new value creation and presents a social construct, dependent on collaboration and information sharing, as well as on combining diverse knowledge, which enables the firms to come up with novel ideas that ultimately get implemented and commercialized (Hage & Hollingsworth, 2000; Taylor & Greve, 2006; Liao et al., 2007).

Knowledge exchange can have a positive influence on any kind of innovation (Vaccaro et al., 2010). This might be particularly true for the "soft" aspects of innovation, as they are even more rooted in information exchange and collaboration than the technological ones (Mothe & Thi, 2010). Members of an organization need the ability to recognize and incorporate relevant knowledge from other members. For example, teams that collaborate and seek information and knowledge were shown to have better innovative performance than the others (Collins & Smith, 2006). The need to exchange knowledge is crucial for organizations that carry out management innovation, such as self-managing teams (Vaccaro, 2010). Therefore, knowledge exchange can be seen as an important predictor of management innovation.

Management innovation can be seen both as an outcome and a process (Damanpour & Aravind, 2012). In my study, I mainly treat it as an outcome and examine some of its most important antecedents and outcomes at the organizational level, but delve deeper into the process of management innovation when explaining the underlying mechanisms that outline the connections among the studied constructs. I chose the cultural perspective (e.g. Zbaracki, 1998) that examines how management innovations get shaped by conditions in an organization. Specifically, I focus on knowledge exchange as an antecedent of management innovation.

There are numerous factors within or outside the firm that could influence this relationship (Walker et al., 2011). I focus on organizational size and IT system development in the studied firms. Internal communication is more difficult in larger firms than in the smaller ones, and therefore indicates a potentially important organizational characteristic in the knowledge exchange–management innovation relationship. Additionally, the level of the knowledge exchange contribution to management innovation might also depend on the development of the state-of-the-art IT system that enables the employees to communicate and share ideas more rapidly and efficiently (Lievrouw & Finn, 2009).

With my study, I aim to contribute to the underdeveloped literature on management innovation with a theoretical conceptualization that links management innovation to perhaps one of its most important antecedents – knowledge exchange, and with an in-depth examination of this relationship by proposing the mediating influence of IT system development and the moderating effect of organizational size. Organizational size and knowledge exchange as antecedents of management innovation were empirically examined using the UK Community Innovation Survey (CIS) data by Mol and Birkinshaw (2009). I empirically test my model on data gathered in three countries - Slovenia, South Korea, and Spain – in order to provide a good basis for the generalization of findings, as well as use a more specific measure of management innovation (Walker et al., 2011) as opposed to relying on three questions that measure non-technological innovation in CIS.

2.1.2 Management innovation outcomes

Innovation is often categorized into technological (technical) and non-technological innovation (Mothe & Thi, 2010), although there are numerous typologies of innovation (Damanpour & Aravind, 2012). Non-technological or non-technical innovations, such as organizational, management, or administrative innovations, are believed to be the antecedents of technological discoveries as they provide the context and stimulation for the occurrence of technological breakthroughs (Barañano, 2003). The other side of the coin is that technological innovations spur the need of non-technological innovations. In this way, the latter facilitate the efficient use of technical innovations as the success of a new technology depends on how the organizational structures and processes respond to the use of new technologies (Armbruster et al., 2008).

Both views imply that technological innovation alone does not automatically guarantee business or economic success (Teece, 2010). This is supported by Johnson, Christensen and Kagermann’s (2008) finding that the majority of new entrants into the Fortune 500 list (e.g. Starbucks, Amazon, or Google) owe their success to business model innovations that involve mainly non-technological changes, as opposed to only technological innovations. Furthermore, non-technological innovations have a significant impact on business performance with regard to productivity, lead times, quality, and flexibility (Goldman et al., 1995; Womack et al., 2007), and thus present an immediate source of competitive advantage. However, literature and specifically empirical research on the ability of the adopted types of innovation to deliver positive outcomes is still in its infancy (Walker et al., 2011).

Although there are numerous studies (e.g. Ireland & Webb, 2007; Johannessen, 2008; Liao & Rice, 2010) demonstrating the positive influence of technological innovation in improving companies' performance, and there exists the "pro-innovation bias" (Damanpour & Aravind, 2012), a stream of research has also pointed out that innovation can result in increased performance variance, which can mean either increased financial gains or losses (e.g. Hill & Rothaermel, 2003; Taylor & Greve, 2006). Therefore, a more holistic treatment of innovation and its relationship with performance is necessary.

There is a small amount of empirical research that examines the relationships between management innovation and the outcomes (Vaccaro, 2010; Damanpour & Aravind, 2012). Whereas many researchers consider management innovation economically and socially important (e.g. Sanidas, 2004), and some of them discovered that it is positively linked to productivity and employment (Edquist et al., 2001), few have empirically explored its relationship with firm performance. Vaccaro et al. (2012), for example, linked management innovation to leadership and explored the role of the organizational size in this relationship. One of the rare empirical studies that attempts to quantitatively measure the influence of management innovation on performance at the organizational level demonstrates that it contributes to organizational performance enhancement indirectly, through performance management (Walker et al., 2011). This is surprising as well as deficient.

In line with the resource-based view (Barney, 1986, 1991), management innovations can represent an important source of sustainable competitive advantage (Porter, 1985) due to their intangible nature, which is what makes them difficult for competitors to imitate (Alänge et al., 1998). On the other hand, technological innovations are rather easy to imitate while they usually result in a tangible product. Hence, an important research question emerges: What is the role of management innovations for the linkage between technological innovations and financial performance? In search of the answer, I opt for a rational and an institutional perspective.

The rational perspective (e.g. Chandler, 1962) focuses on how management innovations deliver improvements in organizational effectiveness. I explore the relationship between management innovation and its outcomes on data gathered from firms in three countries with diverse contexts: Slovenia, a country that has been going through a period of transition over the past 20 years; Spain, one of the founding countries of the European Union that has somewhat struggled economically in the last couple of years; and South Korea, a fast growing Asian country with high innovation levels. I thus also take an institutional perspective (e.g. Guillen, 1994) that focuses on the socio-economic conditions in which new management practices take shape. In addition to contributing to the generalization of the previous findings, I look deeper into the innovation-performance relationship.

The second aim of this chapter is to design and empirically test two competing models that would explain the relationship between management innovation, technological innovation, and firms' financial performance at the organizational level. Specifically, I first examine how management innovation predicts technological innovation and financial performance, and how is technological innovation related to financial performance. This is related to the part of the literature that considers management innovation as an antecedent of technological innovation (e.g. Kimberly & Evanisko, 1981).

In addition, I investigate the aspect that technological innovations result in positive financial outcomes through management innovation (e.g. Armbruster et al., 2008) by examining a mediating effect of management innovation on the relationship between technological innovation and firms' financial performance. Consequently, I introduce management innovation into the link between technological innovation and financial performance and examine its importance. As management innovations are more difficult to imitate (Teece, 1980) and thus provide a better basis for sustainable competitive advantage (Porter, 1985) in comparison with technological innovation, I propose management innovation as relatively more important in enhancing financial performance.

2.2 The importance of knowledge exchange in enhancing management innovation

Nonaka (1991) discusses how creativity at the organizational level is in fact synonymous with knowledge creation, which enables organizations to be more flexible and able to quickly respond to changing environmental conditions or market demands. Creativity is seen as the first step of the innovation process and a necessary prerequisite for innovation (Amabile, 1988; Scott & Bruce, 1994; Amabile et al., 1996). It was also empirically demonstrated that it is a predictor of employees' innovation (Amabile, 1988, 1997). Similarly, knowledge creation and its exchange act as drivers of innovation. The employees use their knowledge base and networks of contacts to generate innovative ideas in their organizations (Amabile, 1983). High level of interaction, discussion, and constructive debate are needed in innovative organizations.

A significant portion of knowledge needed to carry out the work processes is distributed across multiple individuals in an organization, which is why they must collaborate across functional and hierarchical boundaries (Thomas-Hunt, Ogden, & Neale, 2003). The exchange of knowledge and information is thus necessary. Knowledge exchange involves knowledge sharing, as opposed to knowledge hiding or hoarding (Connelly, Zweig, Webster, & Trougakos, 2012), as well as proactively seeking and offering knowledge to others (Cohen, 1998). Therefore, it consists of both donating and collecting knowledge (Lin, 2007). It includes the exchange of information, know-how, and feedback with customers, organizational experts, and others (Cummings, 2004).

Firms have opportunities for higher innovation capabilities when they are able to expand, disseminate, and capitalize on organizational knowledge internally, as well as to share, transfer, and receive knowledge from external partners (Mothe & Thi, 2010). Similar to internal knowledge exchange, the establishment of dense ties networks is needed in order to assimilate, transform, and exploit new external knowledge (Jansen, Van Den Bosch, & Volberda, 2005). However, the likelihood of knowledge exchange among the employees depends upon their motivation and ability (Nahapiet & Ghoshal, 1998; Collins & Smith, 2006), and the organization's ability to adapt internally, managerially, and organizationally.

If information and influence on decision making are shared within the organization, and there is a high level of interaction among the members of an organization, this can spawn innovation (Pearce & Ravlin, 1987). There are studies that depict the importance of knowledge exchange for technological innovation (e.g. Tsai, 2001; Jensen, Johnson, Lorenz, & Lundvall, 2007; Liu & Phillips, 2011), but this could be even more important for "softer" aspects of innovation as they are even more dependent on information exchange and collaboration than the technological ones (Mothe & Thi, 2010).

Teamwork is very important for innovation, which presents a social process that cannot be done effectively in solitude (Barañano, 2003; Hamel, 2007). Collective knowledge exists between rather than within individuals (Lam, 2004). In addition to formal networks, tacit knowledge embodied and embedded in the employees and their social practices is also important for innovation. When communicating about ideas people share knowledge, stimulate new insights, and evaluate ideas according to standards valid in the social context (Ohly et al., 2010). Accordingly, the role of managers - internal and external central agents of change, as Vaccaro (2010) labels them, has been stressed as crucial for the process of management innovation (e.g. Birkinshaw et al., 2008).

A firm that promotes employees to contribute knowledge in groups and organizations is likely to generate new ideas and develop new business opportunities (Darroch & McNaughton, 2002). Haragdon (2008) points out the importance of internal organizational networks for managing creativity and innovation. The boundaries between divisions, groups, or teams make it difficult for ideas to move across. However, many businesses have grown on the basis of management innovation – by taking the ideas developed in one area and applying them in another (Haragdon, 2008). Therefore, networks that foster knowledge exchange environment and connect people across the organization can represent a type of management innovation.

Knowledge exchange creates a common understanding of the organizational context (Cummings, 2004), making it easier for managers with diverse expertise to communicate their conflicting opinions and innovate. However, the mere presence of expertise is insufficient to produce high-quality work. It needs to be shared and searched for through expertise coordination, which involves knowing where expertise is located, knowing where expertise is needed, and bringing the required expertise to a task at hand (Faraj & Sproull, 2000). Therefore, diversity and complexity of knowledge base do not necessarily influence management innovation, except when they are socially integrated (Whitley, 2000; Vaccaro, 2010; Maurer, Bartsch, & Ebers, 2011). An organization needs an effective and efficient system of sharing and reexamining information. The intra-organizational knowledge exchange does not simply refer to obtaining information from various sources. It includes systematic structuring of information (Moorman &

Miner, 1998), which is why the kind of communication climate that supports the exchange of knowledge (van den Hooff & De Ridder, 2004) needs to be established.

A company's innovation capabilities are primarily developed on the basis of social norms and values already existing in the social relations within the company (Johannessen, 2008). Management innovations are more likely to succeed when an affinity between existing goals, targets and indicators and the new practices is implemented (Walker et al., 2011). Knowledge exchange is crucial in communicating and aligning these configurations. Social mechanisms can have a direct impact on the ability of internal change agents to pursue the core activities associated with management innovation (Birkinshaw et al., 2008). Densely connected social relations in an organization may increase the ability to simultaneously pursue more types of innovation (Jansen et al., 2006).

Dougherty (2001) highlights the fact that managing the businesses to leverage innovation and the capabilities to support innovation, which are both part of management innovation, depends crucially on collaboration and the exchange of diverse knowledge. Management innovation may be enhanced if multiple actors communicate, combine their knowledge and expertise, and make collective decisions, since participation in decision-making positively influences the initiation of new ideas and opportunities (Jansen et al., 2005).

Birkinshaw et al. (2008) proposes a four-phase management innovation process: (1) motivation is concerned with the facilitating factors and precipitating circumstances that lead individuals to consider developing their own management innovation; (2) invention is an initial act of experimentation out of which a new hypothetical management practice emerges; (3) implementation is a technical process of establishing the value of the new management innovation in a real setting; and (4) theorizing and labeling is a social process whereby individuals inside and outside the organization comprehend and validate the management innovation in order to build its legitimacy. I explain how knowledge exchange underlies each phase in the following paragraphs.

The motivation phase of the management innovation process is concerned with the facilitation of factors and the precipitation of circumstances that lead individuals to consider developing their own management innovation (Birkinshaw et al., 2008). It has to be connected with the changes perceived in the environment. Innovative efforts include the search and discovery of new things. In this exploration stage, knowledge exchange is of crucial importance because it allows people who are searching to find what they are looking for (López-Nicolás & Meroño-Cerdán, 2011). To solve the problems that an employee tries to tackle, but cannot resolve on his or her own, it is important to ask the others how they see the problem and whether they have ever encountered anything similar (Haragdon, 2008).

Moreover, whether the inquirer will eventually be provided with an answer or solution they are looking for depends on the willingness of the co-workers to share their knowledge. Knowledge exchange enables the changes to be communicated from one area to another quickly, engaging a larger amount of employees in facilitating the change. Thus, key decision-makers can be more successful in seeking new management innovations, and obtain the information they require to make well-informed decisions on the adoption of the available novel solutions.

Implementation, the third stage of the management innovation process, is the process of establishing the value of a new management innovation in a real setting (Birkinshaw et al., 2008). It involves internal selection of the best novel management practices. Knowledge exchange speeds up this process as it makes the information available to multiple actors of the change in the organization. This enables the actions of key individuals to be known, validated and accepted rapidly by a larger number of employees. During the process of reflective experimenting, internal change agents evaluate the progress against their body of experience (Birkinshaw et al., 2008). The knowledge exchange enables the assessment of changes by multiple agents, which means that they will be subject to a broader body of experience and diverse expertise, resulting in more objective and constructive development of change and consequently better results in management innovation.

The implementation process involves careful maneuvering of internal change agents through the political processes of defying the resistance to change and their movement around different interests of various groups. Various demographic (e.g. age, degree, attended institutions) and professional (e.g. knowledge expertise) characteristics result in diverse knowledge and interests, but divergent political interests are also very important in innovating (Drazin, Glynn, & Kazanjian, 1999). They need to be aligned and, in order to achieve this, knowledge exchange and communication are crucial, so that political interests can be negotiated among differing groups.

The aforementioned processes can be much smoother and more effective in an open community of transparent relations, where different interests are communicated clearly and issues are resolved promptly. This cannot occur without continuous information and knowledge exchange, which depends on social relations in an organization. Accordingly, connectedness among the employees develops trust and cooperation, thus permitting the individuals to develop a better understanding and more information to refine new ideas (Jansen et al., 2006). Social relations assist in establishing legitimacy and enabling the adoption of innovation (Subramaniam & Youndt, 2005). They provide an effective way of generating commitment and facilitating the implementation of decisions (Jansen et al., 2005), and thus help the internal change agents that champion management innovation to find and maintain validity and support for their ideas.

Studies (e.g. Hamel, 2006; Birkinshaw et al., 2008; Vaccaro, 2010) provide specific examples of management innovation, such as autonomous communities of practice, self-managing teams, total quality management, etc. In practice, it can be anything done differently by the managers (management practices) that can affect work organization, formal structures between the employees, and work processes. Vaccaro (2010) conceptualizes three broad facets of management innovation: practices, processes, and structures. In the following paragraphs, I examine why knowledge exchange would improve the development of some specific manifestations of management innovation that were pointed out in the previous research.

First, I focus on autonomous communities of practice. One type of their manifestation are self-managing teams (e.g. Vaccaro, 2010). Organizing work in groups with considerable autonomy will increase members' motivation as well as give them freedom and opportunity to engage in innovation (Paulus, 2008). Due to the fact that self-managing teams are highly interdependent, their need to share knowledge becomes essential in carrying out their work (Vaccaro, 2010).

Teamwork is particularly important when the tasks involve collaborative knowledge work (Janz, Colquitt, & Noe, 1997). Such high-collaborative tasks call for a great exchange of information and knowledge among the co-workers (Cramton, 2001). As self-managing teams regulate their activities without the direct intervention of a supervisor and set their own goals, they need to interact extensively face to face (Vaccaro, 2010). The exchange of knowledge may make teams more efficient as the retrieval of information becomes more accurate since team members are familiar with different knowledge of their peers. This facilitates quick feedback regarding ideas, problems or solutions that help employees understand the underlying reasons for others' actions (Vaccaro, 2010). It is important that people working in teams successfully present and communicate their diverse functional areas, professions, backgrounds, and standpoints.

Team members' work will be affected by others within or outside the team as knowledge is obtained from different sources. Collaboration among team members may be insufficient for a team to achieve higher levels of performance as they also need to exchange knowledge in order to implement innovative ideas (Collins & Smith, 2006). Therefore, knowledge exchange both within teams and across functions facilitates the autonomy required for successful management innovation that is manifested in the form of self-managing teams (Vaccaro, 2010).

Each of the different communities of practice should take charge of discrete problems in innovation management (Dougherty, 2001). This enables people to build broader sets of work relationships beyond their everyday contacts and provides for ongoing communication and collaboration (Hildreth & Kimble, 2004). Differentiation in these communities and their integration in a cohesive system that is open to knowledge exchange proved to enhance innovation (Dougherty, 2001). On account of the evidence from these types of management innovation and previously explained role of intra-organizational networks and knowledge exchange at all phases of management innovation, as well as on the basis of the broader importance of knowledge exchange in facilitating innovation, I propose the following hypothesis:

Hypothesis 1. Knowledge exchange is positively related to management innovation.

2.3 The role of IT system development and organizational size in the relationship between knowledge exchange and management innovation

Internal, managerial, and organizational adaptation is required for an organization to translate the employees' exchange of knowledge into innovative outcomes. For example, cross-functional interfaces, which result in lateral forms of communication that deepen knowledge flows across functional boundaries, have shown to improve the organization's capacity to absorb external knowledge, which in turn improves its ability to innovate (Jansen et al., 2005).

A problem-driven search that is connected to multiple phases of the management innovation process (Birkinshaw et al., 2008) is a conscious and often planned activity in which individuals seek to create a new practice in response to a specific problem (Cyert & March, 1963). At the invention phase, individuals in the organization make connections between new ideas proposed by external change agents and the experimental efforts underway in the organization. Such connections can be nurtured by encouraging individuals to attend networking events, such as conferences (Birkinshaw et al., 2008). Thus, it should not come as a surprise that problem-driven search depends greatly on the development of communication channels that are the basis of knowledge exchange.

As the intra-organizational knowledge exchange includes a systematic structuring of information (Moorman & Miner, 1998), in addition to the kind of communication climate that supports the exchange of knowledge (van den Hooff & De Ridder, 2004), it is necessary to establish the support of mechanisms that make knowledge exchange possible. One of such supporting systems is the development of information and communication technology systems in an organization that supports the employees' information and knowledge exchange. As early as 1999, McDermott (1999) discussed the vision that IT could create a web of global knowledge, which would enable the employees to work with greater effectiveness and efficiency. With recent developments in communication technology, this vision has very much become reality, as the employees in modern organizations exchange ideas using video conferences, graphical touch-screen interfaces, or wiki-like web-based intranet portals.

Knowledge exchange is tightly connected to information technology, which in turn enables management innovation. Information systems facilitate the link between key decision makers and other parts of the organization with the collection, process, and dissemination of information and knowledge. In this way, managers can connect employees with diverse knowledge by using information and communication technology. One group of management IT innovations are organizational wikis (e.g. Wagner, 2004). They use peers instead of experts in knowledge evaluation and refinement and base its implementation on information exchange (King, 2006). A recent review of literature on wikis has shown that a culture of collaboration and knowledge sharing is crucial in successful wiki implementation (Standing & Kiniti, 2011).

Another type of management innovation that is similar to wikis and also essentially depends on knowledge exchange are lists of the best practices and solutions available to employees via intranet, for example (Haragdon, 2008). They enable easier and more efficient ways to find solutions to the existing problems, but also depend on the ability and motivation of other employees to share their diverse knowledge and expertise. Therefore, I propose my second hypothesis of this chapter:

Hypothesis 2. IT system development mediates the relationship between knowledge exchange and management innovation.

Internal communication, which is crucial for knowledge exchange, is much more difficult in larger firms than in smaller ones, and the relationship between management innovation and performance is complex and conditional on other characteristics of the organization (Mol & Birkinshaw, 2009; Walker et al., 2011). It has been shown that organizational size positively influences innovation (e.g. Damanpour, 1992; Camisón-Zornoza, Lapiedra-Alcamí, Segarra-Ciprés, & Boronat-Navarro, 2004). It has also been demonstrated to mediate the relationship between management innovation and some of its key antecedents, such as leadership (e.g.Vaccaro et al., 2012). Vaccaro et al. (2012), for example, found that smaller and less complex organizations benefit more from transactional leadership in realizing management innovation, while larger organizations need to rely on transformational leaders to compensate for their complexity and allow management innovation to flourish.

The ability to generate novel outcomes is based on the availability of ideas (Taylor & Greve, 2006). In other words, knowledge about different options (e.g. practices, approaches, or even only opinions and ideas) is a prerequisite for managers to change their work. All types of knowledge need to be explicable in some way in order to share it with other people so that transfer and innovation processes in organizations can be speeded up (Johannessen, 2008). In pursuance of this objective, socialization is necessary to allow an effective sharing of knowledge that is difficult to codify (Nonaka & Takeuchi, 1995). However, the process of socialization at work depends on the size of the company (Morrison, 2002).

Due to the increased number, social relations are much more complex in firms with a large number of employees. The complexity of the relations between employees is increasing exponentially, not linearly, with size (e.g. Robins, Snijders, Wang, Handcock, & Pattison, 2007). However, the connectedness between employees that develops trust and cooperation permits the individuals to develop a better understanding and more information to refine new ideas (Jansen et al., 2006). Therefore, intraorganizational knowledge exchange that includes systematic structuring of information (Moorman & Miner, 1998) is much more difficult in larger firms as opposed to the smaller ones.

Social relations assist in establishing legitimacy and enabling the adoption of innovation (Subramaniam & Youndt, 2005). They provide an effective way of generating commitment and facilitating the implementation of decisions (Jansen et al., 2005), and thus help the internal change agents that champion management innovation to find and maintain validity and support for their ideas. However, in larger companies, such relations are dispersed throughout an organization, and internal change agents cannot communicate and exchange knowledge with as many employees with diverse views on the subject at the matter as they would have liked. Therefore, the finding of Mol and Birkinshaw (2009) that organizational size negatively moderates the relationship between the use of the internal knowledge sources and management innovation should not come as surprise.

Two elements of knowledge exchange are the employees’ ability and motivation (Collins & Smith, 2006). Therefore, a kind of communication climate that supports the exchange of knowledge (van den Hooff & De Ridder, 2004) needs to be established in order to motivate employees to exchange knowledge with their peers. Organizational size has a moderating role on the leader-member relationship because it diminishes the leaders’ influence. Due to the lowered social proximity, leaders cannot share common cognitive patters among members of an organization (Koene, Vogelaar, & Soeters, 2002), resulting in a diminished collective awareness of a mutual organizational climate. Therefore, the third hypothesis of this chapter is as follows:

> *Hypothesis 3. The organizational size hinders the impact of knowledge exchange on management innovation.*

2.4 Management innovation, technological innovation, and financial performance

Management innovations are manifested in new organizational structures, administrative systems, management practices, processes, and techniques that could create value for an organization (Kimberly & Evanisko, 1981; Birkinshaw et al., 2008). Damanpour and Aravind (2012) suggested several dimensions of management innovation: strategy versus structure innovations, innovations in forms versus innovations in procedures, and information technology (IT) innovations versus administrative innovations. I follow the path paved by the empirical study of Walker et al. (2011) and adopt this latter approach to examine two aspects of management innovations in the studied firms: information-technology (IT) and administrative.

The distinction derives from the increasing role of IT in modern organizations. The advancement of information and communication technologies has made IT an integral part of the changes in both technological and organizational processes (Damanpour & Aravind, 2012). This typology of management innovation is thus based on the extent to which IT is embodied in or enables innovation in an organization. In this regard, for instance, innovations in organizational procedures may depend more on IT than those in organizational form. Therefore, innovations with intensive IT components should be distinguished from those with intensive administrative components (Wang, 2010). To that end, Walker et al. (2011) operationalize management innovation as a two-dimensional construct: administrative dimension represents new practices to alter the organization’s managerial processes and systems, whereas the IT dimension reflects the use of information technology to advance the efficiency of managerial processes and systems.

If a firm should expect to compete and sustain performance, continuous innovation - the introduction of streams of different types of innovations over time - is crucial (Damanpour et al., 2009). Whether diverse forms of innovation in an organization are capable of producing positive results depends on its ability to employ new management ideas for modifying and improving its structure and processes to enable strategic renewal and organizational change (Damanpour & Aravind, 2012). Firms are to organize the innovation process efficiently by combining technological capabilities with skills in marketing, management, and organizational competencies (Mothe & Thi, 2010). Firms implementing a combination of customer, organizational, and technological skills tend to introduce more innovation (Lokshin, Gils, & Bauer, 2009). Understanding of both non-technological and technological aspects of innovation is necessary to ensure successful innovation. Despite proposing that technical innovations by themselves are not sufficient for firm performance and economic growth, the relationships between technical and management innovations were predominantly not empirically investigated in the literature (Sanidas, 2004).

In terms of the previous research, a very small body of literature is concerned with the link between management innovation and technological innovation. This research has shown that management innovation often triggers technical innovation, but the process of invention and the uptake is typically slower (Kimberly & Evanisko, 1981; Damanpour & Evan, 1984), which could be related to the content-wise differences between these types of innovations. Several authors considered management innovation economically and socially important (e.g. Sanidas, 2004) and some of them found a positive relationship with productivity and employment (Edquist et al., 2001).

The dynamics of innovation types should be taken into account and examined closely. Introducing only technological or management innovations is not optimal. A balanced introduction of both innovation types is necessary (Damanpour & Evan, 1984). Complementary types of innovation in an organization would ensure the organization to use internal and external competencies to cope with environmental change and be effective over time (Van Den Bosch, Volberda, & De Boer, 1999).

Management innovation can play a central role in the process of changing organizations and facilitating organizational adaptation (Walker et al., 2011). Employees of such organization should consequently become more adaptive and flexible, thus enhancing their own innovativeness (Verdu-Jover, Llorens-Montes, & Garcia-Morales, 2005). Furthermore, managers that are innovative and serve as role models who implement innovations proved to stimulate innovativeness of their employees as well (Jung et al., 2003; de Jong & Den Hartog, 2007). Management innovations have a crucial role in enhancing flexibility and creativity that in turn facilitates the development of technological innovations (Mothe & Thi, 2010). This is supported by additional conceptualizations that link particular forms of management innovation with technological outcomes.

Communities of practice, which are a type of management innovation, are conceptualized to contribute to better management of technology (Dougherty, 2001). Similarly, a particular type of communities of practice, that is self-managing teams (Vaccaro, 2010), involves the introduction of teams responsible for their own internal functioning, setting of priorities, and decision-making in an organization (Bunderson & Boumgarden, 2010). On the basis of previous research and the above explained mechanisms of how management innovation leads to technological breakthroughs, I propose the fourth hypothesis:

Hypothesis 4a. Management innovation facilitates technological innovation.

In addition, I would like to examine the second, complementary view on the relationship between management innovation and technological innovation: technological innovations spur the need for a non-technological (management) solution that supports them and enables their full exploitation. Studies suggest that non-technological forms of innovation lag behind technical innovations (Chenhall, 2003; Askarany & Smith, 2004). Technological innovations can thus frequently serve to encourage the non-technological ones. Information and communication technology is seen as a strong enabler for a variety of innovative business models (Osterwalder & Pigneur, 2010). In line with this idea, Osterwalder (2004) also proposes a different view; a technological change in the business model can have non-technological consequences.

Management innovation is important because it both supplements and complements technological innovation, i.e. the introduction of new products and processes (Schmidt & Rammer, 2007). Organizational innovations are a necessary condition for the success and full exploitation of every technological innovation. Thus, organizational innovation serves as a mechanism to technological innovation success (Barañano, 2003).

Well-organized human resources are a major requirement for obtaining the highest profit from the potential of technology. Thus, technological and organizational innovation must go hand in hand (Barañano, 2003). Internal factors, such as management, drive new cutting-edge technological innovation that can represent a key internal source of competitive advantage. Ultimately, an organization's direction, goal and innovative success is a function of organizational guidance and support that takes on many forms: beliefs and values, mission and strategies, procedures and systems, rewards, and resources such as available time, money, and equipment (Tang, 1999).

Innovation is tightly coupled to change, due to the fact that the organizations use innovation as a tool for influencing the environment or to their changing environments, both internal and external (Damanpour, 1991). However, innovation may involve a wide range of different types of change depending on the organization's resources, capabilities, strategies, and requirements (Baregheh et al., 2009). Firms that are active in technological innovation usually adopt complementary organizational practices (Mothe & Thi, 2010).

Technology is what spurs the need of a new non-technological solution or idea. This is where management innovation comes in to translate the results of technological breakthroughs into financial results. Management innovations are the facilitators of technical innovations, as their success depends on the response of organizational structures and processes to new technologies (Armbruster et al., 2008). Technological innovation by itself does not automatically guarantee business or economic success (Teece, 2010). Technical innovations need the support of organizational innovations in order to function properly (Sanidas, 2004).

Innovation management literature suggests that direct economic success of product and process depends not only upon the product and process innovation itself, but also on the accompaniment of adjustment in the organization of a firm and in marketing methods (Schmidt & Rammer, 2007). This is consistent with the view that non-technological innovation supports technological (Sanidas, 2004; Mothe & Thi, 2010).

Final arguments for the proposed mediation are derived from the business model literature. Chesbrough and Rosenbloom (2002) claim that technical inputs, such as feasibility and performance, greatly influence business model design, which is a non-technological, managerial activity. In turn, every business model element affects both economic and technical outputs (Chesbrough & Rosenbloom, 2002). The economic value of a technology remains latent until it is commercialized in some way via a business model (Chesbrough, 2010). Therefore, I propose a competing hypothesis to my fourth hypothesis:

> *Hypothesis 4b. Management innovation mediates the relationship between technological innovation and financial performance.*

Moreover, I take a rational perspective (e.g. Chandler, 1962) that focuses on how management innovations deliver improvements in organizational effectiveness (Birkinshaw et al., 2008). Management innovations are believed to play a crucial role in developing strategies for growth, facilitating organizational change and renewal, and enabling continuous performance (Birkinshaw & Mol, 2006; Hamel, 2006). Regardless of the research perspective, an important role of managerial and organizational practices on competitive edge and firm performance is acknowledged (Mothe & Thi, 2010). Management innovation is described with anything that substantially alters the way in which the work of management is carried out, or significantly modifies customary organizational forms, and consequently advances organizational goals (Hamel, 2007). As these goals are within the capitalistic societies normally linked to maximizing profits, management innovation should be related to firms' financial performance.

Hamel (2007) claims that technological innovation is short-lived; for long term success, management innovation is essential. Non-technological innovations present a crucial link not only between economic growth and technology but also between societal growth and technology (Sanidas, 2004). Performance is induced by using technological and managerial knowledge resources together, which leads to the introduction of different innovation types in different subsystems (Damanpour et al., 2009).

Volberda (1996) argues that flexibility is the key for firms to stay competitive in the ever-changing environment. It derives from managerial capabilities and the responsiveness of an organization. Developing dynamic capabilities, such as response speed or operational flexibility (Volberda, 1996), presents the domain of managers, and that is why management innovations act as important drivers of organizational change. They play the central role in the process of changing organizations, facilitating organizational adaptation to the external environment and increasing the efficiency and effectiveness of internal processes (Walker et al., 2011).

The examination of the outcomes of particular management innovation types also reveals positive influences associated with these forms of innovation. Communities of practice were shown to support the businesses and enhance product success in the changing environment (Dougherty, 2001). A similar case is TQM adoption (Boyne & Walker, 2002). All in all, evidence from case studies repeatedly points toward the positive effects of the adoption of management innovations (e.g. Birkinshaw & Mol, 2006; Hamel, 2006).

Management innovations are typically tacit in nature and difficult, if not impossible to protect by patent (Teece, 1980). They are also difficult to observe and imitate (Alänge et al., 1998) and as such they could provide a basis for sustainable competitive advantage (Porter, 1985). Birkinshaw et al (2008) concur that management innovation could offer the potential for competitive advantage, but warn that this depends on how valuable, rare, and difficult to imitate they are. They conclude that the influence of management innovation on business performance should be empirically tested (Birkinshaw et al., 2008). Thus, I propose the fifth hypothesis of this chapter:

Hypothesis 5. Management innovation positively influences financial performance.

Innovation-related activities in firms have traditionally been viewed as primary drivers of firm performance as they occupy a critical role in organizational renewal and competitiveness (Liao & Rice, 2010). In today's uncertain and high-risk environment, the firms need to develop innovations in order to maintain or increase their competitiveness. The capacity to innovate is one of the most important factors that impact business performance (Hurley & Hult, 1998). Innovativeness enables the firms to choose different options to satisfy their customers on a sustainable basis in order to provide a basis for the survival. An innovative firm will grow faster, be more efficient and more profitable than a non-innovator (Mansury & Love, 2008). For this reason, innovativeness is a competitive instrument essential for firms' long-term success and survival (Deshpande, Farley, & Webster, 1993).

In a competitive sense, an organization's development of its productive equipment and technology tends to create the ability to respond to environmental challenges and market opportunities with a view to seeking out sustained competitive advantage (Dougherty & Hardy, 1996). Even if there exists a positive bias by the authors regarding innovation outcomes (Damanpour & Aravind, 2012), the answer to the question whether technological innovation drives firms' performance is complex and contingent on multiple factors (Liao & Rice, 2010). For example, firms' innovative processes may be driven by current fads or biases that do not correspond accurately to the market requirements (Kessler & Chakrabarti, 1996; Markman, Gianiodis, Phan, & Balkin, 2005). Moreover, while technological innovation is observed through its traditional measures (e.g. patents, expenditure on R&D), these measures are not connected to the requirements of competitive advantage as they make absolutely no reference to potential customer demand (Liao & Rice, 2010).

Nevertheless, prevailing research evidence suggests that innovativeness is directly or indirectly linked to the achievement of better business performance and competitive advantage (e.g. Ireland & Webb, 2007; Johannessen & Olsen, 2009; Liao & Rice, 2010). Cheng, Lai and Wu (2010) suggest that a firm can influence business performance by enhancing product and process innovation. Similarly, Sadikoglu and Zehir (2010) argue that employee performance, innovation performance, and firm performance are strongly positively related. Although innovation is risky and its success is not guaranteed, the balance of evidence supports the notion that it positively influences performance (Walker et al., 2011). Accordingly, the sixth hypothesis is as follows:

Hypothesis 6. Technological innovation positively influences financial performance.

2.5 Research framework and methodology

2.5.1 Measurement instrument

To measure *knowledge exchange*, I used an eight-item measurement scale developed by Collins and Smith (2006). It consists of two elements, the first is the belief that exchange would yield personal or organizational value (motivation), and the second is the extent to which it is believed that the employees could exchange and combine information (ability) in an organization. A sample item is “The employees in this company are willing to exchange and combine ideas with their co-workers”.

To measure *management innovation*, I used the scale of Walker et al (2011) who operationalize it as a two-dimensional construct: the administrative dimension (three items) represents new practices that alter the organization’s managerial processes and systems, and the IT dimension (two items) reflects the use of new knowledge management and office automation to advance the efficiency of managerial processes and systems. A sample item is “Our organization frequently introduces new management processes (e.g. new job descriptions, establishing new teams of staff etc.)”.

To measure *IT system development*, I used three items that measure the development and use of the following entities in an organization: (1) companies’ intranet, (2) forums (e-chat, e-debates) and (3) electronic e-mail. The variables pertaining to the aforementioned three constructs (knowledge exchange, management innovation, and IT system development) were measured with a five-point Likert-type scale ranging from 1 = strongly disagree to 5 = strongly agree. *Organizational size* was assessed based on the number of employees (a logarithm of that value).

I measure *technological innovation* with the nine-item measurement instrument developed by Tsai (1997) and Wang and Ahmed (2004), and previously used and further validated in various settings by Liao, Fei, and Liu (2008) and Škerlavaj, Song, and Lee (2010a). A sample item is “We continuously improve old products and raise quality of new products”. *Financial performance* is measured with two self-reported items for companies’ value added per employee and return on assets – ROA: “Return on assets (ROA, %) in our company is well below the industry average (Statement A); Return on assets (ROA, %) in our company is well above the industry average (Statement B)”.

Items pertaining to all scales apart from financial performance were measured with the five-point Likert-type scale ranging from 1 = strongly disagree to 5 = strongly agree, whereas financial performance was measured with the bi-polar scale where the respondents were asked to choose a number from one to five that is closer to each pole (with statements A and B representing each pole). By asking the respondents to compare the performance indicators with the industry average, I was able to address the fact that the firms act in different industries where different value added and ROA may be expected. Similar perceptual measures were previously found to be an adequate measure of organizational performance (e.g. Delaney & Huselid, 1996; Škerlavaj, Štemberger, Škrinjar, & Dimovski, 2007).

Empirical data were collected from 118 companies in Slovenia in 2007 (Škerlavaj, 2007), 279 in Spain in 2008 (Škerlavaj & Sánchez de Pablo González del Campo, 2008), and 207 in South Korea in 2008 (Škerlavaj, Song, & Černe, 2008). Specific datasets used in this chapter are only a part of a broader cross-cultural study on firms' organizational learning, innovation, and performance, which was not previously used in any publications. Random sampling was used in all three countries. To select the population in each country, the cut-off was that all participating companies must employ more than 50 people. Translation-back translation procedures (Brislin, 1986) were used in all three countries.

2.5.2 Data collection and sample characteristics

The measures and scales were adjusted to different contexts, particularly concerning the Standard industry classification used in respective countries and the specific legislations considering the revenues of firms. Questionnaires were addressed via mail to senior and middle managers who were considered (by their role) to have adequate knowledge about innovation and performance of their firms. I present the structure of the responding companies for all three countries in Table 2.1.

In order to avoid problems with common method bias, I used the following approaches. First, after the data collection, I conducted Harman's one-factor test to address the common method variance issue. If common method variance was a serious problem in the study, one would expect a single factor to emerge from a factor analysis or one general factor to account for most of the covariance in the independent and dependent variables (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). The results of the factor analysis demonstrated that no general factor was apparent in the un-rotated factor structure, with the first factor accounting for only 22.9 (Slovenia), 35.8 (Spain), and 28.8 (South Korea) percent of the variance. Second, the items used in my study are part of a large-scale questionnaire. Third, some items in the questionnaire were reverse-coded. Therefore, it was unlikely that the respondents would guess the purpose of the study and force their answers to be consistent.

Table 2.1: Structure of the responding companies in all three countries

Country Number of respondents	*Slovenia* (N = 118)	*South Korea* (N = 207)	*Spain* (N = 279)
Company's size (number of employees)			
50-249	38.7%	62.8%	74.6%
250-499	33.7%	4.5%	5.3%
500+	24.1%	32.7%	20.0%
Not specified	3.5%	-	-
Annual revenue (mil. €)			
Under 7	37.4%	53.8%	17.6%
7-27	42.8%	10.1%	50.0%
Higher than 27	19.8%	36.2%	32.4%
Industry			
Agriculture	2.5%	0.1%	1.8%
Fishing	-	-	0.4%
Mining	1.0%	-	0.4%
Manufacturing	46.8%	36.7%	10.8%
Electricity & water supply	1.5%	-	0.7%
Construction	10.3%	5.3%	3.9%
Wholesale & retail trade	10.3%	12.6%	2.9%
Hotels & restaurants	3.4%	0.1%	0.4%
Transportation	6.4%	7.2%	1.8%
Financial intermediation	3.4%	17.4%	0.4%
Real estate	1.0%	10.1%	-
Other community, social & personal services	9.9%	6.3%	2.5%
Not specified	3.4%	4.3%	0.8%

2.6 Data analyses

To validate the measurement instruments and model the structural relationships between the studied constructs, I applied the confirmatory factor analysis (CFA), tested for discriminant validity, calculated reliability indexes, and applied structural equation modeling (SEM). In the CFA, convergent validity and unidimensionality were examined by the loading paths of all items that should exceed .50 (Prajogo & McDermott, 2005). For the second-order factors Management innovation, Technological innovation, and Financial performance, simple second-order models were run prior to combining the constructs AI, IT, TI, and FP into aggregates (summated scales) of involved variables.

Discriminant validity testing was performed with the purpose of examining the degree to which the constructs differ from one another. The evaluation of discriminant validity was performed by constructing models of all possible pairs of hidden variables. It was measured with the pair-wise correlations as proposed by Venkatraman (1989). Discriminant validity is indicated with low correlations between the measures of interest and other measures that are supposed to assess different constructs (Venkatraman & Grant, 1986). Constructs demonstrate discriminate validity when the variance extracted for each construct is higher than the squared correlation between them (Fornell & Larcker, 1981). Obviously and most importantly, correlation should have the directions assumed by theory (Venkatraman, 1989).

Thus, one could expect the constructs describing management innovations (IT, AI) to converge with each other and especially for IT to converge with IT system development, since they are both associated with information technology. However, the IT component of management innovation describes how managers introduce novel practices or systems that deal with information technology into the organization, whereas IT system development illustrates the general development and use of this system in a firm. One could also expect the constructs describing innovations (IT, AI, and TI) to converge with each other and maintain some separation with the construct describing financial performance (FP).

Cronbach alphas were calculated in order to test the composite (construct) reliability. Construct reliability is a measure of reliability and internal consistency of the measured variables representing a latent construct and it must first be established based on the theory before it can be empirically assessed. Although Cronbach alphas depend on a number of items and should thus be interpreted with caution (Cortina, 1993), this indicator is still predominantly used to assess the reliability of a measurement instrument with the cut-off value of .70 (Cronbach, 1951).

To examine the structural relationships between constructs, I used structural equation modeling (SEM) for the following reasons (Prajogo & McDermott, 2005): (1) to allow for the modeling of both observed and latent variables and (2) to test several structural relationships simultaneously. In this case, the maximum likelihood (ML) method was used to estimate the values of the parameters. In the end, overall path coefficients are calculated for each endogenous variable in order to explain the amount of variation in the endogenous variable explained by the model.

There is a plethora of fit indices that can be used in order to test the structural model fit at the global level, while research evidence (e.g. Porter & Ayman, 2010; Škerlavaj, Su, & Huang, 2010b; Černe et al., 2012) supports the idea of using more than one index. χ^2 per degrees of freedom, comparative fit index (CFI), and non-normed fit index (NNFI) are used most often to assess the fitness of a model. The ratio χ^2 per degrees of freedom (an absolute indicator that describes if the residual (unexplained) variance is appreciable) should not exceed 10, while models that have CFI (a relative indicator that explains how well the model does in comparison with a range of other possible models with the same data) and NNFI (an adjusted indicator that describes how well the model combines fit and parsimony) indices greater than .90 have a proper fit (Hair, Anderson, Tatham, & Black, 1998).

To examine the mediation effect of IT system development in the first model and management innovation in the second, causal steps test of mediation (Judd & Kenny, 1981; Barron & Kenny, 1986) was used. Such test presumes a series of requirements that must be true for the mediation model to hold. Full mediation would exist if the previously significant relationship between technological innovation and financial performance was reduced to non-significant levels when including the mediator variable in the analysis. Partial mediation could be claimed if the relationship between technological innovation and financial performance remained significant, but to a lesser degree.

To test the moderating effect of organizational size on the relationship between knowledge exchange and management innovation, I used hierarchical moderated regression analysis (Cohen & Cohen, 1983). Interaction terms often create multicollinearity problems because of their correlations with main effects. I thus computed the interaction terms by centering the variables before multiplying them with each other.

2.7 Results

2.7.1 Validity and reliability of the constructs in the model predicting management innovation

In Table 2.2, I report the results of the confirmatory factor analyses for each second-order factor in all three countries. I report the range of standardized factor loadings for all items involved in the second-order factor in a particular measurement model. I also report fit indices for each model and Cronbach alpha reliability indicators. The analysis of the second-order models for Knowledge exchange, Management innovation, and IT system development provided empirical justification for combining variables into aggregates. After the CFA, I decided to exclude the item KX8 due to the insufficient factor loading.

Reliability levels across countries are satisfactory, and the same applies to the majority of the factor loadings, even if I was occasionally (particularly in the Slovenian model) more liberal in leaving the items in various models to keep the models in respective countries comparable. In the final version of the model, 15 of 16 items were used to measure 6 constructs and 4 second-order factors. For second-order factors Knowledge exchange, Management innovation, and IT system development, simple second-order models were run prior to combining the constructs Motivation, Ability, AI, TI, and ITsystem into aggregates (summated scales) of involved variables. Fit indices for all four second-order models are satisfactory. χ^2/df ranges from 1.338 to 1.110, CFI from .91 to .97, NNFI from .84 to .99, SRMR from .013 to .082, and RMSEA from .072 to .139.

Table 2.2: Confirmatory factor analyses results – management innovation antecedents

Sample			*Model fit indices*					
Dimension	No. of items	Reliability (Cronbach alpha)	Range of standardized coefficients (factor loadings)	NFI	NNFI	CFI	SRMR	RMSEA
Knowledge exchange								
Slovenia	7	.862	.31 to .87	.93	.96	.97	.082	.084
Spain	7	.830	.50 to .79	.90	.89	.91	.074	.139
South Korea	7	.813	.46 to .79	.94	.95	.96	.053	.087
Pooled	7	.823	.41 to .83	.92	.95	.96	.064	.903
IT system development								
Slovenia	3	.651	.45 to .84	.91	.84	.94	.058	.090
Spain	3	.823	.42 to .82	.93	.84	.94	.026	.112
South Korea	3	.884	.46 to .93	.93	.90	.95	.041	.072
Pooled	3	.813	.35 to .96	.99	.99	.99	.013	.017
Management innovation								
Slovenia	5	.680	.30 to .77	.93	.96	.97	.081	.084
Spain	5	.805	.54 to .76	.90	.89	.91	.072	.112
South Korea	5	.794	.51 to .83	.93	.96	.97	.051	.082
Pooled	5	.853	.51 to0.79	.93	.95	.95	.056	.089

Discriminant validity tests (a matrix of Pearson's pair-wise correlations) for four constructs are presented in Table 2.3. The results indicate that discriminant validity is mostly achieved. Granted, the correlations between Knowledge exchange and Management innovation are quite high and significant in all three samples. However, it is logical that the IT component of management innovations is highly correlated with IT system development, since they are both connected to information technology, but one can still claim they measure different concepts because the correlations are below .85. All constructs satisfy this requirement for discriminant validity, and even some high correlations can be predicted on the basis of the theory, as previously explained in the Data analyses subsection.

Table 2.3: Pearson's pair-wise correlations between the involved constructs – management innovation antecedents

Slovenia			1	2	3	4	5	6
	1	Motivation (Knowledge exchange)	-					
	2	Ability (Knowledge exchange)	.713**	-				
	3	IT (Management innovation)	.413**	.429**	-			
	4	AI (Management innovation)	.436**	.558**	.384**	-		
	5	ITsystem (IT system development)	.480**	.431**	.740**	.327**	-	
	6	Size	.181*	.198*	.039	.069	.022	-
Spain			1	2	3	4	5	6
	1	Motivation (Knowledge exchange)	-					
	2	Ability (Knowledge exchange)	.613**	-				
	3	IT (Management innovation)	.556**	.429**	-			
	4	AI (Management innovation)	.491**	.529**	.659**	-		
	5	ITsystem (IT system development)	.438**	.431**	.429**	.532**	-	
	6	Size	.127*	.285**	.096	.152*	.196**	-
South Korea			1	2	3	4	5	6
	1	Motivation (Knowledge exchange)	-					
	2	Ability (Knowledge exchange)	.686**	-				
	3	IT (Management innovation)	.661**	.602**	-			
	4	AI (Management innovation)	.616**	.563**	.640**	-		
	5	ITsystem (IT system development)	.239**	.088	.159*	.091	-	
	6	Size	.092	.284**	.124	.015	.118	-
Pooled			1	2	3	4	5	6
	1	Motivation (Knowledge exchange)	-					
	2	Ability (Knowledge exchange)	.700**	-				
	3	IT (Management innovation)	.539**	.499**	-			
	4	AI (Management innovation)	.539**	.562**	.550**	-		
	5	ITsystem (IT system development)	.465**	.385**	.577**	.313**	-	
	6	Size	.141**	.259**	.095*	.069	.106**	-

**p < .01; *p < .05

2.7.2 Validity and reliability of the constructs in the model of management innovation outcomes

In Table 2.4, I report the results of the confirmatory factor analyses for each second-order factor in all three countries. The analysis of second-order models for Management innovation, Technological innovation, and Financial performance provided empirical justification for combining variables into aggregates. After the CFA, I decided to exclude the item TI9 because of insufficient factor loading.

Table 2.4: Confirmatory factor analyses results – management innovation outcomes

Sample				*Model fit indices*				
Dimension	No. of items	Reliability (Cronbach alpha)	Range of standardized coefficients (factor loadings)	NFI	NNFI	CFI	SRMR	RMSEA
Management innovation								
Slovenia	5	.680	.30 to .77	.93	.96	.97	.081	.084
Spain	5	.805	.54 to .76	.90	.89	.91	.072	.112
South Korea	5	.794	.51 to .83	.93	.96	.97	.051	.082
Pooled sample	5	.853	.51 to .79	.93	.95	.95	.056	.089
Technological innovation								
Slovenia	8	.841	.33 to .86	.91	.94	.96	.061	.081
Spain	8	.905	.62 to .84	.94	.93	.95	.055	.128
South Korea	8	.900	.58 to .82	.96	.97	.98	.036	.064
Pooled sample	8	.885	.57 to .85	.94	.95	.96	.050	.091
Financial performance								
Slovenia	2	.884	.81 to .97	.91	.94	.96	.061	.081
Spain	2	.747	.67 to .89	.94	.93	.95	.055	.128
South Korea	2	.813	.78 to .89	.96	.97	.98	.036	.064
Pooled sample	2	.863	.78 to .93	.94	.94	.95	.050	.098

Reliability levels across countries are again satisfactory, as are most of the factor loadings. In the final version of the model, 15 of 16 items were used to measure 4 constructs and 3 second-order factors. Fit indices for all four second-order models are satisfactory (χ^2/df ranges from 1.233 to 1.185, CFI from .93 to .99, NNFI from .91 to .99, SRMR from .068 to .081, and RMSEA from .022 to .087). For the second-order factor Management innovation, simple second-order model was run prior to combining the constructs IT and AI into aggregates (summated scales) of involved variables.

Discriminant validity tests (a matrix of Pearson’s pair wise correlations) for four constructs are presented in Table 2.5. The results indicate that discriminant validity is mostly achieved, with the exception of Technological innovation that exhibits low correlations with Financial performance in the Slovenian sample. Nevertheless, the vast majority of the constructs satisfy this requirement for discriminant validity, and even some of these exceptions can be predicted based on the theory, as previously explained in the Data analyses subsection.

Table 2.5: Pearson's pairwise correlations between the involved constructs – management innovation outcomes

Slovenia			1	2	3
	1	Management innovation	-		
	2	Technological innovation	.600**	-	
	3	Financial performance	.206*	.131	.274**
Spain			1	2	3
	1	Management innovation	-		
	2	Technological innovation	.818**	-	
	3	Financial performance	.273*	.223**	.479**
South Korea			1	2	4
	1	Management innovation	-		
	2	Technological innovation	.680**	-	
	3	Financial performance	.237**	.223**	.449**
Pooled sample			1	2	3
	1	Management innovation	-		
	2	Technological innovation	.700**	-	
	3	Financial performance	.245**	.237**	-

**p < .01
*p < .05

2.7.3 The relationship between knowledge exchange and management innovation, mediated by IT system development, and moderated by organizational size

In Figure 2.1, the path diagram of my mediated model is presented. Standardized values of path coefficients are presented with t-values in brackets, demonstrating percentages of variance explained for each endogenous construct. The results of fitting the structural model to the data show that the model had a good fit as pointed out by the ranges of fit indices across three countries (Table 2.6). NFI ranges from .912 to .938, NNFI from .87 to .94, CFI from .926 to .944, SRMR from .056 to .041, RMSEA from .100 to .168, and the χ^2/df index between 3.045 and 5.668. It is high in the pooled sample, but still under the cut-off value of 10 suggested by Hughes, Price and Marrs (1986). The model had a good fit in South Korea and in the pooled sample, and exhibited somewhat lower indices in Slovenia and Spain, but still mostly under the cut-off values.

Table 2.6: Model fit indices across three countries – management innovation antecedents

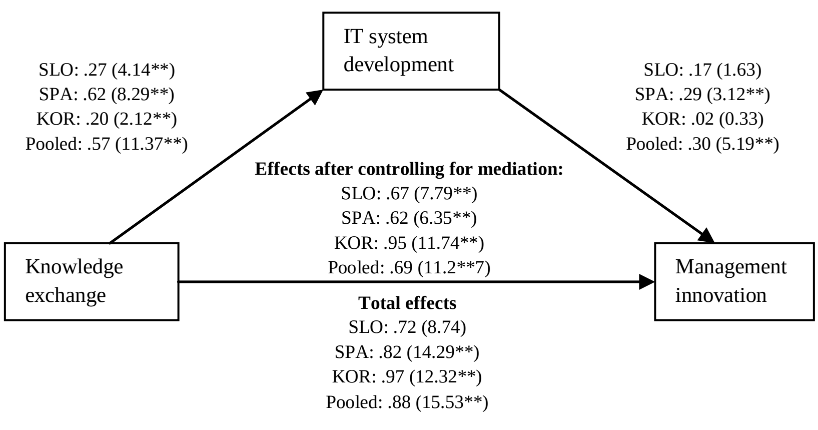
	NFI	NNFI	CFI	SRMR	RMSEA	χ^2/df	P-value
Slovenia (n=118)	.912	.89	.942	.041	.100	3.886	.00787
Spain (n=279)	.914	.87	.926	.056	.123	4.221	.00678
South Korea (n=207)	.921	.94	.943	.042	.168	3.045	.00994
Pooled (n=604)	.938	.90	.944	.056	.113	5.668	.00042

Knowledge exchange is positively linked to management innovation in all three countries, where this relationship is very strong and significant at 99%. In firms with developed knowledge exchange, management innovation also flourishes. In Slovenia, the standardized value is .72 (t = 8.74), and in Spain, this value is .82 (t = 14.29), whereas in South Korea, the standardized value of this path coefficient is the strongest, that is .95 (t = 11.74). The pooled sample produced a comparable value of this link (.88, t = 15.53).

Delving deeper into the knowledge exchange–management innovation relationship, I subsequently examined a mediating role of IT system development on this relationship. As mentioned, I first tested the total effect of knowledge exchange on management innovation, which was very strong and significant in all three countries, as well as in the pooled sample. This is described in the previous paragraph.

Second, I investigated the relationships between the predictor and mediator variable. The relationship between knowledge exchange and IT system development is significant in all three countries (Slovenia: .27, t = 4.14; Spain: .62, t = 8.29; South Korea: .20, t = 2.12), as well as in the pooled sample (.57, t = 11.37). Third, I established a significant link between the mediator variables and the outcome variable. The relationship between IT system development and management innovation is significant in Spain (.29, t = 3.12) and in the pooled sample (.30, t = 5.19), but not in South Korea (.02, t = 0.33) and Slovenia (.17, t = 1.63).

Figure 2.1: The mediating effect of IT system development in the relationship between knowledge exchange and management innovation



***p < .01*
**p < .05*

Finally, I evaluated the relationship between knowledge exchange and management innovation after controlling for the mediating effects of IT system development. In Spain and in the pooled sample, where first three causal steps for mediation hold, the link between knowledge exchange and management innovation is reduced to non-significant levels after introducing a mediating construct – IT development – into the model. Therefore, I could conclude (cf. Judd & Kenny, 1981; Barron & Kenny, 1986) that partial mediation of IT system development exists in case of Spain and in the pooled sample.

I also investigated a moderating effect of organizational size on the relationship between knowledge exchange and management innovation using hierarchical moderated regression. According to Baron and Kenny (1986) and James and Brett (1984), the test for moderation should include a term for the direct effect of the predictor (knowledge exchange), a term for the direct effect of the moderator (organizational size) and the interaction term (or product) of the two. The moderator hypothesis is supported if the interaction term is significant.

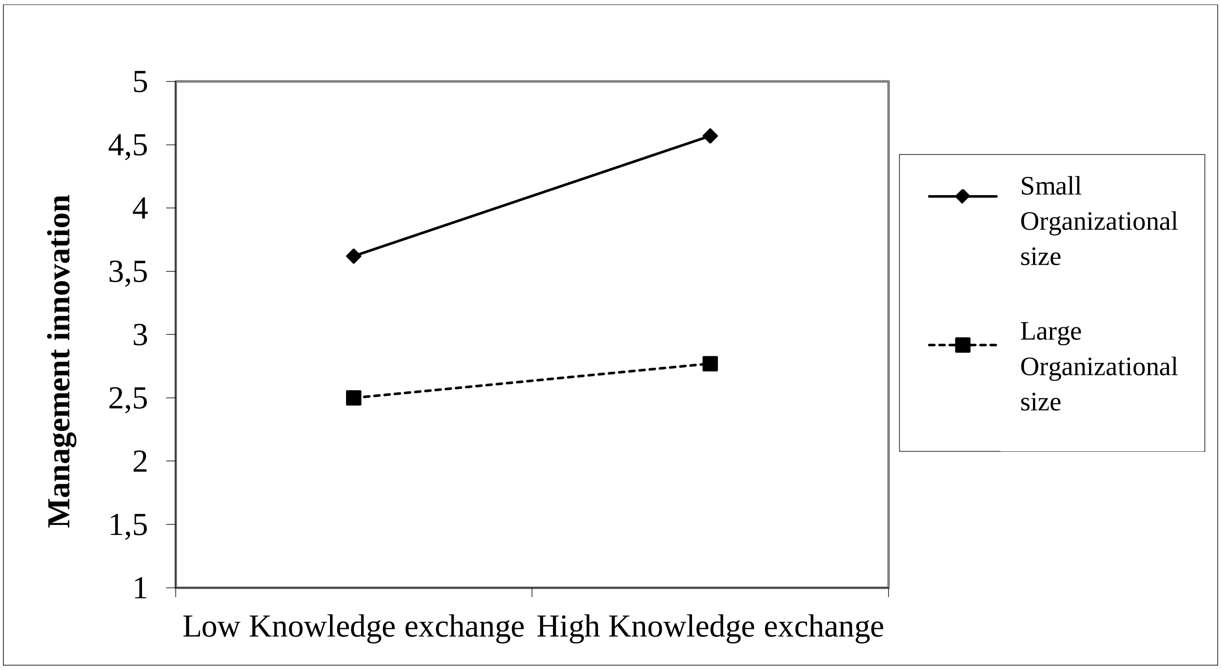
My independent variables were correlated, and that is why I centered the predictor, moderator, and the outcome variables to reduce multicollinearity. I presented the results of the moderated hierarchical regression analysis in Table 2.7. Organizational size moderates the relationship between knowledge exchange and management innovation in Spain (β = -.18, ΔR^2 = .04, F = 9.65, $p < .05$), South Korea (β = -.19, ΔR^2 = .053, F = 11.02, $p < .05$), and in the pooled sample (β = -.17, ΔR^2 =.06, F = 9.84, $p < .05$), but not in Slovenia. This is evident from Figure 2.2.

Table 2.7: Moderated hierarchical regression results for management innovation as the dependent variable

Step and model	*Slovenia*			*Spain*			*South Korea*			*Pooled sample*		
	1	2	3	1	2	3	1	2	3	1	2	3
Knowledge exchange	.72**	.69**	.69**	.82**	.70**	.70**	.97**	.95**	.95**	.88**	.74**	.73**
Organizational size		-.12	-.11		-.28**	-.26**		-.20**	-.21**		-.23**	-.22**
Knowledge exchange × organizational size			-.08			-.19**			-.19**			-.17**
R^2	.188	.219	.229	.218	.286	.302	.243	.287	.296	.251	.289	.311
ΔR^2		.030	.010		.068	.016		.044	.009		.038	.022
F	5.45**	5.98**	5.78**	8.45**	9.87**	9.65**	9.67**	11.23**	11.02**	8.82**	10.07**	9.84**

**p < .01, *p < .05

Figure 2.2: The moderating role of organizational size in the knowledge exchange – management innovation relationship



2.7.4 The relationship between management innovation, technological innovation, and financial performance

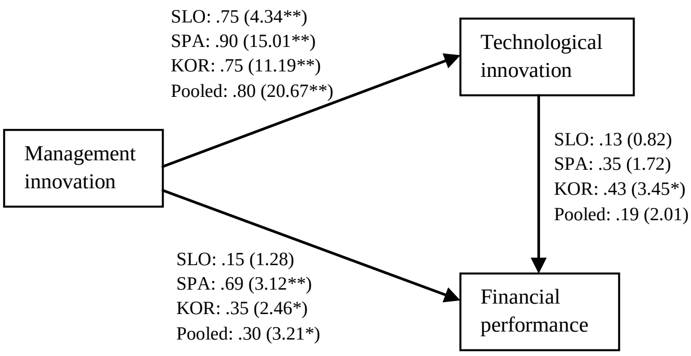
In Figure 2.3, the path diagram of my model is presented. Standardized values of path coefficients are presented with t-values in brackets, demonstrating percentages of variance explained for each endogenous construct. The results of fitting the structural model to the data show that the model had a good fit as pointed out by the ranges of fit indices across three countries (Table 2.8). NFI ranges from .909 to .99, NNFI from .88 to .98, CFI from .936 to .99, SRMR from .081 to .029, RMSEA from .066 to .132, and the χ^2/df index between 4.677 and 1.966. It is again high in Slovenia and the pooled sample, but still under the cut-off value of 10 suggested by Hughes, Price and Marrs (1986). The model had an excellent fit in Spain, South Korea, and the pooled sample, whereas it exhibited somewhat lower indices in Slovenia, but still mostly under the cut-off values.

Table 2.8: Model fit indices for model of the management innovation outcomes

	NFI	NNFI	CFI	SRMR	RMSEA	χ^2/df	P-value
Slovenia (n=118)	.99	.88	.936	.081	.132	3.383	.00129
Spain (n=279)	.98	.98	.989	.031	.066	1.999	.02399
South Korea (n=207)	.98	.98	.990	.037	.068	1.966	.04646
Pooled (n=604)	.99	.98	.990	.029	.078	4.677	.00287

Management innovation is positively linked to technological innovation in all three countries, where this relationship is strong and significant at 99%. Firms engaging in management innovation also innovate better in terms of technological innovation. In Slovenia, the standardized value is .75 (t = 4.34), in Spain, this value is .90 (t = 15.01), whereas in South Korea, the standardized value of this path coefficient is .75 (t = 11.19). The pooled sample resulted in a similar value (.80, t = 20.67).

Figure 2.3: Relationship between management innovation, technological innovation, and financial performance



***p<.01*
**p<.05*

Management innovation predicts companies' financial performance, but not in all countries and not in the same amount nor within equal confidence intervals. In Spain, management innovation is strongly related to financial performance. The standardized coefficient is .69, whereas t-value stands at 3.12. In South Korea, this relationship is moderate in size (standardized value = .35) and is only significant at 95% with a t-value of 2.46. Similar case presents the pooled sample, where this relation is also moderate (standardized value = .30, t = 3.21). In contrast, the link between management innovation and financial performance is not significant in Slovenia (standardized value = .15, t = 1.28).

Similarly, the relationship between technological innovation and firms' financial performance is not significant in Slovenia (standardized value = .13, t = .82). It is also insignificant in the pooled sample (standardized value = .19, t = 2.01) and in Spain, although this link is somewhat stronger in size (standardized value = .35, t = 1.72). The relationship between technological innovation and financial performance in South Korean firms is also moderate in size (standardized value = .43), however, this connection is statistically significant at 95% (t = 3.45).

2.7.5 The mediating effect of management innovation on the relationship between technological innovation and financial performance

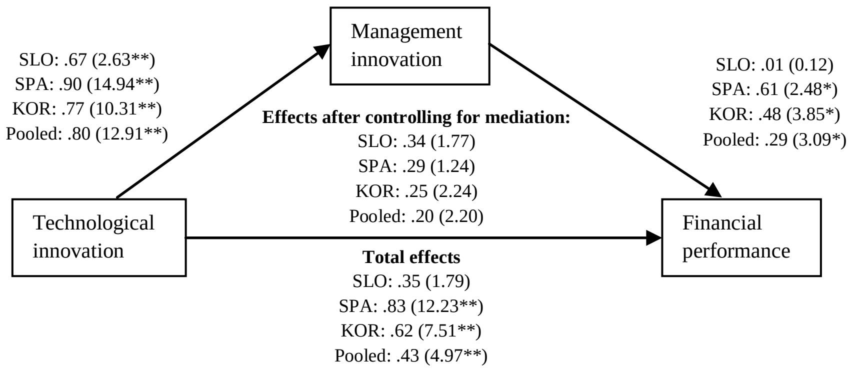
When delving deeper into the innovation–performance relationship, I examined a mediating role of management innovation on the relationship between technological innovation and financial performance (Figure 2.4). The examination of this competing model fit indices (Table 2.9) reveals that the model exhibits worse fit to data than the first model. Thus, the first model has a greater global fit, which supports the view that management innovation serves as a predictor and driver of technological innovation. Nevertheless, as most of the fit indices in the competing model are still acceptable (with the exception of Korean sample), it provides interesting insights regarding the mediation effect of management innovation on the relationship between technological innovation and financial performance. Therefore, both interpretations hold, with the first one being closer to reality, as testified by the global fit indices.

Table 2.9: Competing mediated model fit indices across three countries

	NFI	NNFI	CFI	SRMR	RMSEA	χ^2/df	P-value
Slovenia (n=118)	.910	.87	.928	.091	.141	3.768	.00104
Spain (n=279)	.950	.91	.957	.067	.208	4.957	.00029
South Korea (n=207)	.871	.73	.878	.104	.837	9.799	.00000
Pooled (n=604)	.990	.98	.990	.029	.078	4.677	.00287

First, I tested for a total effect of technological innovation on financial performance. It was found to be significant in South Korea (standardized value = .44, t = 3.51), Spain (standardized value = .55, t = 2.23), and the pooled sample, but not in Slovenia (standardized value = .34, t = 1.77). Second, I investigated the relationship between technological innovation and management innovation, i.e. the predictor and mediator variable. It is significant in all three countries, and in the pooled sample. Third, I established a significant link between management innovation and financial performance, i.e. the mediator and outcome variable, in South Korea (standardized value = .48, t = 3.85), Spain (standardized value = .61, t = 2.48), and the pooled sample (standardized value = .29, t = 3.09), but again not in Slovenia (standardized value = .01, t = .12).

Figure 2.4: The mediating effect of management innovation on the relationship between technological innovation and financial performance



***p<.01*
**p<.05*

Finally, I evaluated the relationship between technological innovation and financial performance after controlling for the mediating effect of management innovation. In Spain, South Korea, and the pooled sample, where first three causal steps for mediation hold, the link between technological innovation and financial performance was reduced to non-significant levels after introducing a mediating construct – management innovation – into the model. Therefore, I can conclude (Judd & Kenny, 1981; Barron & Kenny, 1986) that full mediation exists in these three cases, whereas the Slovenian sample does not confirm mediation. To further support these findings, I calculated the Sobel test (1982) that works well in samples larger than 50. It was significant in all three cases where mediation can be claimed, that is in Spain (z = 3.825, $p < .01$), South Korea (z = 3.248, $p < .01$), and in the pooled sample (z = 2.926, $p < .01$).

On the basis of the results of two competing models, it is clear that, in Spanish and the pooled sample, management innovations are more important in enhancing firms' financial performance than technological innovations. In Slovenia, I cannot make this conclusion due to the fact that the impact of each type of innovation is insignificant. In South Korea, a deeper examination of indirect effects is necessary in order to assess which type of innovation is more important for firms' financial performance.

Table 2.10: Decomposition of effects in the first South Korean model

	Unstandardized coefficients (t-values)			*Standardized coefficients*		
Path	Total effects	Direct effects	Indirect effects	Total effects	Direct effects	Indirect effects
Management innovation →Technological innovation	.76 (7.69**)	.76 (11.19**)	-	.75	.75	-
Management innovation →Financial performance	.56 (5.98*)	.26 (2.46*)	.43(4.42)*	.67	.35	.32
Technological innovation → Financial performance	.43 (11.3**)	.43 (11.3**)	-	.43	.43	-

**$p < .01$
*$p < .05$

The decomposition of total effects into direct and indirect effects in South Korean first model (Table 2.10) and the competing model (Table 2.11) provides an insight into the most important influence. Total effects of management innovation on financial performance in the first model (standardized value = .67) are greater than total effects of technological innovation on financial performance (standardized value = .62) in the competing model. This leads to the final indication that, even in South Korea, management innovation has a more essential role in enhancing firms' performance although the significance of technological innovations should not be underestimated in this case.

Table 2.11: Decomposition of effects in the competing South Korean model

	Unstandardized coefficients (t-values)			*Standardized coefficients*		
Path	Total effects	Direct effects	Indirect effects	Total effects	Direct effects	Indirect effects
Technological innovation → Management innovation	.77 (10.31**)	.77 (11.19**)	-	.77	.77	-
Technological innovation →Financial performance	.60 (6.12*)	.30 (2.98*)	.35(3.79)*	.62	.25	.37
Management innovation →Financial performance	.48 (3.85*)	.48 (3.85*)	-	.48	.48	-

$**p < .01$
$*p < .05$

2.8 Discussion

2.8.1 Discussion on the antecedents of management innovation

The first aim of this chapter was to design and test a model examining the relationship between knowledge exchange and management innovation, taking into account the potentially mediating influence of organizational size and IT system development. Management innovation was conceptualized to play an important role in developing strategies for growth, facilitating employment, social change and renewal, and enabling continuous performance (Edquist et al., 2001; Hamel, 2006). Some of its positive outcomes in terms of organizational performance were also supported empirically (e.g. Walker et al. 2011; Vaccaro et al. 2012), indicating that it is highly relevant to study how organizations can facilitate this type of innovation.

The results in Slovenia, Spain, and South Korea support the idea that knowledge exchange is an important antecedent of management innovation (Hypothesis 1). The link is strong in all three countries. This draws attention to the importance of collaboration and knowledge sharing in the firms that want to apply management innovations. Sharing information and expertise, and actively seeking information contributes to the application of management innovation. Formal mechanisms and practices ensure knowledge transfer between members of an organization and are supported by an information system that enables efficient and effective exchange of information, and that is why they were acknowledged to provide important means necessary for managers to innovate non-technologically.

Management innovation does not arise from contributions of single professionals' groups, but rather from political actions of multiple professional communities espousing their point of view

(Gibbons, 2004). Connectedness within and between units is an important enabler of management innovation, because it increases opportunities for informal talk and accessibility to knowledge sources in an organization (Jansen et al., 2006). Social relations can help a range of individuals to combine knowledge, and develop new knowledge that underlies management innovation.

In line with the knowledge-based view (Grant, 1996; Kogut & Zander, 2003), my study has depicted knowledge as the primary resource underlying new value creation. Innovation is a social construct, dependent on collaboration and information sharing. It crucially depends on combining diverse knowledge to produce novel ideas that get implemented (Hage & Hollingsworth, 2000; Taylor & Greve, 2006; Liao et al., 2007). Therefore, intangible assets, such as the relationships between employees and their collaboration, were proven to be essential in enhancing management innovations.

However, knowledge management that enhances knowledge exchange among members of an organization is a complex entity, dependent on both tangible and intangible assets. To illustrate the importance of "soft" factors, employees' social networks (e.g. Inkpen & Tsang, 2005; Wasko & Faraj, 2005) and organizational culture (e.g. Lopez, Peón, & Ordás, 2004), for example, were found to facilitate the exchange of knowledge that leads to positive outcomes. However, in my study, I focused on tangible organizational characteristics that would influence the knowledge exchange. Dalkir (2007), for instance, claims that the success of a firm's knowledge management depends on people, organizational systems, and IT support.

My study also investigated potential mediating and moderating variables on the knowledge exchange-management innovation relationship. Specifically, I focused on internal organizational characteristics that could prove to be important for the in-depth understanding of the studied relationship. I found support that IT system development is a partial mediator in the knowledge exchange–management innovation relationship (Hypothesis 2). This empirically supports the theoretical conceptualizations (e.g. Moorman & Miner, 1998; McDermott, 1999) that proposed knowledge exchange to be tightly connected to information technology, which in turn enables management innovation.

However, this is not an entirely obvious finding. Dalkir (2007), for example, attributes only 10% of firms' knowledge management effectiveness to IT support. Moreover, IT is connected to more tangible, explicit knowledge that is easier to codify and therefore not as difficult to imitate. On the other hand, management innovation and knowledge exchange are "soft" concepts that are more difficult to duplicate due to their intangible nature (Alänge et al., 1998), and can thus serve as an important basis for competitive advantage (cf. Porter, 1985). Therefore, the link between these very different concepts in nature might not be entirely intuitive, even if my study demonstrated that the existence of such connections results in successful implementation of management innovation. Information systems facilitate the link between key decision-makers and other parts of the organization by making the collection, process, and dissemination of information and knowledge faster and more efficiently. Managers can thereby be connected with employees and each other to combine diverse knowledge by using information and communication technology. It is apparent that systems and routines, which are manifested in the firms' IT systems, are also very important for the flourish of the "soft", intangible forms of innovation.

My findings also support the moderation of organizational size on the relationship between knowledge exchange and management innovation (Hypothesis 3). This result is consistent with the negative interaction between the use of internal sources and organizational size in stimulating management innovation that Mol and Birkinshaw (2009) discovered in their study using the Community Innovation Survey data. Internal communication, which is crucial for the knowledge exchange, is more difficult in larger firms than in the smaller ones. Social relations are more complex in firms with a large number of employees, as a large company results in an increased number of work relationships a person is engaged in. Therefore, intra-organizational knowledge exchange that includes systematic structuring of information (Moorman & Miner, 1998) is less likely to result in management innovations in large firms as opposed to the small ones. Positive effects of knowledge exchange on management innovation are thus hindered in large organizations because of their size and the resulting complexity.

When interpreting mediation and moderation results found in this study, one has to be accurate and country-specific. First, based on the observation of the pooled sample, a partial mediation of IT system development in the relationship between knowledge exchange and management innovation can be claimed. Second, mediation was not equally strong in all three countries. Even if the pooled sample depicted partial mediation of IT system development, somewhat different results among three studied countries provided us with further insight.

IT system development can be claimed to be a partial mediator in the knowledge exchange–management innovation relationship in Spain, but not in Slovenia or South Korea. This indicates that other variables need to be taken into account when researching the antecedents of management innovation. The overall IT system development in a particular economy, for example, could affect the mediating influence of IT system development in studied firms.

Organizational size was found to be an important moderator of the relationship between knowledge exchange and management innovation in Spain, South Korea, and the pooled sample, but not in Slovenia. Otherwise positive influence of knowledge exchange on management innovation facilitation can be hindered in large organizations simply due to the fact that the relationships among the employees become too complex. Even if different findings point out that it is reasonable to include potentially mediating and moderating variables in research designs that aim to explore the antecedents of management innovation, it is also necessary to account for multiple potentially mediating or moderating variables concurrently and to investigate these influences in different and diverse settings.

2.8.2 Discussion on the outcomes of management innovation

The second aim of this chapter is to contribute to research on innovation-performance relationship by pointing out the role of management innovation. I pursue this aim by designing and empirically testing the model examining the relationship between management innovation, technological innovation, and financial performance. First, I contribute to empirical research on the outcomes of management innovation as the results in Slovenia, Spain, and South Korea support the idea that management innovation is related to technological innovation (Hypothesis 4a), as well as that management innovation predicts financial performance in Spanish and Korean firms. These links are moderate at worst but mostly strong in all three countries.

The results of the study also demonstrated some differences in the outcomes of management innovation. In Spain, the link between management innovation and financial performance is strong, whereas in South Korea, this relation is smaller, only moderate in size. In any case, this leads to the conclusion that developing both components of management innovations, administrative and IT, is very important in enhancing firms' performance.

The examination of the link between technological innovation and firms' financial performance demonstrated that only in South Korea is this relation significant and stronger than the link between management innovation and financial performance. All in all, the results across countries demonstrate that management innovations in fact play a more important role in boosting firms' financial performance than technological innovations. Only in Slovenia, neither management innovations nor technological innovations significantly predict firms' financial performance. Therefore, I can partially confirm the Hypotheses 5 and 6.

My study empirically validated the use of management innovation in firms from three countries by examining its outcomes. Data from all three samples demonstrated that management innovation acts as a strong predictor of technological breakthroughs in the firms. It is evident that the use of novel administrative approaches, and IT channels serves as a support system and a driver for technological innovation. I can also claim that engagement in management innovations could lead to firms' success in terms of improved return on assets, and higher value added per employee. This relationship is stronger in the case of Spain, whereas technological innovation is still very important in South Korea. Each of these findings might help to illuminate the effectiveness and efficiency of the management innovation application in enhancing technological innovation and firms' financial performance.

The mediating effect of management innovation in the relationship between technological innovation and financial performance (Hypothesis 4b) points out that firms should organize the innovation process efficiently by combining technological capabilities with skills in marketing, management, and organizational competencies (Mothe & Thi, 2010). Firms that introduce all types of non-technological innovations in addition to process innovations outperform those that introduce a new process without any organizational or marketing innovation (Schmidt & Rammer, 2007). Therefore, both competing models are supported, which means that it is necessary to understand both non-technological and technological aspects of innovation to ensure its success. The generation or adoption of either technical or non-technical innovations may not enable firms to fully realize positive consequences of innovation (Damanpour & Aravind, 2012). Researchers should also examine both technological and non-technological relationships concurrently, because it can significantly alter the view on examined relationships, as pointed out by the second, mediated model in my study.

Despite a number of studies (e.g. Ireland & Webb, 2007; Johannessen, 2008; Liao & Rice, 2010) demonstrating a positive influence of innovation on the improvement of companies' performance, some research also produced different and sometimes contradictory results. Although there exists the "pro-innovation bias" (Damanpour & Aravind, 2012), Taylor and Greve (2006), for example, found that innovation results in increased performance variance, which can mean either financial gains or losses.

Innovative activities are often innately risky, with uncertain costs and potential returns (Christensen, 1997; Koellinger, 2008; Ceccagnoli, 2009). As the results pointed out, management innovation is very important in enhancing firms' performance, which could imply a way of reducing the risk connected with innovation. In addition to technological innovation, which is more expensive, risky, and subject to imitation (Damanpour & Aravind, 2012), firms should adopt management innovations that are more intangible. Due to the tacit nature of management innovations, they are difficult, if not impossible to protect by patent (Teece, 1980), and not at all easy to observe and imitate (Alänge et al., 1998). As such, they provide an important resource that can serve as a basis for sustainable competitive advantage (Porter, 1985; Peteraf, 1993; Barney, 2001) if they are valuable and rare (Birkinshaw et al., 2008). This was further confirmed in my study that helps to illuminate why management innovation is more important in achieving sustainable competitive advantage than technological innovation.

The idea that innovations can lead to either success or failure further indicates that it is necessary to account for unique and specific cultural and country characteristics when examining the innovation–performance relationship and the influence of different innovation types. With an empirical examination of three countries, and the inclusion of management and technological innovation, I address both issues.

It is interesting to observe the similarities and differences in the applicability of management innovation and technological innovation in European and Asian countries. When referring to the influence of management innovation on technological innovation, these relationships are not extremely different in size or direction in the three studied countries. Intriguing differences occur when observing the relationships of both innovation types with financial performance.

The results of my study have shown that in Spain management innovation strongly predicts firms' financial performance, whereas this link is somewhat smaller in size in South Korea. In contrast, technological innovation was found to explain firms' financial performance more strongly in South Korea, whereas in Spain, this relationship was smaller in size and insignificant. This leads to the conclusion that in Spain, the "soft" aspects of innovation are very important in leading to improved financial performance. In South Korea, on the other hand, technological innovation is still very important, although the observation of the indirect effects supported a stronger influence of management innovation on firms' financial performance in this Asian country as well. Interestingly, the relationships linking both types of innovation with financial performance were not found to be significant in Slovenian dataset in contrast to Spain and South Korea.

One way to explain these differences is to examine national context characteristics related to innovation. South Korea is a fast growing country with high innovation levels. Regarding to the Global Entrepreneurship Monitor (GEM) Executive Report (Kelley, Bosma, & Amoros, 2010), there is a distinction between factor-driven, efficiency-driven, and innovation-driven countries. South Korea is one of the innovation-driven economies, where firms are highly focused on organizational innovation since the severe economic crisis in 1997. It is ranked eighth on the Global Innovation Scoreboard's (2008) list regarding countries' innovative activities with the score of .5556 (maximum value of the GIS index is .80). R&D intensity (as a percentage of GDP) is 2.98% in South Korea (2008).

On the other hand, Spain and Slovenia are ranked much lower on the Global Innovation Scoreboard's list (2008), which is 24th and 25th, respectively. R&D intensity (as a percentage of GDP) is 1.46% in Slovenia and 1.12% in Spain, indicating that the importance of technological innovation is lower than in South Korea, where this aspect is a major focus of attention. South Korea has a long tradition of technological and scientific achievements. It is able to acquire the technological capability to successfully undertake duplicative imitations and bring about technological breakthroughs on its own (Kim, 1997).

The observation of the GIS index structure for all three countries provides further insight. GIS index is a sum of three parts: firm activities and outputs, human resources, and infrastructure and absorptive capacity. In South Korea, it is evident that firm activities and outputs (measuring innovation output, which is generally connected to technology), and infrastructure and absorptive capacity, score much higher than in Slovenia or Spain. However, it is a different case in terms of human resources, where the scores in all three countries are quite comparable (2008). The examination of the importance of human resources in a relative manner to the whole GIS index reveals that this aspect is much more important in Spanish firms than in Korea. This is consistent with previous studies that pointed out the crucial importance of human resource management in enhancing innovativeness in Spanish firms (e.g. Jimenez-Jimenez & Sanz-Valle, 2005).

South Korea has a much more paternalistic economy with greater role of men in the companies than in Spain (Lee, 2001; Kelley et al., 2010). This could also help to explain why technological innovation was proven to be more important in Korea than in Spain in terms of achieving better financial performance. Female participation in decision-making is much more connected to the "soft" aspects of management and innovation than to the technological ones (Mukhtar, 2002). Furthermore, participation was linked to innovation (Jimenez-Jimenez & Sanz-Valle, 2005), as were leadership styles and organizational learning (Aragon-Correa, Garcia-Morales, & Cordon-Pozo, 2007), which further indicates the importance of the "soft" approaches to innovativeness in Spanish companies. Altogether, this helps to explain the differences regarding the innovation–performance relationship in the studied countries.

Slovenian dataset, however, could not support the association between two examined types of innovation and financial performance. According to the global macro innovation indexes, there is not much to differentiate between innovation activities in Slovenia or Spain. However, one must delve deeper into the history of both countries to understand the differences that could influence innovation results in companies in two countries. Although Slovenia is now a developed country with a Human Development Index of .929, and a member of the European Union and OECD with almost 90% of the EU27 average GDP per capita, it went through a period of transition in the past twenty years and has not reached its full innovation potential yet (Koschatzky, Bross, & Stanovnik, 2001).

2.8.3 Theoretical contributions

An important contribution of this study is in supporting the importance of knowledge exchange as a predictor of management innovation and empirically estimating its influence. The amount of detailed knowledge about the actual implementation of management innovation is limited (Birkinshaw et al., 2008). I contribute to this discussion by theoretically conceptualizing and empirically supporting the role of knowledge exchange in this process, thereby addressing a future research suggestion made by Walker et al (2011).

By studying the role of an intangible construct, knowledge exchange, in facilitating management innovation, I contribute to the knowledge-based view of firms (Grant, 1996; Kogut & Zander, 2003) that depicts the importance of knowledge in firms’ innovative activities. I provide an in-depth theoretical build-up of why and how knowledge exchange is connected to management innovation, as well as test this link empirically. Although knowledge exchange was previously linked to technological innovation (e.g. Tsai, 2001; Jensen et al., 2007; Liu & Phillips, 2011), and the roles of knowledge and social interactions were discussed in the management innovation literature (e.g. Mol & Birkinshaw, 2009; Vaccaro et al., 2010; Vaccaro, 2010), this study is the first to my knowledge that fuses these two aspects and theoretically discusses as well as empirically tests the link between knowledge exchange and management innovation.

Moreover, I did not only investigate the direct link between knowledge exchange and management innovation, but also took into account some of the most important mediating and moderating constructs or variables. More precisely, my study focused on IT system development in the studied firms’ and their size, as they were both previously conceptualized to influence the knowledge exchange process and innovativeness. I explained how IT system development and organizational size could affect the knowledge exchange–management innovation relationship, which was supported by partial mediation of IT system development, as well as by the moderation effect of organizational size.

As I examine the proposed relationships on data gathered in three countries, Slovenia, Spain, and South Korea, I point out some differences regarding the studied relations that could be culturally based, and depend on the overall development of particular economies. Furthermore, by studying the antecedents of management innovation in three diverse contexts, I provide a good basis for the generalization of findings.

Until recently, the majority of the literature (e.g. Hitt, Hoskisson, & Kim, 1997; Ahuja & Katila, 2001) treated innovation as a synonym for technological breakthroughs, which is why an important and relevant contribution of this chapter lies in the quantitative empirical examination of the antecedents and outcomes of management innovation. This is a non-technological construct that has recently gained wind in the literature, but lacks empirical research (e.g. Birkinshaw et al., 2008; Damanpour & Aravind, 2012). The relationship between management innovation and organizational performance was studied in the English public sector (e.g. Walker et al., 2011), and most of the empirical research on innovation used datasets from Western countries. I provide important basis for the generalization of findings as I use data of firms from three countries with diverse contexts, i.e. Slovenia, Spain, and South Korea. All three countries are listed as innovation-driven economies by GEM (Kelley et al., 2010), which indicates that the study of innovation types and their antecedents and outcomes in these contexts is highly relevant. However, they are different in terms of culture and socioeconomics characteristics that greatly influence innovation processes. This serves as a further basis for the generalization of findings.

In this study, I address the issue of the lack of empirical research that would examine the outcomes of management innovation. The investigation of the influence of management innovations on economic performance of organizations without accounting for the influence of other types of innovation that are concurrently introduced may not accurately reflect the consequences of management innovations (Damanpour & Aravind, 2012). This is why I assess the importance of management innovations in developing technological breakthroughs in firms and further investigate how this impacts on financial performance, as well as how it mediates the relationship between technological innovation and financial performance. In doing so, I provide empirically-based insights into the innovation-performance relationship.

The key contribution of my study to the innovation theory is the realization and empirical evidence that management innovations are more important in enhancing firms' financial performance than technological innovations. This finding can be contributed to the intangible nature of management innovations as opposed to a more tangible nature of technological innovations (Teece, 1980). For this reason, management innovations are more likely to be a source of sustainable competitive advantages (Porter, 1985) of a firm than technological innovations. Even though this finding might be surprising given the predominance of technologically-centered literature on innovation, it is also completely in line with the resource-based view (Barney, 1991). I aim to contribute to the shift of the view in innovation theory, which has long presumed that technological innovations are crucial to organizations' performance (e.g. Ahuja & Katila, 2001), by providing a piece of empirical evidence that depicts management innovations as a key concept of the innovation-performance relationship.

To fully capitalize on technological discoveries, firms should adopt some sort of supporting non-technological management innovations. This was clearly demonstrated by the mediating effect of management innovation on the technological innovation–financial performance relationship. By examining the proposed relationships in three different countries, I discovered that the outcomes of management innovation are also connected to contextual characteristics, which is in line with the institutional view of the firm (Guillen, 1994). It is evident that the link between innovation and performance is stronger in the economies that place more importance on innovation and are already achieving good results in innovation, as is the case in South Korea. It is also apparent how different value systems and practices in various countries affect the innovation-performance relationship. This was supported by examining the differences in this relationship in South Korea and Spain.

More emphasis on the "soft" aspects of innovation in Spanish firms resulted in a strong direct link between management innovation and financial performance. On the other hand, South Korea has a much more technologically-oriented economy (as testified, for example, by GIS results), and it is apparent that management and technological innovations go hand in hand in enhancing firms' financial performance. This highlights the influence of national culture characteristics, and stresses the importance of national innovation systems that depend highly on the institutional and governmental support for innovation (Nooteboom, 2000). I provide an important piece of empirical evidence in line with the institutional perspective (e.g. Guillen, 1994) that focuses on the socio-economic conditions in which new management practices take shape (Birkinshaw et al., 2008).

Thus, the innovation-performance relationship also depends on country-wise characteristics such as institutional support, and on national culture characteristics that affect business processes. In countries such as Spain, more emphasis is placed on the "soft" aspects of innovation, whereas in traditionally high-tech economies, such as South Korea, combining management innovation with technological breakthroughs has proven to be beneficial in enhancing firms' performance. Therefore, my study revealed that national culture, culturally-based business practices deriving from it, institutional support and industrial characteristics are important contextual factors that need to be taken into account when examining the innovation-performance relationship. For example, technological innovation may still prove to be more important than non-technological innovation in industries where the innovation development is a long-term process which depends on extensive funding, and where its results can subsequently be protected by patent rights, as is the case in the pharmaceutical industry.

2.8.4 Practical implications

Management innovation was theoretically (Edquist et al., 2001; Hamel, 2006) and empirically (Walker et al., 2011) demonstrated to lead to positive outcomes in the organization, and that is why this innovation type provides important means for managers to contribute to their firms' success. Therefore, my study provides an important message for managers: in order to enhance management innovation, it is essential to establish an open community that supports knowledge exchange. Knowledge sharing and seeking should be encouraged, thus influencing the employees' motivation to exchange knowledge as opposed to hide it (Connelly et al., 2012).

Management innovation is dependent upon various internal organizational characteristics (Jansen et al., 2006). My study has demonstrated that the characteristics needed to be taken into account are the development of a knowledge exchange culture and the supporting systems in an organization. However, it is not enough that the organization enhances the employees' motivation for exchanging knowledge; it should also provide support for improving their ability to do it. A deeper analysis of results highlights the importance of establishing the systems that support knowledge exchange: rewarding the employees for sharing information, transferring best practices between various areas of work, and assigning individuals for internal dissemination of knowledge, proposals, and ideas.

My study also demonstrated the role of some of the most important internal organizational characteristics that should be taken into account when stimulating management innovation from knowledge exchange. Namely, organizational size was found to moderate this relationship, which is why managers should be aware that this process is more difficult and complex in larger companies. Therefore, they should realize that different approaches to knowledge exchange facilitation will most likely be used in large companies. Furthermore, my study also demonstrated that information exchange should be supported with an easy-to-use IT system that enables the employees to communicate and exchange information rapidly and efficiently.

My results serve as additional evidence that management innovation and technological innovation are positively related to the improved financial performance, which is in line with the previous research results and speculations (e.g. Hamel, 2006; Ireland & Webb, 2007; Birkinshaw et al., 2008; Johannessen, 2008; Liao & Rice, 2010). Consequently, in the organizations, more attention has to be paid to the development of their own novel difficult-to-imitate managerial solutions to improve technological innovation and firms' performance. Furthermore, my results confirmed that management innovation is even more important in achieving better financial results and sustainable competitive advantage than technological innovation, and that it is the mechanism that enables the firms to fully benefit from their technological breakthroughs.

One practical implication of this idea is that investing effort, time, and money into initiatives aimed at developing management innovation can lead to technological innovation and financial performance of modern firms. My study of three countries pointed out several IT and administrative methods and techniques beneficial to this end, as well as signalized the differences among the studied countries that can be attributed to a specific context and the development of innovation economies in the countries. For example, in highly innovative economies, such as South Korea, management innovation can be viewed as a support system for technological innovation that will ultimately act as the basis for achieving superior financial performance.

Managers may not have previously been aware of the positive influence of management innovation owing to its intangible nature that results in near impossibility of the existence of handbooks or step-wise procedures that would guide its implementation, and due to the fact that this type (and other non-technological types of innovation) has not yet received the deserved attention in the literature and practice. This study depicts two roles of management innovation. First, it illustrates it as an enabler and predictor of technological innovation and financial performance. Second, it presents it as a way of enabling the firms to capitalize on technological breakthroughs. In this way, I provide scientifically acceptable and practically applicable flow chart for building strategic organizational initiatives regarding innovation for organizations in different countries.

Furthermore, with management innovation, e.g. new information technology, information systems, approaches to service planning and budgeting, approaches to organizational improvement, and new management processes, firms can achieve better results in technological innovation, as well as improve their financial performance. As such innovation does not require enormous investments, this area of research has important practical implications and provides an array of opportunity even for firms that do not possess unlimited funds to finance their expensive R&D projects.

2.8.5 Limitations and future research suggestions

The first methodological limitation is the inability to directly draw conclusions through causal inference because of the cross-sectional nature of the data gathered. Although the structural models are conceptualized in a causal way, this technique needs to be backed up in advance with theoretical assumptions and previous research findings. For example, superior management innovation might allow for better knowledge exchange among the members of an organization. However, due to the fact that empirical research on the field of management innovation is in its infancy, every bit of empirical insight, even if obtained by cross-sectional data, is very beneficial to advance the knowledge on this subject. I concluded that the scope of my study is more important than complicated longitudinal data gathering. In any case, other research designs such as experimental or longitudinal studies should be conducted in the future when examining the relationships among the studied variables to assess their true impact, even though they are rare due to data gathering problems.

Another limitation of my study is connected to data gathering. An informed single respondent approach was used so there is a potential for single respondent bias. However, I tried to reduce the effects of this limitation as much as possible by ensuring the respondent was a key informant with great insight into the organization's processes. Even so, there may be differences between groups in an organization regarding knowledge exchange and innovation, which is why further research should address this with a multilevel approach and examine these links on data gathered from multiple groups in organizations.

Moreover, as internal organizational networks are tightly linked to knowledge exchange, but can also be viewed as a manifestation of management innovation, it might be useful to apply social network analysis to gain further insight into my studied phenomena. For example, although communication and knowledge exchange in general are important for management innovation, it is worth examining which configuration of the communication network might promote management innovation best: a network full of structural holes consisted of many weak ties or a very dense network.

An important limitation is the scale I used to measure management innovation – although there exists another, more recent scale to measure this construct (developed by Vaccaro et al., 2012), I opted for a simpler scale that measures the IT and administrative dimension of management innovation (similar to the study of Walker et al., 2011). The reason for this is that the data were gathered before the scale of Vaccaro et al. (2012) was developed and validated. Nevertheless, the measurement instrument I used appears to be valid and reliable. For future research, I suggest examining the studied relationships with the scale of Vaccaro et al. (2012) and further studying its psychometrics, or developing and validating a new and comprehensive measurement instrument for management innovation, which would allow for additional generalization of research findings.

Another methodological limitation is the measurement of technological innovation with the perceptions of responding organizations' employees. A more accurate measurement for establishing the degree of a firm's technological innovation may be the number of patents granted or innovations successfully brought to market. However, even this would not ensure more accurate information, as not all technological innovations are patented.

When examining the antecedents of management innovation and their influences, the researchers should be aware that these impacts are not always one-faceted. Due to their complexity and potential collinearity, the inclusion of only one antecedent could lead to insufficient treatment and misleading results. Therefore, future research should not only account for multiple potentially mediating or moderating variables, but also introduce and examine them concurrently, for example by using mediated moderation analyses.

The consequences of management innovation are complex because many different stakeholders are potentially affected (Birkinshaw et al., 2008). Management innovation could affect the performance dimensions differently, and multiple measures might result in alternative relationships (Walker et al., 2011). In addition to the assessment of the management innovation impact on financial performance, I suggest future research should focus on the examination of its relationship with nonfinancial performance, viewed from different shareholders, e.g. customers, suppliers, and employees (Freeman, 1984; Atkinson, Waterhouse, & Wells, 1997).

Additionally, future research should examine the potential mediating constructs in the connection between management innovation and performance, as well as control for firms' size and industry. There are many more factors that could influence the success of an organization in deploying management innovation, such as collective inclination to risk-taking or an organization's general support for innovation, and they should be examined in future research.

There is still a lot of work to be done in conceptualizing management innovation, explicating its processes, differentiating it from other forms of non-technological innovations, as well as operationalizing it and linking it to antecedents and outcomes empirically. A distinction could be made between management innovation and managerial innovation, two terms that are used as an equivalent in the literature from this field. However, the connotation of management innovation stands for any innovation that could be made by the management, whereas managerial innovation describes the innovative practices of management. Therefore, management innovation might focus on the process (what managers do), whereas managerial innovation depicts an outcome of this process, an innovative practice by the management. However, a further conceptualization is required, and it is based on the content and research evidence rather than solely semantics.

2.9 Conclusion

My research points out the crucial role of knowledge exchange in facilitating management innovation in the organizations, providing a basis for researchers to include this important antecedent in their models, as well as for managers to pay attention to the climate of knowledge exchange in the organizations. In addition, I emphasize the role of specific internal organizational characteristics that are more explicit and tangible in nature, in particular organizational size and IT system development, in translating knowledge exchange into management innovations.

The results of a large data set on firms from three countries indicate that management innovation is in fact more important than technological innovation in influencing firms' financial performance directly, as well as in enabling technological innovation and serving as a mechanism that allows the firms to fully benefit from their technological discoveries. This enthrones management innovation as an essential concept in enhancing firms' performance and could result in a shift of view that presumes the crucial and almost exclusive importance of technological innovation. I hope to stimulate additional research that would further validate the importance of management innovation for the success of companies throughout the world.

Chapter 3: RELATIONSHIP BETWEEN INDIVIDUALISM-COLLECTIVISM AND INNOVATION AT THE ORGANIZATIONAL LEVEL: A MULTILEVEL PERSPECTIVE

This chapter aims to unveil the contradictory previous research findings on the relationship between individualism-collectivism and innovation by examining the role of the national culture dimension in enhancing different innovation types (management, technological) at different stages of the innovation process. In addition, I contribute to strengthening inferences from Chapter 2 by examining the relationship between internal knowledge sources and management innovation. I also investigate the moderating role of individualism-collectivism in this relationship.

Using the Community Innovation Survey 2006 micro data for innovation at the organizational level in 13 countries and Hofstede (1980, 2001), GLOBE (2005) and Schwartz (2006) scores for individualism–collectivism, I choose hierarchical linear modeling (HLM) to explain how this national culture dimension predicts technological innovation at different stages (in the form of propensity to innovate and innovative performance). I also investigate how the individualism-collectivism dimension moderates the relationship between management innovation and technological innovation. The results indicate that individualism is positively connected with the propensity to innovate, most likely because an emphasis on personal freedom allows individuals to think and act creatively. Collectivism, on the other hand, is positively associated with innovative performance, where social interaction and collaboration are more important for the commercialization of innovative ideas. Furthermore, the interaction effects demonstrate that, in collectivistic cultures, management innovation plays a more important stimulating role in enhancing technological innovation than in the individualistic ones.

3.1 Introduction

In the past, innovation was inevitably linked to technological breakthroughs with little attention given to the dynamics of management and other forms of non-technological innovation (Alänge et al., 1998; Birkinshaw et al., 2008; Damanpour & Aravind, 2012). However, such a technological view of innovation only encompassing product and process innovation was criticized for ignoring a number of important non-technological elements of innovative organizational activities (Avlonitis et al., 2001). A broader concept of innovation that includes non-technological innovation is needed. The OECD and Eurostat adopted this view in 2005 by introducing organizational and marketing innovation into the guidelines for collecting and interpreting innovation data (The Oslo Manual) and by incorporating respective questions into Community Innovation Surveys starting from 2005 (Schmidt & Rammer, 2007).

Non-technological or non-technical innovations are antecedents and facilitators of the efficient use of technical product and process innovations as their success depends on the response of organizational structures and processes to the use of new technologies (Armbruster et al., 2008). Technological innovation by itself does not automatically guarantee business or economic success (Teece, 2010). Management innovation is defined as "new approaches in knowledge for performing the work of management and new processes that produce changes in the organization's strategy, structure, administrative processes, and systems" (Damanpour & Aravind, 2012, p. 12). It plays an important role in developing strategies for growth, facilitating employment, social change and renewal, and enabling continuous performance (Edquist et al., 2001).

Firms are nested in nations, and they tend to develop and evolve in ways that are compatible with the surrounding national culture (Sagiv et al., 2010). The innovation process is driven and constrained by not only the demographics of employees, but also its organizational, social, and national contexts (Crossan & Apaydin, 2010). Thus, it is imperative to explore how different forms of innovation in firms are carried out within specific institutional and cultural settings. Contextualizing innovation by investigating how specific national cultural characteristics influence innovation processes is relevant for both managers and researchers because it puts research on innovation into context by pointing out the differences in innovation processes at the organizational level within the influence of country-specific national culture characteristics.

National culture is manifested in the shared values of people in a certain national environment (Hofstede, 1980). It is the set of collective beliefs and values that distinguishes people of one nationality from another in a stable, unchanging manner (Hofstede, 2001). It is related to various aspects of innovation, such as national differences in invention and innovation rates (Shane, 1993), cross-national product innovation diffusion (Dwyer et al., 2005), R&D activity and productivity (Couto & Vieira, 2004), and entrepreneurial technology alliance formation (Steensma et al., 2000). Cultural differences, a "soft" factor at the national level, may not only account for cross-national variations in innovation, but also influence the relationship between different types of innovations, because cultural differences affect innovation input, process, and output (Rosenbusch et al., 2011).

Three of the most commonly used independent research projects address multiple dimension models for measuring national culture dimensions: Hofstede (1980, 2001), Schwartz (2006), and GLOBE (House et al., 2004). With considerable controversy regarding the rigor and content of the research of three projects, researchers should be aware of the content-wise differences between the scores when making comparisons (see Hofstede, 2006; Javidan, House, Dorfman, Hanges, & De Luque, 2006; Smith, 2006; Hofstede, 2010; Tung & Verbeke, 2010). However, empirical research that used any of the aforementioned data and linked it to innovation produced contradictory results regarding the influence of several dimensions, with the most vivid discrepancy being present in terms of the effect of individualism-collectivism on innovation (e.g. Rosenbusch et al., 2011; Taylor & Wilson, 2012). Therefore, I focus on this dimension of national culture models. In addition to producing the most equivocal results, it is the one dimension that might be most critical in explaining managerial phenomena such as innovation (Shenkar, 2001; Tung & Verbeke, 2010).

Research on individualism-collectivism and innovation has produced three types of results in general: Shane (1993) and Williams and McGuire (2005) propose individualism as a stimulating factor in innovation; Herbig and Miller (1992) pin collectivism as crucial for innovation enhancement; while Taylor and Wilson (2012) indicate that the national culture dimension should be divided into sub-dimensions that play different roles in fostering innovation. Tung and Verbeke (2010) offer an explanation of these contradictory results, stating that they arise in part, because most scholarly pieces take too generic and vague paths rather than examine the studied relationships in sufficient detail.

Previous studies on with the relationship between individualism–collectivism and innovation focused on different influences of various types of individualism–collectivism. I aim to contribute to international management and innovation literature with a closer examination of the role of different collectivism types on different forms of innovation at different stages of the innovation process. I take an output-based approach (cf. Mothe & Thi, 2010) and propose that individualism–collectivism could have different effects on different types of innovation as well as play a different role at different stages of the innovation process. I concentrate on two main stages of technological innovation: the decision to innovate (invention) and innovative performance (success at commercialization of innovations). I also triangulate Hofstede (1980, 2001), Schwartz (2006), and GLOBE (House et al., 2004) scores regarding the individualism–collectivism dimension. This provides further validation of my research, because these national culture data were gathered at different times from different samples using different data gathering approaches.

I also contribute to strengthening inferences from Chapter 2 by examining the relationship between internal knowledge sources and management innovation. The test of similar relationships on a different data set (CIS data on innovation in contrast to primary data used in Chapter 2) provides powerful means of generalization of findings. In addition, I investigate the moderating role of individualism-collectivism in the relationship between internal knowledge sources and management innovation.

3.2 Management innovation and technological innovation

How management innovation stimulates technological breakthroughs is a research topic that has clearly been neglected by previous research (Damanpour & Aravind, 2012). This is not only surprising, but also deficient. In line with the resource-based view (Barney, 1991), management innovations can represent an important source of sustainable competitive advantage (Porter, 1985) owing to their intangible nature, which makes them difficult for competitors to imitate (Alänge et al., 1998). On the other hand, technological innovations are rather easier to imitate due to the simple fact that they usually result in a tangible product.

The dynamics of innovation types should be taken into account and closely examined. Introducing only technological or management innovations is not the best option possible. Therefore, a balanced introduction of both innovation types is necessary (Damanpour & Evan, 1984; Battisti & Stoneman, 2010). Complementary types of innovations would ensure that the organization can use internal and external competencies to cope with environmental change and thus it could be effective over time (Van Den Bosch et al., 1999), which is why research should simultaneously encompass both non-technological and technological innovation types.

Barañano (2003) claims that management techniques (planning, leadership, and the will to innovate) are the most crucial drivers of technological innovation, in addition to management quality, personnel policy, and management style. Read (2000) agrees – he discovered that two most important determinants of technological innovation are management support for innovation and an innovative organizational culture. Despite the proposal that technological innovations by themselves are not sufficient for firm performance and economic growth, the relationship between management and technological innovations have mostly not been empirically investigated in the literature (Sanidas, 2004).

A fairly small body of literature is concerned with the link between management innovation and technological innovation. The research showed that management innovation often triggers technical innovation, but the process of invention and uptake is typically slower (Kimberly & Evanisko, 1981; Damanpour & Evan, 1984). This could be related to content-wise differences between these types of innovations.

Management innovation can play a central role in the process of changing organizations and facilitating organizational adaptation (Walker et al., 2011). Consequently, employees should become more adaptive and flexible, and thus enhance their own innovativeness (Verdu-Jover et al., 2005). Furthermore, innovative managers who serve as role models that implement innovations have proven to stimulate innovativeness in their employees (de Jong & Den Hartog, 2007). Management innovation has a crucial role in enhancing flexibility and creativity, which in turn facilitates the development of technological innovations (Mothe & Thi, 2010).

> *Hypothesis 1a. Management innovation is positively related to the firms' propensity to innovate.*

To sustain competitive advantage, continuous innovation – the introduction of streams of different innovation types over time – is crucial (Damanpour et al., 2009). Whether or not diverse forms of innovation in an organization are capable of producing positive results depends on the management. New management ideas for modifying and improving the structure and processes that enable strategic renewal and organizational change need to be employed (Damanpour & Aravind, 2012). Firms should organize the innovation process diversely by combining technological capabilities with skills in marketing and management, as well as with organizational competencies (Mothe & Thi, 2010). Firms that implement a combination of management and technological skills tend to introduce more innovation (Lokshin et al., 2009). Understanding and implementing both the non-technological and technological aspects of innovation is necessary to achieve better innovative performance. I therefore hypothesize:

Hypothesis 1b. Management innovation is positively related to firms' innovative performance.

3.3 Individualism–collectivism and innovation

Different models trying to map out differences in national cultures have been established, many of which turn to dimensions, or specific traits of culture, in order to point out different systems of cultural attitudes and behavior. The three most commonly used models of national culture dimensions (Hofstede, 1980; House et al., 2004; Schwartz, 2006) have different views on individualism–collectivism, a national culture dimension that might be the most critical in explaining innovation (Shenkar, 2001; Tung & Verbeke, 2010).

According to Hofstede (1980), an individualistic culture is characterized by loose ties between individual members – individuals being the smallest unit of society – and the superiority of independence and personal achievement to collective interests (Hofstede, 2001). In an individualist culture, people emphasize task achievement and the realization of personal values, even at the expense of interpersonal relationships (Kim, Triandis, Kagitcibasi, Choi, & Yoon, 1994). On the contrary, a collectivist national culture is composed of strong and cohesive groups of people (Hofstede, 1980). In such a cultural context, the smallest unit of society is the family, and collective interests prevail over individual benefits and values (Hofstede, 2001). In addition, a collectivist culture accentuates interdependence and building amicable relationships between individuals, sometimes even at the expense of task achievement (Kim et al., 1994).

Schwartz (2006) created three values at the country level parallel to individualism/collectivism. Autonomy, mirroring individualism, denotes an inclination to promote and protect the individuals' pursuit of their own ideas and intellectual direction. Schwartz (1994) even denotes this inclination as curious broadminded creativity. However, it cannot be understood as completely in line with individualism. Although it may be seen as a part of individualism, selfishness is not inherent to autonomy (Schwartz, 1990). Schwartz (2006) actually created two indices of autonomy – intellectual autonomy measures the degree to which a society encourages individuals to pursue their own ideas and intellectual directions independently, whereas affective autonomy measures the degree to which a society encourages individuals to pursue affectively positive experience for themselves, such as pleasure, excitement, or variation (Schwartz, 2006).

Embeddedness, Schwartz' (2006) value that is most parallel to collectivism, denotes an inclination to identify with a group and its goals, and maintain group traditions and solidarity. It has even been dubbed as conservatism, because it includes restraint of potentially disruptive actions. Embeddedness thus stands for the act of opposing openness to change while maintaining status quo (Schwartz, 2006).

The GLOBE study (House et al., 2004) produced two useful cultural measures for my tests, both centering on the opposite of individualism: collectivism. It divides collectivism into two dimensions. In-group collectivism measures pride and loyalty to small groups such as family or organization. It can be interpreted as familism or localism (Taylor & Wilson, 2012). Institutional collectivism measures collectivism in society as a whole. This dimension represents the degree to which organizational and societal institutional practices encourage and reward the collective distribution of resources and collective action (House et al., 2004). It can be interpreted more broadly as patriotism or nationalism (Taylor & Wilson, 2012).

The contrast between individualism and collectivism has been extensively studied to explain creativity and innovation (Eisenberg, 1999). Cultural conditions determine whether, when, how, and in which form a new innovation will be adopted (Herbig & Day, 1993; Herbig & Dunphy, 1998). Cross-country variation in innovation is present because of not only economic conditions, but also the prevailing social conditions that denote the extent to which individuals are inclined to collaborate with each other. However, the research examination of the relationship between individualism-collectivism and innovation has produced mixed results (e.g. Rosenbusch et al., 2011; Taylor & Wilson, 2012).

The invention or adoption of something new can be contrary to the prevailing group norm, and that is why countries with a strong emphasis on collectivism are normally expected to achieve a lower degree of innovation. On the other hand, individuals in individualistic countries feel free to express their own views and are generally more self-reliant and freethinking, and therefore more inclined to innovate and adopt new ideas. Such freedom to think and act independently is expected to nurture creativity, and make firms more innovative (Erumban & de Jong, 2006).

Innovation initiation or the process of invention, as opposed to commercialization, is often seen as the act of an individual (Williams & McGuire, 2005): the initial ideas emerge in the head of an individual. Others can subsequently be supportive of them or not. Individualistic cultures value freedom more than collectivistic cultures (Herbig & Dunphy, 1998; Waarts & Van Everdingen, 2005). Hence, in individualistic societies, employees have more opportunities to try something new, which reflects in firms’ innovation initiation.

Individuals in individualistic societies are more likely to be recognized, praised, and rewarded for inventive and useful ideas than in collectivistic societies. Furthermore, there is less loyalty to the organization in individualistic societies (Herbig & Dunphy, 1998; Shane, 1993), which promotes external information exchange that is beneficial for innovation. People in individualistic cultures are motivated by personal goals, whereas people in collectivist cultures try to subordinate personal goals to those of the group that they are part of. The level of individualism determines behaviors such as social interactions and psychological needs, for example achievement motivation (Hofstede, 1980), which are in turn related to individual, group, and firm-level innovation.

Individualism can be beneficial for the success of innovation activities. At the invention stage, firms can benefit from highly individualistic managers and employees. Individualism fosters creativity, independence, and autonomy (Jones & Davis, 2000) – characteristics that are beneficial for the invention processes (Van de Ven, 1986; Ramamoorthy, Flood, Slattery, & Sardessai, 2005). Furthermore, individualism can facilitate new product development through product championing (Nakata & Sivakumar, 1996), which involves employees' persuasive activity in promoting and implementing their novel ideas. Thus, empirical evidence that demonstrates the positive effect of individualism on innovation (Shane, 1993; Williams & McGuire, 2005) does not come as a surprise.

Individualistic societies may be more suitable for innovation because they provide a more tolerant environment for potential innovators to perform in. In addition, they offer more social incentives for individuals to do so (Taylor & Wilson, 2012). Societies that rank high on individualism are highly inventive (Shane, 1993). These societies believe in the efficacy of individual effort and are therefore more likely to reward innovators with financial compensation. Moreover, the emphasis on personal freedom allows individuals to think and act creatively, as well as to discover for themselves what works and what does not. This has positive implications for stakeholders at all stages of the innovation process, including scientists, entrepreneurs, investors, and customers (Taylor & Wilson, 2012). On the other hand, in predominantly collectivistic societies, individual effort and expression of creativity that is reflected in firms' innovation initiation is not emphasized. I therefore hypothesize:

Hypothesis 2. Individualism is positively related to the firms' propensity to innovate.

By contrast, several studies propose a positive impact of collectivism on various forms of innovation (Rosenbusch et al., 2011). Individualism at the organizational level can be beneficial, but in some cases also detrimental to the success of innovation activities. Nakata and Sivakumar (1996) argue that whereas individualism facilitates new product development at the invention stage (Ramamoorthy et al., 2005), it may be detrimental to the implementation of an innovation once the new product or service needs to be brought to market. In an attempt to successfully commercialize their innovations, employees of firms need to interact with each other and with outsiders such as customers, suppliers, and other stakeholders (Van de Ven, 1986). Collectivism fosters social interactions and cooperative team behavior (Eby & Dobbins, 1997), and it should therefore be beneficial during the commercialization stage.

Collectivism can facilitate incremental innovations such as improvements to established products (Herbig & Miller, 1992), because these processes require communication and collaboration in the firm, as well as the interaction with key suppliers and customers. Individualism might be especially detrimental for companies as it can weaken teamwork. However, teamwork is needed with regard to special challenges, resistances, and extra efforts that innovation projects involve (e.g. Edmondson & Nembhard, 2009).

Taylor and Wilson (2012) discovered that most measures of individualism have a strong, significant, and positive effect on innovation. However, a certain type of collectivism (i.e. patriotism and nationalism – equivalent to GLOBE's institutional collectivism) can also foster innovation. Such cultures produce a social environment in which both innovators and those bearing the costs of change are more willing to mutually overcome the barriers of innovation for the benefit of their societies than individualistic ones.

Meanwhile, other types of collectivism (i.e. familism and localism – equivalent to GLOBE's in-group collectivism) harm innovation and may impede progress (Taylor & Wilson, 2012). Taylor and Wilson (2011) suggest that these cultures emphasize loyalty to family, friends, and one's immediate social circle, and they might thus foster opposition to technological change or science funding, which threatens local interests. Their findings imply that businesses and innovation scholars should avoid stereotyping all collectivist cultures as anti-innovation. Based on this evidence, a closer examination of the role of different types of collectivism on different forms of innovations and at various stages of the innovation process is necessary. Reward systems that foster innovation in one cultural context may fail to do so in another (Taylor & Wilson, 2012), and be successful at one stage of the innovation process, but detrimental at another.

It is true that innovative orientation is more likely to occur in individualistic cultures and less likely in collectivistic cultures (Mueller & Thomas, 2001). However, several societies that rank low on individualism (e.g. Taiwan, South Korea, Finland, India) have since become globally competitive high-technology innovators (Taylor & Wilson, 2012). The more a society is collectivist, the more organization members engage in cross-functional teamwork to foster innovation effort (Shane, Venkataraman, & MacMillan, 1995). Support and collaboration, a degree to which people from a group actively support and help each other in work, indicated to be positively associated with innovativeness (Hurley, 1995). This might be especially true for the commercialization stage of the innovation process, thus improving firms' innovative performance. Therefore:

Hypothesis 3. Collectivism is positively related to firms' innovative performance.

The process of innovation consists of different types of innovations, with non-technological forms, such as management innovation, facilitating and supporting technological breakthroughs. National culture and particularly the inclination towards collectivism might play an important role in stimulating the knowledge exchange that enables management innovations to serve as a support system for technological innovations.

Innovation is a social construct that depends on collaboration and information sharing as well as on combining diverse knowledge to come up with novel ideas that get implemented (Hage & Hollingsworth, 2000; Taylor & Greve, 2006; Liao et al., 2007). Knowledge and capabilities-based views have largely extended resource-based reasoning by suggesting that knowledge is the primary resource underlying new value creation, heterogeneity, and competitive advantage (Barney, 1991; Grant, 1996; Kogut & Zander, 2003). Knowledge exchange and collaboration can have a positive influence on any kind of innovation (Vaccaro et al., 2010). This might be particularly true for the "soft" aspects of innovation, as they are even more rooted in information exchange and communication than the technological ones (Mothe & Thi, 2010).

A significant proportion of the knowledge needed to carry out innovation processes is distributed among multiple individuals in an organization, which is why they must collaborate across functional and hierarchical boundaries (Thomas-Hunt et al., 2003). The exchange of knowledge and information is thus necessary. Firms have opportunities for higher innovation capabilities when they are able to expand, disseminate, and exploit organizational knowledge internally, as well as share, transfer, and receive knowledge from external partners (Mothe & Thi, 2010). Members of an organization need the ability to recognize and incorporate relevant knowledge from other members. This is how non-technological management solutions become available to all members, which enables firms to support future technological breakthroughs. Such occurrence is more likely to foster firms' inclinations towards innovation and actual innovative performance in cultures that value collectivism.

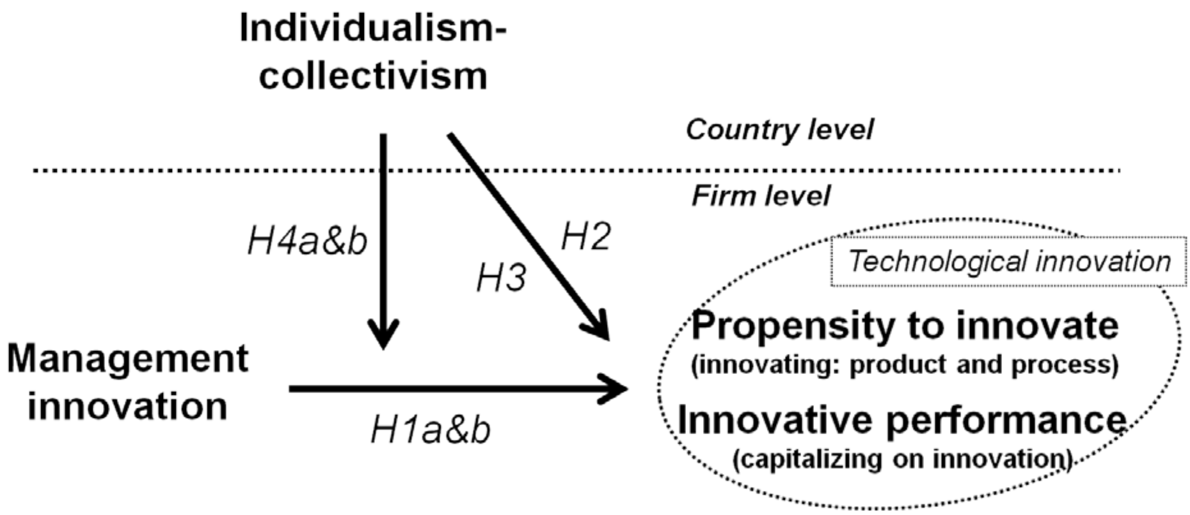
Michailova and Hutchings (2006) propose that collectivism leads to solidarity and frequent information exchanges among organizational members, which in turn leads to intensive knowledge sharing (especially within groups). Intensive interpersonal relationships facilitate the transfer of knowledge in organizations (Nonaka & Takeuchi, 1995). However, organizational members in an individualistic culture are less likely to engage in collective information exchange (Škerlavaj et al., 2010b), and thus diminish the possibility of the exchange of creative ideas.

A collectivistic culture supports and enhances individuals' tendencies to make changes based on their interpretations of the information acquired from the organizational context (Černe et al., 2012). The relationships formed among employees in a more collectivistic organization are more likely to be based on preference and concerns for in-group actions, thereby increasing the likelihood of employees' innovative behaviors. By contrast, organizational members in an individualistic culture tend to pay less attention to the shared context of information interpretation, and they are less motivated and capable of converting knowledge and non-technological solutions into technological innovations. Thus:

> *Hypothesis 4. The relationship between management innovation and the firms' (a) propensity to innovate and (b) innovative performance is moderated by collectivism. In countries with high levels of collectivism, the relationship is generally stronger and more positive than in countries with low levels of collectivism.*

I portray the research model pertaining to the hypotheses in Figure 3.1.

Figure 3.1: Research model pertaining to the hypotheses



3.4 Internal knowledge sources and management innovation – generalizing and contextualizing findings from Chapter 2

I reexamine the relationship between internal knowledge sources and management innovation. Test of similar relationships on a different data set (CIS data on innovation in contrast to primary data used in Chapter 2) provides a basis for generalization of findings. The difference is that I use an equivalent construct to internal knowledge exchange, operationalized by CIS as the use of internal knowledge sources. Thus, Hypothesis 5 is analogous to the examination of the relationship between internal knowledge exchange and management innovation (Chapter 2):

> *Hypothesis 5. The use of internal knowledge sources is positively related to management innovation.*

A large amount of knowledge needed to carry out management innovations is distributed across multiple knowledge sources within an organization, which is why they must be connected across functional and hierarchical boundaries (Thomas-Hunt et al., 2003). An exchange of knowledge and information is thus necessary to enhance management innovation. Collectivism leads to solidarity and frequent information exchanges among organizational members (Michailova & Hutchings, 2006), which in turn increases the possibility of the exchange of creative ideas and intensifies the effects of internal knowledge sources on management innovations.

A collectivistic culture supports and enhances managers' tendencies to make changes based on their interpretations of the information acquired from the organizational context (Černe et al., 2012). In such cultures, it is thus more likely that managers would be able to combine knowledge from various knowledge sources, and innovate. By contrast, managers in an individualistic culture tend to pay less attention to the shared context of information interpretation, and they are less motivated and capable of converting knowledge from internal knowledge sources to non-technological breakthroughs.

Firms have opportunities for higher innovation capabilities when they are able to expand, disseminate, and exploit organizational knowledge internally (Mothe & Thi, 2010). The establishment of dense networks of ties is needed to assimilate, transform, and exploit knowledge (Jansen et al., 2005). This is most likely to occur more efficiently in collectivistic contexts than in the individualistic ones. Internal organizational networks for managing creativity and innovation are more likely to be formed, taking the ideas developed in one area and applying them in another (Haragdon, 2008), which results in management innovations.

Hypothesis 6. Collectivism moderates the relationship between internal knowledge sources and management innovation. In countries with high collectivism, the relationship between internal knowledge sources and management innovation is generally stronger and more positive than in countries with low collectivism.

3.5 Methods

3.5.1 Measures

Community Innovation Survey 2006 micro data (company level) were used for the innovation and control measures. Anonymized data were available and obtained centrally via Eurostat for the following countries: Bulgaria, Cyprus, Czech Republic, Estonia, Ireland, Lithuania, Norway, Portugal, Romania, Slovakia, Slovenia, and Spain. In an attempt to obtain data from as many countries as possible, I wrote an e-mail to all statistical offices in the world in countries that carry out company-level innovation research in compliance with Oslo Manual guidelines. I received one additional dataset from a Chilean innovation survey 2005–2006. Overall, I used data on 90,646 companies. However, this number varies in different models (Tables 3.1–3.5) because data on management innovation are missing or are confidential in some countries, and national culture scores from all projects were not available for all countries.

Management innovation. I used the same approach as Mol and Birkinshaw (2009). Management innovation is a composite measure equal to 1 if the firm introduced at least one of these three management innovations in the period 2004–2006: new or significantly improved knowledge management systems; a major change to the organization of work within the firm; or new and significant changes in relation with other firms or public institutions.

Organizational size is calculated as the logarithm of the number of employees in 2006, since the distribution of firms tends to be highly skewed. The *industry* control variable was generated using NACE international standard codes. *Geographic scope* identifies the firm's largest market as local (0), regional (1), national (2), or international (3). *Innovation inhibitors* present the count variable that measures the number of factors inhibiting a firm’s ability to innovate. Respondents were asked to rate the importance of the listed constraints (e.g. self-reported “lack of quality personnel” or “lack of funds within our enterprise or group”) during the period 2004–2006. They were asked to specify “no effect” or “low”, “medium”, or “high” for each item. The number of cases where the respondent gave a positive response is summed, resulting in a measure varying from 0 to 33. The introduction of new management practices is one plausible way of overcoming the obstacles that hinder innovation (Mol & Birkinshaw, 2009). *In-house R&D* is calculated as a sum of expenditures for in-house R&D in 2006 divided by total turnover in 2006.

Marketing innovation was also used as a control variable. It is a composite variable made of two dummy variables. It is equal to 1 if firms introduced at least one of the following two marketing innovations: significant changes to the design or packaging of goods or services; or new or significantly changed sales or distribution methods.

Individualism–collectivism scores were used from three independent research projects measuring national culture dimensions: Hofstede (1980, 2001), Schwartz (2006), and GLOBE (House et al., 2004). First, I used the individualism score from Hofstede (1980, 2001). To triangulate the different data, the national culture scores from GLOBE (House et al., 2004) and Schwartz (2006) were taken into account. I also used the institutional and in-group collectivism scores describing values from the GLOBE study. GLOBE also offers scores describing practices. It might be relevant to employ the practice values for in-group collectivism that were also well correlated with Hofstede's scores (House et al., 2004), as respondents were asked to evaluate others in society (referent shift) to obtain these scores. This usually results in them talking about their own practices, in particular taking the actual situation as their norm (Hofstede, 2010). These are family-related issues (Brewer & Venaik, 2011) that are well-known to respondents. Nevertheless, I decided to choose only one sort of measure if I can claim to study the same type of dimension (Taras, Steel, & Kirkman, 2010).

In terms of Schwartz's (2006) national culture values, affective and intellectual autonomy and embeddedness were used because they are most closely related to individualism and collectivism, respectively (Schwartz, 2006). However, not all data from all countries were available in three research projects.

I controlled for *uncertainty avoidance* in all models examining the influence of the national culture dimensions. Uncertainty avoidance is a national culture dimension that deals with tolerance for uncertainty and ambiguity (House et al., 2004), which are characteristic for innovation processes. It was previously related to innovation championing (Shane, 1995) and national rates of innovation (Shane, 1993). I used Hofstede's uncertainty avoidance scores in models examining Hofstede's individualism–collectivism and GLOBE's uncertainty avoidance scores in models examining GLOBE's individualism–collectivism and Schwartz's autonomy and embeddedness.

The *propensity to innovate* is a composite binary variable made for two other variables, technological product and process innovations. It is equal to 1 if the firm introduced new or significantly improved products and/or services, or new or significantly improved processes for producing or supplying products during 2004–2006, otherwise it is 0. I follow the approach of previous studies that conceptualized this variable using CIS data (cf. Veugelers & Cassiman, 2004; Mothe & Thi, 2010) to describe firms' inclinations to innovate during the initial stage of the innovation process. As the dependent variable (propensity to innovate) is a dummy, I used a binary outcome model following the Bernoulli distribution. *Innovative performance* is expressed as the percentage of total turnover in 2006 from goods and service innovations introduced from 2004 to 2006 that were new to the firm.

Internal knowledge sources were measured with a similar approach that Mol and Birkinshaw (2009) used. The question opens with a statement: "During the three years (from 2004 to 2006), how important to your enterprise's innovation activities were each of the following information sources?" *Internal* - within your enterprise or enterprise group (response options: low, medium, high, or not used); *external (market) sources* - suppliers of equipment, materials, components, or software, clients or customers, competitors or other enterprises in your sector, and consultants, commercial labs, or private R&D institutes; *institutional sources* - universities or other higher education institutions and government or public research institutes.

Technology alliances are more formalized means of cooperation with other firms. *Alliances* with other firms present a dummy variable with the value of 1 if the company has any cooperation arrangements with other enterprises or institutions. *Public support* is a variable measuring whether firms received any public financial support for innovation activities from the following levels of government: local or regional authorities, central government (including central government agencies or ministries), or the European Union (EU).

3.5.2 Multilevel analysis results

The dataset consisted of two hierarchically nested levels: 90,646 firms (level 1) nested in 13 countries (level 2). To test my hypotheses, I used hierarchical linear modeling (with HLM 7.0) to develop a set of multilevel models based on theoretical predictions using the incremental improvement procedure demonstrated by Hox (2010). In the construction of these models, all variables were grand mean-centered. The fixed effects with robust standard errors for all models are presented in Table 3.1 and Table 3.3. I started with the intercept-only model with propensity to innovate as the dependent variable (Model 1).

First, I added management innovation as a level-1 predictor of the propensity to innovate. To try to address the issue of endogeneity, I added marketing and process innovation as controls in addition to other control variables that were tested in each model (see Table 3.1). The results show that management innovation positively and significantly predicts the propensity to innovate (Model 2: $\gamma = .14$, SE = .04, $p < .01$), even when controlling for marketing innovation, which was also positively related to the propensity to innovate. Thus, my findings support Hypothesis 1a. The propensity to innovate is a binomial variable, and hence Bernoulli distribution was used. In terms of assessing overall model fit, I thus report Laplace deviance estimations for all models.

To test the cross-level effects of individualism/collectivism on propensity to innovate, I added the scores regarding this dimension that I obtained from three research projects to Model 2 (Models 3a to 3c). Individualism (Hofstede) indicated to be positively related to the propensity to innovate (Model 3a: $\gamma = .01$, SE = .00, $p < .01$). Both institutional and in-group collectivisms (GLOBE) were found to be negatively related to the propensity to innovate (Model 3b: $\gamma = -.03$, SE = .01, $p < .05$ and $\gamma = -.09$, SE = .04, $p < .05$, respectively). Schwartz's intellectual and affective autonomy dimension were positively linked with the propensity to innovate (Model 3c: $\gamma = .03$, SE = .01, $p < .05$ and $\gamma = .12$, SE = .05, $p < .01$, respectively). Embeddedness, on the other hand, was negatively related to the propensity to innovate (Model 3c: $\gamma = -.09$, SE = .04, $p < .05$). Thus, I found support for Hypothesis 2.

Table 3.1: Multilevel analysis results for the propensity to innovate as the dependent variable

	Model 1	Model 2	Model 3a	Model 3b	Model 3c	Model 4a	Model 4b	Model 4c
Level 1								
Intercept	-1.08** (.14)	-1.57** (.13)	-1.51** (.14)	-1.56** (.14)	-1.50** (.14)	-1.91** (.11)	-1.94** (.11)	-1.87** (.11)
Organizational size		.01 (00).	.03 (.02)	.03 (.02)	.01 (.02)	.01 (.03)	.01 (.03)	.06 (.03)
In-house R&D		.04** (.01)	02** (.00)	02** (.00)	02** (.00)	02** (.00)	02** (.00)	02** (.00)
Industry		.04 (.03)	.03 (.03)	.03 (.03)	.03 (.03)	.03 (.02)	.03 (.03)	.03 (.03)
Geographic scope		.28** (.03)	.43** (.01)	.48** (.02)	.42** (.02)	.26** (.03)	.26** (.03)	.31** (.03)
Innovation inhibitors		.12** (.00)	.12** (.02)	.12** (.02)	.11** (.02)	.12** (.02)	.11** (.02)	.11** (.02)
Management innovation		.14** (.04)				.17** (.07)	.15** (.07)	.10** (.03)
Marketing innovation		.13** (.04)				.21** (.05)	.20** (.05)	.19** (.04)
Level 2								
Uncertainty avoidance			.05* (.02)	.06* (.02)	.07* (.02)	.05* (.02)	.05* (.02)	.05* (.03)
Individualism (Hofstede)			.01** (.00)			-.02** (.00)		
Institutional collectivism (GLOBE)				-.03* (.01)			-.02** (.01)	
In-group collectivism (GLOBE)				-.09* (.04)			-.09** (.04)	
Intellectual autonomy (Schwartz)					.03* (.01)			.02* (.01)
Affective autonomy (Schwartz)					.12** (.05)			.07** (.01)
Embeddedness (Schwartz)					-.09* (.04)			-.08** (.01)
Laplace deviance estimation		231228.41	90643.54	106243.3	93232.50	198455.23	211002.32	198232.32
Observations	90646	19660	63553	53300	66439	19660	16306	20119

Notes. The entries are the estimates of the fixed effects with robust standard errors. **p<.01, *p<.05, †p<.1. The number of observations differs between the models. Data on management and marketing innovation were missing or are confidential in some countries. The national culture scores for all countries included in the research are not available in all three research projects.

Models 4a–4c (Table 3.1 and Table 3.2) deal with the cross-level interaction effects of individualism/collectivism scores and management innovation on the firms' propensity to innovate. The results indicated that the interaction effect of individualism (Hofstede) and management innovation was significant (Model 4a: γ = -.01, SE = .00, $p < .01$). The interaction effect of institutional collectivism (GLOBE) and management innovation was also significant (Model 4b: γ = .01, SE = .00, $p < .01$), and the same applies to the interaction effect of in-group collectivism (GLOBE) and management innovation (Model 4b: γ = .04, SE = .00, $p < .01$). The interaction effect of affective autonomy (Schwartz) and management innovation was positive and significant (Model 4c: γ = -.08, SE = .01, $p < .01$), just as the interaction effect of intellectual autonomy (Schwartz) and management innovation was (Model 4c: γ = -.03, SE = .01, $p < .05$). The cross-level interaction effect of embeddedness (Schwartz) and management innovation was also positive and significant (Model 4c: γ = .04, SE = .01, $p < .01$).

Table 3.2: Interaction effects between management innovation and national culture scores on the propensity to innovate

Interaction effects	Model 4a	Model 4b	Model 4c
Management innovation x Individualism (Hofstede)	-.01** (00)		
Management innovation x Institutional collectivism (GLOBE)		.01** (.00)	
Management innovation x In-group collectivism (GLOBE)		.04** (.01)	
Management innovation x Intellectual autonomy (Schwartz)			-.03* (.01)
Management innovation x Affective autonomy (Schwartz)			-.08** (.01)
Management innovation x Embeddedness (Schwartz)			.04** (.02)
Laplace deviance estimation	198455.23	211002.32	198232.32
Observations	19660	16306	20119

Notes. The entries are the estimations of the interaction effects with robust standard errors. **p<.01, *p<.05, †p<.1.

The following set of models investigated innovative performance as the dependent variable (Table 3.3). For multilevel model estimation, I report Snijders and Bosker's (1999) overall pseudo R^2 for each model. I also report deviance estimations for all models indicating overall model fit. As in previous models, I first added management innovation as a level-1 predictor of innovative performance. The results indicated that management innovation was positively and significantly related to innovative performance (Model 2: γ = .04, SE = .00, $p < .01$). Thus, my findings support Hypothesis 1b. To test the cross-level effects of individualism/collectivism on innovative performance, I added the scores regarding this dimension obtained from three research projects to Model 2 (Models 3a to 3c). Individualism (Hofstede) was not significantly related to innovative performance (Model 3a: γ = -.00, SE = .00, *ns*). Institutional collectivism (GLOBE) was found to be positively related to innovative performance (Model 3b: γ = .03, SE = .00, *p < .01*), and in-group collectivism (GLOBE) was also positively related to innovative performance (Model 3d: γ = .01, SE = .00, *p < .05*). Schwartz's intellectual and affective autonomy were negatively related to innovative performance (Model 3c: γ = -.01, SE = .00, *p < .05* and γ = -.02, SE = .00, *p < .01*, respectively) in contrast to embeddedness dimension, which was positively related to innovative performance (Model 3c: γ = .05, SE = .01, *p < .01*). Thus, I found support for Hypothesis 3.

Table 3.3: Multilevel analysis results for innovative performance as the dependent variable

	Model 1	Model 2	Model 3a	Model 3b	Model 3c	Model 4a	Model 4b	Model 4c
Level 1								
Intercept	.096** (.00)	.078** (.02)	0.159** (.04)	.098** (.02)	.122** (.02)	0.156** (.04)	.078** (.02)	.112** (.02)
Organizational size		.01 (.00)	.01 (.00)	.01 (.00)	.01 (.00)	.01 (.00)	.01 (.00)	.01 (.00)
In-house R&D		.02** (.00)	.02** (.00)	.02** (.00)	.02** (.00)	.02** (.00)	.02** (.00)	.02** (.00)
Industry		.02 (.01)	.02 (.01)	.02 (.01)	.02 (.01)	.02 (.01)	.02 (.01)	.02 (.01)
Geographic scope		.01** (.00)	01** (.01)	02** (.01)	02** (.01)	02** (.01)	.01** (.00)	.01** (.00)
Innovation inhibitors		.02** (.00)	.01** (.00)	.01** (.00)	.01** (.00)	.01** (.00)	.01** (.00)	.01** (.00)
Management innovation		.04** (.00)				.04** (.00)	.04** (.00)	.04** (.00)
Marketing innovation		.03** (.00)				.02** (.00)	.03** (.01)	.03** (.01)
Level 2								
Uncertainty avoidance			.02* (.02)	.02* (.02)	.02* (.02)	.02* (.02)	.02* (.02)	.02* (.03)
Individualism (Hofstede)			-.00 (.00)			.00 (.00)		
Institutional collectivism (GLOBE)				.03** (.00)			.03** (.00)	
In-group collectivism (GLOBE)				.01* (.00)			.01* (.01)	
Intellectual autonomy (Schwartz)					-.01* (.01)			-.01* (.00)
Affective autonomy (Schwartz)					-.02** (.00)			-.01*(.01)
Embededness (Schwartz)					.05** (.01)			.04** (.00)
Pseudo R^2		.28	.44	.47	.47	.34	.37	.37
Deviance		-9254.23	2578.94	2212.32	2432.11	2593.79	2129.98	2155.62
Observations	90646	19660	63553	53300	66439	16306	20119	19660

Notes. The entries are the estimates of the fixed effects with robust standard errors. **p<.01, *p<.05, †p<.1.

Models 4a–4c (Table 3.3 and Table 3.4) deal with the interaction effects of individualism/collectivism scores and management innovation on firms' innovative performance. The results indicated that the interaction effect of individualism (Hofstede) and management innovation was significant (Model 4a: $\gamma = -.01$, SE = .00, $p < .01$). The interaction effect of institutional collectivism (GLOBE) and management innovation was not significant (Model 4b: $\gamma = -.01$, SE = .00, *ns*) in contrast to the interaction effect of in-group collectivism (GLOBE) and management innovation (Model 4b: $\gamma = .03$, SE = .01, $p < .01$). The interaction effect of both intellectual and affective autonomy (Schwartz) and management innovation was negative and significant (Model 4c: $\gamma = -.01$, SE = .00, $p < .05$ and $\gamma = -.03$, SE = .01, $p < .01$). On the other hand, the interaction effect of embeddedness (Schwartz) and management innovation was positive and significant (Model 4c: $\gamma = .03$, SE = .01, $p < .01$), which supports Hypothesis 4.

Table 3.4: Interaction effects between management innovation and national culture scores on the innovation performance

Interaction effects	Model 4a	Model 4b	Model 4c
Management innovation x Individualism (Hofstede)	-.01** (.00)		
Management innovation x Institutional collectivism (GLOBE)		.01 (.00)	
Management innovation x In-group collectivism (GLOBE)		.03** (.01)	
Management innovation x Intellectual autonomy (Schwartz)			-.01* (.00)
Management innovation x Affective autonomy (Schwartz)			-.03** (.01)
Management innovation x Embeddedness (Schwartz)			.03** (.01)
Pseudo R^2	.34	.37	.37
Deviance	2593.79	2129.98	2155.62
Observations	16306	20119	19660

Notes. The entries are the estimates of the interaction effects with robust standard errors. **p<.01, *p<.05, †p<.1.

In another series of models, I examined the relationship between internal knowledge sources and management innovation, and the moderating role of individualism-collectivism in this relationship (Table 3.5). The results indicated that the use of internal knowledge sources was positively and significantly related to management innovation (Model 2: $\gamma = .24$, SE = .05, $p < .01$). Thus, my findings support Hypothesis 5. To examine the cross-level effects of individualism/collectivism on management innovation, I added the scores regarding this dimension obtained fromthree research projects to Model 2 (Models 3a–3c). Individualism

(Hofstede) was negatively related to management innovation (Model 3a: $\gamma = -.04$, SE = .02, *ns*). Institutional collectivism (GLOBE) was not significantly related to innovative performance (Model 3b: $\gamma = .01$, SE = .01, *ns*), whereas in-group collectivism (GLOBE) was positively related to innovative performance (Model 3d: $\gamma = .05$, SE = .02, $p < .05$). Schwartz's intellectual and affective autonomy were negatively related to innovative performance (Model 3c: $\gamma = -.01$, SE = .01, *ns* and $\gamma = -.04$, SE = .02, $p < .05$, respectively) in contrast to embeddedness dimension, which was positively linked to innovative performance (Model 3c: $\gamma = .06$, SE = .02, $p < .05$).

Models 4a–4c (Table 3.5) deal with the interaction effects of individualism/collectivism and the use of internal knowledge sources on firms' management innovation. The results indicated that the interaction effect of individualism (Hofstede) and internal knowledge sources was significant (Model 4a: $\gamma = -.03$, SE = .01, $p < .05$). The interaction effect of institutional collectivism (GLOBE) and internal knowledge sources was not significant (Model 4b: $\gamma = .00$, SE = .00, *ns*), in contrast to the interaction effect of in-group collectivism (GLOBE) and internal knowledge sources (Model 4b: $\gamma = .03$, SE = .01, $p < .01$). The interaction effect of both intellectual and affective autonomy (Schwartz) and management innovation was not significant (Model 4c: $\gamma = .00$, SE = .00, *ns* and $\gamma = -.02$, SE = .01, *ns*). The interaction effect of embeddedness (Schwartz) and management innovation, on the other hand, was positive and significant (Model 4c: $\gamma = .04$, SE = .01, $p < .05$), which partially supports Hypothesis 6.

Table 3.5: Multilevel analysis results for management innovation as the dependent variable

	Model 1	Model 2	Model 3a	Model 3b	Model 3c	Model 4a	Model 4b	Model 4c
Level 1								
Intercept	-0.26** (.06)	-0.86** (.03)	-0.84** (.03)	-0.82** (.03)	-0.83** (.03)	-0.84** (.03)	-0.82** (.03)	-0.83** (.03)
Geographic scope		.12** (.03)	.11** (.03)	.10** (.03)	.11** (.03)	.11** (.03)	.10** (.03)	.11** (.03)
Industry		.05 (.04)	.07 (.06)	.05 (.05)	.06 (.04)	.06 (.04)	.05 (.04)	.06 (.04)
Organizational size		.15** (.05)	.14** (.04)	.16** (.05)	.17** (.05)	.15** (.05)	.15** (.05)	.17** (.05)
In-house R&D		.07* (.05)	.09* (.05)	.06* (.05)	.08* (.05)	.07* (.05)	.06* (.05)	.07* (.05)
Product innovation		.26** (.08)	.30** (.09)	.27** (.10)	.28** (.08)	.30** (.08)	.28** (.08)	.28** (.08)
Process innovation		.20** (.06)	.23** (.06)	.21** (.06)	.18** (.06)	.23** (.06)	.22** (.06)	.19** (.06)
Alliances		-.01 (.03)	-.02 (.03)	-.02 (.03)	-.03 (.03)	-.02 (.02)	-.01 (.02)	-.03 (.03)
Public support		.00 (.02)	.01 (.01)	.00 (.01)	.01 (.01)	.00 (.02)	.00 (.01)	.01 (.01)
Institutional sources		.09** (.03)	.07** (.03)	.06** (.03)	.07** (.02)	.06** (.03)	.06** (.03)	.09** (.03)
Innovation inhibitors		.05** (.01)	.04** (.01)	.06** (.02)	.05** (.01)	.05** (.01)	.06** (.02)	.05** (.01)
External knowledge sources		.31** (.05)	.29** (.06)	.30** (.07)	.32** (.05)	.31** (.05)	.31** (.07)	.33** (.05)
Internal knowledge sources		.24** (.05)	.20** (.05)	.20** (.05)	.22** (.06)	.24** (.05)	.24** (.05)	.23** (.06)
Level 2								
Individualism (Hofstede)			-.04* (.02)			-.02* (.01)		
Institutional collectivism (GLOBE)				.01 (.01)			.01 (.01)	
In-group collectivism (GLOBE)				.05* (.02)			.04* (.01)	
Intellectual autonomy (Schwartz)					-.01 (.01)			-.00 (.01)
Affective autonomy (Schwartz)					-.04* (.02)			-.03* (.01)
Embeddedness (Schwartz)					.06* (.02)			.06* (.01)
Interaction effects								
Internal knowledge sources x Individualism (Hofstede)						-.03* (.01)		
Internal knowledge sources x Institutional collectivism (GLOBE)							.00 (.00)	
Internal knowledge sources x In-group collectivism (GLOBE)							.03* (.01)	
Internal knowledge sources x Intellectual autonomy (Schwartz)								.00 (.00)
Internal knowledge sources x Affective autonomy (Schwartz)								-.02 (.01)
Internal knowledge sources x Embeddedness (Schwartz)								.04* (.01)
Laplace deviance estimation		103565.17	95432.98	99566.11	91352.23	94543.76	98664.54	92003.32
Observations	20119	20119	19660	16306	20119	19660	16306	20119

Notes. The entries are the estimates of the fixed effects with robust standard errors. ***p<.01, **p<.05, *p<.1.

3.6 Discussion

Innovation in organizations occurs within specific institutional and cultural settings. Contextualizing innovation by investigating how specific national cultural characteristics influence innovation processes is relevant for both managers and researchers. Such an approach puts the research on innovation in context by pointing out the differences in innovation processes at the organizational level under the influence of country-specific national culture characteristics.

Individualism–collectivism is a national culture dimension that is the most critical to explain and understand managerial phenomena such as innovation (Shenkar, 2001; Tung & Verbeke, 2010). Therefore, it is important to clarify previously contrasting results (e.g. Shane et al., 1995; Taylor & Wilson, 2012) in order to better understand the conditions influencing the link between individualism and collectivism at the country level, and innovation at the organizational level.

My study was based on micro data on firm-level innovation from 13 countries and national culture data from three independent projects aiming to measure individualism–collectivism (GLOBE, Hofstede, and Schwartz). Taking an output-based approach (cf. Mothe & Thi, 2010), I found support for the positive role of individualism during the initial stage of innovation (the decision to innovate in the form of the introduction of new products and processes). This is indicated by the positive association between Hofstede's individualism or Schwartz's autonomy and the firms' propensity to innovate. Individualistic cultures value freedom more than collectivistic cultures (Herbig & Dunphy, 1998; Waarts & Van Everdingen, 2005). Hence, in individualistic societies, employees have more opportunities to try something new. This finding is coherent with the pro-individualism view (e.g. Shane, 1993; Williams & McGuire, 2005) in terms of stimulating innovation.

By contrast, several studies proposed a positive impact of collectivism on various forms of innovation (Rosenbusch et al., 2011). My findings support and provide further explanation to such claims in terms of the positive role of collectivism at the final commercialization stage of innovation. The results indicate a positive association between GLOBE's collectivism dimensions or Schwartz's embeddedness and firms' innovative performance. Collectivism fosters social interactions and cooperative team behavior (Eby & Dobbins, 1997), and is therefore beneficial for innovation during the commercialization stage. If firms are to successfully commercialize their innovations, they need to interact with key stakeholders, such as customers and suppliers (Van de Ven, 1986).

I also took into account the impact of individualism-collectivism on different types of innovations by exploring the interaction effects of individualism-collectivism and management innovation in stimulating the firms' propensity to innovate and innovative performance. First, the results indicate a positive role of management innovation in fostering technological innovation (and commercially benefiting from it). This finding can be to some extent attributed to the intangible nature of management innovations (Teece, 1980), making them a more valuable source of sustainable competitive advantage (Porter, 1985). This result is also completely in line with the resource-based view (Barney, 1991) and it represents a contribution to the predominantly technologically-centered literature on innovation. My findings further indicate that the relationship between management innovation and technological innovation is strengthened by collectivism. An environment that emphasizes collaboration and information exchange is therefore beneficial for management innovation to result in technological breakthroughs.

This study provides empirical evidence using broad cross-cultural data from countries that can be placed into six GLOBE country clusters (House et al., 2004): Latin American (Chile), Nordic (Norway), Anglo (Ireland), Latin European (Spain, Portugal), Eastern European (Slovenia, Czech Republic, Estonia, Lithuania, Bulgaria, Slovakia), and Middle Eastern (Cyprus). A broad scope of countries and three datasets used provide means for the generalization of findings, which indicate that management innovation is a key concept of technological innovation stimulation. Furthermore, the findings suggest that collectivism (not individualism) provides a more suitable context for management innovations supporting the technological ones. These findings complement the study conducted by Taylor and Wilson (2012) that business and innovation scholars should avoid stereotyping all collectivist cultures as anti-innovation.

In addition to studying the individualism–collectivism and innovation relationship by accounting for different stages of the innovation process and different types of innovations, my study is also in line with the view that different types of collectivism might be related to innovation differently (cf. Taylor & Wilson, 2012). When examining each relationship, I tested both GLOBE's collectivism dimensions: in-group and institutional collectivism. I did not find many differences except that in-group collectivism significantly interacts with management innovation in predicting firms' innovative performance, whereas institutional collectivism does not. This can be attributed to the fact that in-group collectivism is more helpful in bringing together different actors within the firms, fosters collaboration and is thus a more desired context for transforming management innovations into tangible value when compared with institutional collectivism that has less to do with this process.

In this chapter, I also re-test the relationship between knowledge exchange and management innovation by examining the relationship between the use of internal knowledge sources and management innovations. The results are similar to those of Chapter 2, and indicate that the examined association is positive and significant. The test of similar relationships on a different data set (Community Innovation Survey data on innovation at the organizational level in contrast to primary data used in Chapter 2), and a broader scope of countries (13 compared to three in Chapter 2) provided a solid basis for generalization of findings.

I investigated the moderating effect of individualism-collectivism in their relationship, which adds a national culture contingency in the research on the antecedents of management innovation. The results indicate that in collectivistic cultures, the relationship between the use of internal knowledge sources and management innovation is stronger and more positive. As predicted, collaboration and interaction embedded in collectivistic societies presents a beneficial overarching environment for cultivation of management innovations with the use of knowledge sources in companies.

3.6.1 Theoretical contributions

Several dimensions of national culture were previously found as characteristics of a national culture suitable for enhancing innovation (Scott & Bruce, 1994). However, regarding the influence of individualism-collectivism, previous research produced contradictory results. Some of them can be explained by different types of individualism-collectivism (Taylor & Wilson, 2012); nervertheless, it cannot explain the different results obtained using a uniform score for individualism and linking it to innovation. I contribute to the understanding of these relations by not defining innovation too narrowly, which leads us to the core finding that individualism–collectivism affects innovation differently, depending on the form of innovation and the innovation stage.

I use a broad dataset, more precisely Community Innovation Survey 2006 micro data for firm-level innovation obtained from 13 countries, and thereby address the call made by Franke and Richey (2010) that in order to draw credible generalizations a minimum of seven countries must be used. I also triangulate three datasets from independent projects in order to measure individualism–collectivism, providing more objective and less biased results. This is the first time, to my knowledge, that the combination of these datasets (multiple country CIS micro data and three national culture measures) is used together in a quantitative study.

I provide support for the positive relationship between management innovation and technological innovation, and contribute to the management innovation literature by empirically connecting this form of non-technological innovation to a beneficial outcome in terms of technological innovation. This answers the calls for an empirical examination of the outcomes of management innovation that are lacking (Damanpour & Aravind, 2012). I apply a similar approach to the one used by Mol and Birkinshaw (2009) to investigate the antecedents by using CIS data. However, my study moves such research beyond single country investigations of the antecedents or outcomes of management innovation by using CIS data and focusing on companies from 13 countries. Furthermore, I contribute to the management innovation literature by providing a more in-depth treatment of the outcomes of management innovation, extending its nomological network and indicating that it leads to better results in terms of technological innovation, more intensively in cultures scoring high in the collectivism dimension.

3.6.2 Practical implications

Innovative activities of enterprises do not depend solely on intra-firm organizational capacities; they are also fundamentally shaped by the organization’s environment that influences specific patterns in which innovation processes are embedded (Kaiser & Prange, 2004). Hence national differences in innovation processes and performance can be attributed, at least to an extent, to variations in the cultural and institutional environment (Lundvall et al., 2002). My study contributes to a better understanding of what national culture implies for managerial as well as for policy makers in terms of designing appropriate strategies that would allow the firms to fully capitalize on innovation.

The act of contrasting impacts of individualism–collectivism on innovation at different stages might leave managers wondering what they can do about it, as each pole is bound to influence firms' innovations negatively at one of the stages. However, my findings provide managers across countries with an idea of when innovation processes would be more favorable in their companies, and when they would be more detrimental to innovative performance. My study suggests that managers of more collectivistic societies need to be more careful and aware of their firms' innate shortcomings during the initial innovation stage, when they need to put extra effort on the emphasis of freedom and independent thinking. On the other hand, managers of more individualistic cultures need to put more energy into stimulation of cooperation and collaboration during the final commercialization stage of the innovation process.

My study provides managers with an idea of particular stages of the innovation process at which their employees' national cultural characteristics represent a potential competitive advantage over their competitors from other countries. This is perhaps even more relevant for the policy makers; they are in a position to design national strategies and guidelines so that they can either fully benefit from their countries' characteristics or overcome potential shortcomings. For example, in highly collectivistic cultures, innovation policies should be designed in a way that offers incentives for innovative ideas at the first stage of the innovation process, which is not crucial in individualistic cultures, where creative inventiveness is more present by default. In addition, as firms seem to be more effective during the commercialization stage in collectivistic countries, innovation policies should be designed in a way that would provide support for the inter-organizational collaboration, which takes place during this last stage of the innovation process.

3.6.3 Limitations and future research suggestions

National culture dimensions are robust assessments that attempt to describe in an imperfect fashion what really goes on in terms of the values and practices of people across countries and cultures. They do not exist in a tangible sense; they are rather constructs that are not directly accessible to observation (Hofstede, 2010). This is a generic limitation to any applied cross-cultural research that assumes cultural homogeneity in a single nation and puts intra-national diversity in the second place. However, cultural values may also be determined by the micro characteristics of age, gender, education, and socio-economic status, as well as the macro characteristics of wealth and freedom (Steel & Taras, 2010). It is highly debatable whether the act of bundling individual measures into aggregate indices is appropriate (Tung & Verbeke, 2010). Nonetheless, these scores may be the best we have when trying to understand the differences that drive people's behavior across the globe in a broad scope. I tried to diminish the influence of this robustness by investigating the national culture scores obtained in three different independent research projects. Even if they have differences and should thus be compared with caution (Smith, 2006), such approach is more objective compared with the use of only one dataset, as my research questions call mainly for generalization and objectivity.

The differences among the national culture scores obtained in three datasets should nonetheless be accounted for when interpreting the results. The characterizations of cultures either based on aggregated self-perceptions (in the case of Hofstede's scores) or on aggregated perceptions of others (in the case of the GLOBE project) in one's society are not equivalent procedures. Each one has inherent errors, but none can be considered to provide the single best way to denote national cultures (Smith, 2006).

In my study, I only focused on the individualism–collectivism dimensions of national culture. However, previous examinations of other dimensions that might also significantly influence innovation processes, such as masculinity–femininity, also produced contradictory results. This is why my approach of examining the impact of individualism–collectivism on different innovation types and on different stages of the innovation process should be appropriate and relevant in examining other national culture dimensions, as well as the interactions among different dimensions (Kirkman, Lowe, & Gibson, 2006).

Another limitation of this study is that I only focused on national culture as a contextual factor in the act of shaping innovation in firms in particular countries. The results reveal very small cross-level effect sizes and should thus be interpreted in proportion of their impact. Thus, national culture dimensions only shape a context with a limited amount of impact (which is, nevertheless, significant) on innovation processes in firms. However, other country-level factors such as institutional support and other socio-economic conditions are equally or more important in influencing innovation activities. This is covered in the national innovation systems literature (Freeman, 1992; Lundvall, 1992) that has revealed many factors responsible for the difference in national innovation performance. Nonetheless, national innovation systems may be under the influence and shaped by national culture conditions. This is why future research should be devoted to the connection of these two research streams that are at times (too) separated.

One of key limitations of my study is connected with the measurements I used for innovation. Although the Oslo Manual (OECD, 2005) did a lot in terms of standardizing innovation survey procedures across the world, secondary Community Innovation Survey data could have their shortcomings. These surveys are translated into different languages and distributed by national institutes, and rules about replies of firms and their importance may vary across countries. CIS data may thus be of doubtful quality in terms of the accuracy of such assessments, and the content validity of the items used that are sometimes too broad and generic. To assess management innovation, for example, I was thus left with no choice but to apply this rather liberal view with three items used in CIS (although this was also done in previous studies, e.g. Mol & Birkinshaw, 2009). Other more accurate measures were developed (e.g. Vaccaro et al., 2012). It would be, however, difficult to conduct a study with such broad scope by collecting primary data. In addition, the nature of cross-sectional data prevents me to draw any final causal conclusions. The findings may stem from reverse causality, for example with technological product or process innovation forcing firms to come up with new management practices, which is why future research should apply longitudinal designs to strengthen causal claims.

3.7 Conclusion

As there were some indications (e.g. Rosenbusch et al., 2011) that individualism–collectivism might play a different role at various stages of the innovation process, I examined these relationships by accounting for different types of individualism–collectivism (institutional and in-group) and two stages of the innovation process (the firms' propensity to innovate and innovative performances), as well as simultaneously accounting for different types of innovations: management and technological. Using secondary CIS data and national culture data gathered in three independent research projects, I found support for a positive relationship between management innovation and technological innovation. Individualism indicated to play a positive role in the simulation of the firms' propensity to innovate. By contrast, collectivism was more desirable for achieving technological advances when supported by management innovations, and for the final commercialization stage of the innovation process, when collaboration within the firm and with other stakeholders is more important.

Chapter 4: MICRO-LEVEL FOUNDATIONS OF INNOVATION

In this chapter, I deal with the micro-level foundations of innovation at the individual level. It consists of two field and three experimental studies, and is content-wise divided into two sub-chapters. The first one deals with the work environment conducive to individual creativity, and examines a novel contingency, i.e. knowledge hiding, and investigates the role of personal and contextual factors in this relationship. The second one aims to bring separate research streams of creativity and innovation closer together, and engages into the often overlooked relationship between the two constructs at the individual level. I propose and test a non-monotonic relationship between idea generation and implementation, and, by drawing on self-determination theory, examine how managers should deal with employees' highly creative ideas to optimally capitalize on them.

4.1 Knowledge hiding, perceived motivational climate, and creativity

In the first two studies of this chapter, I proposed and empirically tested a multilevel model of cross-level interactions between knowledge hiding, perceived motivational climate, and employee creativity by using field and experimental data. A field study of 240 employees nested in 34 groups revealed a negative relationship between knowledge hiding and one's creativity that is conceptually based on the reciprocal distrust loop in dyads of employees. Furthermore, the moderation analysis indicated that perceived mastery climate weakens the association between knowledge hiding and creativity, whereas perceived performance climate strengthens this relationship. Study 2 replicated these findings in the experimental study of 132 undergraduate students, in which a reciprocal distrust loop was tested and compared to alternative social and intrapsychic explanatory processes. The moderated mediation results supported the idea that mastery climate indirectly buffers the relationship between knowledge hiding and creativity through distrust and prevention focus, but not through perceptions of risk and psychological safety. Implications for practice and future research are discussed.

4.1.1 Introduction

Scholars and practitioners share a strong interest in the understanding of factors that may help to engage employees in creativity, formally defined as the generation of novel and potentially useful ideas (Amabile, 1983; Shalley, 1991). Creativity is established as a fundamental driver that serves as a basis for individuals, groups, and organizations to pursue innovative efforts. In turn, meta-analytic evidence and numerous studies pin innovation as crucial for the improvement of performance and achievement of continuous competitive advantage (Liao & Rice, 2010; Rosenbusch et al., 2011). How to stimulate creative behavior in the workplace is therefore a highly relevant issue. However, understanding the factors that drive creativity and their interplay remains high on the agenda of researchers (Shalley & Zhou, 2008).

The impact of knowledge and information sharing on creative behavior of employees presents a heavily discussed topic in the creativity research (e.g. Perry-Smith & Shalley, 2003; Perry-Smith, 2006). Employees must be motivated to share their knowledge with others in order to facilitate creative processes (Perry-Smith, 2006), which is why the majority of research focused on factors that might increase knowledge sharing. Although knowledge sharing certainly represents a competitive asset in terms of creativity (Perry-Smith, 2006), knowledge hiding or the intentional attempt to conceal or withhold knowledge that has been requested by others may represent a threat to beneficial outcomes (Connelly et al., 2012), such as creativity. Connelly et al. (2012) argue that knowledge hiding is different from knowledge sharing as it incorporates the intent to withhold knowledge requested by someone else, in addition to the omission of knowledge sharing. People might not share knowledge at times, simply because they do not possess it, and the antecedents of knowledge hiding lie elsewhere. These two factors might also impact creativity differently. For example, knowledge hiding was previously mentioned in the organizational misbehavior literature as stonewalling, i.e. withholding and hiding relevant information (Jansen & Von Glinow, 1985), which may be of critical importance in contexts were creativity is highly relevant and valued.

The notion that organizational members deliberately withhold knowledge attracted the attention of sociologists and anthropologists who studied organizations about 50 years ago (Mechanic, 1962), and it remained a discussion point in the bureaucracy literature, especially in the political vein of literature (e.g. internal political coalitions) for many years (e.g. Nieburg, 1963; Galnoor, 1979). Most of that research, however, was either descriptive or qualitative. Quantitative research only involved structural variables and did not get at dynamics. Research using agency theory (principal vs. agent, to which the notion of motivation is fundamental), such as public choice theory (e.g. Ostrom & Ostrom, 1971), provided some insight into motives that agents might have for keeping things to themselves (or not). However, to the best of my knowledge there are no studies with a specific focus on micro-level foundations of knowledge hiding and its consequences for creativity.

Knowledge hiding processes and outcomes in specific situations remain largely unexplored (Connelly et al., 2012). What we know thus far with respect to knowledge hiding is that it depends on individual factors, and intrapersonal dynamics between the hider and the seeker, and is also affected by organizational factors, such as work climate (Connelly et al., 2012). The relations between knowledge hiding and individual outcomes, however, have only been speculated upon so far, and no research is devoted to the relationship between knowledge hiding and individual creativity. I draw on the importance of interpersonal dynamics (Connelly & Kelloway, 2003), and propose a reciprocal distrust loop as an explanatory mechanism. This social explanation alludes to the importance of trust and dyadic interaction by drawing on social exchange (Blau, 1964) and the norm of reciprocity (Gouldner, 1960).

Futhermore, I compare its importance to alternative, more intrapsychic explanations that Connelly et al. (2012) suggested to be more important for the relationship between knowledge hiding and its outcomes than for the predictors. These individual mechanisms include situational regulatory focus (Shah, Higgins, & Friedman, 1998), perceptions of risk (Slovic, 2000; Weber, Blais, & Betz, 2002), and psychological safety (Kahn, 1990; Brown & Leigh, 1996). A better understanding of how and why knowledge hiding hinders creativity could be important since it may help to explain why creativity enhancement initiatives in organizations fail. My studies thus advance current theory on creativity by examining its novel individual contingency (knowledge hiding) and the interpersonal and intrapsychic mechanisms through which it detrimentally influences knowledge hiders' creative performance.

The environment which organizations create to decrease knowledge hiding has been accentuated as an important aspect of knowledge management (Jarvenpaa & Staples, 2001; Connelly & Kelloway, 2003; Connelly et al., 2012). Whether individuals choose to hide knowledge or not and how this affects creativity may thus be influenced by the extant criteria of success and failure in the work environment, which is also conceptualized as the perceived motivational climate (Ames, 1992b; Ames, 1992a). The examination of the relevance of the motivational climate, as defined by the achievement goal theory (AGT; Nicholls, 1984, 1989; Ames, 1992a), in promoting and facilitating individuals to engage in knowledge hiding (cf. Hirst, Van Knippenberg, & Zhou, 2009; Swift, Balkin, & Matusik, 2010) may be a useful alternative to more personal disposition-based motivational explanations (e.g. Swift et al., 2010; Matzler & Müller, 2011) of such behavior (cf. Schneider & Reichers, 1983). This is a likely outcome as each employee's experience of what he or she has to do in order to be successful at work may influence the value placed on the costs and benefits associated with knowledge hiding. Thereby, the individual evaluation is likely to determine employee's motive to engage in knowledge hiding behavior.

The achievement goal theory is a particularly relevant overarching theoretical approach to help understand the knowledge hiding–creativity relationship. It facilitates the possibility to consider the individual in terms of their dispositional goal orientation (e.g. Matzler & Müller, 2011; Swift et al., 2010) or intrinsic motivation (Gagné, 2009), and also treats the individuals in their context (Johns, 2006; Hirst et al., 2009). Zhou (1998) argues that contextual variables may be more effective predictors of creative behavior above and beyond the role of personality. Recent meta-analytical evidence also stresses the impact of evaluative information on creative processes at work (e.g. Byron, Khazanchi, & Nazarian, 2010; Hammond, Neff, Farr, Schwall, & Zhao, 2011). Apparently, the situational cues about criteria of success or failure in the work environment can contribute significantly to the increase or decrease in creative performance.

Employees placed in a motivational climate characterized by social comparison and intra-team competition may keep any valuable information requested by a colleague proprietary (cf. Johnson et al., 2006) in order to gain some competitive advantage for themselves. On the other hand, when placed in a motivational climate valuing employees' effort, self-development, cooperation, and learning, employees may rather view knowledge hiding as destructive behavior impeding the mutual benefit of knowledge exchange and creativity in their work group. Extant research fails to inform us on whether and how the motivational climate inhibits or enhances knowledge hiding and creativity at work.

This chapter therefore responds to calls to identify specific consequences of knowledge hiding in terms of employee creativity and whether contextual conditions in the form of motivational climate influence this relationship. My study aspires to offer a three-fold theoretical contribution. First, my two (field and experimental) studies may contribute to the creativity literature by increasing the knowledge on what may hinder or enhance creativity and under which conditions. Creativity is a complex phenomenon, subject to numerous individual, as well as broad contextual and social influences (Agars et al., 2008). Unlike previous research that focused on knowledge sharing as an antecedent of creativity (e.g. Oldham & Cummings, 1996; Perry-Smith, 2006; Schepers & van den Berg, 2007), my focus on the intentional withholding of information by employees extends previous research on creativity by specifying how to achieve desired results given the individual-level contingency of employee knowledge-hiding.

Second, I provide a contribution to the work motivation literature by focusing on AGT and arguing that it is likely that the motivational climate employees perceive at work may be a crucial contingency that influences the knowledge hiding–creativity relationship. Previous research emphasized the importance of goal orientations in influencing knowledge exchange (e.g. Matzler & Müller, 2011) and creativity (e.g. Gong, Huang, & Farh, 2009; Hirst et al., 2009), but without considering the relevance of the perceived motivational climate. Therefore, as requested by Payne, Youngcourt and Beaubien (2007), I intend to extend the existing AGT research by making contextual information – in terms of the motivational climate – and its impact clearer to be able to actually test Nicholls' (1984, 1989) situated AGT. In line with this particular theoretical AGT approach, it is assumed that the perceived criteria of success and failure in the environment might have a stronger influence on various work outcomes than dispositional goal orientation. Such climate perceptions help employees understand what behaviors (e.g. knowledge hiding, creativity) are expected and rewarded (Schulte, Ostroff, Shmulyian, & Kinicki, 2009).

I provide further examination of the explanatory mechanisms on how knowledge hiding hurts creativity of the same individual that hides knowledge by comparing a social mechanism (reciprocal distrust loop) to alternative intrapsychic mediators in the moderating role of the perceived motivational climate. Cross-level influences are critical in identifying and understanding group factors that can facilitate or stifle creative behavior in a complex social system (Shalley & Zhou, 2008), which serves as a rationale for using a multilevel approach. My study extends the previous research on situational cues salient for employee motivation, which constitutes a suitable work environment for creativity. By drawing on AGT and investigating the role of the perceived motivational climate, I contribute to the motivational aspect of creativity.

Third, the two studies presented here may constitute a practical contribution to the knowledge management literature. To the best of my knowledge there are no studies that have examined how knowledge hiding influences creativity. Despite the efforts to enhance the sort of knowledge transfer that will consequently foster creativity, success has been elusive, as in many instances employees are unwilling to share their knowledge. Knowledge hiding does exist and presents an important issue in knowledge management (Connelly et al., 2012), where prior research has not devoted enough attention to the exploration of contextual cues and conditions (Von Krogh, Nonaka, & Rechsteiner, 2011). Connelly et al. (2012) stress the need to systematically test the circumstances under which knowledge hiding occurs, its mechanisms, and the possible outcomes. This chapter is therefore important in terms of providing further insight into the outcomes of knowledge hiding behavior in the context of perceived motivational climate, and revealing the means for coping with knowledge hiding in order not to disturb creative processes at work.

4.1.2 Knowledge hiding and creativity

Although it should be understood and examined as a complex and ambiguous concept (Runco, 2008), creativity is most simply defined as the generation of novel and potentially useful ideas

(Amabile, 1983; Shalley, 1991). It deals with the idea generation or exploration as understood in a particular social context (Shalley & Zhou, 2008). Creativity in itself is partly an interpersonal process (Amabile, 1983; Woodman et al., 1993) involving social interactions, collaboration, creative requirements, and creative tensions that lead to novel ideas (Perry-Smith & Shalley, 2003; Perry-Smith, 2006). The generation of creative ideas is often the result of the grouping of novel combinations that involve various perspectives and approaches people are exposed to via social interactions (Allen, 1977). Consequently, it depends largely on information and knowledge sharing (Amabile, 1997), and might thus be crucially influenced by potential knowledge hiding.

The process of creativity consists of problem finding and problem solving (Basadur, 1994). It is a cognitive process that helps a person to come up with different alternatives, and involves an individual's mind and surrounding search to generate potential responses (Amabile, 1983). Problem solving integrates the thinking and behavior in which employees engage to obtain the outcome they seek (Treffinger, Selby, & Isaksen, 2008), which is why knowledge hiding might prevent them from collecting the existing concepts that they require to create new ones (Reiter-Palmon & Illies, 2004). In the case of knowledge sharing, new and relevant ideas are generated or acquired through everyday activities, or obtained from employees' social networks at work. Enhancements in communication and information sharing should foster creative performance by increasing the ability to generate and validate potential solutions in order to determine their appropriateness (Perry-Smith & Shalley, 2003). Mere exposure to diverse alternatives can trigger the process of using wider mental processes and generating more divergent solutions (Kanter, 1988). If knowledge sharing is reduced, people might not be able to generate so many creative ideas (Bartol & Srivastava, 2002). Creativity requires information about a problem and a certain degree of prior knowledge regarding a task at hand (Amabile, 1983). This is why knowledge hiding may have a damaging influence in contexts where creativity is important, and could embody a thus far neglected explanation of the lack of success of creativity enhancement initiatives in organizations.

The aforementioned argument seems reasonable in the case of others hiding knowledge. I argue, however, that an individual's display of high levels of knowledge hiding is related to decreased levels of creativity of that individual. Nevertheless, I follow the approach of Connelly et al. (2012), who allude to the importance of social relations for work in predicting knowledge hiding, and study this construct and its outcome in the form of creativity in dyads. The main explanatory mechanism I propose for the knowledge-hiding creativity relationship is of an interpersonal nature and linked to social exchange and the norm of reciprocity (Gouldner, 1960) in groups of people. Interactions between employees of an organization are generally governed by an unspoken social exchange (Blau, 1964). Positive relationships will draw on norms of reciprocity and expectations of trust, honesty, mutual aid, as well as equal mutual exchange of privileges (Settoon et al., 1996). A person who voluntarily and spontaneously engages in positive behavior towards another person will implicitly invoke a similar reciprocal behavior.

Naturally, it can also happen the other way around. Reciprocity is a moral norm, in other words one of the universal principal components of moral codes within social systems (Gouldner, 1960). It has in fact been an important part of the political strand of the decision making literature (e.g. Morrell, 2005). When a person is affected by negative behavior, such as the intentional withholding of information, he or she develops a basic mind-set of distrust, i.e. the lack of confidence in the other person or a concern that the other person may act in bad faith (Grovier, 1994). Due to the distrust of another person in the dyad, an individual is inclined to provide this behavior back to the person he or she has received it from (Gouldner, 1960).

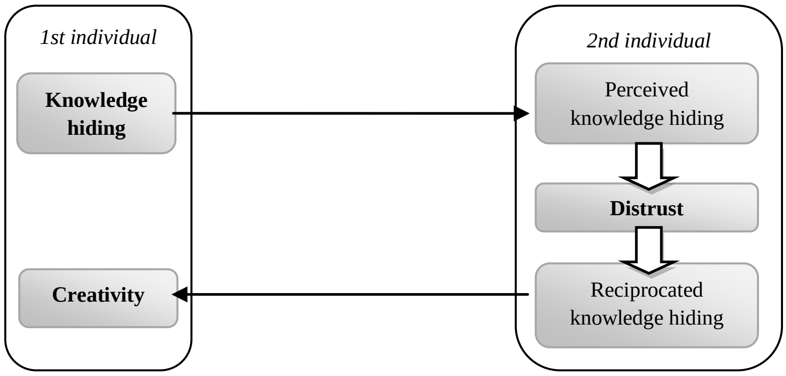
Empirical evidence showed that employees in fact frequently engage in reciprocating counterproductive work behavior because it simply makes them feel better (Tepper, Mitchell, & Almeda, 2011). This refers to the fundamental need to believe in a just world and restore justice when the norms or rules are violated (Lerner, 1980), for example, when co-workers hide knowledge. Connelly et al. (2012) suggest that the history of reciprocity among colleagues may affect the likelihood of an employee to engage in hiding behaviors. In other words, empirical evidence demonstrated that employees hide knowledge from those they distrust, which predicts future intentions to withhold knowledge (Connelly et al., 2012). Consistent with the concept of negative reciprocity (Gouldner, 1960), returning “harms” to those who are responsible for performing negative acts helps to insure the stability of social systems because it discourages future negative actions.

I propose that the described reciprocal distrust loop applies to the situation when an employee requires knowledge and information in order to facilitate or enhance the creative process; for example, new ideas, knowledge about something, or further insight or understanding. I argue that individuals whose requests for assistance in their creative quest were rejected might reciprocate and hide knowledge in return. When a co-worker is denied knowledge and is able to recognize the intentional knowledge hiding, a feeling of distrust is induced. In turn, such acts within the dyad of co-workers underly ineffective social exchanges (Blau, 1964), in other words, reciprocated rejections of assistance or knowledge disclosure. According to the norm of reciprocity (Gouldner, 1960), if a co-worker is denied knowledge by the person who hides it, the co-worker is likely to withhold it from that person when he or she would require knowledge in order to be creative (i.e. intentionally hide knowledge). In turn, the initial knowledge hider would be denied access to a portion of alternatives, example solutions, or any potentially relevant ideas with which he or she would be more likely to make connections that could lead to his or her creativity (Amabile et al., 1996). The reciprocal distrust loop, i.e. the interpersonal mechanism related to dyadic interaction and dyadic social exchange, is focal to this part of Chapter 4, and was also mentioned and briefly described by Connelly et al. (2012) as a salient factor in knowledge hiding and its outcomes. The reciprocal distrust loop underlying my Hypotheses 1 and 2 is shown in Figure 4.1.

Hypothesis 1. Knowledge hiding is negatively related to one’s own creativity.

Hypothesis 2. Co-worker's distrust mediates the negative relationship between knowledge hiding and one's own creativity.

Figure 4.1: Reciprocal distrust loop illustrating the knowledge hiding-creativity relationship



4.1.3 Alternative explanations

The knowledge hiding literature treats its focal construct as an individual-level behavior, which is a characteristic of an individual in a particular social setting (Connelly et al., 2012). In terms of its predictors, only social and interpersonal factors (besides knowledge-related characteristics) are listed as salient for strengthening or reducing knowledge hiding. However, in terms of its consequences and the relationship that knowledge hiding has with its outcomes, individual factors may be just as important (Connelly et al., 2012). This is particularly true for my research, which is focused on the outcome of knowledge hiding in the form of creativity of the very same individual that hides knowledge. For this reason, I briefly conceptualize and empirically test three alternative intrapsychic explanatory mediators in the knowledge hiding–creativity relationship: prevention focus, psychological safety, and perceptions of risk.

Connelly et al. (2012) declared that motivations for knowledge hiding mostly lie in their interpersonal ties and the nature of preceding relations with co-workers. However, other motivations might also be valid. For example, it can be speculated that employees engage in knowledge hiding with a purpose of protecting themselves. This may be the case when individuals come up with ideas that are highly novel and could be subject to criticism or even ridicule, or when they attempt to preserve their advantage in comparison with their co-workers based on particular knowledge they possess. In both cases, they would decide to intentionally hide knowledge and activate a prevention focus. Regulatory focus theory (Higgins, 1997) distinguishes between promotion and prevention focus to describe two motivational systems that underlie approach–avoidance behavior. Prevention focus originates from the survival need for security and self-protection. Its desired end state is safety, which is why the absence of potentially negative outcomes is crucial for such individuals, with behavioral avoidance as the strategic means to goal attainment (Baas, De Dreu, & Nijstad, 2008).

A recent meta-analysis has shown that prevention focus decreases creativity (Baas et al., 2008). This motivational system is related to the narrow scope of attention, concentrating on restricted perceptual details and constraining conceptual access to mental representations with lower accessibility (Friedman & Förster, 2000; Förster & Higgins, 2005). Creative behavior, on the other hand, benefits from restructuring of problem information and accessing to remotely associated cognitive material (Smith & Blankenship, 1991), requiring a broader scope of attention at the perceptual and conceptual levels (Förster, Friedman, & Liberman, 2004). Similarly, moods that are characteristic for people in prevention focus (e.g. fear, calm) produce a more constricted scope of attention and thus impede creativity (Baas et al., 2008). On the basis of this logic, prevention focus acts as the first alternative mechanism that mediates the knowledge hiding–creativity relationship.

In relation to the aforementioned reason that people might hide knowledge with the purpose of protecting themselves and feel safe, I propose the second mediating mechanism: psychological safety (cf. Kahn, 1990; Brown & Leigh, 1996). By hiding knowledge, an individual might feel safer because the co-workers would not be able to exploit his or her weaknesses discovered in case of disclosure of all information. Fear has shown to induce employees to remain silent and keep information to themselves (Kish-Gephart, Detert, Treviño, & Edmondson, 2009). Thus, their co-workers would not be able to use the knowledge that employees possess for their own advantage and against them in a competitive work environment. In turn, employees that feel safer are more creative (e.g. Kessel, Kratzer, & Schultz, 2012) because employees with high levels of psychological safety feel protected and supported in exhibiting their novel ideas, and thereby increase their risky behavior and information seeking that is required for creativity.

In connection with the expressions of risky behavior, I propose the final alternative mediating mechanism in the knowledge hiding–creativity relationship: perceptions of risk (cf. Slovic, 2000). The logic behind its conceptualization is analogous to previous explanatory factors. Intentional knowledge hiding could activate a risk-averse mindset, which would result in diminished perceptions of risk (Weber et al., 2002) that employees distinguish subsequent to their behavior. When individuals perceive that the situation is not as uncertain and risky, they might be more inclined to produce highly novel and unusual ideas, and thereby increase their creativity levels (Dewett, 2006). On the other hand, greater perceptions of risk might foster a more risk-averse mindset, discouraging employees from generating or voicing novel ideas. All three proposed mechanisms might be relevant and valid in terms of explaining the knowledge hiding–creativity relationship. However, regarding their conceptual overlap and basis in self-protection, safety and avoidance behavior, I do not expect all of them to offer a unique insight into the examined relationship, nor that they would prevail over the social mediating mechanism of a reciprocal distrust loop.

4.1.4 Moderating role of perceived motivational climate

Organizational elements that may affect employees' knowledge hiding include the everyday work environment, i.e. the climate and work conditions (Connelly et al., 2012). The climate emerges from socially shared attempts of employees who try to make sense of their situation at work in order to adjust their behavior accordingly. Employees account for situational and contextual cues when reacting to co-workers' requests to share knowledge. Although their colleagues may not have a history of reciprocating assistance, the quality of their relationship and previous interactions may still their decision to engage in reciprocal knowledge hiding behaviors. Accordingly, it has been observed that the context in which employees perform their everyday tasks plays a great role in affecting employees' decisions on whether or not to hide knowledge (Connelly et al., 2012).

The workplace climate is also a key factor for stimulating (or inhibiting) creativity (Scott & Bruce, 1994). A supportive work environment that fosters creative work processes needs to be established (Oldham & Cummings, 1996; Madjar et al., 2002; Zhou, 2003). To achieve this, processes and resources should be allocated and designed in a way that supports creative performance (Scott & Bruce, 1994). The group members' perception of the extent to which creativity is encouraged in the group influences a number of creative behaviors. To encourage creativity, organizations need to create a climate that supports and enables the creative thinking of employees (Amabile, 1988), and the interaction between them. Such a sharing climate enables employees to acquire knowledge and skills, as well as foster creativity, imagination, and exploration (McGill, Slocum, & Lei, 1992).

The perceived motivational climate at work is defined as employees' shared perceptions of the extant criteria of success and failure emphasized through the policies, practices, and procedures of the work environment (Nerstad, Roberts, & Richardsen, in press), and can represent a climate that either enhances or inhibits knowledge hiding and creativity. Accordingly, the motivational climate consists of two dimensions; performance and mastery climate (Ames & Archer, 1988). A mastery climate refers to the situations that support effort and cooperation, and emphasizes learning, mastery, and development of skills (Nicholls, 1989; Ames, 1992a; Ames, 1992b). This was found to promote more adaptive behaviors, such as high performance, high levels of work engagement, trying hard, and persisting when faced with difficulty (Ntoumanis & Biddle, 1999; Roberts, 2012; Nerstad et al., in press), which could be associated with creativity (Shalley & Gilson, 2004).

The componential theory of creativity (Amabile, 1983) describes the way in which cognitive abilities, personal characteristics, and social factors contribute to the creative process. Learning new things is stimulated in a mastery climate (Ames, 1992a), which is directly related to ability and cognitive activity in the componential theory. Employees are able to obtain the information and knowledge needed, which enables a better creative process (Hirst et al., 2009). Furthermore, as self-development, learning, and mastery of skills are emphasized (Ames & Archer, 1988), team members are not afraid to experiment and suggest novel, unusual ideas (Oldham & Cummings, 1996). The act of taking on new, creative tasks and following through with them even when failing should be characteristic of employees in mastery climate groups.

Creativity cannot occur without information and knowledge sharing (Amabile, 1997). Creative processes involve interactions with peers, collaboration, and communication (Perry-Smith, 2006), and these processes are enhanced by a mastery climate (Ames, 1992a). As knowledge sharing and information exchange are likely to be supported in a mastery climate, this climate may reduce the motive for hiding knowledge and rather help to stimulate individual creativity. In line with the theory and empirical findings on employees placed in cooperative situations (e.g. Beersma et al., 2003), a mastery climate may rather create perceptions of shared fate and promote supportive behavior whereby each group member looks out for the interest of the others and not solely his or her own. Thus, insights and lessons learned by one member are shared so that others can also benefit from the knowledge accumulation (Beersma et al., 2003; Johnson et al., 2006). It is therefore likely that employees in a mastery climate will not consider knowledge hiding as a beneficial option, because such behavior will not help them to develop their capabilities and improve the quality of their knowledge (Swift et al., 2010). In addition, behavior such as knowledge hiding is most likely not rewarded in a mastery climate, and that is why the costs of such behavior will be greater than the benefits. A perceived mastery climate may therefore hinder the negative impact of knowledge hiding on creativity.

As a mastery climate is based on cooperation, information exchange (Ames & Archer, 1988), and an atmosphere of trust (Ommundsen, Roberts, Lemyre, & Treasure, 2003), the knowledge hiding of one employee may not be reciprocated by another because that would not be in line with the behavior required for success at work. Success in helping others, and the development of own skills and contributing to knowledge enhancement at work (Matzler & Müller, 2011) would rather be important criteria of success in such a work setting. Thus, it is likely that a mastery climate may “buffer” (i.e. reduce) the negative relationship between knowledge hiding and creativity. I therefore hypothesize:

> *Hypothesis 3a. A perceived mastery climate moderates the relationship between knowledge hiding and creativity. The higher the perceived mastery climate, the less negative the relationship.*

> *Hypothesis 3b. A perceived mastery climate moderates the negative and indirect effect of knowledge hiding on creativity through the mediating mechanism of distrust.*

On the other hand, a performance climate refers to the situations that emphasize normative criteria of success (Nicholls, 1984, 1989; Roberts, 2012). In such climate normative ability, social comparison, and intra-team competition are emphasized (Ames & Ames, 1984; Ntoumanis & Biddle, 1999). Therefore, only the best achievers are acknowledged as being successful (Ames, 1984). Performance climates have also been characterized as the situations of forced social comparison (Ames & Ames, 1984). Individuals in such conditions are overwhelmed with comparative information (e.g. ability grouping, verbal comparisons) (Levine, 1983; Ames & Ames, 1984), and a negative interdependence among the employees may develop. Meta-analytical and other empirical evidence showed that a performance climate promotes more maladaptive behaviors, such as the search for easy tasks, the act of giving up when faced with difficulty, more worries, ineffective strategies, poor performance, turnover intentions, and performance anxiety (e.g. Ames, 1992b; Ntoumanis & Biddle, 1999; Roberts, Kavussanu, & Sprague, 2001; Pensgaard & Roberts, 2002).

As the achievement of outcomes in terms of the demonstration of normative ability is expected, rewarded and given public recognition in a performance climate (Ames & Archer, 1988; Pensgaard & Roberts, 2002), employees might be more inclined to hide knowledge because they want to demonstrate their ability and outperform their colleagues (Matzler & Müller, 2011). Thus, hiding their knowledge may give them a competitive advantage and better chances of "winning", which is considered as the most important objective in a performance climate (Nicholls, 1989; Cumming, Smoll, Smith, & Grossbard, 2007). Therefore, employees are rather motivated to impair the progress of colleagues by hiding their knowledge in an effort to gain positive competitive advantage in a performance climate (Beersma et al., 2003). In turn, this may induce reciprocal knowledge hiding from a colleague, preventing the employees who hid knowledge in the first place from obtaining relevant knowledge and information that would enable them to solve problems creatively.

Knowledge hiding might be more socially acceptable in performance climates, as it can be viewed as the means to achieve individual goals and outperform colleagues, which is encouraged and rewarded in such a climate (Ames, 1992a; Van Yperen, Hamstra, & Van Der Klauw, 2011). Such behavior may be even more detrimental for creative processes at work. I therefore hypothesize:

> *Hypothesis 4. A perceived performance climate moderates the relationship between knowledge hiding and creativity. The higher the perceived performance climate, the more negative the relationship.*

4.1.5 Exploratory three-way interactions with knowledge hiding, mastery climate, and performance climate/mastery goal orientation/perceived supervisor support/decision autonomy/task interdependence

In addition to testing the hypothesized relationships, I also want to explore a couple of potential three-way interactions that may derive from my examined predictors. The first exploratory three-way interaction deals with the relationship between mastery and performance climate. Mastery and performance climates are not the opposing poles of the motivational climate scale. On the contrary, they are two distinct types of the perceived context at work, and can both be present at low or high levels at the same time (Ommundsen & Roberts, 1999), which is why they can act in interaction when predicting behavior and outcomes at work. Thus, I first test *an exploratory three-way interaction with knowledge hiding, a perceived mastery climate, and a perceived performance climate*.

Individuals typically analyze, react, and are influenced by their environment according to their goal orientation (Roberts, Treasure, & Conroy, 2007), which is defined as a disposition towards the development or demonstration of ability in achievement situations (Nicholls, 1984, 1989; Payne et al., 2007). Like the motivational climate, goal orientation is also is decribed in mastery (or task-involving) or performance (or ego-involving) terms. More specifically, individuals form a personal theory of achievement at work, which in turn affects the person's beliefs about avoiding failure and achieving success in the activity (Roberts et al., 2007). This means that the difference between mastery and performance oriented individuals depends on how they define or judge their competence. Individuals who pursue a mastery orientation focus on self-development and building competence, while a performance orientation is based on social comparison, which means that the individual judges his or her capacity in relation to that of others (Nicholls, 1984; Payne et al., 2007). Therefore, they are based on or act in interaction with motivation climates.

Pro-mastery view of goal orientation that is prevalent in literature is supported by findings that relate mastery orientation to positive outcomes. Mastery orientation was suggested to be of greater advantage for motivation to achieve success (Roberts, 2001). Empirical findings, where mastery goals are related to adaptive patterns of cognition, affect, and behavior, consistently find positive relations (Midgley, Kaplan, & Middleton, 2001; Elliot & Dweck, 2005). Consequently, literature on goal orientation generally supports the notion of enhancing mastery goal orientation in organizations (VandeWalle, Brown, Corn, & Slocum, 1999; Mehta, Feild, Armenakis, & Mehta, 2009). Individuals with different levels of mastery orientation may differ in their interpretation of knowledge hiding, which results in a different effect of knowledge hiding on creativity. However, the individual's behavior and goal orientation will depend on the social context (Ames & Archer, 1988; Ames, 1992b; Button, Mathieu, & Zajac, 1996; Elliot & Dweck, 2005), and thus on group motivational climate. I suggest that employees' dispositional goal orientation and the motivational climate at work may together contribute to explain whether employees are motivated to hide their knowledge, and to consequently find themselves in a less desirable position in terms of acquiring required knowledge to be creative.

Connelly et al. (2012) argue that when employees compete for recognition (performance orientation), knowledge hiding may increase short-term performance ratings, but rather decrease long term performance of groups and organizations. The current study may help to clarify these issues by examining the role of goal orientation in interaction with other antecedents of creativity, a long-term oriented process or behavior. Specifically, I examine and hypothesize the interaction of mastery orientation and knowledge hiding in stimulating creativity in an environment characterized by a mastery climate.

It has been argued that considering individuals' type of goal orientation would possibly determine how they evaluate the costs and benefits of sharing their knowledge (Swift et al., 2010) because the more dominant goal orientation makes them define success and failure differently. Employees' dispositional goal orientations may therefore determine whether and with whom they actually share their knowledge. I suggest that this may also hold true for knowledge hiding, because in line with the above presented arguments, individuals with different goal orientations might also evaluate the benefits and drawbacks of withholding knowledge differently.

Mastery orientation can be related to intrinsic motivation framework (e.g. Amabile, 1983; Oldham & Cummings, 1996; Shalley, Zhou, & Oldham, 2004). Mastery oriented individual tends to be more intrinsically motivated, and more likely to exhibit high creativity (Zhou, 1998).

However, the latest results suggest that prosocial motivation, not intrinsic, presents a true driver of creativity (Grant & Berry, 2011). This indicates that other factors might play an important role in the association between intrinsic mastery goal orientation and creativity. Particularly, employees with high intrinsic motivation or high mastery goal orientation tend to seek higher levels of challenge and mastery experience (Ames, 1992a), provided that they work in an environment that enables such triggers, such as group mastery climate.

Therefore, I propose that mastery oriented employees who will seek information they require to be creative and master their skills will be less affected by reciprocal knowledge hiding. Highly intrinsically motivated mastery oriented employees would go out of way and make an extra effort to collect knowledge they require (Janssen & Van Yperen, 2004). On account of their extra effort, employees in mastery climates would not reciprocate and hide knowledge any more, as they will be able to recognize and appreciate the effort (Ames & Archer, 1988; Aunola, Nurmi, Onatsu-Arvilommi, & Pulkkinen, 1999) for cooperation and achievement of common goals.

I have established that a situation where mastery oriented individual is placed in a mastery motivational climate should be optimal for the mitigation of a negative effect of knowledge hiding on creativity. Furthermore, I will examine other possible combinative situations regarding motivational climate and goal orientation. Contextual factors that are characteristic for performance climate, such as competition, expected evaluation, and contingent award, were identified as external constraints that inhibit creativity (Amabile, 1983). Therefore, we cannot expect to find that any type of goal orientation in a performance climate is able to mitigate the negative effect of knowledge hiding on creativity.

This could be different in terms of performance-oriented employees under the mastery climate conditions. Achievement-oriented individuals react to positive developmental feedback and other mastery-oriented characteristics to a lesser extent than less achievement-oriented individuals (Zhou, 1998). Therefore, they may not be as receptive to positive inducements from the environment but would rather hide knowledge to be better than colleagues, even if this is not characteristic for the atmosphere they are in.

With regard to performance goal orientations empirical findings indicate both positive and negative outcome patterns (Midgley et al., 2001). Highly achievement-oriented individuals who receive negative feedback will be distracted by their failure (Zhou, 1998). When individuals become rigid and outcome focused, they are not likely to be as creative (Amabile, 1983). On the basis of aspects such as performance standards, deadlines, and production schedules, performance goal orientation is necessary in an organizational context if the organization is to be successful (Button et al., 1996). However, performance goal orientation might be less desirable when dealing with loose, challenging, and experimental creative work. Therefore, I only explore *a mitigating interaction effect of mastery goal orientation and a perceived mastery climate in the knowledge hiding–creativity relationship*.

Creative performance of employees quite often depends upon the leadership, which is demonstrated by several conceptualizations and empirical studies (e.g. Scott & Bruce, 1994; Oldham & Cummings, 1996; Elkins & Keller, 2003; Oke, Munshi, & Walumbwa, 2009). Overall, evidence suggests that inducements at levels above an individual, such as establishment of a positive motivational climate (Amabile, 1988), organizational support (Oldham & Cummings, 1996; Madjar et al., 2002), or supervisor and social support (Amabile et al., 1996; Ramus & Steger, 2000), indirectly influence individual creativity, mostly because they help to develop employees' positive emotional states, such as psychological safety (Baer & Frese, 2003) that is built in the appropriate climate for stimulating creativity (Ekvall, 1996). Employees feel safer and more confident, which in turn boosts their creativity (Baer, Oldham, Jacobsohn, & Hollingshead, 2008).

Risky and bold behavior, going out of way to obtain required information and knowledge, and taking initiative causes novel ideas to occur. In order for this to happen, mental models in a team or an organization need to change, and employees need to be stimulated and encouraged to come up with new suggestions. The creation of a safe climate encourages creativity (West, 2002). This is why supervisor support (Amabile et al., 1996; Ramus & Steger, 2000) is increasingly linked to creativity enhancement initiatives.

Certain types of leader behaviors induce employees' perceptions of leader support that is conducive to their subsequent creativity. These leader behaviors have to do with emotional support, and more instrumental support forms (Amabile, Schatzel, Moneta, & Kramer, 2004). Supervisory encouragement presents the last one, and facilitates employees with tasks, ensures them to develop the expertise necessary to perform well, and elicits the intrinsic motivation for creative work (Amabile et al., 1996). In line with the more interpersonal support, leaders' demonstrations of empathy and consideration were also found to enhance employees' creativity (Oldham & Cummings, 1996; Amabile et al., 2004).

In line with the organizational support theory (Eisenberger, Huntington, Hutchison, & Sowa, 1986; Eisenberger et al., 2002), supervisor support includes providing help and resources to the subordinates (Shanock & Eisenberger, 2006). Thus, the majority of leaders' effectiveness in stimulating creativity can be explained through social influence (Mumford et al., 2002). This might be even more expressed in mastery climates, where cooperation and proactive learning is stimulated (Ames & Archer, 1988). The provision of developmental feedback to employees appears to be a crucial act (Zhou, 2003) that boosts the employees' intrinsic motivation, affects employees' mood states, clarifies creative standards, and facilitates the employees' acquisition of creativity-related skills, and thus mitigates the negative effect of knowledge hiding on creativity.

Inducements of mastery climates are usually carried out by the leaders or supervisors (Smith-Jentsch, Salas, & Brannick, 2001; Dragoni, 2005), which is why they may be interpreted as supervisor support or intertwine and act together in stimulating knowledge sharing and thus mitigating negative influence of knowledge hiding on creativity. In mastery climates, the leader is likely to use a private evaluation of demonstrated ability, and is thus more personally involved in the relationship with his or her subordinate (Smith-Jentsch et al., 2001), which is manifested in a greater level of perceived support.

Team leaders can affect creative behavior of team members by influencing the followers' perceptions of a mastery climate supportive for creativity (Gumusluoglu & Ilsev, 2009). The leaders are the ones that create a work environment that encourages creativity (Amabile et al., 2004). Through honest and transparent relations with co-workers, the inducement of mastery climate appropriate for creativity can be perceived by others. Mastery climate that stimulates creative behaviors is established within the team, as is supervisor support. Together they influence the relationship between knowledge hiding and creativity. They prevent the reciprocal knowledge hiding of the person from whom the employee hid knowledge. People are inclined to share knowledge, because they are supported to do so by a group mastery climate, communicated or induced through high levels of supervisor support (Smith-Jentsch et al., 2001). Thus, I explore the following three-way interaction: *a perceived mastery climate and perceived supervisor support moderate the relationship between knowledge hiding and creativity.*

The first three exploratory three-way interactions of this chapter deal with individual characteristics and behaviors (knowledge hiding, goal orientations), and contextual influences (motivational climates, supervisor support). All these can be influenced either through a long period of time or by taking drastic measures, such as letting go of unsuitable employees or the recruitment of new, more appropriate people. But what can managers do in terms of work design that can frequently be the quickest and most efficient way of dealing with misbehavior and turning negative problems into positive opportunities? I explore two job-related characteristics that might play a role in knowledge hiding–creativity relationship in a stimulating group mastery motivational climate: task interdependence and decision autonomy.

In a mastery climate, a collective atmosphere of justice, trust and cooperation is established (Ames & Archer, 1988; Colquitt, Scott, & LePine, 2007). This leads to more effective social exchanges (Blau, 1964) as co-workers that trust an employee might not perceive his or her knowledge hiding as an act of distrust and would therefore not reciprocate by withholding knowledge and information from him or her in return. However, the situation might change when the work of one employee highly depends on the work of another. Task interdependence triggers two psychological states of experienced responsibility: responsibility for one's personal work and outcomes, as well as for others' work and personal outcomes for which one initiates task interdependence (Kiggundu, 1983). In such cases of high task interdependence in a work group, co-workers might view knowledge hiding as an action of betrayal and undermining of a collective mission and effort. This is particularly the case with groups high in mastery climate (Ommundsen et al., 2003).

Consequently, high task interdependence of employees in groups high in mastery climate might lead to an even more negative relationship between knowledge hiding and creativity, as the reciprocated knowledge hiding of information crucial for creative behavior is even more severe than the initial knowledge hiding. It is possible that, in mastery climates, even if this is against the contemporary calls in knowledge management for connecting and networking (e.g. Kane, Robinson-Combre, & Berge, 2010), it is best to isolate employees in terms of task interdependence to prevent reciprocal actions of knowledge hiding from co-workers. In this the way, they would still be able to obtain information they require to be creative because they would not consistently interact with co-workers due to work design and hide knowledge, in which case reciprocal logic would dictate knowledge hiding in return and consequently a lack of knowledge when needed for creative behavior. Thus, I explore how *a perceived mastery climate and task interdependence moderate the relationship between knowledge hiding and creativity*

Intrinsic motivation has been established as an important driver of creativity (e.g. Amabile, 1983; Oldham & Cummings, 1996; Shalley et al., 2004). Job or decision autonomy is an important job-related characteristic that managers can induce in the workplace in terms of redesigning the work to stimulate intrinsic motivation and thus creativity (Lawler & Hall, 1970; Hackman & Oldham, 1976; Liu, Zhang, Wang, & Lee, 2011). The more employees feel they have control over what goes on and the more decisions they can make on their own, the more they feel their job allows them to be creative (Zhang & Bartol, 2010). On the contrary, if an individual works in a low autonomy environment where he or she has little freedom in deciding how to work on the task, and has little control over the process of executing the task, the individual is likely to experience diminished intrinsic motivation and exhibit low creativity (Deci & Ryan, 1987; Deci, Connell, & Ryan, 1989; Zhou, 1998).

Mastery climate might interact with decision autonomy in stimulating creativity. A mastery oriented individual tends to be more intrinsically motivated (Ames & Archer, 1988) and more likely to exhibit high creativity (Zhou, 1998). To be highly intrinsically motivated, and hence creative, an individual needs to work in a high task autonomy condition, in addition to receiving positive feedback delivered in an informational style (Zhou, 1998), which is consistent with a mastery climate. Under mastery climate conditions, individuals often tend to care more about doing well, are more involved in the work (Patrick, Kaplan, & Ryan, 2011), and are likely to react more positively to a high task autonomy condition. In such event, the employees experience the highest level of competence and self-determination and will thus exhibit higher creativity (Zhou, 1998).

The empowerment of employees with high decision autonomy in mastery climate basically means that they are given the freedom to make decisions without much interaction with others (Golden, 2007). In terms of knowledge hiding–creativity relationship, the logic is similar to this relationship subjected to mastery climate, but even strengthened due to the fact that employees are now basically instructed not to share as much information when making decisions (Janz et al., 1997). Therefore, knowledge hiding might not result in much reciprocated knowledge hiding because employees are stimulated to share it by the climate and trust one another. Consequently, knowledge hiders are still able to obtain information necessary for their creativity.

By contrast, the individuals will not be very creative in the case of employees working in a group characterized by high mastery climate, hiding knowledge, and having to interact a lot with co-workers in order to make decisions (having low decision autonomy). In these cases, the individuals are expected to interact a lot and share information, otherwise the co-workers will consider this as a failure of work instructions, which may be viewed as a serious offence in mastery climate environment (Ames, 1992b; Ommundsen et al., 2003; Alfermann, Lee, & Würth, 2005). Consequently, they would be more inclined to reciprocate and hide knowledge back. I therefore explore *how a perceived mastery climate and decision autonomy moderate the relationship between knowledge hiding and creativity.*

4.1.6 Study 1: Methods

4.1.6.1 Sample and procedures

Empirical data were collected from 240 employees and their 34 direct supervisors in two Slovenian companies in August, September, and October 2011. A translation-back translation procedure was used to translate the questionnaire from English to Slovenian and back to English. It should be noted that my sample only included the employees that have a work e-mail address and can be divided into teams with a particular supervisor, and not the production workers. The members of these groups are more likely to produce creative ideas in the surveyed companies. All these groups participated in the survey. The work process in the groups involves encouragement of members to come up with creative ideas, which are later on implemented with the help of the group. The creativity part, i.e. the generation of novel and useful ideas, is usually carried out individually.

The first company is an aluminum manufacturer that employs about 800 people. Their motto is to produce “aluminum of the future” and manufacture foundries, evaporators, and castings, but they are also becoming increasingly involved in the services of designing power stations and providing advanced laboratory measurements. The second company functions within the metal processing industry and employs about 2200 people. They deal with modern-day blacksmithing and are vested in the production of innovative products made from raw metal. With almost 100 years of experience, they have evolved from ironmongery and nowadays produce metal products using modern materials and innovative technologies.

The examples of ideas rated as highly creative in the first two companies included solar power stations; monitoring program for the discharge of effluents; innovative metal bike handlebars to support their local biking team; nano-based coatings for metal products; and radically redesigning the assembly line to be more sustainable and eco-friendly. The examples of ideas rated as less creative included redesigning the casting model; optimizing a cooling system; developing a new functional hand tool; adding a new hook to the hand tool that provides it with a new function; and new quality assurance protocol.

The average response rate per group was 7.06 employees, whereas the number of direct reports per group supervisor who answered ranged from three to 21. If we take into consideration only the 34 groups that participated (and not other employees in the companies), I achieved a 55.3% response rate for supervisors’ direct reports (in-group response rates ranged from 25% to 100%).

About 65% of the participants were male and about 45% were between 35 and 45 years old (SD = 7.01). 41% of respondents reported less than seven years of work experience (SD = 8.43) and 40% reported less than three years of working with a particular supervisor (dyad tenure: SD = 5.43).

4.1.6.2 Measures

Unless otherwise noted, seven-point Likert-type scales ranging from 1 (“strongly disagree”) to 7 (“strongly agree”) were used in the study.

Knowledge hiding was self-reported and assessed with the 12-item scale developed by Connelly et al. (2012) – α = .89. The scale opens with a statement: “In a specific episode in which a particular co-worker requested knowledge from you and you declined” and includes items such as “I pretended I did not know what s/he was talking about”. A recent meta-analysis (Berry, Carpenter, & Barratt, 2012) showed that self-reported counterproductive work behavior, such as knowledge hiding, actually captures a broader subset of this behavior than the other-reported ones, and supports the use of self-reported measures.

Creativity was measured according to the 13-item questionnaire developed by Zhou and George (2001) – α = .95, which includes items such as “He/she is not afraid to take risks” and “He/she is a good source of creative ideas”. It was supervisor-reported. As identical behaviors may be considered innovative or creative in one organizational context, and unsettling or disruptive in another (Agars et al., 2008), perceptual measures were used because they enable the most relevant subjective assessments about domain-specific creativity from the actors involved in the social setting where the creativity process is taking place.

The perceived motivational climate (mastery climate and performance climate) was measured with the 14-item instrument developed by Nerstad, Roberts, and Richardsen (in press) – α = .79 for mastery climate and .84 for performance climate. The scale asks how employees perceive that success is defined in their work situation, and opens with a statement: “In my department/work group” and then allows the respondents to assess mastery (sample item: “Each individual’s learning and development is emphasized”) and performance (sample item: “There exists a competitive rivalry among the employees”) climate. Mastery and performance climate ratings by the subordinates belonging to the same group were aggregated at the group level by averaging to obtain a single score for each group.

To validate the aggregation of individual-level measures of mastery climate and performance climate on group level, I calculated the intraclass correlations (ICCs) and the multi-item within-group agreement ($r_{wg(J)}$). For mastery climate (a slightly skewed shape), the average $r_{wg(6)}$ was .83, ranging from .65 to .99, whereas ICC(1) was .16 and ICC(2) was .45 (F = 1.86, p = *.012*). For performance climate (also a slightly skewed shape), the average $r_{wg(8)}$ was .84, ranging from .63 to .96 with ICC(1) at .21 and ICC(2) at .56 (F = 2.36, p = *.001*). As indicated by James (1982), ICC(1) generally ranges from zero to .50 with a median of .12. The values obtained in my study are above this median and indicate that significant between-group variances exist in terms of perceived motivational climate. However, there are no definite guidelines for determining acceptable values. Even if a definite critical cutoff for $r_{wg(J)}$ estimates does not exist, the traditional heuristic cutoff recommended for aggregation is .70 (James, Demaree, & Wolf, 1984; Lance, Butts, & Michels, 2006). Given my particular research question and the fact that I was aggregating measures regarding the motivational climate in a group as perceived by the employees, I proceeded to create the aggregate measures of perceived mastery and performance climate. As perceived group climate reflects the employees' shared perceptions, an aggregated measure for climate may be the best way to examine its relationship with knowledge hiding (Connelly et al., 2012).

In order to avoid problems with common method bias, data were collected by two separate questionnaires: one for the employees and one for their supervisors, who assessed employee creativity. Following this approach, Podsakoff, MacKenzie, Lee and Podsakoff (2003) state that additional statistical remedies are unnecessary. Nevertheless, as data regarding predictor and moderator variables (knowledge hiding and perceived motivational climate) were only employee-based, I used the following approaches. Data were collected in two collection waves, and the second (when creativity and some of the control variables, such as task variety and task interdependence, were assessed) took place about three weeks after the first one. The items used in this study are part of a large-scale questionnaire; therefore, the respondents would probably not have been able to guess the purpose of the study and manipulate their answers to be consistent. In addition, I reverse-coded some items in the questionnaire.

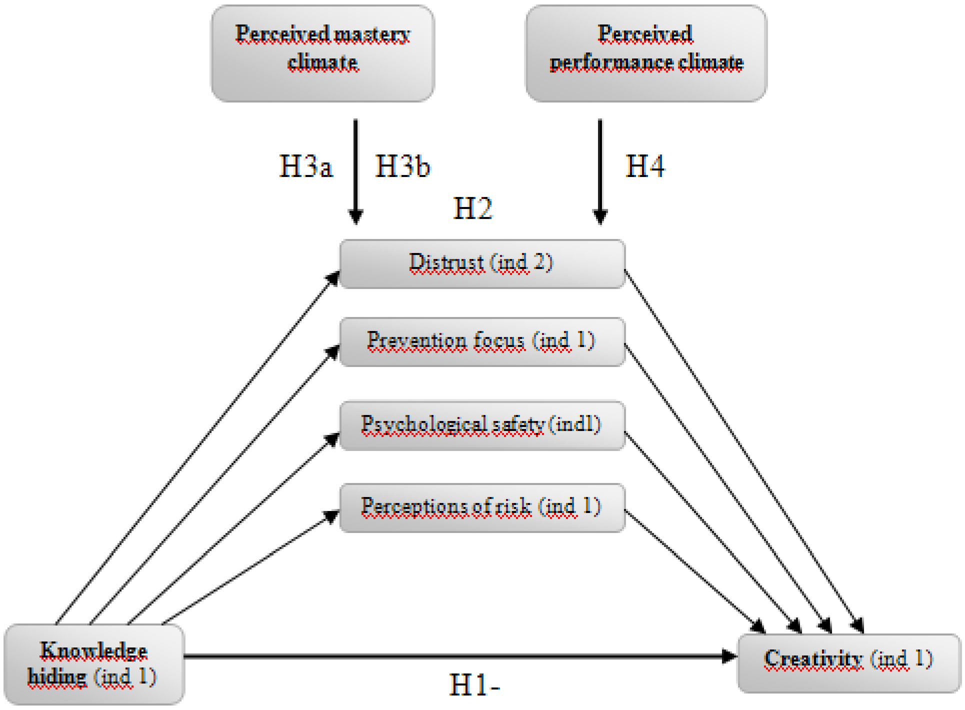
Control Variables. Goal orientation (performance orientation and mastery orientation) was measured with an adapted version (Nerstad et al., in press) of the nine-item scale (excluding the performance avoidance items) developed by VandeWalle (1997) – $\alpha = .74$ for performance orientation and .83 for mastery orientation. The adapted version is more in line with Nicholls' (1984, 1989) AGT by questioning participants how they define success at work. Although knowledge hiding is closely tied to the social setting, it also depends on individual factors (Connelly & Kelloway, 2003). In addition, there are various perspectives on AGT which approach the salience of dispositional goal orientation differently. Thus, individuals are predisposed by their personal theory of achievement to act in a mastery- or performance-oriented manner. These predispositions are conceptualized as dispositional goal orientations (Roberts et al., 2007) According to the person-centered AGT approach dispositional goal orientation is presumed to determine how motivational climate is interpreted. On the other hand, the situated AGT approach emphasizes how goal orientation is a function of either the situation or an interaction between the person and the situation (Maehr & Zusho, 2009). As the theoretical baseline I apply and test in this article is based on the situated AGT perspective (e.g. Ames, 1992; Nicholls, 1989), I controlled for *dispositional goal orientation* in all analyses to conduct a more conservative test of whether the situation in terms of motivational climate has an impact over and above the dispositional goal orientation of employees.

Not all jobs require the same amount of creative behavior and output. There are numerous studies that argue in favor of the situational component of creativity (e.g. Amabile, 1988;

Woodman et al., 1993; Amabile et al., 1996). Thus, I controlled for the objective *job requirement for creativity,* which is a variable that was set up by an HRM expert to evaluate the creativity required at different job types that the respondents held based on the job title, job description, and its placement within the organizational structure. *Task variety* was tapped with three items from Hackman & Oldham (1980): "My job requires me to use a number of complex or high level skills", "The job is quite simple and repetitive" – reverse coded, and "There is a lot of variety at my job" - $\alpha = .89$. A**s** distrust and reciprocity could be affected by how often co-workers are in contact with one another, I controlled for *task interdependence* that was assessed with a five-item scale by Van Der Vegt, Emans and De Vliert (2000) - $\alpha = .68$.

I also controlled for *age and gender* as previous research indicated that goal orientation may differ according to age, and males and females may interpret the motivational climate differently (Payne et al., 2007; Abrahamsen, Roberts, & Pensgaard, 2008). Other control variables included *employee education, expertise* (a proxy for work experience was used for this), and *company* (to see whether the fact that I gathered data on two different companies had any impact on the results). Expertise in particular is a valuable control as employees who have been performing a particular task for a longer period of time may perceive its difficulty or creativeness differently (Amabile, 1998; Wiley, 1998). I also controlled for *dyad tenure* (for how long an employee has been working under the supervision of a particular direct supervisor) as the length of the supervisor-subordinate relationship can impact on work perceptions (Fagenson-Eland, Marks, & Amendola, 1997). All control variables (except the job requirement for creativity and company) were self-reported. Figure 4.2 depicts the relationships among my focal constructs that I test in field and experimental studies.

Figure 4.2: Relationships among my focal constructs



4.1.7 Study 1: Results and discussion

4.1.7.1 Descriptive statistics, validity, and reliability

Table 4.1 provides descriptive statistics of all variables analyzed in this study. I began by observing the factor structure of the focal variables and thus conducted a confirmatory factor analysis using AMOS 17 software with maximum likelihood estimation procedures. The expected four-factor solution (creativity, knowledge hiding, mastery climate, and performance climate) displayed excellent fit with the data (Chi-square [696] = 1310.95, CFI = .981, SRMR = .038). The factor loadings ranged from .74 to .86 for creativity items, .65 to .90 for knowledge hiding items, .69 to .89 for mastery climate items, and .70 to .88 for performance climate items.

I tested all alternative nested models to examine whether a more parsimonious model achieved equivalent fit (for creativity and knowledge hiding on the same factor, Chi-square [699] = 3188.06, CFI = .620, SRMR = .120; for creativity and mastery climate on the same factor, Chi-square [699] = 2679.781, CFI = .700, SRMR = .106; for creativity and performance climate on the same factor, Chi-square [699] = 3021.572, CFI = .647, SRMR = .126; for mastery climate and performance climate on the same factor, Chi-square [699] = 2680.668, CFI = .699, SRMR = .114; for knowledge hiding and mastery climate on the same factor, Chi-square [699] = 2728.573, CFI = .692, SRMR = .115; and for knowledge hiding and performance climate on the same factor, Chi-square [699] = 3023.665, CFI = .647, SRMR = .127). Chi-square difference tests indicated that my model achieved significantly better fit.

Table 4.1: Means, standard deviations, and correlations [a,b,c]

	Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Creativity	5.34	1.06	(.95)															
2	Knowledge hiding	1.94	.85	-.18*	(.89)														
3	Mastery goal orientation	6.13	.91	.34**	-.12	(.83)													
4	Performance goal orientation	5.24	1.21	.26**	.02	.31**	(.74)												
5	Company	1.70	.04	.03	-.04	-.02	.08	-											
6	Age	44.34	7.01	.04	.10	-.11	-.00	-.02	-										
7	Gender	1.65	.38	.09	.05	.09	.05	.06	-.07	-									
8	Education	2.45	.71	.06	.05	.04	.02	-.03	-.06	-.15*	-								
9	Expertise	10.67	8.43	-.08	-.07	-.09	-.07	.11	.40**	-.09	-.03	-							
10	Dyad tenure	5.21	5.43	.02	-.08	.03	.06	.24**	.08	-.08	-.01	.49**	-						
11	Team size	7.06	3.12	.05	-.00	.06	-.03	.02	-.17	-.14	.05	.09	.09	-					
12	Task interdependence	4.75	.98	-.05	.10	.08	-.02	.11	-.09	.04	-.08	.02	-.07	-.09	(.68)				
13	Task variety	5.11	1.53	.02	.02	.01	-.10	.03	-.20**	-.06	-.04	-.21**	-.04	.11	.08	(.89)			
14	Job requirement for creativity	4.12	1.31	.73**	-.34**	.21**	.09	.05	-.06	.09	.11	-.08	-.09	.02	-.09	-.03	-		
15	Mastery climate	4.56	.89	.23**	.04	.22**	.26**	.56**	.16*	.14	.03	.12	.22**	-.01	.13*	.13*	.-14*	(.79)	
16	Performance climate	3.74	.92	.08	-.03	.25**	.28**	.26**	.06	.07	-.09	.08	.13	-.06	-.20*	.02	-.01	-.03	(.84)

[a] n=240.
[b] Coefficient alphas are on the diagonal in parentheses.
[c] For gender, 1 = “female”,2 = “male”. * p < .05, ** p < .01

4.1.7.2 Multilevel analysis results

The dataset consisted of two hierarchically nested levels: 240 employees (level -1) nested in 34 groups (level -2) which all had one group supervisor. I used hierarchical linear modeling to test the following aspects of my multilevel model: (1) the existence of a multilevel structure, (2) the cross-level effect of mastery and performance climate on individual creativity, and (3) the interaction effects between knowledge hiding, creativity, and perceived motivational climate. Supervisory ratings of creativity violated the independence assumption (that is to say, each supervisor provided ratings of creativity for multiple employees). This justified my use of random coefficient modeling (multilevel analysis) as an appropriate strategy for analyzing the cross-level effects of various constructs on creativity.

To test my hypotheses, I developed a set of multilevel models based on theoretical predictions by using the incremental improvement procedure demonstrated by Hox (2010). In the construction of these models, all variables were grand-mean centered. The fixed effects with robust standard errors for all models are presented in Table 4.2. I started with the intercept-only model with employee creativity as the dependent variable (Model 1).

First, I added knowledge hiding as a level-1 predictor of creativity. The results show (supporting Hypothesis 1) that knowledge hiding is negatively and significantly related to creativity (Model 2: $\gamma = -.21$, $SE = .04$, $p < .01$). Out of the control variables, only job requirement for creativity was significantly related to creativity (Model 2: $\gamma = .52$, $SE = .04$, $p < .01$). For multilevel model estimation, although this is difficult and robust in two-level models, I report Snijders and Bosker's (1999) overall pseudo R^2 for each model. These estimates are based on proportional reduction of Level 1 and Level 2 errors owed to predictions in the model. I also report deviance estimations for all models.

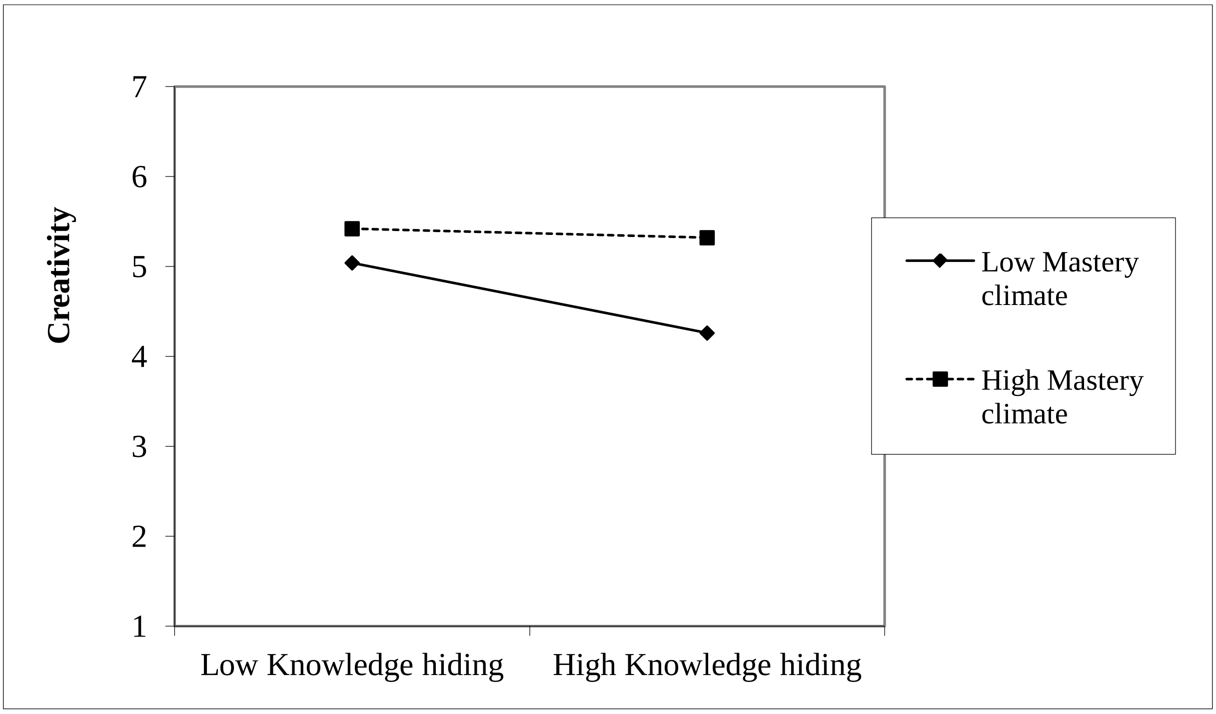
Table 4.2: Multilevel analysis results for creativity as the dependent variable[a]

	Model 1	Model 2	Model 3	Model 4	Model 5
Level 1					
Intercept	5.41** (.11)	5.45**(.06)	5.44**(.06)	5.43**(.06)	5.43**(.06)
Age		-.05 (.03)	-.05 (.03)	-.06 (.03)	-.06 (.03)
Gender		-.04 (.08)	-.04 (.08)	-.03 (.05)	-.03 (.05)
Education		-.02 (.05)	-.02 (.05)	-.01 (.05)	-.01 (.05)
Expertise		.00 (.01)	.00 (.00)	.00 (.00)	.01 (.01)
Dyad tenure		.00 (.01)	.00 (.01)	.00 (.00)	-.00 (.00)
Company		-.13 (.14)	-.13 (.14)	-.13 (.14)	-.13 (.13)
Job requirement for creativity		.52** (.04)	.52** (.04)	.51** (.05)	.51** (.04)
Task variety		.03 (.03)	.03 (.03)	.02 (.03)	.02 (.03)
Task interdependence		.05 (.05)	.05 (.05)	.05 (.04)	.05 (.04)
Knowledge hiding		-.21** (.04)	-.21** (.04)	-.21** (.07)	-.21** (.07)
Mastery goal orientation			.01 (.05)	-.00 (.07)	-.00 (.06)
Performance goal orientation			-.00 (.04)	-.00 (.03)	-.01 (.03)
Level 2					
Team size		.08 (.05)	.08 (.05)	.08 (.04)	.09 (.05)
Mastery climate			.02 (.07)	.02 (.07)	.03 (.07)
Performance climate			-.03 (.08)	-.05 (.06)	-.04 (.08)
Interaction effects					
Knowledge hiding × Mastery climate				.17* (.07)	.17* (.08)
Knowledge hiding × Performance climate				-.12† (.06)	-.12† (.06)
Knowledge hiding × Mastery climate × Performance climate					.01 (.00)
Pseudo R^2		.29	.35	.39	.40
Deviance	639.93	490.32	485.42	488.11	498.13
n (level 1)	34	34	34	34	34
n (level 2)	240	240	240	240	240

[a] The entries are the estimates of the fixed effects with robust standard errors. **p<.01, *p<.05, †p<.10

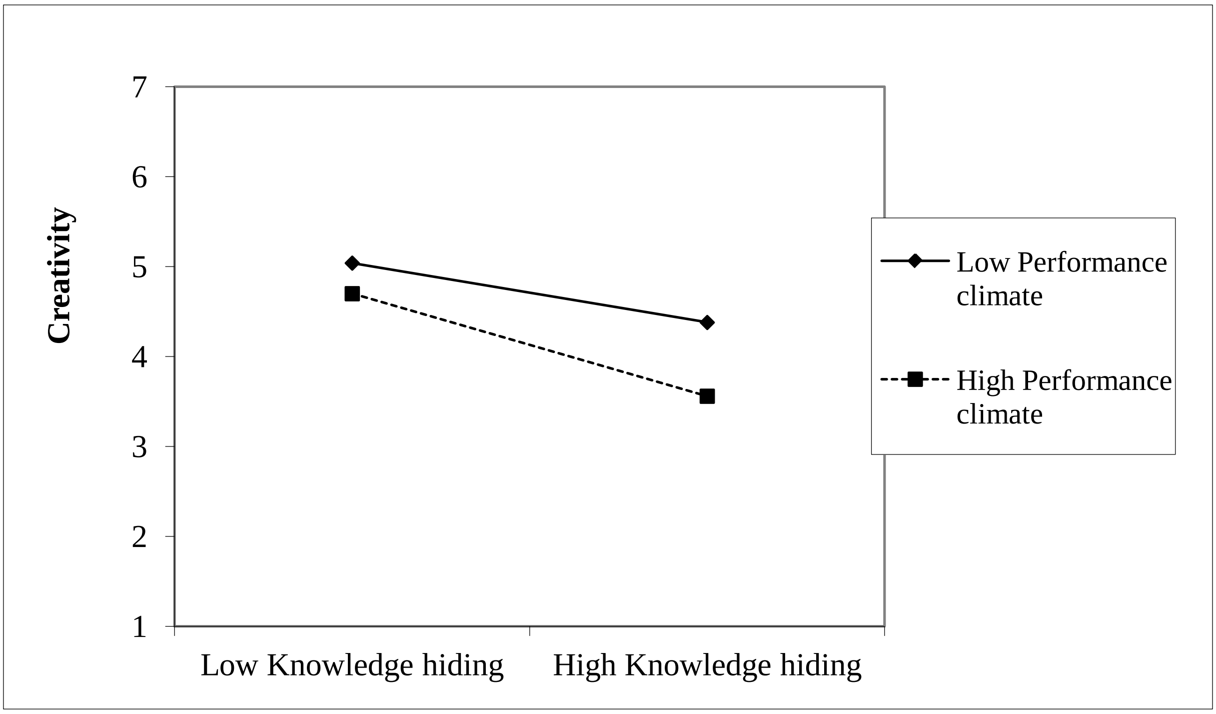
To test the cross-level main effects of motivational climate, I added both mastery and performance climate to Model 2 (Model 3). I examined the coefficients of corresponding parameters estimated in the models, controlling for mastery goal orientation and performance goal orientation respectively. Neither approach was significantly related to creativity. Model 4 deals with interaction effects of motivational climate types and knowledge hiding on employee creativity. I examined interaction effects between knowledge hiding and mastery climate to see whether the negative effect of knowledge hiding on creativity might be softened by mastery climate. The results reveal that there is indeed a significant positive interaction effect between knowledge hiding and mastery climate (γ = .17, *SE* = .08, p < .05). These effects are shown in Figure 4.3, and indicate that in groups where employees perceive higher levels of mastery climate, the slope demonstrating the relationship between knowledge hiding and employee creativity is less negative. To test this interpretation, I statistically compared the slopes of both curves to zero. Knowledge hiding significantly predicted lower levels of creativity when mastery climate was low (γ = -.39, *SE* = .09, t = -2.99, *p < .01*), but not when it was high (γ = -.01, *SE* = .08, t = -.03, *ns*), which supports Hypothesis 3a.

Figure 4.3: The moderating effect of perceived mastery climate on the knowledge hiding–creativity relationship



In Model 4, I also examined the interaction effect between knowledge hiding and performance climate. The interaction effect was not statistically significant by traditional significance standards (γ = -.12, *SE* = .06, *p < .10*). Hypothesis 4a was thus not supported. The interaction effects between knowledge hiding and performance climate on employee creativity are nevertheless shown in Figure 4.4, where it is evident that in groups where employees perceive higher levels of performance climate, the slope demonstrating the relationship between knowledge hiding and employee creativity is more negative. The statistical comparison of the slopes of both curves to zero revealed that they were both significantly different from zero (ώ = -.14, *SE* = .07, t = -2.38, $p < .05$ for high performance climate and ώ = -.10, *SE* = .06, t = -1.99, $p < .05$ for low performance climate).

Figure 4.4: The moderating effect of perceived performance climate on the knowledge hiding-creativity relationship



In Model 4, I conducted an exploratory three-way interaction analysis of the interplay among knowledge hiding, mastery climate, and performance climate in predicting creativity. As I expected, the results indicated that the three-way interaction (knowledge hiding × mastery climate × performance climate was not significant (Model 5: γ = .01, *SE* = .00, *ns*).

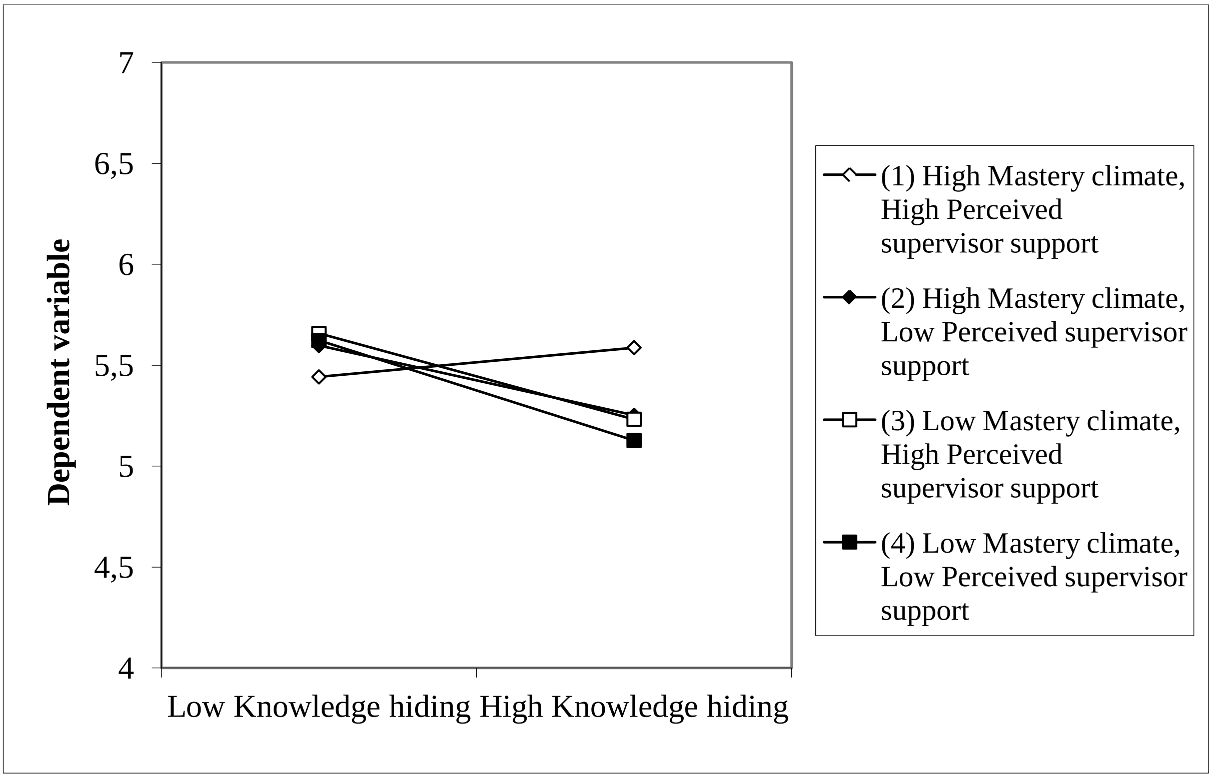
Table 4.3 reveals the results of four additional exploratory three-way interaction effects. In Model 6, I examined three-way interaction effects of knowledge hiding, mastery climate, and mastery goal orientation on creativity. The results show that three-way interaction is not significant (γ = .05, *SE* = .07, *ns*). In Model 7, I examined three-way interaction effects of knowledge hiding, mastery climate, and perceived supervisor support on creativity. This interaction is significant (γ = .20, *SE* = .11, $p < .05$). High perceived supervisor support accompanied by mastery climate (Figure 4.5) appears to reverse the negative effect of knowledge hiding on creativity (curve 1). It is also apparent that, in work groups scoring low in mastery climate, the relationship between knowledge hiding and creativity is even more negative (curve 2) for people not perceiving their supervisor's support than in work groups that are not characterized by high mastery climate. To test this interpretation, I statistically compared the slope of curve 2 to zero. As expected, when high mastery climate was accompanied by low perceived supervisor support, knowledge hiding significantly predicted lower levels of creativity (t = -3.173, p < .01). T-tests also revealed that the slope of curve 2 was significantly different from other slopes (slope 1 and 2: t = 2.580, p < .05; slope 2 and 3: t = -3.629, p < .01; slope 2 and 4: t = -3.332, p < .01).

Table 4.3: Multilevel results for exploratory three-way interactions

	Model 6	Model 7	Model 8	Model 9
Level 1				
Intercept	5.41** (.11)	5.44** (.06)	5.43*** (.06)	5.43*** (.06)
Age	-.01 (.01)	-.01 (.01)	-.00 (.01)	-.00 (.01)
Gender	-.05 (.04)	-.04 (.04)	-.10 (.06)	-.10 (.06)
Education	.01 (.04)	.03 (.04)	.01 (.05)	.01 (.05)
Expertise	-.01 (.01)	-.00 (.01)	-.01 (.01)	-.01 (.01)
Dyad tenure	.01 (.01)	.00 (.01)	.03 (.03)	.03 (.03)
Knowledge hiding	-.17** (.09)	-.14* (.08)	-.24** (.09)	-.21* (.09)
Mastery goal orientation	.01 (.05)	.05 (.05)	.03 (.05)	.05 (.05)
Performance goal orientation	-.00 (.03)	-.01 (.02)	-.00 (.03)	-.01 (.02)
Perceived supervisor support	.04 (.01)	.07 (.02)	.05 (.02)	.07 (.01)
Task interdependence	.05 (.02)	.08 (.03)	.05 (.05)	.09 (.06)
Decision autonomy	.19* (.08)	.19* (.10)	.27* (.10)	.29* (.11)
Level 2				
Team size	.10 (.03)	.10 (.03)	.08 (.03)	.08 (.03)
Mastery climate	.02 (.10)	.06 (.10)	.04 (.07)	.06 (.08)
Performance climate	-.05 (.06)	-.09(.05)	-.05 (.06)	-.09(.05)
Interaction effects				
Knowledge hiding × Mastery climate	.16** (.05)	.18** (.07)	.26** (.07)	.26** (.07)
Knowledge hiding × Performance climate	.05 (.04)	.07 (.06)	.05 (.05)	.07 (.06)
Knowledge hiding × Mastery orientation	.26** (.12)			
Knowledge hiding × Perceived supervisor support		.14* (.04)		
Knowledge hiding × Mastery climate × Mastery orientation	.05 (.07)			
Knowledge hiding × Mastery climate × Perceived supervisor support		.20* (.10)		
Knowledge hiding × Task interdependence			-.26* (.12)	
Knowledge hiding × Decision autonomy				.06 (.03)
Knowledge hiding × Mastery climate × Task interdependence			-.34** (.11)	
Knowledge hiding × Mastery climate × Decision autonomy				.32** (.10)
Pseudo R^2	.42	.40	.43	.42
Deviance	520.4	526.27	524.03	522.14
n (level 1)	34	34	34	34
n (level 2)	240	240	240	240

Notes. The entries are the estimates of the fixed effects with robust standard errors. **p<.01, *p<.05.

Figure 4.5: Three-way interaction effects of knowledge hiding, mastery climate, and perceived supervisor support on employee creativity



In Model 8, I examined three-way interaction effects of knowledge hiding, mastery climate, and task interdependence on creativity. The results show that three-way interaction is significant ($\gamma = -.34$, *SE* = .11, $p < .01$). This interaction is shown in Figure 4.6, where it is evident that for employees performing low interdependence tasks in groups with high mastery climate, the relationship between knowledge hiding and creativity is less negative (curve 2). T-tests revealed that the slope of curve 2 was significantly different from other slopes (slope 1 and 2: t = -4.529, $p < .01$; slope 2 and 3: t = 5.897, $p < .01$; slope 2 and 4: t = 5.028, $p < .01$).

In Model 9, I examined three-way interaction effects of knowledge hiding, mastery climate, and decision autonomy on creativity. The results show that the three-way interaction is also significant ($\gamma = .32$, *SE* = .10, $p < .05$). This is shown in Figure 4.7, where it is evident that for people with high decision autonomy when working in groups with high mastery climate, the relationship between knowledge hiding and creativity is positive (curve 1). T-tests revealed that the slope of curve 1 was significantly different from other slopes (slope 1 and 2: t = 2.317, $p < .05$; slope 1 and 3: t = 7.058, p < .01; slope 1 and 4: t = 5.727, $p < .01$).

Figure 4.6: Three-way interaction effects of knowledge hiding, mastery climate, and task interdependence on employee creativity

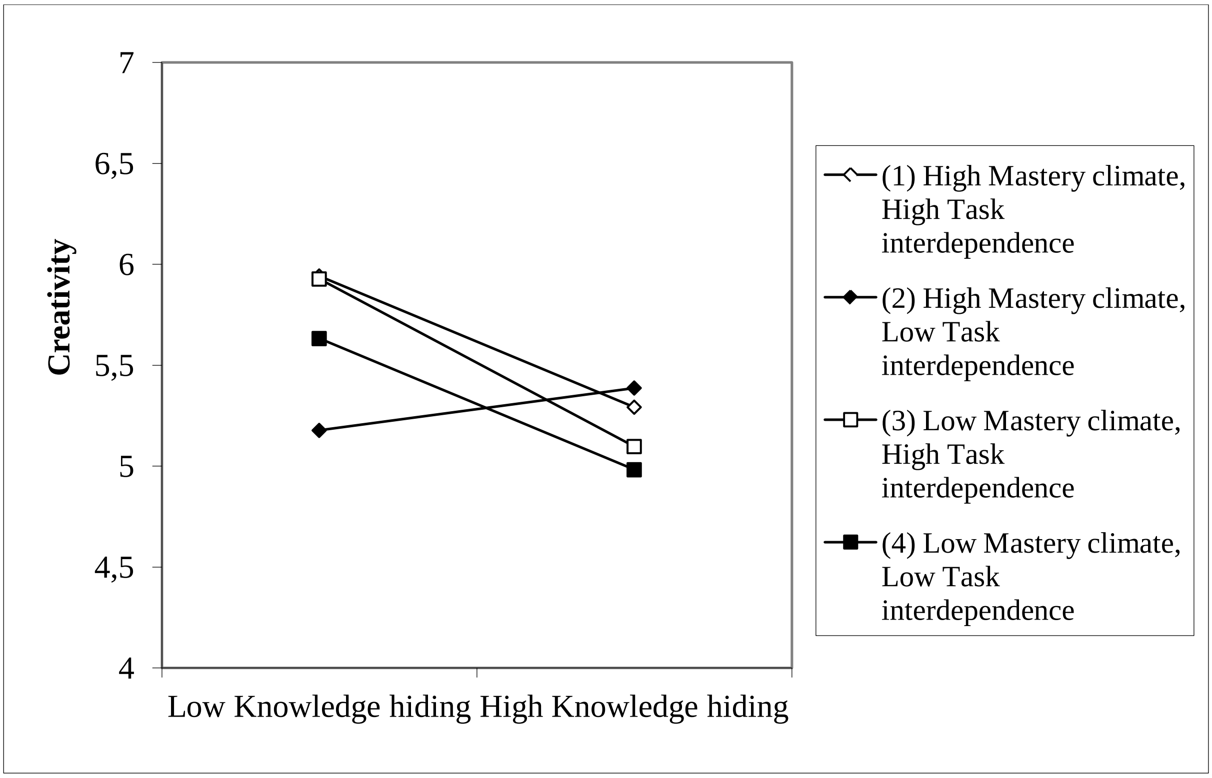
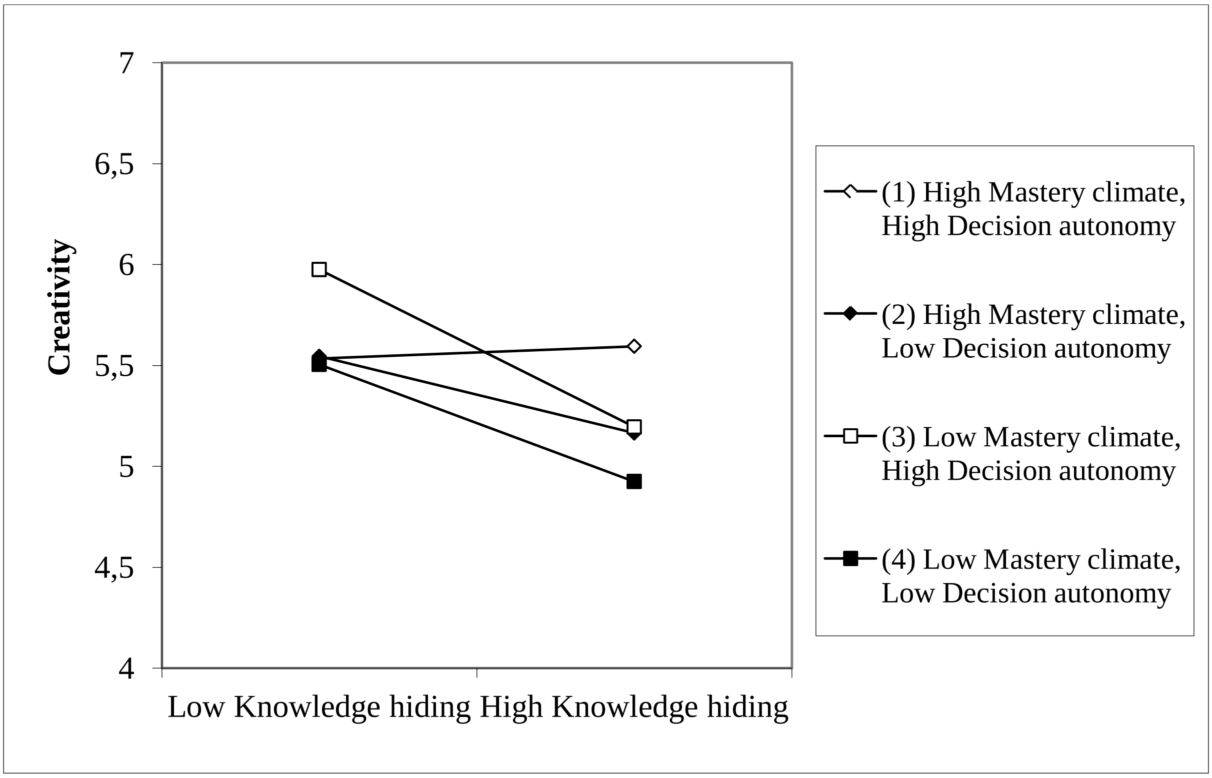


Figure 4.7: Three-way interaction effects of knowledge hiding, mastery climate, and decision autonomy on employee creativity



Although logical reasoning explained in the hypotheses build-up would lead us to speculate that mastery climate would not only fuel creativity, but also act as a buffer in the negative knowledge hiding-creativity relationship, my exploratory three-way interaction effects indicated it may not necessarily be so. Interesting results were found regarding mastery climate when observing the graphs portraying exploratory three-way interaction effects. Group mastery climate can only mellow this negative relationship if accompanied by proper managerial or individual factors. Yet, within groups with high mastery climate that was not accompanied by high mastery orientation of the group members, the effect of knowledge hiding on creativity was not significantly more negative. However, there are probably not a lot of employees that would score high in mastery orientation and hide knowledge, as attested by the negative correlation between the two variables (Table 4.1).

Thus, perhaps mastery climate by itself cannot act as a buffer for the negative relationship between knowledge hiding and creativity. There is a mechanism thatmanagers can use to try to mitigate this effect as pointed out by this study, and that is to exhibit high levels of support. The results suggest that the supervisor support as perceived by employees is the one factor that supports mastery climate in preventing the negative effect of knowledge hiding on creativity. However, this factor needs to be present in every group motivational climate setting, as the absence reveals a steep negative slope illustrating the relationship between knowledge hiding and creativity. This is in line with the previous research that emphasizes the role of supervisor support in enhancing employee creativity (e.g. Ramus & Steger, 2000). Furthermore, it could also be argued that supervisor support and mastery climate conditions are related to each other; by exhibiting high levels of support, immediate supervisors might construct mastery climate conditions in their groups.

Connelly et al. (2012) indicate that knowledge hiding and the related processes and outcomes are affected by the characteristics of the knowledge in question. Complicated and complex knowledge, for example, is more likely to be related to evasive hiding. Furthermore, knowledge hiding and its outcomes may be dependent on the quantity and frequency of social interactions among employees. Thus, it is highly relevant to examine knowledge hiding and its relationship with employee creativity as a function of job and a type of knowledge and interaction it demands.

Three-way interaction effects also demonstrated that employees who hide knowledge in groups high in mastery climates exhibit the highest levels of creative behaviors if their task does not require them to frequently collaborate with others. This is why their behavior is not extensively against the expected behavior in mastery climates, which would be viewed as betrayal (Ommundsen et al., 2003). Thus, low task interdependence is suitable in an attempt to mitigate the negative effect of knowledge hiding on creativity when trying to influence this relationship with mastery motivational climate.

Similar conclusions can be found when examining the role of decision autonomy. The results of all models demonstrate that decision autonomy by itself is positively related to better results in creativity, and that it is best to provide employees who hide knowledge with decision autonomy in groups with high mastery climate. This enables them to perform the tasks by themselves, and thus avoid the reciprocal distrust loop with others, which in turn does not have as detrimental influence on their own creativity. These three-way interaction results thus serve as an excellent basis for future research.

There are a couple of factors that need to be taken into account when interpreting the results of Study 1. As Connelly et al. (2012) state, knowledge hiding may be a relatively under-reported low-base-rate event. It might also be obvious to the respondents that knowledge hiding is not a desirable behavior, which is why it may be under-reported in questionnaire surveys. Any other-reported survey would not be accurate, however, as it is difficult to ask supervisors or co-workers to assess an employee's knowledge hiding behaviors when, by definition, the actions involved would be concealed (Connelly et al., 2012). Furthermore, meta-analytical data suggest that other-reported assessments of counterproductive work behavior do not capture unique and valid incremental variance beyond self-report, and even assess such behavior in a more narrow way (Berry et al., 2012).

Second, the relationship between knowledge hiding and creativity depends upon motivational climate, and perceived mastery and performance climate might even act as antecedents of knowledge hiding. Therefore, the issue of endogeneity could play a role in Study 1, although I included a number of control variables that can be theoretically linked to my dependent or independent variables. Third, the perception of creativity might differ among employees who conduct various tasks that require different amounts of creative behaviors (Hennessey & Amabile, 2010). One task might require a great amount of creative behavior, whereas another might not require employee performing it to be creative at all. I controlled for the expertise that undeniably plays a role in the perceptions of creativity, as well as for job requirement for creativity, but I could not effectively control for the influence of tasks as such (cf. Wood, 1986).

Fourth, the social explanatory mechanism of reciprocal distrust loop depends heavily on dyadic interaction between the co-workers. Simply controlling for task interdependence is not sufficient. Moreover, I could not collect sequential data on an employee's knowledge hiding and distrust of his or her co-worker that emerges afterwards, as well as whether this is the factor that predicts the diminished levels of creativity of the first employee. I could not assess perceived knowledge hiding and adequately test the proposed distrust loop, nor could I compare this mediator to other mechanisms of a more intrapsychic nature that can also be important for explaining the basic relationship between knowledge hiding and creativity.

4.1.8 Study 2: Methods

To strengthen causal inferences and rule out alternative explanations, as well as to address four limitations of Study 1, I conducted an experimental study in which participants generated creative ideas to solve a business problem. By drawing upon the results of my first study, the aim of my second study was to test the results I obtained using a different method, controlling for the task, and have creative outcome rated by multiple experts. Most importantly, I wanted to test the proposed distrust loop and compare this explanatory mechanism in moderated mediation analyses for the relationship between knowledge hiding and creativity with other more intrapsychic mediators. I independently manipulated mastery and performance climates, and manipulated knowledge hiding, to mitigate the effect of under-reporting of this undesirable behavior.

4.1.8.1 Experimental studies

As experimental studies represent a relatively underused research method in Slovenian organizational studies research, I utilize this section for a brief presentation of this method, its characteristics, and for a demonstration of its potential use. It must be emphasized that I only use experimental studies as an addition to field studies. As they are frequently cross-sectional (because of difficulties related to the gathering of longitudinal data) and always subject to business environment-related influences, no field study is perfect. Therefore, an addition of another experimental study is almost a must if a researcher is to make a strong theoretical and empirical contribution.

The reason to use experimental studies is closely related to making causal claims. Researchers often estimate relationships by using correlational data, where the predictor variables are not exogenously manipulated (Antonakis, Bendahan, Jacquart, & Lalive, 2010). In field studies, one has limited control, and cannot completely get rid of (or estimate, for that matter) the omitted variable bias despite including control variables. Therefore, in order to eliminate any kind of external influences inherent to real-life business environment and get closer to making more accurate (implicit or explicit) causal claims, it is imperative to combine field and experimental research designs.

In general, experiments can be either field or laboratory. One additional way is to conduct internet experiments, which can only be used to validate or support claims found in previous field or laboratory experiments (Birnbaum, 2000). In a laboratory experiment, the researcher plans and establishes artificial conditions for the manipulation of the studied conditions, and then examines their effect on some other phenomena (Webster & Sell, 2007). While it may be argued that experimental studies fail to capture the “real world”, it is actually not the researchers’ intent to recreate the real-life phenomena in the laboratory (Hegtvedt, 2008). The majority of laboratory experiments in social sciences are conducted by social psychologists, and carried out to examine small group phenomena as it is quite difficult to establish complex social interactions in laboratory experiments. Nonetheless, experiments need to exhibit not only external, but also internal validity; they need to be generalizable, but only under the same initial conditions (Webster & Sell, 2007).

Another important issue in experimental studies is related to ethics. Researchers that conduct experiments have the responsibility to protect human dignity of the participants. General ethical concerns related to conducting experiments include (Hegtvedt, 2008): 1) objectification of participants (treating them merely as research material instead of human beings); 2) potential harms to participants (inconvenience, physical, psychological, or social harm); 3) coercive, exploitative, or intrusive practices and; 4) maintenance of privacy and confidentiality.

In terms of the experimental design, researchers have an option to either use a one-factor-at-a-time approach or consider possible interactions among factors (factorial experiments, Montgomery, 2008). Naturally, one has to adapt their experimental design to this decision; devise control (without manipulations) and experimental (with manipulations) groups accordingly and use manipulations that relate to one or more variables. Manipulations represent priming of a particular event in order to enhance or diminish the participants' perceptions of a particular factor in the experimental task. An experimental task needs to be set up in a way that allows the participants to experience phenomena examined in the experiment.

Two important principles of experimental design are randomization and replication (Montgomery, 2008). Randomization is important for the subsequent use of statistical methods. Both the allocation of the experimental material and the manipulations need to be randomly determined (Montgomery, 2008). On the other hand, replication means that each factor combination needs to be independently repeated in experimental and control groups. Field experiments frequently adopt a quasi-experimental design (Kirk, 2009), where participants cannot be randomly assigned to treatment levels and perhaps only an experimental group is used and changes are assessed on the basis of a change in time (measuring phenomena before and after the manipulation).

Experimental data need to be gathered in some way – this is usually done with regular surveys after the experimental task. Data are then analyzed using t-tests, analyses of variance, or multivariate analyses of variance for examining differences between experimental and control groups. First, one needs to conduct the manipulation checks; more precisely, examine whether experimental priming was successful on the factor variables. Second, one should inspect the differences in terms of the dependent (criterion) variable(s). After establishing that the manipulations were acceptable and that there are significant differences among groups in terms of the outcome variable(s), researchers can start analyzing data as one would do in a field study: by using any type of quantitative data analysis techniques.

4.1.8.2 Sample, design, and procedures

I conducted an experiment with 132 second-year undergraduates in HRM course at a Slovenian university. The age of the participants ranged from 20 to 28, and the average age was 22.2 years (SD = 1.25). About 65% were female. Roughly 70% of them had some work experience, such as student or summer jobs. They were given extra points for participation. The experiment used a three-by-two (mastery climate/performance climate/no climate induced by knowledge hiding, low/high) between-subjects factorial design. The participants were randomly assigned to three classrooms prior to the course. I introduced the study by explaining that I was interested in studying how people solve business problems. The experiment started with the presentation of a marketing scenario to the participants. The participants were assigned the role of the company's marketing managers. In the scenario, the organization had developed a new product and a project team of two students was assembled (thus, the students were asked to form dyads, as knowledge hiding tends to most significantly influence its outcomes in dyadic interaction, Connelly et al.,

2012) to introduce the product into the market successfully. The scenario consisted of two stages (15 minutes each). Each stage represented a particular phase of the product launching process.

Before the beginning of the first stage, I introduced the manipulations of mastery and performance climate, each in one classroom. The manipulation consisted of two coherent aspects from which a specific motivational climate was derived, i.e. induced by the teacher with teaching strategies consistent with Ames (1992a), performance climate in the first classroom and mastery climate in the second, and the members were given instructions coherent with a particular climate. In the third, control classroom, no inducement regarding motivational climates was provided. Half of the participants in each classroom were given special instructions regarding knowledge hiding (i.e. a sign “Hide your knowledge and information” written on the instruction sheet in each stage).

In the first stage, one of the team members had to assume a role of strategy planner and the other a role of sales channels designer. Each one had relevant information about what the other one’s role should be like. For example, strategy planner had information about the sales channels designer (explanations of what this particular domain is supposed to mean and what goals they might be expected to achieve):

> A sales channel designer should consider options on sales channels through which we can market our product and choose the best, and also some of the more unconventional ones. What are sales channels? For example, internet (in all forms and shapes), phone sales, sales representatives, our own stores, door-to-door sales, or anything else you come up with.

On the contrary, the sales channels designer had information about the strategy planner:

> A strategy planner should consider how the project can achieve optimal marketing results with minimal resources. This includes balancing and coordinating sales channels with marketing activities. He or she should come up with a holistic and rounded plan that would incorporate all marketing efforts into one unified whole. Strategy is usually directed either towards differentiation or cost efficiency. Marketing segmentation and target segments should also be considered.

When they completed the task, I assessed *perceived knowledge hiding* of the second person in the dyad who was supposed to hide it by using the scale of Connelly et al. (2012), which I adapted to concern this particular task and others’ knowledge hiding instead of one’s own (α = .93). That second person (not the one who hid the knowledge) also provided a score of their *distrust* in the first one (“please rate your level of distrust of another team member you felt during the task” with anchors “1 = completely trusted”, “7 = completely distrusted”).

The second stage of the task represented an extension of the first. One of the dyad members was asked to come up with at least three slogans for the new marketing campaign, while the other was in charge of the advertising. Once again, the first person had information about the other one on the instruction sheet and vice versa. Advertising:

> Your team member who is in charge of advertising should come up with creative ideas for advertisements, that is television, newspaper ads, magazine ads, billboards, flyers, etc. It is desired that he or she thinks outside the box and comes up with unusual places for these advertisements, as well as interesting ideas for the content of the advertisements.

Slogans for a new marketing campaign:

> Your teammate who deals with a new marketing campaign should come up with at least three various slogans that will be as creative as possible. Our company would market our product in commercials or any promotional materials using these slogans. A slogan is a motto, a short line that is easy on the ear and can be quickly remembered. It can express briefly and effectively the purpose or an idea of a product.

After they completed the task, I assessed *knowledge hiding* of the second individual in the dyad who was not under the manipulation (reciprocated knowledge hiding). This was self-reported using the scale of Connelly et al. (2012) - $\alpha = .92$. Both individuals' *creative ideas* were assessed by two independent raters (experts in the field of creativity) on a scale from "1 = not at all creative" to "7 = very creative". The two raters achieved good reliability (ICC2 = .83) and agreement (average deviation = .80) that is within conventional guidelines (LeBreton & Senter, 2008). I thus averaged their ratings into the overall creativity measure of the first and the second individual's second stage of the task outcome.

After completing both tasks, all participants answered questions regarding the *perceived mastery and performance climate*. I adapted the scale, i.e. substituted the word "employees" with the "participants" ($\alpha = .86$ for mastery and .82 for performance climate), and the participants on whom I manipulated *knowledge hiding* also self-reported this phenomenon during the whole task (the same scale by Connelly et al., 2012 - $\alpha = .84$). These responses (climates and knowledge hiding) served as *manipulation checks*. The participants also assessed alternative mediators: *prevention focus* (9 items from General Regulatory Focus Measure (GRFM) by Lockwood, Jordan, & Kunda, 2002 - $\alpha = .96$), *perceptions of risk* (tapped with the following question: "How certain were you during the task that you will be able to come up with an output that will satisfy your supervisor?" The responses were taken on a 7-point scale "1 = very uncertain, 7 = completely certain"), and *psychological safety* (one item from Edmondson, 1996: "If you make a mistake in this team, it is held against you" – reverse coded).

The participants also reported on control variables, such as *promotion focus* (other 9 items from GRFM, Lockwood et al., 2002, $\alpha = .98$), *propensity of risk* (social risk attitude scale by Weber et al., 2002, 10 items – $\alpha = .98$), *goal orientations* (the same scale as in Study 1, $\alpha = .92$ for mastery and .85 for performance approach), *dispositional creativity* (5 items, Kirton, 1976 - $\alpha = .94$), *perceived task interdependence* (5 items, as in Study 1, $\alpha = .75$), and *task difficulty* (one item: "The task was difficult"). I also controlled for *age*, *gender*, and *work experience*.

4.1.9 Study 2: Results

Means and standard deviations for each condition are shown in Table 4.4. In terms of manipulation checks, a multivariate analysis of variance (MANOVA) showed the expected main effects of the climate manipulation on the perceived mastery climate (F[2,129] = 13.11, $p < .01$) and the perceived performance climate (F[2,129] = 32.52, $p < .01$), as well as the expected main effect of the knowledge hiding manipulation on self-reported knowledge hiding (F[1,131] = 66.21, $p < .01$).

When turning to creativity as the dependent variable, in support of Hypothesis 1, Table 4.4 reveals creativity means in differential knowledge hiding conditions (F[1,129] = 12.42, $p < .01$). The MANOVA also revealed a significant interaction effect of the knowledge hiding and motivational climate manipulations on creativity (F[2,128] = 1.98, $p < .05$; Figure 4.8). The interaction was robust even after including all control variables (F[17,48] = .57, $p < .05$). To support Hypotheses 3a and 4, simple effects showed that knowledge hiding decreased participants' own creativity in performance climate conditions (F[1,115] = 5.34, $p < .05$) and where no climate was induced (F[1,115] = 1.87, $p < .05$), but not in mastery climate conditions (F[1,115] = .34, *ns*).

Figure 4.8: Creativity scores in different experimental conditions

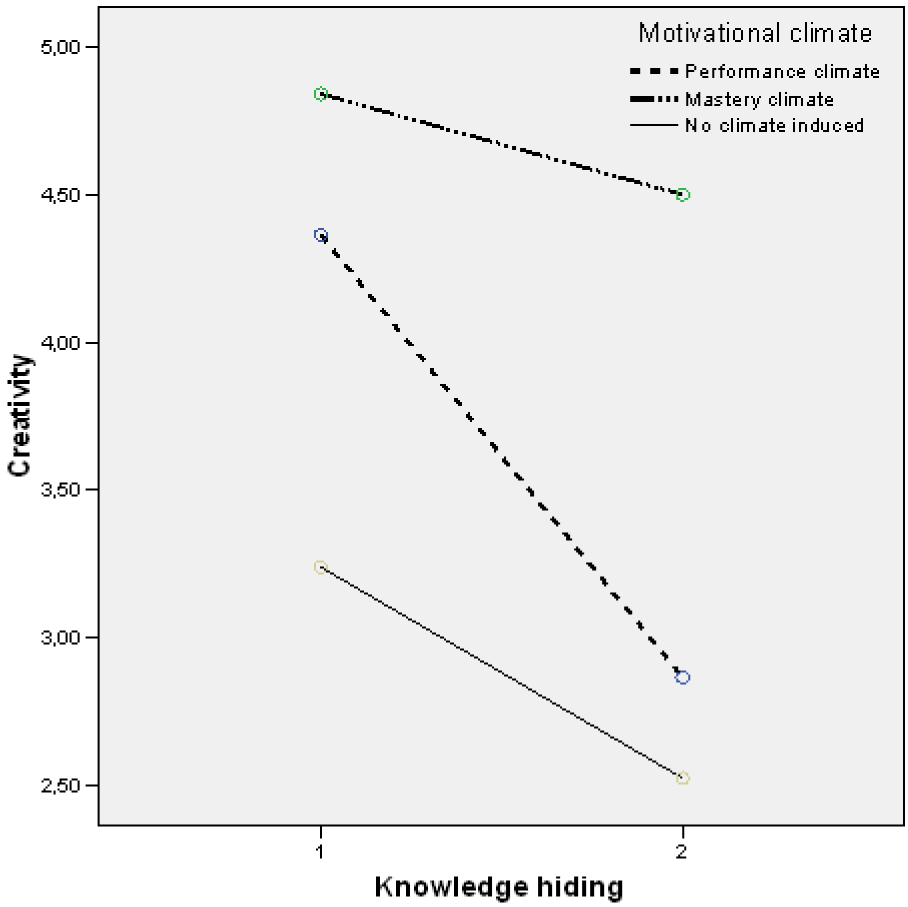


Table 4.4: Means and standard deviations by condition [a]

Condition	Creativity	Performance climate	Mastery climate	Distrust	Prevention focus	Perceptions of risk	Psychological safety	Knowledge hiding
No knowledge hiding, performance climate (*n* = 22)	4.36 (1.49)	4.59 (1.18)	4.14 (1.36)	1.68 (1.94)	2.32 (1.04)	2.27 (.93)	5.82 (1.05)	1.73 (1.45)
Knowledge hiding, performance climate (*n* = 22)	2.86 (.83)	5.45 (1.34)	4.27 (1.35)	5.32 (.96)	5.41 (1.40)	4.22 (1.57)	5.82 (1.68)	4.86 (1.83)
No knowledge hiding, mastery climate (*n* = 22)	4.84 (1.89)	2.86 (1.81)	5.64 (1.56)	2.53 (1.78)	3.53 (1.39)	3.05 (1.84)	5.74 (.93)	1.32 (.48)
Knowledge hiding, mastery climate (*n* = 22)	4.5 (.91)	2.91 (1.15)	5.86 (1.04)	5.09 (.97)	4.73 (1.67)	4.68 (1.32)	6.14 (.83)	2.27 (1.03)
No knowledge hiding, no climate induced (*n* = 22)	3.24 (1.79)	2.71 (1.79)	4.05 (2.29)	1.57 (1.21)	2.76 (.96)	2.28 (1.42)	5.57 (1.03)	1.52 (.68)
Knowledge hiding, no climate induced (*n* = 22)	2.52 (1.04)	2.95 (1.26)	4.35 (1.75)	4.78 (1.24)	4.74 (1.14)	4.09 (1.35)	6.09 (.90)	2.61 (1.27)

[a] Standard deviations are in parentheses

To test the reciprocal distrust loop and establish distrust as a mediator in the knowledge hiding–creativity relationship, I examined three simple mediations separately. I first studied whether perceived knowledge hiding of the second individual in the dyad mediated the relationship between knowledge hiding of the first individual and distrust of the second individual (Table 4.5). Next, I examined whether distrust of the second individual mediated the relationship between perceived knowledge hiding and reciprocated knowledge hiding of the second individual (Table 4.6). Finally, I investigated whether reciprocated knowledge hiding of the second individual mediated the relationship between distrust of the second individual and creativity of the first individual in the dyad (Table 4.7). I followed standard procedures to examine mediation with a bootstrap approach (Preacher & Hayes, 2004). If all three mediations hold, this would allow me to proceed with the examination of distrust as an explanatory mechanism in the moderated mediation analyses.

Table 4.5 reveals that all four steps hold for full mediation of perceived knowledge hiding (2nd individual) in the relationship between knowledge hiding of the first individual and distrust of the second individual hold. By drawing 1000 random samples and using replacement from the full sample, I constructed bias-corrected confidence intervals for this indirect mediating effect. The indirect effect from the full sample was .59 and the confidence interval from the bootstrap analysis excluded zero (.36, .99).

Table 4.6 reveals that all four steps for partial mediation of distrust in the relationship between perceived knowledge hiding and reciprocated knowledge hiding of the second individual hold (the relationship between perceived knowledge hiding and distrust was already examined in column 3 of Table 4.5, which is why I did not repeat this investigation in Table 4.6). The relationship between perceived knowledge hiding and reciprocal knowledge hiding is still significant, but reduced in size when adding distrust as a mediator. By drawing 1000 random samples and using replacement from the full sample, I constructed bias-corrected confidence intervals for this indirect mediating effect. The indirect effect from the full sample was .03, and the confidence interval from the bootstrap analysis excluded zero (.01, .07).

Table 4.7 reveals that all four steps for full mediation of reciprocated knowledge hiding (2nd individual) in the relationship between distrust (2nd individual) and creativity (1st individual) hold (the relationship between distrust and reciprocated knowledge hiding was already examined in column 2 of Table 4.6, which is why I did not repeat the research in Table 4.7). By drawing 1000 random samples and using replacement from the full sample, I constructed bias-corrected confidence intervals for this indirect mediating effect. The indirect effect from the full sample was .06, and the confidence interval from the bootstrap analysis excluded zero (.01, .11), which finally supports Hypothesis 2. On the basis of this evidence, I proceeded to examine distrust as an explanatory mechanism in the knowledge hiding–creativity relationship.

Next, I used the Edwards and Lambert (2007) moderated mediation procedures to first examine whether participants' reports of distrust (2nd individual), prevention focus, perceptions of risk, and psychological safety (1st individual) mediated the effect of the knowledge hiding manipulation on creativity. I present results in Table 4.8 (distrust) and Table 4.9 (alternative explanatory mechanisms).

I began by conducting moderated regression analyses predicting distrust (Table 4.8, left column). The interaction between mastery climate and knowledge hiding in predicting distrust was significant. The relationship between knowledge hiding and distrust was positive in low mastery climate condition (b = .35, s.e. = .09, β =.24, p < .01), but negative in high mastery climate condition (b = -.15, s.e. = .09, β =-.14, p < .05). Next, I tested whether distrust predicted creativity when knowledge hiding, mastery climate, and their interaction were controlled. These analyses were conducted while controlling for alternative mediators (Table 4.8, right column). Distrust was a significant predictor and the coefficient on the interaction term decreased below statistical significance. To examine whether this was a significant decrease, I used bootstrap procedures to construct 95% bias-corrected confidence intervals around the indirect effects of both levels of mastery climate (Edwards & Lambert, 2007). The confidence interval for the indirect effect of knowledge hiding on creativity through distrust excluded zero for both high mastery climate (-.01, -.14) and low mastery climate (-.12, -.37), indicating that distrust mediated the relationship between knowledge hiding and creativity at both levels of mastery climate, which supports Hypothesis 3b.

I compared these results to other, alternative mediators. Only in the case of prevention focus (Table 4.9, first column), knowledge hiding and mastery climate interact in predicting this intrapsychic mediator. This is not the case for the perceptions of risk (Table 4.9, column 2) and psychological safety (which was, however, negatively predicted by the interaction between knowledge hiding and performance climate). To return to prevention focus, the relationship between knowledge hiding and prevention focus was positive in the low mastery climate condition (b = .46, s.e. = .12, β =.40, p < .05), but negative and insignificant in the high mastery climate condition (b = -.04, s.e. = .12, β =-.04, *ns*). Next, I tested whether prevention focus predicted creativity when knowledge hiding, mastery climate, and their interaction were controlled for. These analyses were conducted while controlling for other mediators (Table 4.9, right column). Prevention focus was a significant predictor and the coefficient on the interaction term (knowledge hiding x mastery climate) decreased below statistical significance. To examine whether this was a significant decrease, I used bootstrap procedures to construct 95% bias-corrected confidence intervals around the indirect effects of both levels of mastery climate (Edwards & Lambert, 2007). The confidence interval for the indirect effect of knowledge hiding on creativity through prevention focus excluded zero for both high mastery climate (-.01, -.10) and low mastery climate (-.08, -.20), which indicated that prevention focus mediated the relationship between knowledge hiding and creativity at both levels of mastery climate.

Table 4.5: Simple mediation analyses for distrust as the dependent variable

Variables	Perceived knowledge hiding (2)				Distrust (2) - Step 1				Distrust (2) - Step 2				Distrust (2) - Step 3			
	b	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*
Task difficulty (2)	-.08	.13	-.05	-.62	-.30	.18	-.15	-1.66	-.27	.17	-.14	-1.58	-.27	.18	-.14	-1.54
Age (2)	-.05	.10	-.05	-.55	.29*	.13	.21	2.11	.30*	.13	.22	2.25	.30*	.13	.22	2.22
Gender (2)	-.05	.27	-.01	-.20	-.11	.37	-.02	-.30	-.10	.36	-.02	-.27	-.10	.37	-.02	-.27
Work experience (2)	.20	.11	.17	1.69	-.24	.16	-.17	-1.53	-.30	.16	-.21	-1.83	-.29	.16	-.21	-1.79
Perceived task interdependence (2)	.01	.11	.01	.10	-.08	.15	-.05	-.56	-.08	.14	-.06	-.59	-.08	.15	-.06	-.58
Propensity of risk (2)	-.02	.08	-.02	-.23	.23*	.11	.19	2.07	.23*	.11	.20	2.16	.23*	.11	.20	2.12
Prevention focus (2)	.22*	.09	.23	2.42	.31*	.12	.26	2.48	.25	.13	.21	1.95	.25	.16	.21	1.89
Promotion focus (2)	.01	.09	.00	.09	.11	.13	.08	.83	.10	.12	.08	.83	.10	.13	.08	.81
Perceptions of risk (2)	.16	.08	.17	1.99	.59**	.11	.50	5.22	.55**	.11	.46	4.83	.55**	.12	.46	4.63
Psychological safety (2)	.03	.13	.02	.25	-.25	.17	-.14	-1.43	-.26	.17	-.14	-1.53	-.26	.17	-.14	-1.48
Knowledge hiding (1)	.54	.10	.53	5.34	.32*	.14	.15	2.58					.04	.23	.00	.11
Perceived knowledge hiding (2)									.27*	.13	.20	2.09	.27*	.22	.20	2.19
R^2	.79**				.75**				.76**				.76**			
F (df)	13.24 (11, 38)				10.41 (11, 38)				10.91 (11, 38)				9.74 (12, 37)			

$^{**}p < .01$, $^{*}p < .05$

Table 4.6: Simple mediation analyses for reciprocated knowledge hiding as the dependent variable

Variables	Reciprocated knowledge hiding (2) - Step 1				Reciprocated knowledge hiding (2) - Step 2				Reciprocated knowledge hiding (2) - Step 2			
	b	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*
Task difficulty	.10	.08	.07	1.33	.26	.19	.19	1.33	.12	.08	.09	1.49
Age	-.05	.06	-.05	-.82	-.22	.15	-.23	-1.43	-.07	.06	-.07	-1.05
Gender	.18	.16	.06	1.07	.60	.37	.27	1.80	.18	.16	.06	1.11
Work experience	-.08	.07	-.08	-1.12	.29	.17	.29	1.70	-.06	.07	-.06	-.83
Perceived task interdependence	.03	.06	.03	.44	.16	.16	.15	.98	.03	.07	.03	.52
Propensity of risk	.03	.05	.03	.59	-.00	.12	-.01	-.02	.01	.05	.01	.28
Prevention focus	.00	.06	.01	.11	.19	.14	.23	1.32	-.01	.06	-.01	-.13
Promotion focus	-.00	.06	-.00	-.05	-.16	.13	-.17	-1.18	-.01	.06	-.01	-.16
Perceptions of risk	-.03	.05	-.04	-.70	-.10	.15	-.12	-.66	-.07	.06	-.08	-1.06
Psychological safety	.07	.08	.05	.93	-.02	.19	-.01	-.12	.09	.08	.07	1.10
Distrust (2)					.36*	.16	.52	2.17	.22*	.07	.18	2.02
Perceived knowledge hiding	.55**	.06	.56	9.13					.23*	.06	.34	2.13
R^2	.89**				.42*				.89**			
F (df)	29.89 (11, 38)				2.54 (11, 38)				27.22 (12, 37)			

[a] Distrust (2) denotes the perceived distrust of the second individual in the dyad.
[**] $p < .01$, [*] $p < .05$

Table 4.7: Simple mediation analyses for creativity (1) as the dependent variable[a]

Variables	Creativity (1) - Step 1				Creativity (1) - Step 2				Creativity (1) - Step 3			
	b	*SE*	*b*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*
Task difficulty	.18	.16	.11	1.12	.21	.16	.12	1.32	.208	.17	.12	1.22
Age	-.17	.13	-.15	-1.35	-.20	.12	-.17	-1.62	-.196	.13	-.17	-1.44
Gender	.25	.319	.07	.79	.32	.33	.09	.97	.323	.34	.09	.95
Work experience	.15	.14	.13	1.06	.18	.14	.15	1.27	.182	.15	.15	1.18
Perceived task interdependence	-.07	.13	-.06	-.57	-.06	.13	-.05	-.45	-.064	.13	-.05	-.46
Propensity of risk	.25*	.10	.25	2.38	.26*	.10	.26	2.57	.25*	.11	-.25	-2.36
Prevention focus	-.36**	.12	-.36	-2.99	-.35**	.11	-.35	-2.98	-.352	.12	-.34	-2.77
Promotion focus	-.01	.11	-.01	-.12	-.03	.11	-.02	-.26	-.029	.12	-.02	-.24
Perceptions of risk	-.34**	.13	-.34	-2.59	-.36**	.10	-.36	-3.53	-.35*	.13	-.35	-2.62
Psychological safety	.24	.16	.16	1.52	.25	.15	.16	1.61	.24	.16	.16	1.49
Distrust (2)	-.25*	.14	-.25	-2.05					-.02	.15	-.02	-.12
Reciprocated knowledge hiding					-.19*	.12	-.07	-2.01	-.19*	.13	-.07	-2.02
R^2	.71**				.72**				.72**			
F (df)	8.80 (11, 38)				8.92 (11, 38)				7,97 (12, 37)			

[a] Distrust (2) denotes the perceived distrust of the second individual in the dyad. $^{**}p < .01$, $^{*}p < .05$

Table 4.8: Moderated mediation analyses for distrust as the explanatory mechanism[a, b]

Variables	Distrust (2)								Creativity (1)							
	Step 1				Step 2				Step 1				Step 2			
	b	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*
Task difficulty	-.27	.18	-.15	-1.60	-.29	.18	-.13	-1.58	.15	.21	.10	.70	.09	.22	.06	.39
Age	.28	.14	.20	1.97	.36	.15	.26	2.31	.07	.18	.07	.41	.15	.19	.15	.77
Gender	-.11	.39	-.02	-.28	-.07	.39	-.01	-.19	-.03	.46	-.01	-.07	-.05	.46	-.01	-.11
Work experience	-.22	.17	-.16	-1.29	-.27	.18	-.19	-1.50	.03	.21	.03	.15	-.02	.22	-.02	-.11
Perceived task interdependence	-.09	.15	-.06	-.56	-.04	.16	-.02	-.25	.00	.19	.00	.01	-.01	.18	-.01	-.03
Propensity of risk													-.06	.16	-.07	-.39
Prevention focus													-.25*	.16	-.23	-2.53
Promotion focus													-.03	.19	-.03	-.17
Perceptions of risk													.11	.18	.13	.63
Psychological safety													.46*	.22	.35	2.08
Distrust (2)													**-.21***	**.10**	**-.22**	**-2.07**
Knowledge hiding	.27*	.14	.19	2.01	.25*	.24	.20	2.22	-.39*	.25	-.37	-2.05	-.36	-.45	-.34	-1.49
Mastery climate	-.02	.10	-.02	-.26	-.05	.13	-.04	-.39	.26	.15	.32	1.76	.28	.15	.33	1.83
Performance climate	-.04	.12	-.03	-.38	-.02	.14	-.02	-.17	.04	.16	.05	.30	.04	.16	.05	.27
Knowledge hiding x mastery climate					**-.20***	**.10**	**-.49**	**-2.24**	**.24***	**.12**	**.28**	**2.03**	.11	.12	.16	-.91
Knowledge hiding x performance climate					-.04	.09	-.13	-.47	-.04	.10	-.16	-.37	-.04	.10	-.20	-.46
R^2	.75**				.77**				.41*				.43*			
F (df)	8.40** (13,36)				7.43** (15,34)				2.56 (15,34)				2.54 (16,33)			
ΔR^2					.02*								.02*			

[a] Values in bold are relevant to the tests of Hypotheses. [b] Distrust (2) denotes the perceived distrust of the second individual in the dyad.
$^{**}p < .01$, $^{*}p < .05$

Table 4.9: Moderated mediation analyses for alternative explanatory mechanisms[a]

Variables	Prevention focus (1)								Perceptions of risk (1)								Psychological safety (1)								Creativity (1)							
	Step 1				Step 2				Step 1				Step 2				Step 1				Step 2				Step 1				Step 2			
	b	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*
Task difficulty	-.30	.24	-.18	-1.24	-.29	.25	-.18	-1.18	-.11	.25	-.06	-.44	-.10	.25	-.06	-.42	.29	.15	.27	1.95	.30	.15	.28	2.03	.15	.21	.10	.70	.09	.22	.06	.39
Age	-.10	.20	-.09	-.51	-.08	.21	-.07	-.37	-.13	.20	-.11	-.63	-.08	.22	-.07	-.37	-.14	.12	-.18	-1.13	-.12	.13	-.16	-.93	.07	.18	.07	.41	.15	.19	.15	.77
Gender	.00	.56	.00	-.00	-.04	.58	-.01	-.08	-.28	.57	-.08	-.49	-.20	.59	-.05	-.34	.44	.34	.19	1.28	.37	.35	.16	1.07	-.03	.46	-.01	-.07	-.05	.46	-.01	-.11
Work experience	.14	.25	.11	.55	.14	.26	.12	.55	.11	.26	.09	.42	.06	.27	.05	.22	-.01	.15	-.00	-.03	.01	.15	.01	.04	.03	.21	.03	.15	-.02	.22	-.02	-.11
Perceived task interdependence	.02	.22	.01	.10	.03	.22	.03	.16	.12	.22	.09	.52	.12	.23	.09	.52	.01	.13	.01	.10	.03	.13	.03	.22	.00	.19	.00	.01	-.01	.18	-.01	-.03
Propensity of risk																													-.06	.16	-.07	-.39
Prevention focus																													-.25*	.16	-.23	-2.53
Promotion focus																													-.03	.19	-.03	-.17
Perceptions of risk																													.11	.18	.13	.63
Psychological safety																													.46*	.22	.35	2.08
Distrust (2)																													-.21*	.10	-.22	-2.07
Knowledge hiding	.33*	.20	.31	2.67	.46*	.23	.38	2.56	-.17	-.20	.14	-.83	-.42	.84	-.35	-.42	-.25*	.12	-.28	-2.26	-.27	.49	-.33	-.54	-.39*	.25	-.37	-2.05	-.36	.45	-.34	-1.49
Mastery climate	-.12	.15	-.13	-.83	-.12	.16	-.12	-.73	-.18	.15	-.19	-1.17	-.23	.16	-.25	-.23	.02	.09	.03	.25	.01	.09	.01	.09	.26	.15	.32	1.76	.28	.15	.33	1.83
Performance climate	.16	.17	.16	.93	.12	.19	.12	.66	.03	.18	.03	.17	.06	.19	.06	.06	-.04	.10	-.07	-.43	-.09	.11	-.14	-.84	.04	.16	.05	.30	.04	.16	.05	.27
Knowledge hiding X mastery climate					-.21*	.13	-.26	-2.12					.11	.13	.43	.11					.01	.08	.02	.04	.24*	.12	.28	2.03	.11	.12	.16	-.91
Knowledge hiding X performance climate					.09	.12	.34	.73					.02	.12	.07	.02					-.21*	.08	-.62	-2.28	-.04	.10	-.16	-.37	-.04	.10	-.20	-.46
R^2	.21*				.23*				.08				.09				.24*				.28*				.41*				.43*			
F (df)	2.64 (8,41)				3.55(10,39)				.44 (8,41)				.41 (10,39)				2.62 (8,41)				2.53 (8,41)				2.56 (15,34)				2.54 (16,33)			
ΔR^2					.02*								.01								.02*								.02*			

[a] I repeated the last column from Table 4.8 for better illustration. $^{**}p < .01$, $^{*}p < .05$

4.1.10 Discussion

Understanding and mitigating the negative influence of knowledge hiding on various outcomes represents a relevant issue in knowledge management (Connelly et al., 2012). I drew on the norm of reciprocity (Gouldner, 1960) to argue that when a co-worker is denied knowledge needed in order to be creative, in turn, the same person is likely to reciprocate knowledge hiding to the initial knowledge hider. This would successively impede the knowledge hider's creativity, as supported in both my studies. In my experimental Study 2, I found support for the distrust loop based on the norm of reciprocity (Gouldner, 1960), and social exchange theory (Blau, 1964). This social explanatory mechanism holds even after examining the impact of alternative intrapsychic mediators. Prevention focus is the only mediator that can explain the relationship between knowledge hiding and creativity, but not the perceptions of risk and psychological safety. The first key message of this research is that knowledge hiding is detrimental to knowledge hiders' creativity. This could be described with a metaphor of "shooting oneself in the foot".

In line with the achievement goal theory (AGT; Nicholls, 1984, 1989; Ames, 1992a) I examined how to mitigate the negative effect of knowledge hiding on creativity, and simultaneously considered several alternative intrapsychic mediators. The results indicated that the act of inducing a mastery motivational climate represents a beneficial approach to buffer the detrimental effect of knowledge hiding on one's own creativity. This is true even after controlling for dispositional goal orientation and accounting for both significant impacts of distrust and prevention focus. This indicates that a mastery climate is important for fostering creativity above and beyond employees' goal orientation. Additionally, as long as the mastery climate is high, individuals focus on distrust, and self-protection and safety (i.e. prevention focus) does not seem to be a problematic issue for their creativity. As the results suggest, these working conditions are appropriate for stimulating creativity within the contingency of employee knowledge hiding.

I thereby challenge the assumptions that negative actions always result in negative consequences. My second key message is that, under appropriate mastery climate conditions, knowledge hiding, which is otherwise known as negative behavior, does not necessarily result in a strong negative impact on employee creativity. On the other hand, under high performance climate conditions, the association between knowledge hiding and creativity was even more negative (albeit this interaction was not significant by traditional standards in the field Study 1). This is in line with the previous findings indicating that competition and social comparison are not optimal for encouraging creativity enhancement initiatives (e.g. Johnson et al., 2006; Roberts et al., 2007).

I also found empirical evidence for a three-way interaction among knowledge hiding, mastery climate, and perceived supervisor support/decision autonomy/task interdependence in predicting employee creativity. The results imply that the act of inducing mastery climate might not be enough; such approaches work best when immediate supervisors exhibit high levels of support. Alternative remedies are related to job design. Apparently, under mastery climate conditions, knowledge hiders hurt themselves and others the least when they are isolated; be it with low task interdependence or high decision autonomy.

4.1.10.1 Theoretical contributions

Recent theory and research on organizational creativity emphasized the importance of creating favorable work environments to stimulate individual creativity (e.g. Amabile, 1983; Woodman et al., 1993). Previous research, however, underestimated the relational and social aspects of job design (Perry-Smith, 2006; Grant, 2007), as well as neglected to account for knowledge hiding as an individual-level contingency that can explain the failure of creativity enhancement initiatives in organizations beyond the lack of knowledge sharing.

An important theoretical contribution of my two studies is the conceptualization of the relationship between knowledge hiding and creativity via a distrust loop that involves reciprocal knowledge hiding of a colleague who is in turn related to the diminished creativity of the employee who hid his or her knowledge in the first place. Based on the norm of reciprocity (Gouldner, 1960) and social exchange theory (Blau, 1964), this conceptualization serves as an important and novel theoretical mechanism in explaining the link between knowledge hiding and creativity. I therefore contribute an important piece of theoretical conceptualization and empirical research on both knowledge hiding and its outcomes, and the work context conductive for creativity. Directly manipulating the motivational climate in the second study allowed me to rule out the possibility that other factors were accountable for the results. By randomly assigning participants to different types (and no type) of motivational climate and knowledge hiding manipulations, I was able to make stronger causal inferences regarding the impact of a mastery climate and a performance climate in the knowledge hiding–creativity relationship.

Furthermore, I could test the distrust loop with all its elements by implementing a complex experimental design that included a three-stage execution. I found support for my proposed interpersonal mechanism, even when comparing its role to other, more intrapsychic explanations. Thereby, I made a valuable empirical contribution with rich data on mediating mechanisms in a laboratory experiment. The moderated mediation results support the moderating effect of a mastery climate through the mediation of distrust and prevention focus, but not through perceptions of risk and psychological safety. The results thus indicate that employees engage in knowledge hiding with a purpose of protecting themselves, activating a prevention focus and behavioral avoidance, which in turn decreases creativity. This is likely to happen because of a narrow and constricted scope of attention detrimental to creative behavior (Baas et al., 2008; Förster & Higgins, 2005; Friedman & Förster, 2000).

The existence of a reciprocal distrust loop is somewhat in contrast to the findings of the literature on unforgiveness as a coping strategy (Worthington Jr & Wade, 1999). This discipline provides the theoretical basis for the idea that employees gain more if they withhold negative reciprocity. It is apparent, however, that human nature is not inclined to do so. People would rather reciprocate negatively and gain a short-term feeling of satisfaction (Tepper et al., 2011), even if they would lose more on the long term.

The examination of the relevance of the perceived motivational climate by controlling for employee goal orientations in influencing the knowledge hiding–creativity relationship represents another important contribution of the current study. This is a relevant contribution because goal orientations and the motivational climate act together according to AGT (Maehr & Zusho, 2009; Roberts, 2012). Considering this interaction provides us with a more accurate assessment of the work environment that influences the outcomes of knowledge hiding among employees in terms of their creativity. Thus, I contribute to motivational theory, more specifically to traditional AGT (Nicholls, 1984; Ames, 1992a), as my results support the situated AGT perspective (Maehr & Zusho, 2009) in arguing for the salience of the motivational climate. Thus, in line with Nicholls' (1989) AGT, and as emphasized by Payne et al. (2007), contextual information is important because it signals the kind of behavior that is expected and rewarded in the work place. I therefore expand previous empirical findings by showing how the extant criteria of success and failure perceived by employees does play an important role for organizational behavior (i.e. knowledge hiding and creativity) over and above dispositional goal orientation. I thereby advance previous findings focusing on creativity (e.g. Gong et al., 2009), which stressed the importance of selecting employees on the basis of their dispositional goal orientation. On the contrary, my findings highlight the significance of facilitating the right context in terms of a mastery climate due to its power to shape individual dispositions and behavior. In this way, I respond to scholars such as Johns (2006), who argue for the importance of researchers to consider context in order to advance the field of organizational psychology.

Accordingly, another important contribution of my two studies is the investigation of a higher-level contextual influence on creativity. Systematic and comprehensive research on creativity cannot be conducted without thinking about multiple levels (Woodman et al., 1993), and the domain of climates and creativity is multilevel in nature and should be studied as such (Drazin et al., 1999). My research involves a complex multilevel scenario: phenomena of interest involve supervisors, who influence an organization's characteristics (perceived motivational climate), which in turn relate to individual-level behavior (knowledge hiding and employee creativity) controlling for the influence of individual (goal orientations) factors.

In general, research on the factors in knowledge hiding–creativity research is in its infancy stage. This is even more so valid for the multilevel perspective to the phenomena in question. The same is true of the consequences of knowledge hiding, where empirical research is lacking (Connelly et al., 2012). My two studies respond to calls for the empirical investigation of failure of knowledge transfer, knowledge withholding, and knowledge hiding at the workplace, their processes and relationship with various outcomes. Connelly et al. (2012) state that it is crucial to consider the context in which communication and cooperation between employees who hide knowledge takes place. I respond to this suggestion by explaining the role of motivational climate as a significant contextual variable to the relationship knowledge hiding - creativity. By doing so, I contribute to the body of literature that aims to understand work environments conducive to creativity.

4.1.10.2 Practical implications

In increasingly dynamic and uncertain work environments, organizations depend on creative ideas from employees (George, 2007). This part of Chapter 4 indicates how knowledge hiding negatively influences one's own creativity and how managers can mitigate this effect by inducing particular motivational climate conditions at work. I also show how interpersonal dynamics crucially affect the knowledge hiding–creativity relationship above and beyond intrapsychic mechanisms. My findings support the view that emphasizes a mastery climate as a suitable work environment for stimulating creative behaviors when faced with knowledge hiding. In addition, the need for self–protection seems to decrease in such environments while a mastery climate fosters trust rather than distrust among employees. Managers need to be aware, however, that stimulating performance climate, i.e. emphasizing competition and goal achievement at any cost, leads to even worse scenarios. Under such conditions, knowledge hiding has an even more negative influence on employee creativity. Providing incentives for employees to "betray" their co-workers (i.e. inducing performance climate) should be avoided as it negatively impacts on creativity. This serves as a powerful explanation for the potential failures of creativity enhancement initiatives that are based on competition instead of collaboration.

In the light of my findings, I suggest that managers should rather facilitate a mastery climate. This can be accomplished by (a) designing tasks that are meaningful; (b) giving employees choice and allowing them to participate in decision-making; (c) recognizing outcomes and behaviors that include making an effort, being creative, sharing ideas, and learning from mistakes; (d) treating all employees equally and giving everyone the possibility and time to develop their potential; (e) evaluating employees on the basis of progress, creativity, mastery, effort expended, and conducting a private evaluation, rather than comparing them with colleagues (Ames, 1992a; Roberts, 2012). These suggestions are based on findings from sport and educational settings, but can possibly be accomplished in other contexts by facilitating the commitment-based human resource management practices (Arthur, 1994; Combs, Liu, Hall, & Ketchen, 2006), because such practices align well with the values emphasized in a mastery climate.

4.1.10.3 Limitations and suggestions for future research

By focusing on the perceived motivational climate, I decided to include a limited number of factors mitigating the knowledge hiding–creativity relationship. Other factors, such as quality of relations with others (e.g. Ekvall, 1996) and individual traits, may play an equally important role. We do not understand my findings in the light of climate – goal orientation profiles yet (Levy-Tossman, Kaplan, & Assor, 2007). The profile perspective could therefore present an important line of inquiry for future research. In particular, interaction (balance) in performance and mastery climates should be examined in relation with different goal orientations. The orthogonal goal orientation perspective (Nicholls, 1984, 1989) that emphasizes the positive potential of performance goals alongside mastery goals (DeShon & Gillespie, 2005) should be investigated. Furthermore, the ability of mastery motivational climate to reverse the negative relationship between knowledge hiding and creativity could also depend on other factors. Further research into the exploration of work situations that stimulate or hinder the negative relationship between knowledge hiding and creativity under the extant motivational climate is required.

Although the data did not indicate this, it might also be true that, under particular conditions, knowledge hiding actually leads to an increase in individual creativity. For example, individuals might be inclined to come up with creative ways to hide their knowledge. Or, as a result of the reciprocal knowledge hiding, the employees might need to be more creative because they can no longer rely on new information coming from their co-workers. In these situations, they might have to come up with novel and creative solutions in order to compensate for the lack of knowledge. The lack of information might increase the creativity of some people when solving their problems as they have to create unique solutions on their own. It would therefore be beneficiary to explore the boundary conditions under which knowledge hiding might facilitate creativity, both in terms of task characteristics, contextual variables, and dispositional traits.

The participants in the experimental study were somewhat homogeneous, as I used a student sample. Consequently, there is a potential threat to the generalizability of the findings associated with the experiment, but they do serve to strengthen the causal claims of the survey-based Study 1. Furthermore, as noted by Highhouse and Gillespie (2009), the use of student samples is only problematic when the behavior studied is specific to one demographic or occupational group. Since knowledge hiding and creativity may be relevant to all workers, including students, this population constituted a reasonable sample to provide further tests of my hypotheses. All in all, my two-study multi-method approach addresses generalizability concerns and indicates that knowledge hiding negatively predicts creativity, as well as that this relationship depends upon its interaction with perceived motivational climate.

4.1.11 Conclusion

It is an unfortunate fact of organizational life that employees sometimes intentionally withhold knowledge from their co-workers. Although knowledge hiding is a relatively low-base-rate event, its consequences are likely to be devastating to organizational creativity, innovation, and performance. Specifically, knowledge hiders end up hurting their own individual creativity by intentionally withholding information from their colleagues. These co-workers retaliate by reciprocating knowledge hiding via an interpersonal distrust loop. However, managers have the ability to mitigate this process by inducing mastery climate conditions. On the other hand, solely by inducing performance climate, they could attain quite the contrary effect.

4.2 Curvilinear relationship between employee creativity and individual innovation

In three studies using both field and experimental data, I contribute to bridge the gap between separated research streams on creativity and innovation. First, I suggest that too much employee creativity can prevent the achievement of the best innovation results at the individual level. Second, I examine the ways to manage this relationship in terms of reaping the effects of highly creative ideas. In field Study 1, I found a curvilinear inverse U-shaped relationship between employee creativity and innovation that suggests diminishing returns which creativity has for innovation. I draw on self-determination theory that suggests three psychological needs (autonomy, competence, and relatedness) have to be satisfied in order to yield optimal functioning. I go beyond the person-centric approach in examining the relationship between creativity and innovation at the individual level, and propose a moderating effect of supportive supervision and autonomy. I show that these can buffer the curvilinearity in the relationship between creativity and innovation, and transform it to a positive and linear one. In my experimental Studies 2 and 3, I replicate the curvilinear main effect and the moderating effects. I also discover that competence mediates the moderating effect of decision autonomy, whereas both competence and relatedness mediate the moderating effect of supportive supervision.

4.2.1 Introduction

"Creative individuals alternate between imagination and fantasy on one end, and rooted sense of reality on the other" (Csíkszentmihályi, 1997, p. 63).

At any of the studied levels, innovation cannot occur without its single most important determinant at the individual level, creativity (Mohr, 1969; Amabile, 1988; Amabile, 1996). Creativity is defined as the generation of novel and useful ideas (Amabile et al., 1996). Creative behavior is a necessary, though insufficient antecedent of innovation, which also includes the finalizing step, i.e. the implementation of creative ideas (Amabile, 1988; Scott & Bruce, 1994). Creativity and innovation not only result from the overall firm activities, but also fundamentally derive from the minds of individual employees (Amabile et al., 2004). This is why creativity at the individual level provides the foundation for individuals, groups, and organizations to pursue innovative efforts. Managers gain a lot from understanding how to stimulate innovation from creativity, as the implementation of creative ideas presents the final step that provides a tangible value for the firm.

Literature on creativity and innovation (with recent notable exceptions, e.g. Baer, 2012) provides little effort to differentiate between two stages of the innovation process and include them in their research models simultaneously. This is critical to the continued development of the fields of creativity and innovation (Agars et al., 2008). Studies that directly examine the conditions that determine when creative ideas are converted into actual innovations are rare, partly because of a wide gap and confusion in research caused by the independence of the research streams of creativity and innovation. Previous research focused either on the examination of the creativity antecedents or on the investigation of the implementation drivers. The first part was mostly covered in the behavioral research on individual creativity, whereas the second was the domain of the organizational research on innovation (Woodman et al., 1993). Both are strong and somewhat self-sufficient, with (too) little recognition of the fact that they could benefit from the findings of the other group (West, 2002; Agars & Kaufman, 2008).

The production of creative ideas does not necessarily result in their implementation (Baer, 2012). However, how creative ideas ultimately get implemented remains an unexplored black box of the innovation process, as the role of personal and contextual factors in this procedure receive little attention in the literature. In the creativity literature, it is common to only focus on the predictors of creativity and then assume that they indirectly enhance innovation. However, the factors influencing the innovation process (i.e. how creative ideas ultimately get implemented) might have different influences on creativity itself. This has important implications for research and practice. If we ignore the differential influences of factors that should stimulate innovation from creativity and only rely on predictors of creativity, our conceptualizations might have limited value in predicting innovation at any of the studied levels.

This part of Chapter 4 aims to answer the calls to bring together previously separated research on creativity and innovation (West & Farr, 1990; Woodman et al., 1993) by treating this relationship non-linearly. This presents an extension of Baer’s (2012) article in which he proposed that high levels of creativity might result in negative consequences for innovation under particular boundary conditions. The main purpose of this part of Chapter 4 is to focus on the ways to stimulate innovation (i.e. creative idea implementation) from creativity at the individual level, proposing that too much creativity can prevent the achievement of the best results in terms of innovation. Innovation implementation at the individual level is the basic foundation for group or organizational creativity and innovation. Micro level research can thus be very beneficial to understand the process and mechanisms of converting creative ideas into innovations. However, there was a lack of research that targets particular factors which influence individual innovation (Naglieri & Kaufman, 2001), as the majority of studies that focus on the implementation of creative ideas only examine innovation at higher levels, and not at the individual level (Reiter-Palmon et al., 2008).

Although some creativity researchers theorized about the presence of non-linear relationships between creativity and innovation (e.g. West, 2002), reviews by Dionne (2008) and Rosing et al. (2011) find that the majority of creativity and innovation research continues to hypothesize and test linear associations. Previous studies (with the exception of Baer, 2012, who looked at boundary conditions of this linear relationship) paid little attention to understanding when, why, and how excessive creativity might have a detrimental effect on innovation. Such focus “obscured the prevalence and importance of non-monotonic inverted U-shaped effects, whereby positive phenomena reach inflection points at which their effects turn negative” (Grant & Schwartz, 2011, p. 61). This is surprising and unfortunate as the examination of curvilinear effects can help us understand how a relationship can change over the range of both independent and dependent variables. West (2002) conceptualized about this at the group level; however, creativity and innovation are not isomorphic, and the relationship between the two might be influenced by various factors at different levels differently (Agars et al., 2008). I find a thorough investigation of this relationship at the individual level to be highly relevant and necessary.

I aim to take research on the relationship between creativity and innovation one step further by moving away from linear relations alone, as they often do not necessarily portray relations between examined phenomena accurately (Grant & Schwartz, 2012). The common deficiency of the majority of studies in the field of management is the presumption of monotonic linear relations that fail to account for the "too-much-of-a-good-thing" effect (Pierce & Aguinis, in press). By theorizing and modeling of non-linear relationships, I allow for a more complex investigation of the focal constructs. I suggest that the association is quadratic in nature, i.e. that moderate levels of creativity are optimal for individual innovation implementation. The conceptualization of such relationship is based on the fact that excessively creative ideas are usually founded on the novelty part of creativity during the idea generation stage (Csikszentmihalyi, 1997). Very novel ideas might be difficult to implement due to their out-of-the-box nature and others' resistance that may arise because of their risky nature. The acknowledgement and test of the curvilinear relationship between creativity and innovation is thus my first intended contribution.

Second, I draw on self-determination theory (SDT; Deci & Ryan, 1985, 1991; Ryan, 1995) to suggest several moderating factors that can help to harvest high-level creativity results in terms of superior innovation. SDT represents an established and sound conceptual framework that can provide valuable insights for creativity and innovation research. The core premise of SDT is that individuals can be proactive and engaged in beneficial activities as a function of social-contextual conditions (Ryan & Deci, 2000). These conditions influence the satisfaction of three innate psychological needs – autonomy (i.e. the possibility to choose from various opportunities), competence (i.e. the need to feel competent to succeed in doing the task at hand), and relatedness (i.e. the need to have a sense of belonging and connection with others). When they are satisfied, they yield optimal functioning (Ryan & Deci, 2000; Gagné & Deci, 2005), which is when creative behavior is at the highest levels as studies showed (Amabile, 1983; Oldham & Cummings, 1996). However, these dynamics are relatively under-researched regarding the relationship between creative idea generation and their implementation. Recent developments in SDT suggest that self-determination might be even more important for innovation (Cadwallader, Jarvis, Bitner, & Ostrom, 2010) because determination and engagement that stem from satisfied psychological needs are even more crucial for the implementation of creative ideas than for their generationg.

When conceptualizing the ways to stimulate self-determination, I draw on the extant existing literature that shows the importance of supportive supervision for self-motivation (Deci et al., 1989). SDT concurs that job characteristics present one way of stimulating motivation, however the interpersonal style of supervisors is even more important (Deci et al., 1989; Gagné & Deci, 2005). This is also consistent with findings in creativity and innovation literature. Contextual factors, in particular team leader and management support, showed to be more important for the implementation than idea suggestion (Oldham & Cummings, 1996; Axtell et al., 2000). I propose that the supervisor support is the key to enhance the employees' perceptions of competence and relatedness. I also examine autonomy as a moderator that can stimulate perceptions of competence as it is considered the most important of three psychological states (Ryan & Deci, 2000; Gagné & Deci, 2005; Ryan & Deci, 2006), mostly because it can serve as a basis for other two to be satisfied (Dysvik, Kuvaas, & Gagné, in press). Managers can also directly and more easily influence it than competence and relatedness via support for autonomy and relational job redesign.

4.2.2 Employee creativity and individual innovation

Creativity is a phenomenon focused on the formation of novel and useful ideas (Amabile, 1996). Innovation, on the other hand, is concerned with the implementation of the chosen alternatives (Amabile, 1988; Scott & Bruce, 1994). In more detail, it deals with the generation of possible alternatives, selection among those alternatives, and implementation (Unsworth, 2001; Anderson et al., 2004). It refers to the "development and implementation of new ideas by people who over time engage with others within an institutional context" (Van de Ven, 1986, p. 591). As such, employees' workplace innovation can be understood as a broader process that includes the idea generation and its implementation within the work setting (Hammond et al., 2011). However, this cannot take place if the condition of an individual exhibiting creative behavior was not met, which pins creativity as the most important factor of innovation at the individual level (Amabile, 1988). A positive relationship between the two constructs is consistent with the findings of the empirical studies (e.g. Baer, 2012).

Innovation encompasses two different and sometimes even opposing processes, i.e. creativity and implementation, which are linked to two different activities, exploration and exploitation (Axtell et al., 2000). Creative ideas must not only be new, but also useful, and require the exploitation of the existing knowledge (Rosing et al., 2011). Although creativity is the production of ideas that are both novel and useful, novelty tends to take a primary focus early in the idea generation process (Campbell, 1960; Csikszentmihalyi, 1997). Very novel ideas may be more threatening or difficult to convert into useful innovations. This is why excessive creativity is primarily characterized by very high levels of novelty. Thus, the relationship between creativity and implementation may not be as straightforward as it seems. These processes are complex and non-linear (Rosing et al., 2011), which is why the generation of creative ideas does not necessarily lead to their implementation. In order to provide further insight into this relationship, it is highly relevant to examine whether employees can be too creative to implement their ideas successfully.

Optimal engagement is extremely important in the process of idea implementation. This is why I suggest that the mechanisms explaining the curvilinear relationship between creativity and innovation implementation are heavily intertwined with psychological states necessary for optimal functioning as derived by SDT (i.e. competence, relatedness, and autonomy, Ryan & Deci, 2000). Contextual factors that stimulate creative individuals to carry out implementation processes are also needed for the implementation, in addition to individual creative foundations.

Even at the individual level, the process of innovation implementation is open to social-political maneuvers of an employee with others (Baer, 2012). It requires collaboration and “selling” of ideas to other employees or groups in an organization (Axtell et al., 2000). To navigate through these political processes, individuals require “salesmanship” skills, sponsorship, and advocacy, which act as mechanisms for influencing decisions (Van de Ven, 1986; Green, Welsh, & Dehler, 2003). Interactions shape individuals’ evaluation and potential acceptance of ideas. This is difficult to achieve without the perceptions of competence and relatedness, i.e. that an individual will believe in his or her idea and be able to convince the others that this is the best idea.

In addition to creativity, other resources are thus needed for implementation. It is not sufficient to be up to an innovative task in terms of very high creativity; it is also necessary to have the competence to switch between different requirements of innovation flexibly. Individuals need to possess and be aware of the necessary abilities or social relationships that allow them to be involved and benefit from the resources of important supporters in the organization (Baer, 2012). In terms of implementation, greater emphasis is placed on interpersonal and social competence rather than on creative potential. However, selling or social/political skills represent a component that cannot be found in all creativity types. In particular, individuals who are very high in responsive or expected creativity are not assumed to possess sufficient competence in terms of these actions (Unsworth, 2001) that are essential for individual innovation implementation.

The tasks with different characteristics in terms of creative stimulation cause different levels of commitment to them. High creativity in itself requires plenty of engagement and focus on it, and demands other highly developed cognitive skills and actions. Creativity can increase innovation, but only to a certain point – too much creative engagement may lower the implementation performance. It is difficult for individuals identified as highly creative to resist a cognitive fixation tendency on their creative ideas (Smith, 1995). In other words, highly creative employees may tend to get caught up toying with creative idea generation and lose track of its potential implementation.

Highly creative people may ignore implementation requirements because they are too concerned with discovering something new with little attention paid to its fruition (McMullan, 1976). Thus, individuals would be most successful in implementing creative ideas at moderate levels of creative activation as moderate activation levels increase task engagement and result in the optimal use of cognitive resources (e.g. Gardner, 1986). This is consistent with SDT, which claims that the optimal use of cognitive resources and the consequent competence is the key ro optimal functioning. Because they are not very caught up in creative cognition and behavior, individuals exhibiting moderate levels of creativity will be more likely to be able to engage in successful social-political maneuvering in order to sell ideas to others and implement them. Too little or too much of creative activation could lead to a lack of engagement in implementing ideas and cause cognitive interference, thereby hindering innovation.

As it denotes something new, any creative idea is related to uncertainty. This can stimulate disagreements caused by differences in viewpoints among those who are affected by novel ideas.

Because they produce uncertainty, highly creative ideas are likely to be met with more skepticism and hesitation (Janssen, Van de Vliert, & West, 2004). Very high novelty is threatening to others. The implementation of creative ideas challenges the established power structures in an organization (Baer, 2012), which is why it is likely that innovation implementation will conflict with some interests within the organization, and cause resistance (Janssen et al., 2004). Some creativity is required for ideas to be noticed as different from the previous status quo, but too much novelty may cause too much resistance in the organization for the ideas to ever get implemented. However, less divergent changes (i.e. moderately creative ideas) are less likely to elicit resistance in a work group (Battilana & Casciaro, in press).

Innovation requires some constraints during the idea development process. However, highly novel ideas tend to be more scattered and unorganized, and too little attention is devoted to their usefulness that is usually not the focus during the generation stage (Csikszentmihalyi, 1997). Moderately creative ideas tend to be more focused and as such have a better chance of being useful and implemented (Mumford et al., 2002). Implementation needs some structure and focused problem solving that is usually uncharacteristic of individuals producing highly creative ideas. A playfully light attitude is typical of such individuals, but they need other competences as well. They should be persistent and determined because much hard work, competence, and focus are necessary to bring a creative idea to completion and to overcome the obstacles that a creative person inevitably encounters due to the uncertainty that causes resistance to change. I therefore hypothesize:

> *Hypothesis 1. Employee creativity has an inverted U-shaped relationship with individual innovation.*

4.2.3 Moderating roles of perceived supervisor support and decision autonomy

Employees in organizations tend to develop general views concerning the extent to which their supervisors value their contributions and care about their well-being. This is denoted by the term perceived supervisor support (Eisenberger et al., 2002). It encompasses both instrumental and socio-emotional support (Amabile et al., 2004), for example to help other employees who were absent, orient new employees to their jobs, help others when their workload increases, and assist others with their duties (Shanock & Eisenberger, 2006). According to Amabile et al. (2004), there are two views on supervisor support. A perspective that includes both task- and relationship-oriented leadership behaviors is more common in the creativity literature, whereas the leadership literature usually adopts a narrower view that only deals with relationships. I adopt a broader view that is more inherent to the creativity literature.

The implementation of creative ideas depends on the context and the person. Hammond et al. (2011) argued that contextual factors, such as leadership, become more important for a successful implementation than for the mere generation of creative ideas. Innovation implementation involves changing the status quo, which implies resistance, conflict, and a requirement for sustained effort. Therefore, the effort to innovate must be stimulated externally.

This implies a great role of leadership. Rosing et al. (2011) indicated that a single leadership style cannot constantly promote innovation effectively. Instead, particular leadership traits or mechanisms for influencing employee behaviors are more important. Supportive supervision might be the key, and it has also shown to be essential in bringing creative ideas to fruition in terms of innovation implementation at higher levels (Mohamed, 2002). This is consistent with a recent meta-analysis (Rosing et al., 2011), which showed that supervisor support is more important for implementing than generating ideas.

In line with the self-determination theory, work climates that promote satisfaction of three important psychological states can be crucially affected by the role of the immediate leaders (Gagné & Deci, 2005). I suggest that supportive supervision moderates the relationship between creativity and innovation via a mediating role of competence and relatedness. This moderation role is conceptualized in a way that high levels of supervisor support make the relationship more linear and positive. This is why my arguments relate mostly to how supportive supervision increases individual innovation of very creative individuals, and where the most unlocked potential seems to lie in terms of capitalizing on their “too” novel ideas.

When supervisors understand employees’ perspectives better, encourage their initiative, and provide feedback in a constructive rather than controlling way, the subordinates display more positive work-related attitudes (Gagné & Deci, 2005). This helps to improve the perceptions of fairness and reduce the levels of stress related to innovation (Janssen, 2004; Khazanchi & Masterson, 2011) because it enhances feelings of security. More importantly, supportive supervision that is manifested through the constructive feedback and open communication influences feelings of competence that can enhance intrinsic motivation for the action at hand, such as the implementation of highly creative ideas (Ryan & Deci, 2000).

To stimulate the improved implementation of highly creative ideas, supervisors should not only control and monitor employee work (Oldham & Cummings, 1996; Krause, 2004), but also permit a degree of participation and involvement (Amabile et al., 2004; Černe, Jaklič, & Škerlavaj, in press). Csikszentmihalyi (1997) argues for the employees’ balance between fantasy at one end and a sense of reality at the other. Highly creative tasks are often poorly defined and do not need control, but at least some structuring, routinization, and direction (Bain, Mann, & Pirola-Merlo, 2001; Ohly, Sonnentag, & Pluntke, 2006). Tight relations with supervisors manifested in perceived supervisor support that can provide structure may help improve employee perceptions of self-competence and influence the internalization (Ryan & Deci, 2000) of the fact that very creative ideas also need to be implemented if an organization is to have any benefit from them. Employees are likely to adopt activities that relevant social groups value, i.e. innovation implementation that provides a tangible value to the firm, when they feel efficacious in those activities (Ryan & Deci, 2000). When individuals do not feel competent to implement their highly creative ideas, they become amotivated (Ryan & Deci, 2000).

Implementation is a social-political process (Van de Ven, 1986), which depends upon the social interactions and connections. Although a person can generate new ideas alone, the implementation of ideas typically depends on the approval, support, and resources of others (Axtell et al., 2000). Supervisor support can represent an important mechanism for connecting employees to the resources and supporters needed for implementation, and thereby prevents alienation that can happen to individuals who get caught up with highly creative work. In this way, individuals' relatedness with the supervisors and others increases.

Supervisors manage creative crises with their support and place these crises in the context of a broader mission. Supervisors who define and articulate challenging missions are more likely to better stimulate innovation from creative ideas (Mumford et al., 2002). They can act as supporters and sponsors of a highly creative idea, and thereby offer both verbal and practical support for innovation (West & Anderson, 1996). If very high novelty were threatening to others, supervisor support would serve as an excellent buffer against this threat, and enable very novel ideas to be implemented in innovation. Furthermore, supportive supervisors may engage in helping employees "sell" creative ideas within the organization and assist in their implementation. They can facilitate the accomplishment of work goals and direct employee behaviors towards implementation.

Supportive supervisors provide access to the resources, assistance, and encouragement in the face of difficulties (Rosing et al., 2011) that are inherent in implementing highly novel ideas. Individuals may have ideas and even submit them independently of supervisor support; however, supervisor support is crucial for the outside perception of the quality of ideas (Frese, Teng, & Wijnen, 1999). Perceived supervisor support helps to produce a climate or context that is supportive of innovation – by promoting creativity and providing assistance and support for implementation, thereby facilitating relatedness. The satisfaction of this psychological need is crucial for the internalization of the task (Ryan & Deci, 2000) and thus more successful implementation of highly creative ideas. The motivation for innovation implementation is more likely to flourish in contexts characterized by a sense of security and relatedness (Ryan & Deci, 2000). Therefore, the implementation of highly creative ideas increases when employees are both able (competence) and enabled to participate (relatedness) in decision making (Anderson & West, 1998; Yang & Konrad, 2011), which both stem from supportive supervision.

> *Hypothesis 2. Supervisor support moderates the relationship between employee creativity and individual innovation: the relationship is positive and linear for employees who perceive high levels of supervisor support. The relationship is, in general, weaker and curvilinear with an inverted U-shape for employees who perceive low levels of supervisor support.*

> *Hypothesis 3a. Relatedness mediates the moderating effect of supervisor support on the relationship between employee creativity and individual innovation.*

> *Hypothesis 3b. Competence mediates the moderating effect of supervisor support on the relationship between employee creativity and individual innovation.*

Autonomy refers to the extent to which an individual has control over decision-making on how to carry out a task (Hackman & Oldham, 1980). In contrast with competence and relatedness, the other two psychological states emphasized by SDT as crucial for optimal functioning at work (Deci et al., 1989), I chose autonomy as an independent moderator. While external support initially represents an important predictor of innovation, structural job changes are more important in the long run (Axtell, Holman, & Wall, 2006). Presented by Deci and Ryan (1985) as a subtheory within SDT, the cognitive evaluation theory specifies that competence and relatedness cannot enhance intrinsic motivation and engagement in the task unless accompanied by a sense of autonomy. People must experience their behavior as self-determined, which means they must perceive an internal locus of causality for their motivation to be in full effect (Ryan & Deci, 2000). This is consistent with the recent developments in STD that suggest competence is only related to intrinsic motivation when autonomy is high (Dysvik et al., in press). This pins autonomy as the most important of the three psychological states. I propose that the moderating effect of autonomy makes the relationship between creativity and individual innovation positive and linear, and thereby increases the implementation levels of highly creative ideas. This moderation occurs through the mediating role of competence.

In a high decision autonomy condition, an individual has the freedom to choose a method and procedure to get the work done (Zhou, 1998). This is a basic human need (Deci & Ryan, 1991) that should be satisfied in order to achieve optimal results at work. When people perceive offered rewards or imposed demands as attempts to control them, they tend to lose interest in the task (Sheldon & Filak, 2008). Accordingly, SDT scholars showed that intrinsic motivation and optimal performance is affected by autonomy within the task setting (Ryan & Deci, 2000).

In high autonomy conditions, numerous employees feel they have control over the situation. The more decisions they can make on their own, the more in control they might feel in terms of idea implementation. The person–job integration process of innovation implementation is assured by the decentralization of decision-making in order to promote autonomy (Drach-Zahavy, Somech, Granot, & Spitzer, 2004). Highly creative people need to be able to take the initiative in promoting their ideas (Miron, Erez, & Naveh, 2004) and be driven by internal motivators to actively engage in solving problems connected with highly creative idea implementation in order to improve their innovative performance. People with intrinsic motivation have more confidence and self-esteem needed for carrying out the task at hand (Ryan & Deci, 2000). Autonomy itself facilitates the perceptions of self-competence that employees need in order to overcome difficulties connected with the implementation of highly creative ideas. On the contrary, if an individual works in a low autonomy environment with little freedom in deciding how to work on a task and has little control over its execution it, he or she is likely to experience diminished intrinsic motivation (Zhou, 1998) to work towards the implementation of creative ideas.

Very creative ideas are more difficult to implement due to their “out-of-the box” nature, and the risk and uncertainty that is related to the novelty (Janssen et al., 2004). Employees in high autonomy conditions should have more discretion to implement their ideas even when these are threatening. As they are allowed to implement them, this stimulates their perceptions of confidence. Furthermore, it is more likely that they will actually become implemented as individuals with high autonomy have discretion to do so even if they are faced with opposition that disapproves very novel and risky ideas.

Highly creative individuals often tend to care more about performing well and are more passionately involved in the work (McMullan, 1976), particularly in non-routine task environments (Keller, 2012). This is why they are likely to react more positively to a high task autonomy condition. In such circumstances, employees experience the highest level of competence and self-determination (Zhou, 1998), and thus put more effort into implementing their own creative ideas. This is why they are more likely to be resilient and determined to go through with the final step of the innovation process, implementation. If they are enabled (given autonomy) by an organization or by the leadership to implement their highly creative ideas, they are more likely to feel competent about doing it, which will produce better results in term of individual innovation.

Hypothesis 4. Autonomy moderates the relationship between employee creativity and individual innovation: the relationship is positive and linear for employees with high levels of autonomy. The relationship is, in general, weaker and curvilinear with an inverted U-shape for employees with low levels of autonomy.

Hypothesis 5. Competence mediates the moderating effect of autonomy on the relationship between employee creativity and individual innovation.

4.2.4 Exploratory examination of the moderating roles of the perceived mastery and performance climate

Organizational elements that may affect the employees' innovation process include the everyday work environment that involves the climate and everyday work conditions (Scott & Bruce, 1994). As the climate emerges from the socially shared attempts of employees who try to make sense of their situation at work in order to adjust their behavior accordingly, employees account for situational and contextual cues when engaging in the innovation process (Bunce & West, 1995). Accordingly, it has been observed that the context in which employees perform their everyday tasks plays a great role in affecting the employees' creative outcomes in the form of implementation (Axtell et al., 2000; Baer, 2012). Contextual factors are even more important for a successful implementation than a mere generation of creative ideas (Hammond et al., 2011).

An implementation is a social-political process (Van de Ven, 1986) dependent upon social interactions and connections. To encourage the innovation implementation, organizations need to create a climate that supports and enables the interaction among employees. This sharing climate enables employees to acquire knowledge and skills necessary to implement their creative ideas, as well as to obtain approval, support and resources from others (Axtell et al., 2000). As derived from the achievement goal theory, a mastery climate is based on cooperation and information exchange (Ames & Archer, 1988). Collaboration that is essential for the innovation implementation is a process that is thus enhanced by a mastery climate (Ames, 1992a).

A work environment that supports the implementation of creative ideas needs to be established to enhance the innovation implementation (Oldham & Cummings, 1996; Madjar et al., 2002; Zhou, 2003). In mastery climate conditions, the relations between supervisors and employees are tighter and based on support (Smith-Jentsch et al., 2001; Dragoni, 2005). In mastery climates, supervisors are more personally involved in the relationship with their subordinates (Smith-Jentsch et al., 2001). Tighter relations with supervisors may help to improve employee task orientation, which was indicated to be positively related to the innovation implementation (West & Anderson, 1996; West, 2002).

Innovation will more likely occur in work groups where support for innovation is present, and where innovative attempts are rewarded rather than punished (Amabile, 1983). Support for innovation presents the expectation, approval, and practical support for attempts to introduce new and improved ways of performing in the work environment (West, 1990). It results in intra-team safety and thus helps to improve the perceptions of fairness and reduce the levels of stress related to innovation (Janssen, 2004; Khazanchi & Masterson, 2011), as well as enhances the employees' commitment, thereby facilitating innovation (West, 2002).

Innovation increases when employees experience participative or psychological safety (Baer & Frese, 2003); in other words, when they are allowed to be involved and can participate in the decision-making, and openly voice their ideas (Anderson & West, 1998; Yang & Konrad, 2011). This is much more likely to occur in high mastery climate conditions, where the employee-supervisor relationships are tighter and more supportive (Smith-Jentsch et al., 2001; Dragoni, 2005).

Another mechanism that describes how mastery climate might moderate the examined relationship is related to feedback. Developmental feedback is positively linked with the innovation implementation (Klein & Sorra, 1996; West, 2002). An atmosphere of trust is characteristic for high mastery climate conditions (Ommundsen et al., 2003). In this atmosphere, employees are more likely to seek feedback on their work (Peterson & Behfar, 2003). The feedback they receive might help them to improve their ideas and bring them closer to implementation. Through idea evaluation and revision (Mumford, Connelly, & Gaddis, 2003), this facilitates individual adaptation and positively influences implementation of creative ideas.

The innovation implementation involves changing the status quo, which implies resistance, conflict, and the requirement for sustained effort. A mastery climate promotes adaptive behaviors, such as trying hard and persisting when faced with difficulty (Ntoumanis & Biddle, 1999; Roberts, 2012). It is thus suitable for tasks that require a great deal of persistence and perseverance, such as the innovation implementation. In mastery climate conditions, social interactions that are fundamental for the innovation implementation are stimulated, a feedback within supportive relations with supervisors is more likely to occur, and persistence is promoted, and therefore mastery climate should be suitable for stimulating the innovation implementation from creative ideas. Thus, it is likely that *a perceived mastery climate may "buffer" (i.e. reduce)* *the curvilinearity in the relationship between creativity and innovation, making it positive and linear*.

In performance climate conditions, the normative criteria of success is emphasized (Roberts, 2012). In this climate normative ability, social comparison, and intra-team competition are fostered (Ames & Ames, 1984; Ntoumanis & Biddle, 1999). The best achievers are acknowledged as being successful (Ames, 1984). As the achievement of the outcomes in terms of demonstrating normative ability is given public recognition (Ames & Archer, 1988; Pensgaard & Roberts, 2002), employees might be motivated to implement their creative ideas because they would want to perform better than their colleagues. Thus, going the extra mile to bring creative ideas to fruition may give them an advantage and better chances of "winning", which is considered the most important objective in a performance climate (Cumming et al., 2007).

As tasks are less varied and challenging in the performance climate (Ntoumanis & Biddle, 1999), employees might be more focused and oriented towards the implementation. The right amount of structure on one hand and freedom on the other (Csikszentmihalyi, 1992) might be necessary to implement creative ideas. In order to compete and perform better than others, employees would have to be more goal-oriented rather than distracted by creative stimuli. Therefore, they are more likely to be determined to go through with the final step of the innovation process, implementation. Accordingly, *a perceived performance climate may also "buffer" (i.e. reduce) the curvilinearity in the relationship between creativity and innovation, making it positive and linear*.

4.2.5 Study 1: Methods

4.2.5.1 Sample

Empirical data were collected from 240 employees and their 34 direct supervisors in two Slovenian companies in September and October 2011. A translation-back translation procedure was used to translate the questionnaire from English into Slovenian, and back into English.

The first company is a manufacturing firm that employs about 450 people, and produces mainly steel constructions. They provide original and complete solutions from concept to project completion, with constant emphasis on innovativeness and sustainable development. Their solutions are often completely unique and based on customers' needs, and include façades and walls, roofs, eco solutions for diminishing power usage, modular units, steel constructions of every kind, noise attenuation systems, and fire protection systems.

The majority of employees in this company have an e-mail address and can be divided into specific work groups with direct supervisors, which is why they were included in my sample (sample size = 267). By the estimation of top managers, all these employees are empowered to come up with creative ideas and continue with their implementation. The examples of ideas rated as highly creative in the first company included ideas for novel machinery, such as a robotic manipulator for the assembly of façade elements; a fluorescent nano tubes-based wall coating, filled with zinc; self supporting, insulating fire-proof modular panel; modular façade system; iridescent paint; modular sport object; photovoltaic system; innovative structure designs, e.g. platforms or steel homes; an anti-corrosion implant; a new contest for the employees entitled “The Craziest Idea”; creative rewards for the best ideas, e.g. the chance to drive a Formula 1 car, a visit to a nuclear submarine, a visit of CERN’s accelerator complex, or an astronaut training session at NASA. The examples of ideas rated as less creative included upgrading the reward system; redesigning the existing steel structures; branching out to other nearby markets; developing a fire-proof façade; creating a new color of the steel structure or a new glue that holds the structures together; presenting a new leadership development program; an e-learning system; and a marketing plan for the photovoltaic system.

The second company functions in the metal processing industry, employs about 2200 employees, and also exhibits creativity and innovation more than the average company in their industry. It deals with technologically advanced blacksmithing and is vested in the production of innovative products made of raw metal. With almost 100 years of experience, they evolved from ironmongery and nowadays produce metal products using modern materials and innovative technologies. It should be noted, however, that my sample only included employees that have a work e-mail address and can be divided into specific work groups with direct supervisors (sample size = 130), and not the production workers. Employees who were involved in my sample of this company are more likely to express creative ideas and to be able to implement them. The examples of ideas rated as highly creative in this company included creating an innovative metal bike handlebars to support their local biking team; making use of the beautiful landscape that surrounds the factory by branching into tourism; designing a flexible manufacturing system and nano-based coatings for metal products; radically redesigning the assembly line to be more sustainable and eco-friendly. The examples of ideas rated as less creative included developing a new functional hand tool; adding a new hook to the hand tool that provides a new function; and a new quality assurance protocol.

Individual innovations in both companies derive from creative ideas of employees that are “sold” within the organization and actually implemented afterwards. This implies some socio-political processes that employees need in order to convince their co-workers to vest trust in their ideas. Both companies apply more or less team organizational structure, although the level of interaction among team members depends on the task and the work process in different departments. Usually, team members need to communicate their ideas to other team members and team supervisor. After a round of feedback and discussion, the idea is either accepted or rejected. If it is accepted, an individual can proceed to implement it. Depending on the idea, employee can implement it on his or her own, or require assistance of others, but stay in charge of the process. There are differences in terms of various departments and work occupations, but this is the general process in these firms.

The average response rate per group was seven employees, and the number of direct reports per group supervisor that answered ranged from two to 18. Taking into consideration only the chosen 34 groups that participated, this provided a 60.5% response rate for supervisors’ direct reports (the in-group response rates ranged from 15% to 100%). About 68% of the participants were male and about 37% were between 35 and 45 years old (SD = 7.02). A total of 36% of the respondents reported less than seven years of work experience (SD = 7.89) and 35% reported less than three years of working with this particular supervisor (dyad tenure: SD = 4.97).

4.2.5.2 Measures

Creativity. Identical behaviors may be considered to be "creative" in one organizational context and disruptive in another (Agars et al., 2008), which is why perceptual measures were used as they enable the most relevant subjective assessments about domain-specific creativity from the actors involved in the social setting where the innovation process is carried out. I used the nine-item scale developed by Tierney, Farmer, & Graen, 1999 – α = .93. To avoid overlap with innovation implementation, I only used items concerning the generation of novel and useful ideas, and not the implementation. Thus, the items I used are the following (Tierney et al., 1999): "How often has this employee . . . demonstrated originality in his or her work? . . . took risks in terms of producing new ideas in doing job? . . . found new uses of the existing methods or equipments? . . . solved problems that had caused other difficulties? . . . identified opportunities for new products/processes? . . . generated novel, but operable work-related ideas? . . . served as a good role model for creativity? . . . generated ideas that are revolutionary in our field?"

Individual innovation. I measured individual innovation with six items taken from de Jong and den Hartog (2010) that only concern the idea championing and implementation part of innovation, and not creativity - α = .95. These items are the following (de Jong & den Hartog, 2010): "How often does this employee . . . search out new working methods, techniques or instruments? . . . find new approaches to execute tasks? . . . make important organizational members enthusiastic for innovative ideas? . . . attempt to convince people to support an innovative idea? . . . systematically introduce innovative ideas into work practices? . . . contribute to the implementation of new ideas?"

Perceived supervisor support. I used four items from Eisenberger et al. (1986) - α = .84, as in the studies by Pazy and Ganzach (2009), and Kuvaas and Dysvik (2010). The items are: "My supervisor cares about my opinions. My work supervisor really cares about my well-being. My supervisor strongly considers my goal and values. My supervisor shows very little concern for me" (reverse coded).

Decision autonomy. Decision autonomy was tapped using three items from Hackman and Oldham's (1980) Job Diagnostics Survey – α = .83. The items are "How much authority do you have in . . . determining how work exceptions are to be handled. . . . establishing rules and procedures about how your work is to be done. . . . setting quotas on how much work you have to complete."

Control variables. I controlled for *age* and *gender*, as well as for *employee education* and *expertise* (for which a proxy for work experience was used). Expertise in particular is a valuable control, as employees who perform a particular task for a longer period of time may perceive its difficulty or creativeness differently (Amabile, 1998). Similar is true for another variable I controlled for, i.e. whether employees had any *managerial duties*. I also controlled for *dyad tenure* (how long an employee has worked under the supervision of a particular direct supervisor), as the length of the supervisor–subordinate relationship can impact perceptions about work (Fagenson-Eland et al., 1997). All control variables were self-reported.

Task variety was assessed with another three items from Hackman and Oldham's (1980) Job Diagnostics Survey - $\alpha = .73$: "My job requires me to use a number of complex or high level skills"; "The job is quite simple and repetitive" – reverse coded; and "There is a lot of variety at my job". I controlled for task variety because complex and varied jobs support and encourage higher levels of creativity than relatively simple and routine jobs do (Hackman & Oldham, 1980; Deci et al., 1989; Oldham & Cummings, 1996).

Not all jobs require the same amount of creative behavior and output. Numerous studies argue in favor of the situational component of creativity (e.g. Amabile, 1988; Woodman et al., 1993; Amabile et al., 1996), and consider the creative requirement as a neglected predictor of employee creativity (Unsworth et al., 2005). People are creative at work because they are expected to be. Thus, I controlled for the objective *job requirement for creativity*, which is a variable that was set up by an HRM expert who evaluated the creativity required at different job types the respondents held on the basis of the job title, job description, and its placement in the organizational structure. I also controlled for *task interdependence* that was tapped with a five-item scale by Van Der Vegt, Emans, and De Vliert (2000) - $\alpha = .81$. The sample items include "I depend on my colleagues for the completion of my work" and "I have a one-person job; I rarely have to check or work with others" (reverse-coded). This might play a role in the social-political processes of the innovation implementation (Van der Vegt & Janssen, 2003). I also controlled for *work engagement* (measured with a nine-item UWES scale - Schaufeli, Bakker, & Salanova, 2006 - $\alpha = 71.$, the sample items include "I am enthusiastic about my job" and "At my work, I feel bursting with energy") that can contribute to achieving desirable business outcomes, such as innovation (Harter, Schmidt, & Hayes, 2002; Hakanen, Perhoniemi, & Toppinen-Tanner, 2008).

In order to avoid problems with common method bias, data were collected by two separate online questionnaires: one for employees and one for supervisors, who evaluated employees' individual innovation, creativity, and work engagement. As data regarding predictor and criterion variables (creativity and individual innovation) were only supervisor-based, I used additional approaches (Podsakoff et al., 2003). Data were collected in two waves, the second occurring about three weeks after the first one. The items used in my study were part of a large-scale questionnaire; therefore, it is unlikely that respondents were able to guess the purpose of the study and force their answers to be consistent. Some items in the questionnaire were also reverse-coded.

4.2.6 Study 1: Results

Table 4.10 provides descriptive statistics of all variables analyzed in Study 1. I first observed the factor structure of the focal variables. The expected four-factor solution (creativity, individual innovation, perceived supervisor support, and decision autonomy) displayed an excellent fit with the data (Chi-square [203] = 403.25, CFI = .953, SRMR = .040, RMSEA = .029). The factor loadings ranged from .71 to .92 for creativity items, .86 to .91 for individual innovation items, .78 to .86 for perceived supervisor support items, and .77 to .91 for decision autonomy items.

I tested alternative nested models to examine whether a more parsimonious model achieved an equivalent fit (for creativity and individual innovation on the same factor, Chi-square [251] = 632.32, CFI = .820, SRMR = .081, RMSEA = .073; for perceived supervisor support and creativity on the same factor, Chi-square [251] = 1207.31, CFI = .79, SRMR = .092, RMSEA = .082; and for individual innovation and perceived supervisor support on the same factor, Chi-square [251] = 1149.93, CFI = .804, SRMR = .119, RMSEA = .091). Chi-square difference tests showed that my model achieved a significantly better fit.

In my sample, employees were grouped within their supervisors. As each supervisor provided the ratings of creativity and innovation for multiple employees, this violates the independence assumption. I therefore applied a multilevel analysis using HLM (Hierarchical Linear Modeling) version 7.0 (Raudenbush & Bryk, 2002) with a restricted maximum likelihood estimation to test my hypotheses. This approach allowed me to model the non-independence in my dependent variable by partitioning its variance into a within-supervisor and between-supervisor component. I present these results in Table 4.11. All predictor variables were grand-mean centered to reduce unnecessary multicollinearity between the linear terms and their quadratic counterparts (Aiken & West, 1991). In the first step (Model 1), I entered seven control variables. Only expertise and age were significantly related to individual innovation. These relationships were negative, which indicates that more experienced employees exhibited less individual innovation on average in my sample. In Step 2 (Model 2), creativity was entered (in addition to perceived supervisor support and decision autonomy), and this was found to be positively related to individual innovation (γ = .35, $p < .01$).

Table 4.10: Study 1 - Means, standard deviations, and correlations[a, b]

	Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Age	2.33	1.17	-													
2	Gender [c]	1.68	.54	.04	-												
3	Education	3.26	1.05	-.35**	-.11	-											
4	Expertise	5.28	5.27	.28**	-.15*	-.05	-										
5	Dyad tenure	3.16	3.22	.17**	-.24**	.04	.64**	-									
6	Task variety	5.22	1.32	-.01	-.01	-.01	-.14*	-.15*	(.73)								
7	Managerial duties	1.32	.70	-.01	.01	.27**	.05	.01	.07	-							
8	Creativity	5.79	.79	-.06	.07	-.03	-.08	-.08	.22**	-.00	(.93)						
9	Perceived supervisor support	5.09	1.33	-.03	.10	.19**	.09	.05	.02	.03	.19**	(.84)					
10	Decision autonomy	4.37	1.45	.02	.15*	-.02	-.03	.03	.25**	-.08	.19**	.08	(.83)				
11	Individual innovation	4.61	1.24	-.10	.25**	-.08	-.22	-.18	.13*	-.04	.32**	.26**	.17**	(.95)			
12	Creative requirement	5.42	1.50	-.11	.03	.02	.02	-.00	.18**	.03	.71**	.25**	.14*	.29**	-		
13	Task interdependence	5.18	1.24	.02	.12	-.01	-.03	-.07	.29**	.02	.07	.14*	.15*	.05	.10	(.81)	
14	Work engagement	5.22	.94	-.11	.01	.09	.07	-.03	-.01	.05	.06	.35**	-.09	.00	.00	.13*	(.71)

[a] n = 240.
[b] Coefficient alphas are on the diagonal in parentheses.
[c] 1 = "female", 2 = "male".
** $p < .01$, * $p < .05$

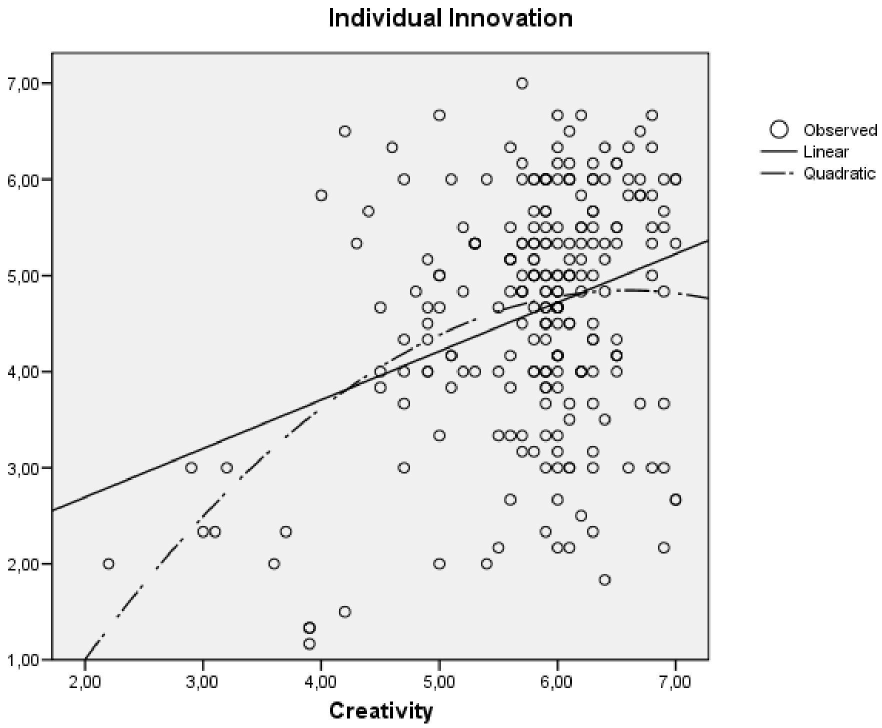
Table 4.11: Study 1: Multilevel analysis results for individual innovation as the dependent variable[a,b]

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	4.63** (.09)	4.62** (.07)	4.62** (.07)	4.62** (.06)	4.62** (.07)	4.62** (.06)
Age	-.09* (.05)	-.10* (.05)	-.10* (.05)	-.14* (.05)	-.12* (.05)	-.16* (.06)
Gender	.15 (.15)	.13 (.13)	.13 (.11)	.13 (.12)	.13 (.12)	.13 (.12)
Education	-.09 (.08)	-.15* (.07)	-.15* (.06)	-.17* (.06)	-.17* (.07)	-.19* (.06)
Expertise	-.04* (.02)	-.04* (.02)	-.04* (.02)	-.03* (.01)	-.04† (.02)	-.03† (.01)
Dyad tenure	.00 (.03)	.00 (.03)	01 (.03)	.00 (.02)	01 (.03)	00 (.02)
Task variety	.11† (.06)	.05 (.06)	.04 (.06)	.04 (.05)	.04 (.06)	.04 (.06)
Task interdependence	-.00 (.07)	-.03 (.06)	.00 (.05)	.00 (.05)	-.00 (.05)	.00 (.05)
Work engagement	.02 (.08)	.11 (.09)	.10 (.10)	.08(.10)	.09 (.09)	.07 (.09)
Managerial duties	-.02 (.12)	.01 (.01)	.03 (.10)	.03 (.10)	.03 (.09)	.03 (.10)
Perceived supervisor support		.24** (.07)	.25** (.07)	.18† (.09)	.25** (.07)	.17* (.08)
Decision autonomy		.05 (.05)	.07 (.05)	.08 (.05)	.04 (.05)	.06 (.06)
Creativity		.35** (.09)	**.32** (.08)**	.26** (.07)	.27** (.07)	.26** (.07)
Creativity^2			**-.20** (.05)**	-.23** (.06)	-.22** (.07)	-.22** (.07)
Interaction effects						
Creativity × Perceived supervisor support				**.16* (.05)**		**.16* (.04)**
Creativity^2 × Perceived supervisor support				**-.14* (.06)**		**-.11* (.05)**
Creativity × Decision autonomy					**.15* (.08)**	**.14* (.07)**
Creativity^2 × Decision autonomy					**.13* (.05)**	**.12* (.05)**
Pseudo R^2 [d]	.10	.26	.28	.31	.30	.33
Deviance	787.25	759.69	759.50	754.34	753.37	750.12

[a] n = 240. [b] Robust standard errors are presented next to the fixed effects in parentheses. [c] Values in bold are relevant to the tests of hypotheses.
[d] I report Snijders and Bosker's (1999) overall pseudo R^2 for each model. These estimates are based on proportional reduction of Level 1 and Level 2 errors owed to predictions in the model. $^{**}p < .01$, $^{*}p < .05$, $^{\dagger}p < .10$

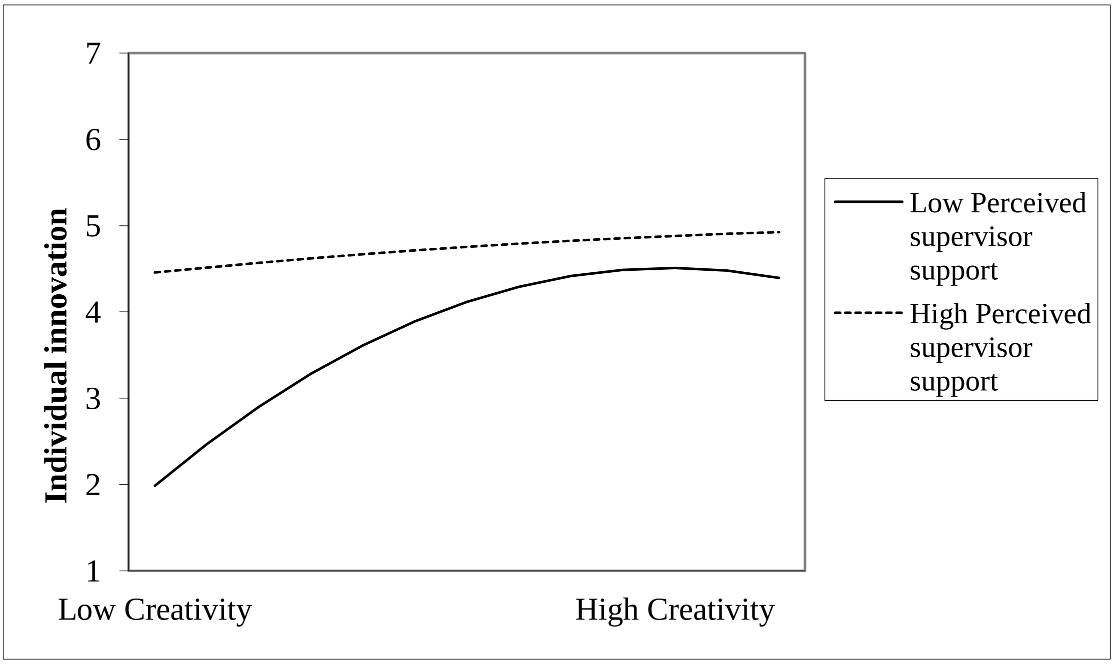
In Step 3 (Model 3), I added the quadratic term of creativity (i.e. creativity squared) to the equation, and this was found to be significant ($\gamma = -.20$, $p < .01$). The negative quadratic term in conjunction with a positive linear term ($\gamma = .32$, $p < .01$) suggests a predominantly positive, concave downward curve (Aiken & West, 1991). In Figure 4.9, I present a plot of the linear and quadratic regression models that demonstrate the relationship between employee creativity and individual innovation. The plot shows that when creativity increases, individual innovation also increases. However, once creativity reaches the inflection point of 6.2, individual innovation peaks and then declines while creativity increases. The inverted U-shape of this curve is consistent with Hypothesis 1, and it argues in favor of the diminishing results that creativity has for innovation.

Figure 4.9: Study 1: Curvilinear relationship between employee creativity and innovation



To test Hypothesis 2, which predicted that the curvilinear relationship between creativity and individual innovation is positive and linear when employees perceive high levels of supervisor support, I followed the approach used in previous studies (e.g. Tangirala & Ramanujam, 2008; Farh, Lee, & Farh, 2010) and pursued the graphing method outlined by Aiken and West (1991) for interpreting interactions in the presence of curvilinear relationships. I created two interaction terms (Creativity × Perceived supervisor support and Creativity^2 × Perceived supervisor support) and entered them into the regression equation in Step 4 (Model 4). The results showed that two interaction terms (as a block) were significant ($p < .05$). The negative quadratic term ($\gamma = -.14$, $p < .05$) in conjunction with the positive linear term ($\gamma = .16$, $p < .05$) suggests a predominantly positive, concave downward curve (Aiken & West, 1991). The quadratic fit of employee creativity in predicting individual innovation (Figure 4.10) shows that for employees who perceive low levels of supervisor support, the curve portraying the examined relationship is even more curvilinear. By contrast, for employees who perceive high levels of supervisor support, creativity is positively related to individual innovation in an almost linear fashion, with a steeper slope and only slight U-shaped curvilinearity.

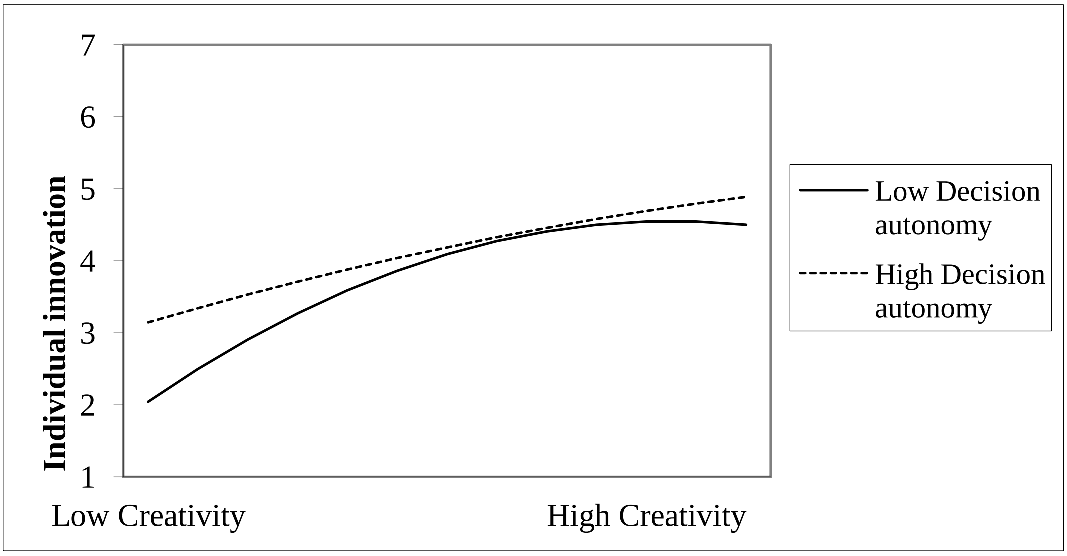
Figure 4.10: Study 1: Relationship between employee creativity and innovation by the level of perceived supervisor support



To further analyze this quadratic-by-linear interaction effect, I tested simple slopes of the regression curves corresponding to all possible combinations of low (one standard deviation below the mean), medium (the mean), and high (one standard deviation over the mean) levels of creativity with low and high levels of perceived supervisor support (cf. Aiken & West, 1991). In the case of high perceived supervisor support, the simple slope of the regression curve was positive, but did not significantly differ from zero at low, medium, and high levels of creativity, supporting the linear shape of the curve with a gentle positive slope. In the case of low perceived supervisor support, the simple slope had a significantly positive value at low levels of creativity (ώ = 1.03, t = 3.34, $p < .01$), whereas it was positive but did not significantly differ from zero at medium levels of creativity, and was negative but did not significantly differ from zero at high levels of creativity. This supports the idea that high creativity has diminishing returns for innovation at low levels of perceived supervisor support, but not at high levels of this moderator.

To test Hypothesis 4, which predicted that the curvilinear relationship between creativity and individual innovation is positive and linear when moderated by decision autonomy, I created two interaction terms (Creativity × Decision autonomy, and Creativity^2 × Decision autonomy) and entered them into the regression equation in Step 5 (Model 5). In this case, both the quadratic and the linear terms were positive ($\gamma = .13$, $p < .05$ and $\gamma = .15$, $p < .05$, respectively). Figure 4.11 depicts the interaction at two levels of employee creativity, and shows that for employees who perceive low decision autonomy, the curve portraying the examined relationship is even more curvilinear. By contrast, for employees who perceive high levels of decision autonomy, the curve is positive and more linear, with only a slight U-shaped curve. In Step 6, I finally evaluated both moderating effects in the same model (Model 6). As in previous two models, the results indicated a negative quadratic term ($\gamma = -.11$, $p < .05$) in conjunction with a positive linear term ($\gamma = .16$, $p < .05$) for perceived supervisor support, and positive quadratic and linear terms for decision autonomy ($\gamma = .12$, $p < .05$ and $\gamma = .14$, $p < .05$ respectively).

Figure 4.11: Study 1: Relationship between employee creativity and innovation by the level of perceived decision autonomy



As was the case with perceived supervisor support, I tested simple slopes of the regression curves corresponding to all possible combinations of low, medium, and high levels of creativity with low and high levels of decision autonomy (cf. Aiken & West, 1991). In the case of high decision autonomy, the simple slope of the regression curve was positive and significantly different from zero at low (ώ = .57, t = 2.75, $p < .01$), medium (ώ = .57, t = 2.75, $p < .01$), and high (ώ = .56, t = 2.74, $p < .01$) levels of creativity, supporting the positive linear shape of the curve. In the case of low decision autonomy, the simple slope had a significantly positive value at low levels of creativity (ώ = .73, t = 2.96, $p < .01$), whereas it was positive but did not significantly differ from zero at medium levels of creativity, and was negative but did not significantly differ from zero at high levels of creativity. This supports the idea that high creativity has diminishing returns for innovation at low levels of decision autonomy, but not at high levels of this moderator.

To explore the moderating roles of the perceived mastery and performance climate, I examined the same level-1 dependent and independent variables (creativity and innovation). However, I used a multilevel approach with level-2 predictors to examine the contextual (moderating) influence of the motivational climates. The focal factor structure was also different from that of the first part of this study, which is why I repeated the test. The expected four-factor solution (creativity, individual innovation, perceived mastery climate, and perceived performance climate) displayed a good fit with the data (Chi-square [428] = 817.98, CFI = .915, RMSEA = .078, SRMR = .051). The factor loadings ranged from .70 to .92 for creativity items, .88 to .91 for individual innovation items, .79 to .92 for mastery climate items, and .70 to .85 for performance climate items. I tested alternative nested models and found that the first model achieved a significantly better fit.

To explore whether the curvilinear relationship between creativity and innovation would be positive and more linear when moderated by a perceived mastery climate, I entered two interaction terms in the regression equation in Step 5 (Table 4.12, Model 5a). The results showed that two interaction terms (as a block) were significant ($p < .05$), which accounted for 5% of additional variance in individual innovation. The linear term was negative, whereas the quadratic term was positive ($\gamma = -.32$, $p<.05$ and $\gamma = .16$, $p < .10$ respectively). The quadratic fit of employee creativity in predicting individual innovation is shown in Figure 4.12. For employees who perceive low levels of mastery climate, the curve portraying the examined relationship is even more curvilinear. In contrast, for employees with high perceived mastery climate, creativity is almost linearly related to innovation.

To explore whether the curvilinear relationship between creativity and individual innovation would be weaker when moderated by a perceived performance climate, I again created two interaction terms and entered them in the regression equation in Step 6 (Model 5b). The results showed that the second interaction term was marginally significant ($p < .10$), which accounted for 3% of additional variance in individual innovation. Once again, both linear and quadratic terms were positive ($\gamma = .23$, *ns* and $\gamma = .11$, $p < .10$, respectively). The quadratic fit of employee creativity in predicting individual innovation is presented in Figure 4.13. It shows that for employees in low performance climate conditions, the curve portraying the examined relationship is even more curvilinear. In contrast, for employees who perceive high levels of performance climate, the curve is almost linear.

In mastery climate conditions, social interactions that are fundamental for innovation implementation are stimulated, feedback within supportive relations with supervisors is more likely to occur, and persistence is promoted, and mastery climate should thus be suitable for stimulating innovation implementation from creative ideas. Therefore, the results indicate that a mastery climate “buffers” (i.e. reduces) the curvilinearity in the relationship between creativity and innovation, and makes it more linear.

As in performance climate conditions, normative criteria of success are emphasized (Roberts, 2012), and social comparison and intra-team competition are fostered (Ames & Ames, 1984; Ntoumanis & Biddle, 1999), the employees are stimulated to achieve better results than their co-workers. They are thus motivated present their creative ideas and implement them. Similarly to the moderating effect of mastery climate, I found support for the moderation of performance climate, which makes the relationship between employee creativity and individual innovation less curvilinear and more monotonic.

Table 4.12: Exploratory multilevel analysis results for the moderating role of motivational climate

	Model 1	Model 2	Model 3	Model 4	Model 5a	Model 5b
Level 1						
Intercept	4.63** (.10)	4.63** (.09)	4.64** (.09)	4.64** (.09)	4.66** (.09)	4.64** (.09)
Age		-.06 (.07)	-.05 (.06)	-.05 (.06)	-.05 (.06)	-.03 (.05)
Gender		08 (.06)	09 (.06)	09 (.06)	09 (.06)	09 (.06)
Education		-.11† (.08)	-.13† (.08)	-.13† (.08)	-.13† (.08)	-.13† (.09)
Expertise		-.04* (.02)	-.05* (.02)	-.05* (.02)	-.05* (.02)	-.06* (.03)
Dyad tenure		-.01 (.03)	-.01 (.03)	-.01 (.03)	-.01 (.03)	-.02 (.03)
Managerial duties		-.01 (.12)	-.01 (.11)	-.01 (.11)	-.01 (.12)	-.02 (.12)
Job complexity		.11* (.06)	.09† (.03)	.09† (.03)	.09† (.04)	.09† (.04)
Decision autonomy		.13** (.04)	.10** (.03)	.10** (.03)	.10** (.03)	.11* (.04)
Perceived supervisor support		.26** (.07)	.20** (.06)	.20** (.06)	.21** (.06)	.20** (.06)
Mastery goal orientation		-.00 (.10)	-.16† (.09)	-.16† (.09)	-.16† (.09)	-.15* (.07)
Performance goal orientation		.03 (.07)	.05 (.06)	.05 (.06)	.05 (.06)	.05 (.08)
Creativity			.35** (.10)	.32** (.10)	.29** (.11)	.27** (.10)
Creativity^2				-18* (.10)	-13† (.07)	-13† (.07)
Level 2						
Mastery climate			.14 (.14)	.13 (.14)	.14 (.14)	.14 (.29)
Performance climate			.32† (.16)	.32† (.16)	.30† (.16)	.32* (.15)
Interaction effects						
Creativity X Mastery climate					-.32* (.15)	
Creativity^2 X Mastery climate					.16† (.09)	
Creativity X Performance climate						.23 (.18)
Creativity^2 X Performance climate						.11† (.05)
Pseudo R^2		.14	.24	.26	.31	.29
Deviance	776.15	780.07	749.31	749.02	748.64	751.15

Notes. The entries are the estimates of the fixed effects with robust standard errors. $^{**}p < .01$, $^{*}p < .05$, $^{\dagger}p < .10$.

Figure 4.12: Relationship between employee creativity and individual innovation by perceived mastery climate

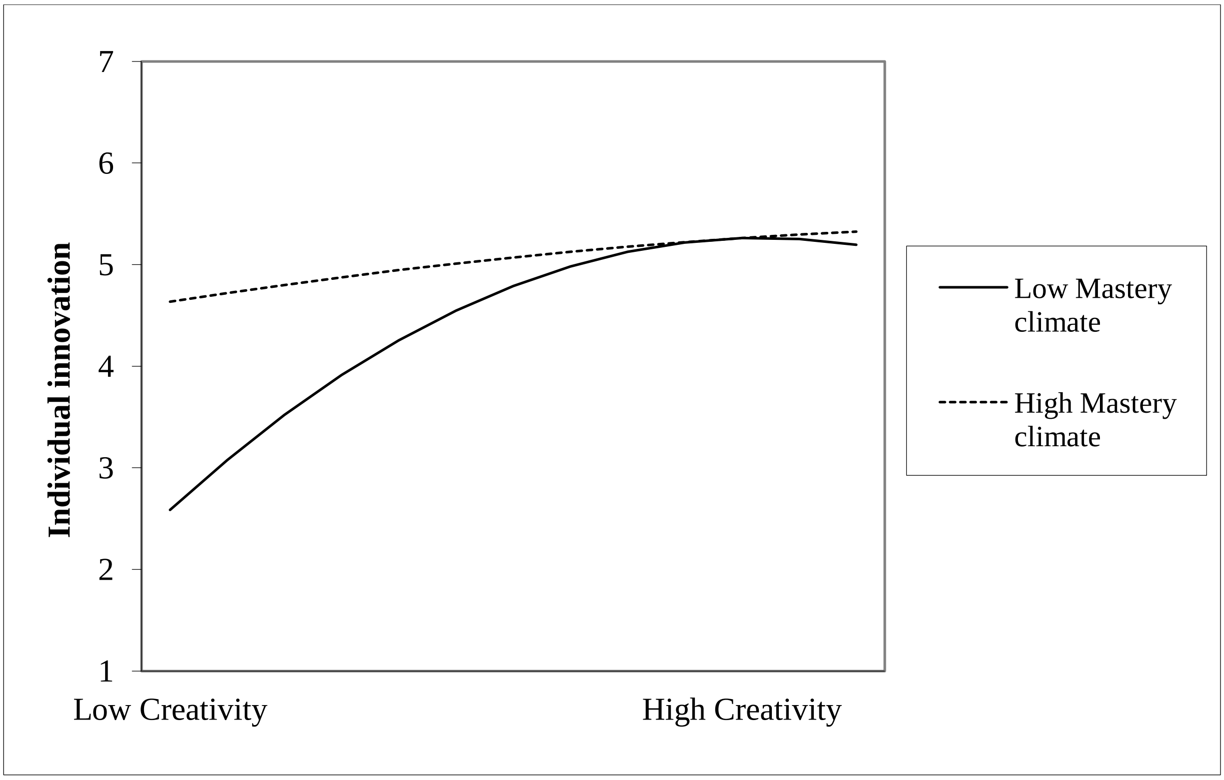
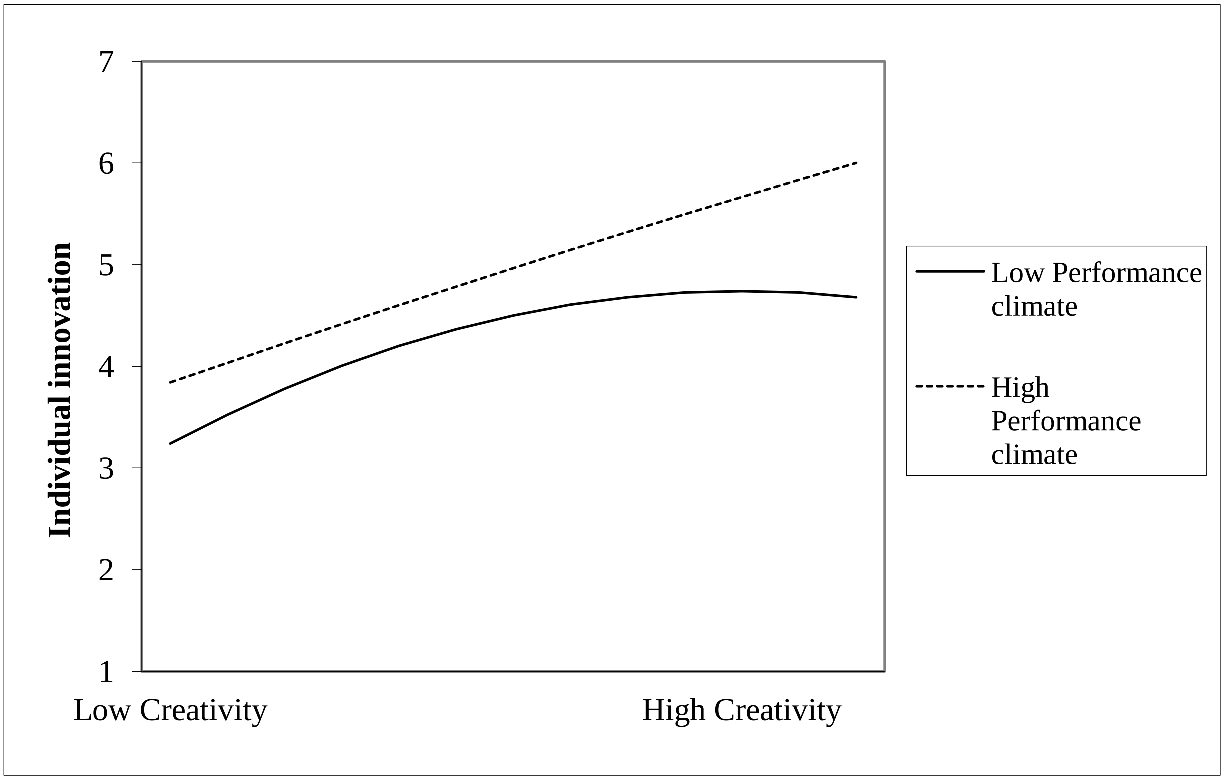


Figure 4.13: Relationship between employee creativity and individual innovation by perceived performance climate



4.2.7 Study 2: Methods

To strengthen causal claims and rule out alternative explanations, as well as to test the mediating mechanisms that underlay my hypotheses, I conducted two additional laboratory experiments. In both experiments, I directly manipulated creativity, which allowed me to rule out the possibility that omitted knowledge, skill, motivation, and ability variables that could influence innovation implementation were responsible for the results. In addition, the first one (Study 2) included independent manipulations of autonomy, whereas in the second one (Study 3), I independently manipulated supervisor support. By randomly assigning the participants to experience three different levels of creative activation, I could constructively replicate my tests of the curvilinear relationship between individual creativity and innovation (Hypothesis 1), and the moderation of autonomy (Hypothesis 4) and supervisor support (Hypothesis 2) that affects this relationship and is mediated by relatedness (Hypothesis 3a) and competence (Hypotheses 3b and 5).

4.2.7.1 Sample, design, and procedures

I conducted an experiment with 123 second-year undergraduates in an HRM course at a Slovenian university. The age of the participants ranged from 18 to 34 years, with a mean age of 21.2 years (SD = 1.77). Twenty-six percent had at least one year of work experience. They were given extra points for participation. The experiment used a three-by-two (low/moderate/high creativity by low/high autonomy) between-subjects factorial design. I introduced the study by explaining that I was interested in studying how people solve work-related problems. The experiment started by presenting an HRM scenario to the participants. They were assigned to the role of a large car retail company's HR managers. In the scenario, one of the company's branch managers has just resigned and the company's HR department has to come up with a print newspaper job advertisement to find a replacement. The participants received a case in which previous manager's tasks were written in detail. Prior to the course, they were given instructions on what they need to pay attention to when designing a job ad, e.g. it should provide all the necessary information, be appealing, not discriminatory, etc.

Creativity manipulation. The participants were randomly assigned to three classrooms prior to the course. First, they received and read the materials that consisted of the case and the instructions to first generate and write down (describe) ideas of a job advertisement (20 minutes) and then design it (e.g. write and draw it on a sheet of paper, as it would appear in the newspaper – 30 minutes). Before the beginning of the first stage, I introduced my manipulations of low, moderate, and high creativity, each in one classroom. The manipulation consisted of the teacher's instruction to the participants to generate uncreative ideas in the first classroom, moderately creative ideas in the second, and very creative ideas in the third. The participants were also given written instructions coherent with a particular creativity inducement:

> *Low creativity:* Your job is to generate ideas about how this particular job advertisement should look like and what it should contain. Please do not be overly creative; it is important that the ideas you put down are based directly on the case description.

> *Moderate creativity:* Your job is to generate moderately creative ideas about how this particular job advertisement should look like and what it should contain. Turn on your creativity, but do not go overboard.

> *High creativity:* Your job is to generate very creative ideas about how this particular job advertisement should look like and what it should contain. Your ideas should be as novel and out-of-the-box as possible.

Autonomy manipulation. In the second stage of the experimental task, the participants were instructed to carry out the ideas they had put down in the first stage and write and draw the actual job advertisement. During this second stage of the task, they were also instructed to form teams of four or five to simulate the sociopolitical processes that are connected with the innovation implementation, and to express their feeling of relatedness with other team members, not with the supervisor. The participants were told to advise other group members on how to carry out the implementation of ideas "they felt were good enough to be implemented". To manipulate autonomy, I gave special instructions that induced high autonomy to half of the participants. These manipulations are in line with the approach proposed by Sheldon and Filak (2008):

> During this task, we just want you to play around with the job ad, and learn how to do it in your own way. You can choose which ideas to implement, the methods and sequence of implementation. Just try to get into it, and see where it takes you.

Thus, the autonomy support manipulations emphasized a choice, self-direction, and the participant's perspective on the task (Deci & Ryan, 1987; Shalley, 1991; Sheldon & Filak, 2008). The other half was given instructions that induced low autonomy:

> In this experiment, you must follow instructions precisely, and implement your ideas in our way. In order to achieve the best results, we cannot let you have any choice about which ideas to implement and in which order. We know what we are doing, so just follow our instructions very carefully, please.

Thus, the experimenter control and the absence of choice were emphasized (Deci & Ryan, 1987; Shalley, 1991; Sheldon & Filak, 2008). The instruction sheet referred to the instructions to carry out every second idea, and to do it in the same exact order as they had put them down during the first stage of the task.

4.2.7.2 Measures

All items used the same scale anchors as in the previous study (7-point Likert-type scale).

Individual innovation. Two independent raters, i.e. experts in HRM (because the assignment was to develop a job advertisement) and innovation, assessed the innovativeness of the outcome each participant produced on a scale anchored at 1, "not at all innovative"; 7, "very innovative". Two raters achieved good reliability (ICC2 = .78) and agreement (average deviation = .89) that is within the conventional guidelines (LeBreton & Senter, 2008). I thus averaged their ratings into the measure of the overall innovation of each individual's second stage of the task outcome.

Competence was tapped using the three-tem measure by Sheldon et al. (2001). It opens with "During this event I felt . . ." (this is also true for relatedness and autonomy, other two psychological states derived from SDT) and includes items such as “that I was taking on and mastering hard challenges” and “very capable in what I did”. Relatedness was also measured with three items from Sheldon et al. (2001) – a sample item: “close and connected with other people who are important to me”.

Manipulation checks and control variables. I had two other independent raters, i.e. experts in HRM and creativity, assess creativity of ideas the participants proposed during the first stage of the task. They also used a scale anchored at 1, “not at all creative”; 7, “very creative”. It should be noted that the raters did not assess the quantity, but creativity of the ideas that participants had written down and described. As two raters achieved good reliability (ICC2 = .84) and agreement (average deviation = .89), once again well within the conventional guidelines (LeBreton & Senter, 2008), I averaged their ratings into the measure of the overall creativity of each individual’s first stage of the task outcome. I measured autonomy with a different scale than in Study 1. This three-item measure (Sheldon et al., 2001) includes items such as “that my choices were based on my true interests and values” and “free to do things my own way”.

I controlled for *dispositional creativity* with a five-item scale assessing an individual’s creative cognitive style (Kirton, 1976). The scale included items such as “I have original ideas”, and “I am stimulating”. In addition to demographic information, this was the only scale that the participants filled out prior to the task, as they completed the others after the second stage of the experimental task. I also controlled for *task difficulty* (“How difficult was the task?”, on a 7-point scale (1 = not difficult at all, 7 = very difficult) because this was shown to affect both perceived competence and innovation (Nicholls, 1984; Ito & Peterson, 1986). I also controlled for *perceived supervisor support*, using the same scale as in Study 1.

4.2.8 Study 2: Results

Means and standard deviations for each condition are shown in Table 4.13. A multivariate analysis of variance (MANOVA) showed the expected main effects of the creativity manipulation on creativity ($F[1,122] = 142.27$, $p < .01$) as well as the expected main effects of the autonomy manipulation on self-reports of autonomy ($F[1,122] = 243.04$, $p < .01$). No other effects were significant. Turning to individual innovation as the dependent variable, in support of Hypothesis 1, Figure 4.14 reveals a curvilinear relationship between creativity manipulation and individual innovation. In support of Hypothesis 4, the MANOVA also revealed a significant interaction effect of the creativity and autonomy manipulations on innovation ($F[2,121] = 5.54$, $p < .01$; Figure 4.15). The interaction was robust even after I controlled for task difficulty and perceived supervisor support ($F[2,119] = 5.01$, $p < .01$). Simple effects showed that creativity increased individual innovation when autonomy was high ($F[1,121] = 3.08$, $p < .05$), but not when autonomy was low ($F[1,121] = .49$, *ns*).

Table 4.13: Study 2: Means and standard deviations by condition[a,b]

Condition	Individual innovation	Competence	Relatedness	Autonomy	Creativity
Low creativity, low autonomy (n = 21)	1.57 (.96)	3.60 (1.84)	4.21 (1.43)	2.94 (.79)	2.31 (.77)
Low creativity, high autonomy (n = 20)	3.00 (1.79)	4.48 (2.27)	3.83 (1.77)	5.38 (1.59)	2.44 (1.17)
Moderate creativity, low autonomy (n = 20)	4.93 (1.39)	3.82 (1.87)	3.75 (1.74)	3.67 (1.15)	4.87 (1.06)
Moderate creativity, high autonomy (n = 21)	5.23 (1.09)	6.03 (1.02)	4.62 (1.03)	6.11 (.72)	4.57 (.71)
High creativity, low autonomy (n = 20)	2.91 (1.03)	4.58 (2.18)	4.57 (1.96)	4.23 (1.41)	5.78 (.94)
High creativity, high autonomy (n = 21)	4.36 (1.23)	5.58 (1.22)	4.47 (1.33)	5.93 (.92)	5.80 (.97)

[a] Standard deviations are in parentheses
[b] I manipulated autonomy after the first stage of the generation of creative ideas.

Figure 4.14 Study 2: Individual innovation scores in differential creativity conditions

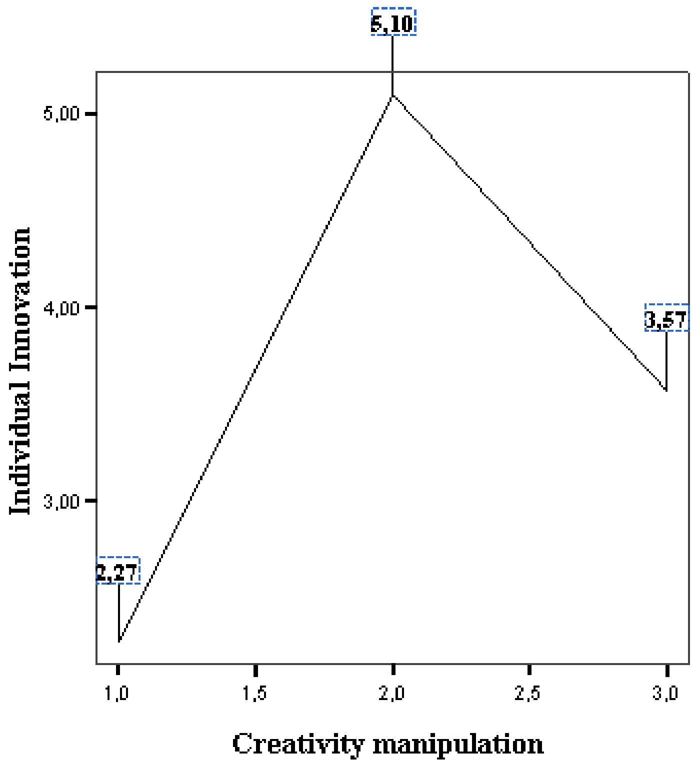
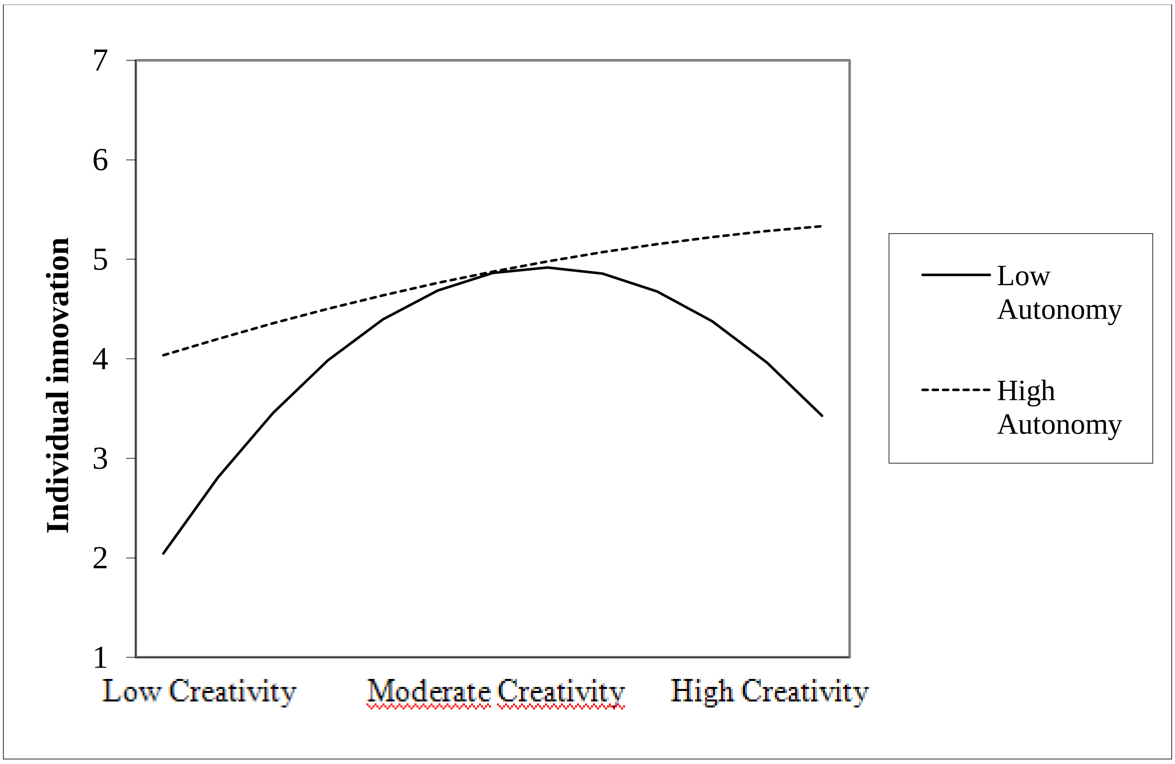


Figure 4.15: Study 2: Relationship between creativity and innovation by level of autonomy



With regard to competence, the MANOVA showed a significant effect of the autonomy manipulation on competence ($F[1,122] = 24.23$, $p < .01$). The effect was stronger after I controlled for perceived supervisor support, task difficulty and relatedness ($F[1,119] = 27.71$, $p < .01$), and no other effects were significant. On the contrary, the MANOVA did not show a significant effect of the autonomy manipulation on relatedness ($F[1,122] = 1.88$, *ns*). Next, I used the Aiken and West (1991) moderated regression procedures to examine whether the participants' reports of competence moderated the effect of the creativity manipulation on individual innovation. I present the results in Table 4.14. Competence interacted positively with the creativity manipulation and its interaction term to predict higher individual innovation (Table 4.14, column 4). In this analysis, when I added the moderating effect of competence, the moderating effect of autonomy was reduced to non-significance (Table 4.14, columns 3 and 4). The same cannot be said for relatedness, which, as expected, did not interact with the creativity manipulation nor reduce the moderating effect of autonomy to a non significant level (Table 4.14, columns 3 and 5).

Furthermore, I examined if competence mediated the moderating effect of autonomy on the relationship between creativity and individual innovation. I applied non-recursive modeling procedures recommended by Edwards and Lambert (2007), using the constrained nonlinear regression module. By drawing 1000 random samples using replacement from the full sample, I constructed bias-corrected confidence intervals for the indirect moderating effect of autonomy through the mediator of competence. The indirect effect from the full sample was .11 and the confidence interval from the bootstrap analysis excluded zero (.04, .26).

I followed the same procedure for the relationship between creativity squared and individual innovation; the indirect effect from the full sample was .12 and the confidence interval from the bootstrap analysis excluded zero (.06, .29). These results support Hypothesis 5 and show that competence mediated the moderating effect of autonomy on the relationship between creativity and innovation. Thus, the experimental Study 2 facilitated stronger causal inferences about the curvilinear relationship between employee creativity and individual innovation, and about the moderating effect of autonomy on this relationship, as well as provided an examination of the mediating mechanism of competence that helps explain the investigated relationship by applying mediated moderation analysis.

Table 4.14: Study 2: Mediated moderation analyses[a]

Variables	Competence				Relatedness				Individual innovation (Step 1)				Individual innovation (Step 2a)				Individual innovation (Step 2b)			
	b	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*
Task difficulty	-.35	.09	-.24	3.53**	-.28	.09	-.22	-3.17**	-.42	.08	-.34	-5.22**	-.39	.08	-.32	-4.62**	-.37	.08	-.30	-4.43**
Perceived supervisor support	.22	.10	.16	2.13*	.24	.09	.20	2.68*	.23	.08	.20	2.91*	.21	.08	.18	2.54*	.23	.08	.20	2.81*
Creativity	.17	.50	.14	.33	-.29	.45	-.26	-.64	.20	.40	.20	.51	.15	.42	.14	.36	-.25	.47	-.24	-.54
Creativity^2	.10	.12	.33	.77	.14	.11	.52	1.19	-.30	.30	-.30	-.31	.01	.11	.03	.07	.10	.12	.42	.87
Decision autonomy	**.62**	**.09**	**.60**	**6.28****	.17	.19	.51	1.35	.07	.08	.34	.96	.01	.02	.28	.68	.09	.09	.08	.54
Creativity × Decision autonomy	-.01	.10	-.02	-.06	.07	.09	.31	.81	**.33**	**.04**	**.32**	**2.76***	**.03**	**.10**	**.14**	**.32**	.25	.10	.28	2.42*
Creativity^2 × Decision autonomy	-.02	.02	-.41	-.97	-.03	.02	-.56	-1.31	**.43**	**.08**	**.49**	**5.38****	**-.01**	**.02**	**-.26**	**-.56**	.29	.10	.31	2.82*
Competence													.05	.08	.26	.67	.16	.10	.19	1.59
Competence × Creativity													**.21**	**.09**	**.33**	**2.59***				
Competence × Creativity^2													**.34**	**.09**	**.39**	**3.52****				
Relatedness													.15	.09	.16	1.62	.16	.13	.17	1.20
Relatedness × Creativity																	.17	.12	.77	1.50
Relatedness × Creativity^2																	.05	.02	1.00	1.88
R^2	.52**				.40**				.56**				.61**				.59**			
F (df)	17.67 (7, 115)				12.47 (7, 115)				20.59 (7, 115)				15.67 (10, 112)				14.35 (11, 111)			
ΔR^2	.52				.40				.56				.05*				.03			

[a] Values in bold are relevant to the tests of hypotheses.
$^{**}p < .01$, $^{*}p < .05$

4.2.9 Study 3: Methods

In this experimental study, I aimed to test the moderating effect of supervisor support (mediated by relatedness and competence – Hypotheses 2, 3a, and 3b) on the curvilinear relationship between individual creativity and innovation.

4.2.9.1 Sample, design, and procedures

I conducted an experiment with 117 second-year undergraduates in an HRM course at a Slovenian university. The age of the participants ranged from 19 to 31 years, and the mean age was 21.26 years (SD = 1.75). The experiment used a three-by-two (low/moderate/high creativity by low/high supervisor support) between-subjects factorial design. It started with the presentation of an HRM scenario to the participants. In the scenario, they had to think of one employed person they know and are familiar with his or her work (e.g. their parents, relatives, or friends), and redesign his or her job.

Creativity manipulation. The participants were randomly assigned to three classrooms prior to the course. They received and read the instructions to first generate and write down (describe) ideas for job redesign, i.e. what is wrong with the job and what can be done about it to improve the employee's well-being (15 minutes). I then introduced my manipulations of low, moderate, and high creativity, as in Study 2.

Supervisor support manipulation. In the second stage of the experimental task, the participants were instructed to write a screenplay for a video clip that would portray the job redesign by using ideas they had come up with during the first stage (30 minutes). During this second stage of the task, they were again instructed to form teams of four or five. As in Study 2, the participants were told to advise other group members on how to carry out the implementation of the ideas "they felt were good enough to be implemented". To manipulate supervisor support, I gave special instructions similar to the approach used by Smith-Jentsch, Salas and Brannick (2001):

> During this task, we want you to write the screenplay freely and as you imagine it. Use your own style, the way you want it, to produce a comprehensive description of the job redesign. We want you to play around with the job design, and learn to do it in your own way. Whenever you feel like you are not sure how to perform the task or you need any help with it, do not hesitate to ask your supervisor. He or she will be happy to provide assistance and guidelines for you to complete the task as efficiently as possible.

Thus, the supervisor support manipulations emphasized the constructive feedback, relationship quality, supervisor openness, clarification of the objectives, active provision of instrumental help and socio-emotional support, positive reinforcement, and encouragement (James & James, 1989; Ashford, Rothbard, Piderit, & Dutton, 1998; Smith-Jentsch et al., 2001; Amabile et al., 2004). The other half was given the instructions that induced low supervisor support:

> In this experiment, we want you to write the screenplay as you imagine it. The screenplay must contain every other idea you wrote down during the first stage. If you have any problems, the supervisor may or may not help you; it depends on his or her time and effort. In any case, the supervisor knows what he is doing, so follow his or her instructions exactly, please.

Thus, the acts of providing negative or no feedback, checking the status of the task too often, displaying the lack of interest in the participants' work and ideas, and not providing help or advice were emphasized (Amabile et al., 2004; Shanock & Eisenberger, 2006). In addition to the written instructions, the supervisor (one in each classroom) also acted in line with the manipulation. For example, in conditions with low support, the supervisor failed to provide any constructive feedback and was critical and unsupportive (by using statements such as "Shouldn't you know that by now?" and "No, no, no, you are doing it all wrong!"). In conditions with high support, polite responses and positive reinforcements were provided even when the participants were incorrect ("Even if this time you didn't get it completely on target, don't let this stop you from trying again." and "Don't be afraid to speak up and ask for my help."), and the supervisor constantly exhibited positive feedback and help.

4.2.9.2 Measures

The same scales with the same anchors as in the previous study were used. Once again, two experts rated individual innovation (ICC2 = .77; average deviation = .78) and creativity (ICC2 = .79; average deviation = .81).

4.2.10 Study 3: Results

Means and standard deviations for each condition are shown in Table 4.15. A multivariate analysis of variance (MANOVA) showed the expected main effects of the creativity manipulation on creativity ($F[1,116] = 151.11$, $p < .01$), and the expected main effects of the supervisor support manipulation on perceived supervisor support ($F[1,116] = 122.23$, $p < .01$). No other effects were significant. Turning to individual innovation as the dependent variable and in support of Hypothesis 1, Figure 4.16 portrays individual innovation means in differential creativity conditions. In support of Hypothesis 2, the MANOVA also revealed a significant interaction effect of the creativity and supervisor support manipulations on innovation ($F[2,115] = 5.87$, $p < .01$; Figure 4.17). The interaction was robust even after I controlled for task difficulty and decision autonomy ($F[2,113] = 5.11$, $p < .01$). Simple effects showed that creativity increased individual innovation when supervisor support was high ($F[1,115] = 5.34$, $p < .05$), but not when supervisor support was low ($F[1,115] = .34$, *ns*).

Table 4.15: Study 3: Means and standard deviations by condition[a,b]

Condition	Individual innovation	Supervisor support	Competence	Relatedness	Autonomy	Creativity
Low creativity, low support (*n* = 19)	1.59 (.87)	3.56 (.98)	3.33 (1.52)	3.32 (1.21)	4.97 (1.09)	1.86 (1.00)
Low creativity, high support (*n* = 20)	2.61 (1.55)	5.43 (1.24)	4.97 (1.98)	3.64 (1.40)	4.12 (1.32)	2.36 (1.08)
Moderate creativity, low support (*n* = 19)	5.10 (1.54)	3.91 (1.11)	3.57 (1.76)	3.99 (1.56)	4.01 (1.06)	4.11 (1.36)
Moderate creativity, high support (*n* = 20)	5.70 (1.21)	6.44 (.99)	6.23 (1.02)	4.56 (1.22)	4.65 (1.31)	4.78 (1.06)
High creativity, low support (*n* = 19)	1.48 (1.01)	4.45 (1.32)	4.23 (1.79)	3.88 (1.67)	4.10 (1.06)	5.91 (1.09)
High creativity, high support (*n* = 20)	5.85 (1.11)	6.33 (1.05)	6.11 (1.10)	4.98 (1.39)	4.46 (1.02)	5.99 (1.22)

[a] Standard deviations are in parentheses
[b] I manipulated supervisor support after the first stage of the generation of creative ideas.

Figure 4.16: Study 3: Individual innovation scores in differential creativity conditions

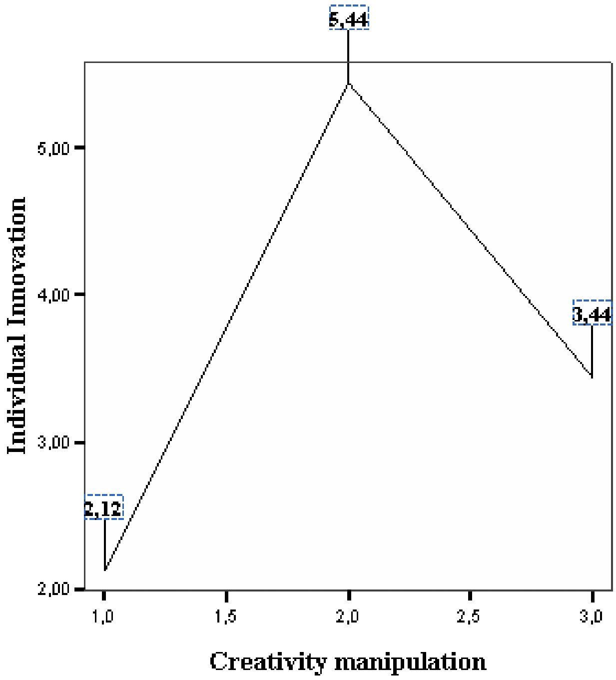
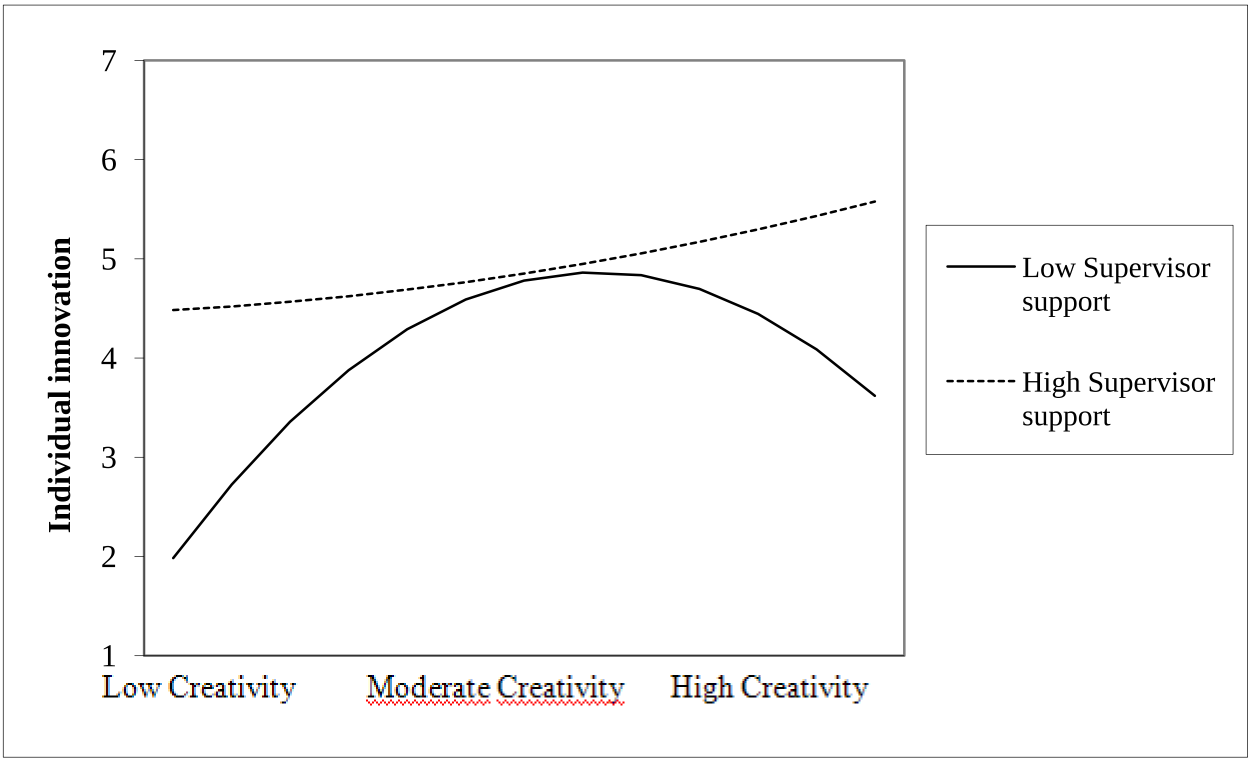


Figure 4.17: Study 3: Relationship between creativity and innovation by level of supervisor support



Turning to competence, the MANOVA showed a significant effect of the supervisor support manipulation on competence ($F[1,116] = 31.10$, $p < .01$). The effect was stronger after I controlled for decision autonomy, task difficulty, and relatedness ($F[1,113] = 33.43$, $p < .01$) and no other effects were significant. Turning to relatedness, and in support of Hypothesis 3a, the MANOVA showed a significant effect of the supervisor support manipulation on competence ($F[1,116] = 26.91$, $p < .01$). The effect was stronger after I controlled for decision autonomy, task difficulty, and competence ($F[1,113] = 28.12$, $p < .01$) and no other effects were significant. Next, I used the Aiken and West (1991) moderated regression procedures to examine whether the participants' reports of competence and relatedness moderated the effect of the creativity manipulation on individual innovation. I present the results in Table 4.16. Competence interacted positively with the creativity manipulation and its interaction term to predict higher individual innovation (Table 4.16, column 4). In this analysis, when I added the moderating effect of competence, the moderating effect of supervisor support was reduced to non-significance (Table 4.16, columns 3 and 4). I can say the same for relatedness, which interacted positively with the creativity manipulation and its interaction term to predict higher individual innovation (Table 4.16, column 5). In this analysis, when I added the moderating effect of relatedness, the moderating effect of supervisor support was reduced to non-significance (Table 4.16, columns 3 and 5).

Moreover, I examined whether competence and relatedness mediated the moderating effect of supervisor support on the relationship between creativity and individual innovation by using the same procedures as in Study 2. By drawing 1000 random samples using replacement from the full sample, I constructed bias-corrected confidence intervals for the indirect moderating effect of supervisor support through the mediator of competence. The indirect effect from the full sample was .12, and the confidence interval from the bootstrap analysis excluded zero (.03, .27). I performed the same test for the relationship between creativity squared and individual innovation; the indirect effect from the full sample was .10, and the confidence interval from the bootstrap analysis excluded zero (.04, .25).

I performed the same procedure for the indirect moderating effect of supervisor support through the mediator of relatedness. The indirect effect from the full sample was .10 and the confidence interval from the bootstrap analysis excluded zero (.02, .23). I conducted the same test for the relationship between creativity squared and individual innovation; the indirect effect from the full sample was .12, and the confidence interval from the bootstrap analysis excluded zero (.02, .25). These results support Hypotheses 3a and 3b, and show that both competence and relatedness mediated the moderating effect of supervisor support on the relationship between creativity and innovation. Thus, the experimental Study 3 facilitated stronger causal inferences about the curvilinear relationship between employee creativity and individual innovation as well as about the moderating effect of supervisor support on this relationship. It also provided evidence on the mediating mechanisms of competence and relatedness.

Table 4.16: Study 3: Mediated moderation analyses[a]

Variables	Competence				Relatedness				Individual innovation (Step 1)				Individual innovation (Step 2a)				Individual innovation (Step 2b)			
	b	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*	*b*	*SE*	*β*	*t*
Task difficulty	-.44	.11	-.34	4.98**	-.21	.11	-.19	-2.23*	-.37	.11	-.27	-4.98**	-.31	.10	-.35	-4.95**	-.35	.09	-.33	-4.28**
Decision autonomy	.32	.09	.26	3.43**	.12	.12	.10	1.76	.25	.09	.22	3.06*	.24	.08	.20	2.87*	.21	.07	.18	2.64*
Creativity	.12	.45	.13	.29	-.20	.34	-.18	-.54	.25	.34	.21	.97	.20	.38	.17	.96	.16	.34	.16	.93
Creativity^2	.09	.10	.27	.42	.11	.10	.38	1.03	-.16	.14	-.09	-.86	-.02	.10	-.03	-.04	.04	.10	.20	.43
Supervisor support	**.62**	**.09**	**.60**	**6.28****	**.55**	**.08**	**.47**	**5.65****	.11	.06	.24	1.20	.03	.03	.17	.65	.04	.04	.05	.32
Creativity × Supervisor support	.01	.10	.02	-.06	.05	.06	.28	.74	**.39**	**.05**	**.36**	**3.27****	**.05**	**.11**	**.13**	**.48**	**.15**	**.11**	**.19**	**1.72**
Creativity^2 × Supervisor support	-.01	.04	-.11	-1.02	-.04	.03	-.48	-1.21	**.48**	**.07**	**.46**	**5.76****	**.02**	**.01**	**.20**	**.48**	**.17**	**.13**	**.27**	**1.78**
Competence													.06	.07	.24	.73	.22	.08	.20	2.67*
Competence × Creativity													**.26**	**.06**	**.33**	**3.00****				
Competence × Creativity^2													**.37**	**.11**	**.42**	**4.02****				
Relatedness													.24	.11	.26	2.62*	.02	.03	.02	.13
Relatedness × Creativity																	**.24**	**.07**	**.19**	**2.79***
Relatedness × Creativity^2																	**.25**	**.05**	**.30**	**2.88***
R^2	.48**				.46**				.58**				.63**				.62**			
F (df)	15.23 (7, 111)				14.56 (7, 115)				22.11 (7, 115)				17.43 (10, 106)				16.94 (11, 105)			
ΔR^2	.48				.46				.58				.05*				.04			

[a] Values in bold are relevant to the tests of hypotheses.

$^{**}p < .01$, $^{*}p < .05$

4.2.11 Discussion

Creativity as a stand-alone concept without the implementation part has a limited business value. It is a necessary, but far from sufficient precondition for innovation. However, the link between creativity and innovation at the individual level, and the conditions affecting it, has been (surprisingly) largely unexplored. I embrace a holistic view and examine creativity and innovation together. Additionally, I fine-tune the creativity-innovation relationship in an attempt to conduct a more precise assessment of its nature. The results indicate that the innovation process is different than previously proposed and investigated. In line with Dionne's (2008) speculation, it seems that an individual innovation pattern may be non-linear and non-monotonic as portrayed by an inverse U-shaped curve, pointing towards diminishing returns that very high levels of creativity may have on innovation.

I build upon the work of Baer (2012) and move beyond the person-centric perspective in examining the relationship between individual creativity and innovation. By drawing on self-determination theory (Deci & Ryan, 1985, 1991; Ryan, 1995), I found support for the moderating effects of supervisor support and autonomy through mechanisms of competence and relatedness. These were found to buffer the curvilinear relationship between creativity and innovation, making it positive and linear. The elements of the self-determination theory can be used as managerial remedies to unlock the potential of highly creative individuals with "overly" novel ideas. However, my findings also suggest that under the conditions of high autonomy or support, uncreative ideas are being implemented at about the same rate as those that are much more novel and useful. It appears that people who have the freedom to implement their ideas or feel they are supported by their supervisors proceed to implement even some of their mundane ideas.

4.2.11.1 Theoretical contributions

This part of Chapter 4 provides contributions both to creativity and innovation literatures. It serves as a notion to the creativity literature that highly novel ideas do not always necessarily result in a tangible value. It also directs attention towards further micro research on the foundations of the innovation process at the individual level. This endeavor can reveal many otherwise neglected but important innovation performance factors rooted in the cognition and motivation of individuals. Furthermore, I make an even more important contribution by attempting to bring previously separated fields of creativity and innovation closer together.

As stated in a recent study by Baer (2012, p. 4), "the observation by Van de Ven (1986) that the conversion of ideas into actual innovation is one of the central problems in the study of innovation appears to be as true today as it was more than a quarter century ago". Although there is a widespread agreement that creativity and implementation are two distinct activities of the innovation process with possible different antecedents, scholars did not always make this division. A large body of literature treats creativity and implementation as indicative of the same concept, innovation, with a variety of possible facilitators. It is necessary to make a distinction between these two. In addition to prevailing literature, I focused on the relationship between creativity and innovation instead of their respective antecedents.

Much of the research on either creativity or innovation treated these phenomena as uniform or linear processes (Rosing et al., 2011). Management research often merely focuses on linear relations between particular antecedents and outcomes. However, this only reinforces the "more is better" assumption and fails to discuss the need for balance between deficiency and excess (Pierce & Aguinis, in press). I addressed the calls of Dionne (2008) and West (2002) to examine the curvilinear non-monotonic relationship between creativity and innovation. By not assuming a linear relationship, my three studies contribute an important departure from traditional approaches by providing a novel conceptualization accompanied by empirical evidence that supports the curvilinear relationship between creativity and innovation at the individual level.

My research systematically considers the complexity of the innovation process and moves beyond the assumed linear monotonic relations, which provides a greater level of specificity (Edwards & Berry, 2010) and thus a greater theoretical value. It highlights the importance of exploring nonlinearity in the relationship between creativity, innovation, and its influences, and provides a more nuanced and in-depth assessment. This is consistent with Pierce and Aguinis' (2011) call for a paradigmatic shift from linear to curvilinear models that allow us to examine the relationships in ways we might have otherwise missed, which is essential to improve the management theory and practice.

Recent theory and research on organizational creativity emphasized the importance of creating favorable work environments to stimulate individual creativity (e.g. Amabile, 1983; Woodman et al., 1993). However, the previous research mostly overlooked the focus on how to stimulate individual innovation, the implementation of creative ideas, from creativity. Furthermore, the relational and social aspects of job design that might stimulate initiative in these processes have been underestimated (Grant, 2007; Grant, Nurmohamed, Ashford, & Dekas, 2011). My three studies, that is one field and two experimental, extend the current understanding on the most effective ways to construct a work environment that stimulates innovation implementation from creativity at the individual level.

I introduce the elements of self-determination theory (Deci & Ryan, 1985, 1991; Ryan, 1995) as novel contingencies for the relationship between individual creativity and innovation. By using the SDT, I was able to contribute the exploration of the black box of innovation through the relationship of its beginning and end phases. I identify key theoretical mechanisms that explain the transformation of creative ideas into innovation. By moving beyond the person-centric perspective of idea implementation, my three studies are complementary to the work of Baer (2012). They account for the person-context interaction (Woodman et al., 1993) that is consistent with the SDT by examining individual traits or behavior (creativity as a predictor and the mediating roles of perceived competence and relatedness) and contextual factors (supportive supervision and autonomy) simultaneously. I indicate how these factors affect both the slope and the shape of the curve of the relationship between individual creativity and innovation.

Three studies presented here also contribute to the work motivation theory. They extend the previous understanding on motivating creative individuals by explaining how to motivate highly or even "overly" creative individuals to implement their ideas. I contribute particularly to self-determination theory in two aspects. First, I conceptualized the connections between its constructs and supervisor support and provided empirical evidence that supportive supervision can stimulate perceived competence and relatedness among the employees. In self-determination literature, support was previously predominantly discussed in relation with support for autonomy (Deci et al., 2001). In this chapter, I treat it as a general support by the supervisor. Therefore, it is important to note that supervisor support is a much broader term than autonomy support (e.g. Eisenberger et al., 2002; Amabile et al., 2004). Support of employees' choices, acknowledgement of feelings, and the ability to provide help in the absence of monitoring and controlling are characteristic for supportive supervision. These managerial behaviors do not exclude a greater employees' perception of autonomy. Hence, supervisor support and autonomy are not mutually exclusive.

Second, the self-determination theory was previously predominantly applied in the creativity literature (e.g. Amabile, 1983; Oldham & Cummings, 1996). My three studies demonstrate the salience of self-determination for stimulating innovation implementation from creative behaviors at the individual level. This is also beneficial for SDT, as it highlights its importance in the innovation field. My findings can act as triggers to stimulate further research on other individual-level phenomena based on SDT. My approach examines the mediated moderation of the stimulating role of autonomy on competence need satisfaction, as well as of the facilitating role of supportive supervision on satisfying the need of both competence and relatedness. These factors altogether have the potential to optimize the relationship between creativity and innovation. My findings thus further demonstrate the salience of examining the interaction among three psychological needs rather than just assuming their additive or synergistic effects (Dysvik et al., in press).

4.2.11.2 Practical implications

This part of Chapter 4 shows that although it is a common belief that we need creative employees to produce innovative output, very high levels of creativity may result in an increasingly diminishing individual innovation output. Too novel ideas may be perceived as risky, lacking support and competence, and hence would not result in their implementation. However, these seemingly over-optimistic ideas have high potential gains inherently attached. They can be considered as high risk - high gain cases. Therefore, organizations need to be cautious when dealing with highly creative individuals. They need a suitable environment, which enables them to implement their "crazy" ideas. In fact, this is where the majority of unlocked potential is hidden.

I provide evidence to suggest two paths that organizations can take in order to improve the implementation of highly creative ideas. First, group supervisors should exhibit high levels of instrumental and socio-emotional support. This can contribute to the creation of a more desirable climate denoted by relatedness and serve as a practical way to provide more tangible resources (e.g. via training) to stimulate competence. Second, I show that creative employees need high levels of autonomy to feel more competent, which in turn helps them to bring their creative ideas to completion. While this is known for creativity, it may in fact be surprising for innovation. It is not control that is suitable for implementation, but rather tight supportive relationships with supervisors accompanied by high levels of autonomy that is positively related both to creativity

(Greenberg, 1992; Amabile et al., 1996) and innovation (Spreitzer, De Janasz, & Quinn, 1999). Managers who seek to increase innovation implementation from creativity among their employees should ensure that employees have a sense of control over their situations rather than provide tight control with little support and guidance. Even if employees are very creative, this approach would stifle their idea implementation and detrimentally influence on individual innovation.

4.2.11.3 Limitations and directions for future research

Despite the aforementioned contributions, this part of Chapter 4 is not without limitations. The innovation process is complex, and in reality, creation and implementation do not necessarily proceed in a neat and linear way, but can take place interchangeably (Anderson et al., 2004). There is a need to generate and implement ideas throughout the innovation process in a constantly changing manner (Rosing et al., 2011). Therefore, to split them into two strictly separated phases or stages seems somewhat problematic. In practice, it is also possible that a person who implements creative ideas does not suggest them (Ohly et al., 2010). However, creativity is widely accepted as the necessary antecedent of innovation at the individual level (Amabile, 1988; Baer, 2012), and this distinction for research purposes enables a further insight into the innovation process. Future research should, however, focus on treating innovation as a complex phenomenon accounting for possible loop swings regarding creativity and implementation (Van de Ven & Sun, 2011). Nevertheless, by conducting two experimental studies, I could strengthen my causal claims and prevent alternative explanations connected with the reciprocal relationships.

More work, however, needs to be done to integrate macro-level innovation research with micro-level creativity work (Agars et al., 2008). Although I drew from both bodies of literature, a further multilevel approach and more complex research designs would be useful. This type of empirical research is still somewhat limited particularly in assessing the bottom-up processes. Nevertheless, any type of cross-level assessments that would account for factors at different levels would help to investigate the isomorphism and the interdependence between creativity and innovation at different levels.

I provided a theoretical conceptualization and empirical evidence of a curvilinear relationship between creativity and innovation at the individual level. Future research should also further explore the differential effects of various personal or contextual variables on creativity and innovation. By drawing on SDT and focusing on perceived supervisor support and decision autonomy, I only included a limited amount of factors influencing the creativity–individual innovation relationship. Other factors, such as the quality of relations with supervisors, as well as individual traits, such as disposition towards risk, may play an equally important role.

I was also able to explore the mediating mechanisms of competence and relatedness in two experimental studies only. Future research should collect field data exploring mediated moderations in line with the Study 2 and 3 to replicate my findings. Furthermore, the ability of the investigated moderators to reduce the curvilinear relationship between employee creativity and individual innovation could also depend on other factors, such as the social context of network structures in interaction with other personal or contextual variables. This presents an opportunity to investigate this relationship with quadratic three-way interactions that would closely follow the interactional perspective on creativity (cf. Woodman et al., 1993). Further research is required to explore the work situation that might deliberately or unknowingly stimulate or buffer the curvilinear relationship between employee creativity and individual innovation in more detail.

4.2.12 Conclusion

It has been often implied that creativity and innovation are positively related (e.g. Amabile, 1988). However, research streams that investigate the respective phenomena have been too divided and at times even ignorant to the findings of other party. The investigation of the relationship between creativity and innovation at the individual level, particularly by not presuming monotonic relations, has remained unresolved in previous research. My findings support a positive relationship, but shift the view from linear approximations to more insightful curvilinear assessments. Although more employee creativity indeed leads to increased individual innovation, too much creativity results in diminishing innovation outcomes after the inflection point. In addition, I showed how organizations could intervene contextually and make this relation positive and linear (i.e. capitalize on the most creative ideas), either through supervisor support or via relational job design, by providing creative people with higher levels of decision autonomy. In line with the self-determination theory, autonomy and supervisor support stimulate the psychological states of competence and relatedness, which yields optimal functioning and better results in terms of individual innovation.

Chapter 5: GENERAL DISCUSSION AND CONCLUSION

5.1 Summary of findings and contributions

In Tables 5.1 and 5.2, I summarize the main findings of each chapter, how I obtained them, and to which literature they aim to contribute. Overall, the redline of my PhD project deals with non-technological innovation by applying central principles of multilevel theory building and research organized around *what, how, where, and why* of multilevel theoretical models (Kozlowski & Klein, 2000). I discuss these in the following paragraphs.

What? Theory building should begin with the designation and definition of the theoretical phenomenon and the endogenous constructs of interest (Kozlowski & Klein, 2000). In my dissertation, I was building a theory and applying research that attempts to understand non-technological innovation. I wished to clarify this sub-field of innovation by delineating it from the field of innovation in general, as well as by showing how various types of innovation overlap and share similar knowledge bases. At different levels of analysis, I provided distinct definitions of innovation types and showed whether (and to what extent) they are isomorphic.

In terms of non-technological innovation, this construct has some global properties – it denotes the creation and implementation of something new and useful that is non-technological (Damanpour & Aravind, 2012). This can apply for individual, group, or firm levels. However, non-technological innovation at different levels is not completely isomorphic as it has a lot of configural properties, i.e. functionally equivalent but different or discontinuous across levels (cf. Chen, Mathieu, & Bliese, 2004). They are not assumed to coalesce and converge among the group members, and individual contributions to configural unit properties are distinctly different (Kozlowski & Klein, 2000). This is why configural unit properties have to capture the array of these differential contributions to the whole (Kozlowski & Klein, 2000). Creating something new may originate at the individual level, and may be implemented there or at the group or organizational level, with many processes, as well as personal and contextual influences in-between.

How? I aimed to contribute to the clarification of the field and to provide a basis for empirical research in terms of multilevel foundations of non-technological innovation, with a qualitative review in triangulation with co-citation analysis and science mapping techniques that I applied in Chapter 1. Following this examination, I focused on the most popular type of non-technological innovation lately, which is management innovation, and examined its antecedents and outcomes. I also demonstrated how non-technological innovation forms have antecedents and outcomes unique from technological innovation. I explicitly focused on the role of knowledge exchange, and the relationship of management innovation with technological innovation. I highlighted its unique predictive role in fostering technological innovation, and pinpointed its importance for stimulating firms' performance by accounting for the country-level context of national culture, specifically the most social and "soft" dimension, that is individualism-collectivism. This is also the one dimension where the most controversies could be found in the previous literature.

In the next and final step, I attempted to bridge the gap and provide further insight at lower levels by examining the micro foundations of non-technological innovation in the form of individual creativity and innovation. I demonstrated that it is important to differentiate between two phases of the innovation process at the individual level, as well as examine their interrelationship and account for both personal and contextual factors at work.

Where? I followed the principle of Kozlowski and Klein (2000) that suggests that unit specification at different levels should be driven by the theory of the phenomena in question. In my dissertation, I mostly focused on top-down processes, and processes and interrelationships of proximal phenomena at different levels in different settings by using various methods. There is no all-encompassing multilevel data analytic strategy that would be appropriate to all research questions (Kozlowski & Klein, 2000). At different levels of my dissertation, different research questions were relevant. This is why I did not examine them all in one model nor focus on providing a comprehensive examination of bottom-up emergence processes for the most part.

Why and why not? I have, however, touched upon the bottom-up processes when dealing with micro-level foundations, as well as in providing more or less analogous (homologous; i.e. similar across the levels of research) relationships at different levels of analysis. Nevertheless, I did not engage deeply in specific bottom-up examination and description of the emergence processes as non-technological innovation forms do not emerge via easy-to-comprehend and model compositional processes (such as motivational climate that I examined and bottom-up modeled in Chapter 4). They rather adopt a compilation type of emergence (cf. Chan, 1998; Chen et al., 2004) that is much more difficult to conceptualize, measure, and analyze. Further developments will have to be made in the multilevel theory of non-technological innovation as well as in understanding the modeling of bottom-up processes in general to appropriately conceptualize non-technological innovation (or innovation in general, for that matter) as an emergent process. Moreover, bottom-up emergent effects necessitate long-term longitudinal or time-series designs (Kozlowski & Klein, 2000), which was beyond the scope of this dissertation.

I focused on elucidating the relevance of taking a multilevel approach in examining non-technological innovation extensively in the introduction. In each chapter, I provided a detailed explanation of the assumptions underlying top-down or constraining processes that I examined. I applied a multilevel approach because the rather novel field of non-technological innovation is becoming developed, as witnessed by a recent literature review of Damanpour & Aravind, 2012, and because non-technological innovation types and their foundations are influenced by higher-level organizational units, and reflect actions or cognitions of lower-level organizational units (Kozlowski & Klein, 2000). Both need to be accounted for if one hopes to obtain a thorough and comprehensive scientific examination of non-technological innovation.

Table 5.1: Summary of the main findings – Chapters 1 and 2

Chapter (Title) and research questions	Overarching theories	Study type (methodology/design/analysis)	Main findings	Contributions (to which literature)
Chapter 1: Intellectual structure of the non-technological innovation field: Qualitative literature review, article co-citation analysis and science mapping *RQ1: What types and forms constitute non-technological innovation?*	Innovation theory Intellectual structure approach Knowledge base theory	Qualitative literature review, co-citation analysis, science mapping (direct citation analysis)	Key influxes to non-technological innovation field (in contrast to innovation) Identification of primary domains within the field and key contributions Identification of the most important issues within the field Delineating among different types of non-technological innovation based on their knowledge base	Clarification of the non-technological innovation field using both qualitative and quantitative approaches Analysis of the non-technological innovation field development (innovation studies, non-technological innovation discipline)
Chapter 2: Antecedents and outcomes of management innovation *RQ2a: How are knowledge exchange, organizational size, and IT system development related to management innovation?* *RQ2b: What is the relationship between management innovation, technological innovation, and financial performance?*	Resource and knowledge-based view Cultural and institutional perspectives on management innovation	Field study – firm-level data of 604 companies in three countries: Slovenia, Spain, and South Korea; structural equation modeling (SEM) and hierarchical moderated regression analysis	Internal knowledge exchange is an important predictor of management innovation Management innovations are more important for enhancing firms' financial performance than technological innovations	Empirical examination of the antecedents and outcomes of management innovation on a broad dataset from three countries Shift of the techno-centered view on innovation towards the importance of intangible innovation approaches (innovation studies, management innovation)

Table 5.2: Summary of main findings – Chapters 3 and 4

Chapter (Title) and research questions	Overarching theories	Study type (methodology/design/analysis)	Main findings	Contributions (to which literature)
Chapter 3: Relationship between individualism-collectivism and innovation at the organizational level: A multilevel perspective *RQ3a&3b: What is the relationship between individualism-collectivism (country level), knowledge exchange, and non-technological and technological innovation (organizational level)?*	Innovation theory Knowledge-based view Output-based approach Cultural and institutional perspectives on management innovation Multilevel theory	Community Innovation Survey 2006 micro data for innovation at the organizational level in 13 countries and Hofstede (1980, 2001), GLOBE (2005) and Schwartz (2006) scores for individualism–collectivism, hierarchical linear modeling (HLM)	Individualism–collectivism dimension moderates the relationship between management innovation and technological innovation Individualism is positively related to propensity to innovate, whereas collectivism is positively associated with innovative performance In collectivistic cultures, management innovation plays a more important stimulating role in enhancing technological innovation	Clarifying previously contrasting results of the relationship between individualism-collectivism by accounting for different measures of national culture, two different types of innovation (management and technological) and two different stages of the innovation process (the propensity to innovate and innovative performance) (innovation studies, management innovation, national culture and international management)
Chapter 4: Micro-level foundations of innovation: Knowledge hiding, creativity, and individual innovation *RQ4a: What is the influence of motivational climate at the team level and the influence of knowledge hiding and achievement goal orientation at the individual level on employee creativity*? *RQ4b: What are the interrelationships between motivational climate, knowledge hiding, perceived supervisor support, task interdependence, and decision autonomy in stimulating employee creativity*?	Achievement goal theory (AGT) Social exchange theory Knowledge-based view Self-determination theory (SDT) Innovation theory Multilevel theory	Two field studies – primary data in three Slovenian firms (group and individual levels), three experimental studies on undergraduate students; hierarchical moderated regression analysis, random coefficient modeling (multilevel analysis), MANOVA, moderated mediation, mediated moderation	Knowledge hiding decreases creativity via a social reciprocal distrust loop Mastery climate buffers the aforementioned negative effect Creativity is curvilinearly related to innovation (inverse U-shape), indicating that ideas can be too creative to get implemented High supervisor support and autonomy make the curve positive and linear through increased psychological states of competence and relatedness	Conceptualizing the mechanism through which knowledge hiding affects one’s own creativity Showing how managers can remedy negative effects of knowledge hiding by implementing appropriate motivational climate Bringing together separated fields of creativity and innovation Explaining the curvilinear relationship and its remedies by drawing on SDT (creativity and innovation, knowledge management, motivational theories of creativity)

5.2 Overarching theoretical and methodological contributions

One of the most important contributions of my dissertation to innovation literature is to clarify the field of non-technological innovation. I do so in several steps; In Chapter 1, I first provide quantitative in-depth evidence for delineating among various types of non-technological innovation based on knowledge inflows. I also help to establish non-technological innovation as a field of its own and show how its development differs from the field of innovation in general. Most importantly, I identify the most important antecedents of intangible nature (the role of social side, Kanter, 1988; Abrahamson & Rosenkopf, 1997; den Hertog, Bilderbeek, & Maltha, 1997; Dawson & Daniel, 2010; Perry-Smith, 2006; Dionne, 2008; Taylor & Wilson, 2012 and knowledge exchange, Nonaka, 1994; Mol & Birkinshaw, 2009; Taylor & Wilson, 2012), and empirically examine them in Chapters 2–4 at various levels of research. More precisely, I study knowledge exchange in the form of knowledge hiding at the individual level in Chapter 4, and in the form of internal knowledge exchange at the firm level in Chapters 2 and 3. I investigate the salient role of the social side in the form of supervisor support and motivational climate in Chapter 4, and in the form of individualism-collectivism in Chapter 3. All findings empirically support theoretical foundations that argue for the importance of these facets, as identified in the quantitative literature review.

Another theoretical contribution of my dissertation as a whole is to bridge the disciplinary gap between exploration and exploitation. This is most apparent in Chapter 4 at the individual level, where I bring together the separated research streams of creativity and innovation (Woodman et al., 1993; Dionne, 2008) to contribute by providing a nuanced investigation of their relationship. However, parallels are made at higher levels as well. In Chapters 2 and 3, I investigate the exploration-exploitation by examining the relationship between management innovation and technological innovation. As some scholars argue that these two types can be both explorative and exploitative (e.g. Jansen et al., 2006), I additionally focus on exploitation by examining the effects on financial performance (Chapter 2) or innovation performance as portrayed by the percentage of the revenue from innovations (Chapter 3). This integrative and recurrently validating view provides the incorporation of insights across various sub-disciplines of innovation and creativity.

An important overarching contribution of my dissertation is to synthesize and extend prior work on the development of multilevel theory and research of non-technological innovation field. A levels approach, which combines micro and macro perspectives, engenders a more integrated science (Kozlowski & Klein, 2000) of non-technological innovation. By focusing on significant and salient phenomena of non-technological innovation and its predictors (knowledge exchange and the social side), conceptualizing and assessing at multiple levels, and exhibiting concern about both top-down and bottom-up (to a lesser extent) processes, I contribute to building a science of non-technological innovation in organizations that is theoretically rich and application-relevant. This multilevel theory building is particularly valuable as it represents a substantial challenge to organizational scholars that are trained, for the most part, to think micro *or* macro, but not micro *and* macro, that is to think multilevel (Kozlowski & Klein, 2000). I expand the micro-level integration by applying two approaches recommended by Rousseau (2011): actively using alternative approaches (the use of multiple data sources and methods) and systematically reviewing findings that integrate the results of Chapters 1–4 across levels.

Accordingly, another contribution of my dissertation is related to its scope. I examine similar relationships in different contexts and with different measures (for example, tapping management innovation with primary field data and secondary Community Innovation Survey micro data). I followe the framework for multilevel research (Rousseau, 1985) and describe the levels of theory, measurement, and analysis in all chapters of my dissertation. This provides a more accurate assessment of the constructs in question without making common fallacies at different levels of analysis. To adequately account for the theory levels, I provide definitions of the examined non-technological innovation constructs at different levels (at different chapters). I deliberately study them separately at different levels not to make any theoretical confounds. To account for the appropriate levels of measurement and analysis, I used survey scales that do not contain items with ambiguous or mixed-level item referents, which would undermine their construct validity (Mathieu & Chen, 2011).

In line with the contingency (cf. Damanpour, 1996; Oldham & Cummings, 1996) and interactionism theories (cf. Tushman & Rosenkopf, 1992; Woodman et al., 1993), I contribute to the non-technological innovation field and the field of innovation in general by examining the higher context that influences the innovation processes and comparing its role to unit-based factors. I examine contextual (climate and supervisor support) and personal (knowledge hiding and goal orientation) factors at the individual level, as well as investigate the country (national culture dimensions) and firm (internal knowledge exchange, size, and IT system development) at the organizational level. By adopting a multilevel perspective with hierarchical linear modeling, I try to apply micro rigor in macro innovation research at the company and country levels.

I examine the relationships using an appropriate analytic approach that accounts for dependence among lower-level units, their nesting, and cross-level influences (Mathieu & Chen, 2011). Namely, random coefficient modeling techniques offer powerful ways to test different aspects of multilevel models, and include the Bayesian weighting of lower-level effects and sophisticated treatment of multilevel error term distributions (Snijders & Bosker, 1999; Raudenbush & Bryk, 2002). OLS or standard hierarchical regression procedures would not be appropriate due to the violation of the homoscedasticity assumption (i.e. that all random variables in the sequence have the same finite variance) and the interdependence of the cases' characteristics (Hofmann, 1997; Raudenbush & Bryk, 2002). Unaccounted-for non-independence can be problematic as it affects standard error estimates used to determine the statistical significance (Bliese & Hanges, 2004). I could perform a more precise empirical assessment with HLM, which applies the generalized least squares estimates for the level-2 parameters that provide a weighted level-2 regression so that the groups with more precise level-1 estimates (of intercepts and slopes) receive more weight in the level-2 regression equation (Hofmann, 1997). This is also true if the researchers collect data from hierarchical structures although they have no particular interest in modeling the influence of higher level variables (Bliese & Hanges, 2004), as I do in terms of the relationship between individual creativity and innovation in Chapter 4.

Therefore, another contribution of my dissertation is in the rigorous empirical examination with a wide variety of methods and techniques. The use of various methods (multiple field and experimental studies, the use of primary and secondary data) and data analysis techniques (e.g. co-citation analysis, structural equation modeling (SEM), mediated SEM, hierarchical moderated regression analysis, random coefficient modeling with cross-level main effects, cross-level interactions, and cross-level triple interactions, mediated moderation analysis, MANOVA, curve analysis, agreement, validity, and reliability analysis) at different levels of analysis provides an empirical contribution that adds to the validity of my inferences.

5.3 Managerial implications

In each chapter, I point out specific implications for practice, which are tangible and relevant to managers because of their explicitness (Table 5.3). However, this dissertation also offers some overarching managerial implications. I mainly provide clarification of the organizational-level content of non-technological innovation and its types. Managers are frequently unaware of what exactly they need to do in order to innovate non-technologically. My dissertation helps in addressing this concern as it provides a better idea and definitions of non-technological innovation at different levels. It also points out a very important issue of embeddedness; managers need to be aware of the fact that the whole is more important than the sum of its parts, and that particular processes act independently to some extent, but are also related to their context.

Another practical implication is that I describe both contextual cues that are important for the process of innovation, and its micro-level foundations. This gives managers an idea of which non-technological innovation they can adopt or pursue, what exactly it constitutes, and to which outcomes it may lead if carried out properly. My dissertation provides managers with knowledge about the heuristics; more precisely, what might happen if they intervene in one way or another (for example, by exhibiting high levels of supervisor support, fostering mastery climate conditions, or providing employees with autonomy in the workplace). Chapter 4 is particularly valuable in that manner; it illustrates how one (presumably beneficial) managerial remedy (inducing performance climate) can cause detrimental effects in particular boundary conditions.

Table 5.3: Summary of managerial implications

Chapter (Title)	Study type (methodology/design/analysis)	Managerial implications
Chapter 1: Intellectual structure of the non-technological innovation field: Qualitative literature review, article co-citation analysis and science mapping	Qualitative literature review, co-citation analysis, science mapping (direct citation analysis)	Identification of elements of non-technological innovation Attempt to clear the confusions and overlapping types of innovation Explicit descriptions of what constitutes each type of non-technological innovation Identification of internal and external determinants of non-technological innovation
Chapter 2: Antecedents and outcomes of management innovation	Field study – firm-level data of 604 companies in three countries: Slovenia, Spain, and South Korea; structural equation modeling (SEM) and hierarchical moderated regression analysis	Highlighting the importance of establishing systems that support knowledge exchange and a practical road-map of how to do that Investing effort, time, and money in the initiatives aimed at developing management innovation can lead to technological innovation and financial performance
Chapter 3: Relationship between individualism-collectivism and innovation at the organizational level: A multilevel perspective	Community Innovation Survey 2006 micro data for innovation at the organizational level in 13 countries and Hofstede (1980, 2001), GLOBE (2005) and Schwartz (2006) scores for individualism–collectivism, hierarchical linear modeling (HLM)	An idea of the conditions under which the innovation processes in the companies would be more favorable and when they would be more detrimental towards innovative performance
Chapter 4: Micro-level foundations of innovation: Knowledge hiding, creativity, and individual innovation	Two field studies – primary data in three Slovenian firms (group and individual levels), three experimental studies on undergraduate students; hierarchical moderated regression analysis, random coefficient modeling (multilevel analysis), MANOVA, moderated mediation, and mediated moderation	Knowledge hiding negatively influences one’s own creativity; a road-map of how managers can mitigate this effect by inducing particular motivational climate conditions at work Organizations need to be cautious when dealing with highly creative individuals; I suggest two paths that organizations can take in order to improve the implementation of highly creative ideas: supportive supervision and autonomy

5.4 Limitations and future research suggestions

One limitation of this study is related to the cascade of the examined relationships. There is a certain level of correspondence (homology) in the examined constructs and their interrelationships at different levels, such as knowledge hiding at the individual level and knowledge exchange at the organizational level, creativity and innovation at the individual level, as well as management and technological innovation at the organizational level. As moral codes are rarely organizationally specific, there may be some correspondence between the national culture characteristics and motivational climates in the groups of the examined organizations, in a sense that the climates reflect the broader context of a national culture (Burke, Chan-Serafin, Salvador, Smith, & Sarpy, 2008). However, to truly test a multilevel model of all interrelationships comprehensively, one would require a sample of multiple companies and their employees nested in groups in multiple countries that is similar to Chapter 3. This would certainly represent a broad research program that is well beyond the scope of my dissertation.

Another limitation of my research is related to the issue of time, and thus the important question of when (Kozlowski & Klein, 2000). I did not account for time as a boundary condition or a moderator in any of the chapters by ignoring changes in the examined constructs and processes over time. Even if I could establish causality by conducting experiments, I would not be able to grasp the changing nature of non-technological innovation constructs and their interrelationships with various predictors or outcomes over time. This is relevant to every discipline, but particularly salient for innovation that helps to explain the development and changes in the organizations (Van de Ven & Poole, 1995). Moreover, innovation at the organizational level is not simply a sum of its parts. The collective structure, compilation, and interplay of innovation at the group and individual levels should be considered in terms of the emergence to higher levels, which would again require a longitudinal approach. For future research, I suggest that studies should explicitly specify the temporal assumptions for the non-technological innovation phenomena in question and adopt a longitudinal perspective. Furthermore, as my dissertation is multilevel, it is inherently subject to the limitations or challenges of multilevel analysis in general (cf. Mathieu & Chen, 2011), i.e. the ambiguities surrounding the units of inquiry, violations of the nesting assumption, and the lack of longitudinal approach.

My dissertation belongs primarily to the scientific area of the organization studies, which is why I did not focus on topics related to non-technological innovation of a more industrial economics nature, such as social innovation or institutional characteristics for fostering non-technological innovation types. Both areas represent a promising framework for providing a better understanding of the intangible types of innovation. Social innovation (e.g. Henderson, 1993) with its increasingly popular stream of eco or green innovation (e.g. Porter & van der Linde, 1995) examines how civilian initiatives and movements can shape politics and businesses with formal or informal influence.

National innovation systems (cf. Lundvall, 1992; Lundvall et al., 2002) and country innovation policies are also an important aspect of the country-level context for fostering or inhibiting innovation at the organizational level. However, I only focused on the most intangible characteristic of the national context, which is national culture, and concentrated on its most social dimension: individualism-collectivism. To leave out the national innovation systems, which overlap with national culture and represent an important country-level contextual factor of innovation, might be considered as a limitation of this dissertation. Therefore, future research can focus on examining various business environment characteristics at the country level and apply a multilevel approach in examining their top-down influences on the innovation processes and outcomes.

A distinction related to the difference between exploration and exploitation and between incremental and radical innovations is the question of an innovation that is new to the firm or new in general. For example, whereas management innovations were first conceptualized as new managerial approaches in general (Birkinshaw & Mol, 2006; Birkinshaw et al., 2008), the authors later on made an extension to this thinking for management innovations to also include solutions new to the firm (Vaccaro et al., 2012). I adopted this approach in my empirical studies as it provides a broader definition of this innovation type, allows for its examination at a much broader scope, and recognizes that non-technological innovations relate more strongly to incremental than to radical innovations (Jansen et al., 2006; Vaccaro et al., 2012). This can present a limitation, as factors that influence innovation with regards to this perspective may affect the innovation processes differently than if I would conceptualize innovations as new in general. Furthermore, this approach tells little about the predictors of "true" innovations, i.e. the breakthrough ideas that have worldwide influence. Thus, future research should add to the prevailing perspective in non-technological innovation literature and focus on how non-technological solutions manifest or relate to radical innovations that are new in general, and not only to the context in which they take place.

An important aspect of non-technological innovation that was also pointed out by co-citation analyses is strategically dealing with higher-order dynamic capabilities (cf. Teece et al., 1997). They denote the firm's ability to integrate, build, and reconfigure internal and external competencies in order to address quickly changing environments (Teece et al., 1997). In my dissertation, I focused more on the resources side of strategy (thereby choosing an individual foundation), as opposed to taking a collective higher-order capability view that would carry predominantly strategic implications. Due to its extensively strategic nature and implications, this would be beyond the scope of this dissertation. Nevertheless, non-technological innovations are (in contrast with technological innovations) largely under-researched in strategic management and policy-making fields. This is why future research should focus on both institutional policy contingencies and strategic decision-making, as well as dynamic capabilities that shape the firms' non-technological innovation processes and outcomes.

5.5 Conclusion

This dissertation demonstrates the importance of referring to multilevel theory for non-technological innovation research and taking a multilevel perspective to examine its content, context, and predictors. No single-level perspective can adequately account for organizational behavior that underlies non-technological innovation. The macro perspective neglects the means by which the individual behavior, perceptions, affect, and interactions shaping individual creativity and innovation give rise to higher-level management and technological innovation. Organizations do not behave; people do (Kozlowski & Klein, 2000). In contrast, the micro perspective disregards contextual organizational and country-level factors that can significantly constrain the non-technological innovation processes and outcomes.

On the basis of my research, it is safe to say that future theoretical or empirical models of non-technological innovation should benefit from adopting a multilevel perspective. This approach bridges the gap in different disciplines, and implements insights and advancements from diverse aspects. From a practical perspective, managers and organizations should benefit from a more precise understanding of both individual and contextual influences in constructing work environments that could ultimately foster creativity and innovation at individual, group, or organizational levels.

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SLOVENIAN SUMMARY / POVZETEK

Uvod

Vse od zgodnjega dela Schumpeterja (1934) inovativnost prepoznavamo kot ključni element konkurenčnosti (Mansury & Love, 2008). Je pomemben vir konkurenčne prednosti v vedno bolj spreminjajočem se okolju (Crossan & Apaydin, 2010), zato ni presenetljivo, da je inovativnost v središču diskusij o oblikovanju družbenih in ekonomskih politik. Vedno bolj je zastopana tudi v znanstvenem raziskovanju, in sicer tako v tehničnih kot družboslovnih vedah, še posebej v študijah s področja poslovnih ved, managementa in organizacije.

V preteklosti so avtorji inovativnost neločljivo povezovali s tehnološkimi preboji, malo pozornosti pa so namenjali dinamikam inovacij v managementu in ostalim oblikam netehnoloških inovacij (Alänge, Jacobsson, & Jaryehammar, 1998; Birkinshaw, Hamel, & Mol, 2008; Chenhall, 2003; Damanpour & Aravind, 2012; Freeman & Soete, 1997). Tehnološki fokus na inovativnost je bil deležen kritik zaradi neupoštevanja številnih pomembnih netehnoloških elementov inovativnih organizacijskih aktivnosti (Avlonitis, Papastathopoulou, & Gounaris, 2001). Potrebno je širše razumevanje koncepta inovativnosti.

Netehnološke inovacije avtorji pogosto uporabljajo kot sinonim za inovacije v organizaciji, managementu ali administraciji, vendar te tri predstavljajo podpomenke krovnemu terminu netehnološke inovacije (Mothe & Thi, 2010; Schmidt & Rammer, 2007). To so dejavniki in sprožilci učinkovite uporabe tehničnih inovacij v proizvodih in procesih, saj je njihova uspešnost odvisna od tega, kako se organizacijske strukture in procesi odzivajo na uporabo novih tehnologij (Armbruster, Bikfalvi, Kinkel, & Lay, 2008). Ti procesi se v organizacijah odvijajo na različnih ravneh in so podvrženi različnim vplivom tako od spodaj navzgor (grajenje, angl. *emergence*) kot od zgoraj navzdol (kontekstualni vpliv).

Glavni namen paradigme večnivojskega raziskovanja je v zagotavljanju bolj povezanega razumevanja pojavov, ki se odvijajo prek različnih ravni v organizacijah (Kozlowski & Klein, 2000). Sistem raziskovanja je ponavadi razdeljen na ravni organizacije, skupine in posameznika. Vsaka od teh ravni predstavlja domeno različnih disciplin, teorij in pristopov. Raziskovalci s pretežno psihološko usmeritvijo prevladujejo na mikro ravneh raziskovanja. Po drugi strani so znanstveniki, ki uporabljajo sociološke ali ekonomske pristope k proučevanju podjetij kot organizacijskih sistemov, bolj prisotni pri makro raziskovanju (Mathieu in Chen, 2011). Srednja pot je bila tradicionalno predvsem domena družbenih psihologov. Ti priznavajo, da na vsak pojav vplivajo dejavniki nad in pod ravnjo, na kateri se nahaja (Yammarino & Dansereau, 2011).

Ločnica med mikro in makro raziskovanjem je zelo prisotna tudi na področju inovativnosti in zaradi dodatnih vplivov psihologije ter sociologije še toliko bolj na področju netehnoloških inovacij. Na eni strani je prisoten makro pogled, ki temelji predvsem na strategiji. Na mikro nivoju pa so prisotne struje organizacijskega vedenja in psihologije, ki se osredotočajo na ustvarjalnost, motivacijo, zmožnost ter možnost za inoviranje na ravni posameznikov ali timov (npr. Amabile, 1988; Amabile, Conti, Coon, Lazenby, & Herron, 1996; Hulsheger, Anderson, & Salgado, 2009). Ob preučevanju kompleksnih pojavov so postale meje in omejitve ene ali druge perspektive vse bolj očitne (Short, Palmer, & Ketchen, 2003). Zato ni presenetljivo, da so znanstveniki opazili pomanjkljivosti ločenih mikro in makro raziskovalnih tokov na področju netehnoloških inovacij ter pozvali k spremembi tega dejstva (npr. Damanpour in Aravind, 2012). Zaradi tega razloga večnivojsko raziskovanje predstavlja pomemben način za nadaljnje napredovanje na področju netehnoloških inovacij.

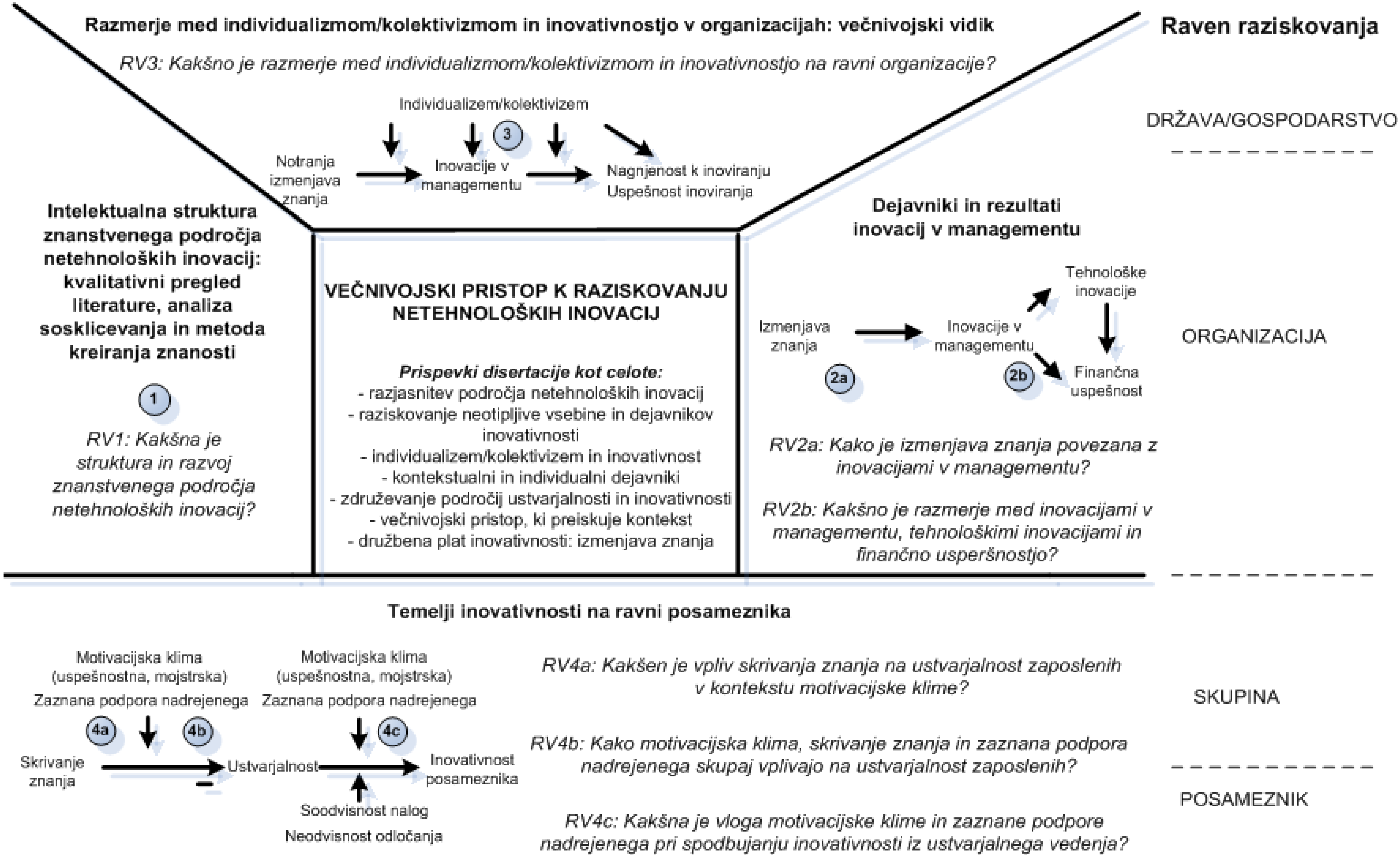
Crossanova in Apaydinova (2010) razumeta večnivojsko analizo kot ključen element v raziskovanju notranjih in zunanjih dejavnikov inovativnosti. Posamezniki in organizacije ali organizacije in države so odvisni drug od drugega, čeprav se ne nahajajo na isti ravni raziskovanja (House, Rousseau, & Thomas-Hunt, 1995). Poleg variabilnosti znotraj skupin je prisotna tudi variabilnost med skupinami, ki izhaja iz skupnega vira. Zaradi tega je ključnega pomena raziskovati razmerja in odvisnosti prek različnih ravni raziskovanja.

Glavni namen raziskovanja v moji disertaciji se nanaša na preučevanje in razjasnjevanje področja netehnoloških inovacij z uporabo večnivojskega pristopa na in prek štirih ravni raziskovanja: posameznik, skupina, organizacija in država/gospodarstvo. Raziskovalni model disertacije prikazuje Slika 1. Z namenom prispevanja k širšem raziskovalnem področju inovativnosti sem gradil na večnivojski teoriji (Kozlowski & Klein, 2000) in se osredotočil na neotipljivo vsebino inovativnosti, njen kontekst ter najpomembnejše dejavnike. Ob tem sem še posebej izpostavil vlogo izmenjave znanja in družbenega vidika inovativnosti.

1 Intelektualna struktura znanstvenega področja netehnoloških inovacij: kvalitativni pregled literature, kreiranje znanosti in analiza sosklicevanja

V praksi se mnogi managerji ne zavedajo, kaj točno obsega kompleksni konstrukt inovativnosti, sploh pa ne manj oprijemljivih aktivnosti inoviranja. Številne nejasne tipologije in konceptualizacije še dodatno prispevajo k temu (Damanpour & Aravind, 2012). Razumevanje inovativnosti v obliki kompleksnega in večdimenzionalnega fenomena ostaja pomembna točka na dnevnem redu raziskovalcev (Adams, 2003). Tipi inovativnosti so morda le umetna razlikovanja in so si pravzaprav konceptualno ali operativno podobni (Edquist et al., 2001). Dimenzije inovativnosti, kot so tip, stopnja ali radikalnost, se prekrivajo (Damanpour & Aravind, 2012; Damanpour & Gopalakrishnan, 1998) ali so medsebojno odvisni (Walker, 2008). Ne obstaja pa enoten konceptualni model, ki bi združeno prikazal vse tipe in oblike inovativnosti, še posebej netehnoloških inovacij (Lam, 2004). Razdrobljenost področja nam preprečuje natančno oceno razmerij med posameznimi elementi, kar v končni fazi onemogoča usklajenost področja (Crossan & Apaydin, 2010).

Slika 1: Raziskovalni model disertacije



Netehnološki tipi inovativnosti niso niti jasno opredeljeni niti razmejeni drug od drugega, od ostalih tipov in oblik tehnološkega inoviranja, od inovativnosti na splošno ter od ustvarjalnosti. Zaradi tega sem v drugem poglavju uporabil metodo kreiranja znanosti, ki temelji na bibliometriji ter tako pripravil kvantitativni pregled literature. Rezultat je odkritje ključnih področij raziskovanja znotraj literature netehnoloških inovacij in analiza njenega razvoja. Poleg tega sem trianguliral rezultate analize sosklicevanja in kreiranja znanosti s kvalitativnim pregledom literature dejavnikov ter rezultatov netehnoloških inovacij. S kombinacijo navedenih metod sem lahko odkril, od kod izvira znanje na posameznih podpodročjih raziskovanja. Z uporabo člankov za enote analize in vključitvijo vseh citatov, na voljo v ISI Web of Science, sem sledil razvoju intelektualne strukture področja netehnoloških inovacij v obdobju 1975–2011.

V prvem poglavju sem predvsem prispeval k pojasnjevanju izvora posamezne podteme, kar zagotavlja vpogled v njihovo vsebino in predstavlja temelj za boljše razločevanje med različnimi tipi netehnoloških inovacij. Rezultat mojega pristopa je primerjalna analiza tipov inovativnosti in njihovih razlik, primerjava rezultatov z drugimi kvalitativnimi pregledi literature s področja netehnoloških inovacij (Damanpour in Aravind, 2012) ter kvantitativnimi pregledi literature s področja inovacij na splošno (Fagerberg et al., 2012; Martin, 2012). Rezultati kažejo, da se razvoj področja netehnoloških inovacij, ki v zadnjem času raste bolj eksponentno od področja inovacij na splošno, loči od tehnoloških predvsem po vplivu psiholoških študij na ravni posameznika in nepretrganem vplivu sociologije.

2 Dejavniki in rezultati inovacij v managementu

Inovacije v managementu predstavljajo pojem, ki je v zadnjem času v znanstveni literaturi bolj v uporabi od ostalih pojmov za opisovanje netehnoloških inovacij (Birkinshaw et al., 2008; Damanpour & Aravind, 2012; Walker, Damanpour, & Devece, 2011). Damanpour in Aravindova (2011, str. 12) sta ponudila naslednjo definicijo inovacij v managementu: »novi pristopi v znanju za izvajanje dela managementa in novi procesi, ki imajo za rezultat spremembe v strategiji, strukturi, administrativnih procesih ter sistemih organizacije«. Pomembno vlogo igrajo v razvoju strategij za rast, spodbujanju zaposlitve, družbenih sprememb in napredka ter v zagotavljanju neprekinjene uspešnosti (Edquist, Hommen, & McKelvey, 2001; Hamel, 2006). Zato je v smeri zagotavljanja uspešnosti v inoviranju nujno razumeti tako tehnološke kot netehnološke vidike inovativnosti (Damanpour & Aravind, 2011).

V drugem poglavju sem oblikoval in preveril model dejavnikov inovacij v managementu s strukturnim modeliranjem (SEM) ter hierarhično moderacijsko regresijo. Najprej sem se naslonil na kulturni vidik (Zbaracki, 1998), na podlagi katerega sem preučeval, kako posamezni dejavniki znotraj organizacije oblikujejo inovacije v managementu, in se osredotočil na njihovo preverbo. Usmeril sem se na izmenjavo znanja, velikost organizacije in razvitost IT sistemov v podjetjih.

S strukturnim modeliranjem sem preveril dva konkurenčna modela za raziskovanje rezultatov inovacij v managementu. To sem opravil na podatkih, zbranih v 604-ih podjetjih iz treh držav: Slovenije, Španije in Južni Koreje. Uporabil sem racionalni vidik (Chandler, 1962), na podlagi katerega sem preučeval, kako inovacije v managementu vodijo v izboljšanje učinkovitosti in uspešnosti organizacij. Čeprav so mnogi raziskovalci predpostavljali ekonomski in družbeni pomen inovacij v managementu (npr. Sanidas, 2004), so le redki empirično raziskovali njihovo razmerje z uspešnostjo podjetij.

Rezultati nakazujejo na ključno vlogo izmenjave znanja pri spodbujanju inovacij v managementu. Poleg tega je raziskava pokazala, da izmenjava znanja vpliva na inovacije v managementu prek razvitih IT sistemov. Ti omogočijo pretok informacij in znanja znotraj organizacije. Na razmerje med izmenjavo znanja in inovacijami v managementu pa negativno vpliva velikost podjetij. Pomemben prispevek tega poglavja je teoretična konceptualizacija in empirična preverba vloge izmenjave znanja v procesu inovacij v managementu.

Rezultati so pokazali, da inovacije v managementu pozitivno vplivajo na tehnološke inovacije v podjetjih iz vseh treh preučevanih držav. Poleg tega so inovacije v managementu relativno pomembnejše od tehnoloških za izboljšanje finančnih rezultatov organizacij. Tehnološke inovacije so še vedno pomembne, toda med državami obstajajo pomembne kulturne in institucionalne razlike, ki vplivajo na procese in rezultate inoviranja. Poleg teh rezultatov je konkurenčni mediacijski model pokazal, da inovacije v managementu omogočajo podjetjem, da v popolnosti izkoristijo svoja tehnološka odkritja v smislu finančne uspešnosti.

Z omenjenim raziskovanjem sem ponudil nova spoznanja na področju razmerja med inovativnostjo in uspešnostjo organizacij. Moj namen je bil prispevati k premiku v miselnosti znotraj teorije inovativnosti, ki je dolgo predpostavljala, da so tehnološke inovacije ključne za uspešnost organizacij (npr. Ahuja & Katila, 2001). To sem storil z zagotovitvijo empirične potrditve, ki je ponazorila pomen inovacij v managementu in ga prikazala kot ključni koncept v razmerju med inovativnostjo in uspešnostjo. Prispeval sem k literaturi o inovacijah v managementu in o inovacijah na splošno z empirično analizo pomembnosti tako oprijemljivih kot manj oprijemljivih dejavnikov, ki prispevajo k izboljšanju uspešnosti organizacij.

3 Razmerje med individualizmom/kolektivizmom in inovativnostjo na ravni organizacije

Organizacije so združene znotraj držav in se posledično razvijajo na način, ki ustreza obdajajoči nacionalni kulturi (Sagiv, Schwartz, & Arieli, 2010). Proces inoviranja usmerjajo in omejujejo ne le demografske značilnosti zaposlenih, pač pa tudi organizacijsko, družbeno in nacionalno okolje (Crossan & Apaydin, 2010). Nacionalno kulturo, skupne vrednote ljudi na določenem narodnem področju (Hofstede, 1980), so v preteklosti preučevali v povezavi z različnimi vidiki inovativnosti (npr. Shane, 1993). Kulturne razlike, ta neotipljivi dejavnik na ravni države, ne vpliva le na meddržavne razlike v inovativnosti, pač pa tudi na razmerje med različnimi tipi inovativnosti. Kulturne razlike namreč vplivajo na inovativne vložke, procese in rezultate (Rosenbusch, Brinckmann, & Bausch, 2011). Empirično raziskovanje je prineslo nasprotujoče si rezultate glede vpliva različnih dimenzij nacionalne kulture. Najvidnejša odstopanja so prisotna pri vplivu individualizma/kolektivizma.

V tretjem poglavju sem torej poskušal razkriti in razložiti nasprotujoče si rezultate predhodnih raziskav o razmerju med individualizmom/kolektivizmom (dimenzija nacionalne kulture) in inovativnostjo. To sem naredil z raziskovanjem vpliva omenjene dimenzije na spodbujanje različnih tipov inovativnosti (inovacije v managementu in tehnološke inovacije) ob upoštevanju različnih stopenj procesa tehnoloških inovacij (nagnjenost k inoviranju in uspešnost inoviranja). Poleg tega sem prispeval k močnejši potrditvi sklepov iz tretjega poglavja, in sicer s ponovno raziskavo vpliva notranjih virov znanja na inovacije v managementu. Opazoval sem tudi moderacijski vpliv individualizma/kolektivizma na omenjeno razmerje.

Moj pristop, ki je obsegal preučitev konteksta inovativnosti z raziskovanjem, kako posamezne značilnosti nacionalne kulture vplivajo na proces inovativnosti, je vključeval večnivojsko analizo (raven organizacije in države). Uporabil sem mikro podatke s Popisa inovacijske dejavnosti 2006 za inovativnost na ravni organizacij v 13-ih državah in podatke Hofstedeja (1980, 2001), raziskave GLOBE (2005) ter Schwartza (2006) za individualizem/kolektivizem. Triangulacija treh podatkovnih baz, pridobljenih iz treh neodvisnih projektov, ki merijo individualizem/kolektivizem, je zagotovila objektivnejše rezultate. Podatke sem analiziral s hierarhičnim linearnim modeliranjem – HLM (Du Toit & Du Toit, 2007; Hox, 2010).

Rezultati so pokazali, da je individualizem pozitivno povezan z nagnjenostjo k inoviranju. Temu je tako zaradi poudarka na osebno svobodo in individualnost, ki omogoča posameznikom, da razmišljajo in delujejo ustvarjalno. Po drugi strani pa je bil kolektivizem pozitivno povezan z uspešnostjo inoviranja, saj je v tej fazi za komercializacijo idej pomembnejše družbeno povezovanje in sodelovanje. Hkrati so interakcije vplivov pokazale, da inovacije v managementu igrajo pomembnejšo vlogo pri spodbujanju tehnoloških inovacij v kolektivističnih kot v individualističnih kulturah.

4 Mikro temelji inovativnosti

Inovativnost na kateri koli od preučevanih ravni (država/gospodarstvo, organizacija, skupina, posameznik) se ne more zgoditi brez njenega najpomembnejšega dejavnika, ustvarjalnosti (Amabile, 1996; Amabile, 1988; Mohr, 1969). Ta konstrukt, ki vsebuje ustvarjanje novih in uporabnih idej, je potreben, ne pa tudi zadosten pogoj za inovativnost. Slednja poleg ustvarjalnosti vključuje tudi zadnji korak, implementacijo (udejanjanje) idej (Amabile, 1988; Amabile, Conti, Coon, Lazenby, & Herron, 1996; Scott & Bruce, 1994). Zato je znanje o tem, kako pretvoriti ustvarjalne predloge v inovativnost, ključnega pomena za managerje, saj predstavlja zaključni korak, ki podjetju zagotavlja oprijemljivo vrednost.

Avtorji so do določene mere že razpravljali o tem, kako ustvarjalne ideje pretopiti v implementacijo. Tako deljenje znanja (Liu & Phillips, 2011), spodbudna klima ali kultura (Mueller & Thomas, 2001), pa tudi vodenje (Gumusluoglu & Ilsev, 2009) predstavljajo faktorje, ki naj bi vplivali na zadnji korak udejanjanja ustvarjalnega vedenja. Kljub temu prevladuje raziskovanje inovativnosti na višjih nivojih (Reiter-Palmon, Herman, & Yammarino, 2008).

Preučevanja dejavnikov, ki bi vplivali na implementacijo na individualnem nivoju, pa primanjkuje (Naglieri & Kaufman, 2001).

Model Terese Amabile (1998) predstavlja tri osebne komponente ustvarjalnosti (posameznikove izkušnje, veščine ustvarjalnega mišljenja in motivacija). S tem razkriva dejavnike ustvarjalnosti na individualnem nivoju. Toda individualne značilnosti niso edini dejavniki, ki pogojujejo ustvarjalno vedenje posameznika, saj je potrebno upoštevati tudi kontekst na višjih ravneh raziskovanja (Oldham & Cummings, 1996). Ustvarjalnost je družbeni konstrukt, ki vključuje družbene odnose, sodelovanje, ustvarjalne zahteve ter ustvarjalne napetosti, ki vodijo k novim idejam (Perry-Smith, 2006; Perry-Smith & Shalley, 2003; Unsworth, Wall, & Carter, 2005). Da bi organizacije spodbujale ustvarjalnost, morajo ustvariti klimo, ki podpira in omogoča ustvarjalno mišljenje posameznikov (Amabile, 1988).

V četrtem poglavju sem se ukvarjal z mikro temelji inovativnosti na ravni posameznika. Preiskoval sem tako kontekstualne kot tudi individualne dejavnike ustvarjalnosti in inovativnosti, kar predstavlja močan razlog za uporabo večnivojske analize (HLM). To poglavje je sestavljeno iz dveh terenskih in treh eksperimentalnih študij ter se vsebinsko deli na dve podpoglavji. V prvem sem raziskoval delovno okolje, ki spodbuja ustvarjalnost posameznikov. Pri tem sem v raziskovanje ustvarjalnosti uvedel nov dejavnik – skrivanje znanja. Raziskoval sem vlogo osebnih in kontekstualnih dejavnikov v razmerju med skrivanjem znanja in ustvarjalnostjo.

Raziskava v dveh podjetjih na 240-ih zaposlenih, ki so bili razdeljeni v 34 delovnih skupin (podatki, zbrani na dveh ravneh), je nakazala na negativno razmerje med skrivanjem znanja in lastno ustvarjalnostjo. To razmerje konceptualno temelji na vzajemni zanki nezaupanja znotraj dvojic zaposlenih. Moderacijska analiza je pokazala, da mojstrska motivacijska klima zmanjša negativen vpliv skrivanja znanja, medtem ko ga uspešnostna klima še poveča. Druga raziskava je replicirala omenjene rezultate na eksperimentalni študiji 132-ih dodiplomskih študentov. V njej sem preveril vzajemno zanko nezaupanja in jo primerjal z alternativnimi družbenimi ter psihološkimi mediatorji.

V drugem podpoglavju četrtega poglavja sem skušal doprinesti k združevanju relativno ločenih raziskovalnih področij inovativnosti in ustvarjalnosti. Osredotočil sem se na pogosto prezrto razmerje med njima na nivoju posameznikov. Oblikoval in testiral sem nelinearno razmerje med ustvarjanjem ter udejanjanjem idej. Navezujoč se na teorijo samodoločanja sem raziskoval tudi, kako naj bi managerji ravnali z visoko ustvarjalnimi idejami zaposlenih, da bi imeli od njih kar največ. V prvi raziskavi na zaposlenih iz dveh podjetij sem odkril v obliki narobe obrnjene črke U ukrivljeno obliko krivulje razmerja med ustvarjalnostjo in inovativnostjo zaposlenih.

Nadalje sem na podlagi teorije samodoločanja predpostavil moderacijski vpliv podpore nadzornika in avtonomije pri delu. Pokazal sem, da omenjena dejavnika ublažita krivuljasto obliko in pretvorita preučevano razmerje v pozitivno ter linearno. Rezultate sem repliciral v dveh eksperimentalnih študijah. Z empirično obravnavo različnih vplivov na dve različni stopnji procesa inovativnosti (ustvarjalnost in udejanjanje) sem prispeval k zapolnitvi vrzeli, ki je nastala z ločitvijo raziskovalnih struj ustvarjalnosti in inovativnosti. To ima velik pomen tako za raziskovanje kot za prakso. Če ne vzamemo v obzir dejavnikov, ki bi lahko različno vplivali na ustvarjalnost in inovativnost, imajo konceptualizacije omejeno vrednost.

5 Skupna diskusija prispevkov in zaključek

Eden od najpomembnejših prispevkov doktorske disertacije za znanstveno področje inovativnosti je v razjasnitvi podpodročja netehnoloških inovacij, kar sem dosegel v več korakih. Najprej sem v prvem poglavju zagotovil kvantitativne in kvalitativne dokaze za razmejevanje med različnimi tipi netehnoloških inovacij. Argumenti temeljijo na prilivih znanja v področje (analiza sosklicevanja in metoda kreiranja znanosti) ter na kvalitativnem pregledu literature. Prav tako prvo poglavje pomaga pri prikazu netehnoloških inovacij kot ločenega znanstvenega področja in pri prikazu, kako se njegov razvoj razlikuje od področja inovacij na splošno.

Najpomembneje je, da sem ugotovil ključne dejavnike neotipljive narave (vloga družbene plati, Kanter, 1988; Abrahamson & Rosenkopf, 1997; den Hertog, Bilderbeek, & Maltha, 1997; Dawson & Daniel, 2010; Perry-Smith, 2006; Dionne, 2008; Taylor & Wilson, 2012 in izmenjave znanja, Nonaka, 1994; Mol & Birkinshaw, 2009; Taylor & Wilson, 2012), ki sem jih empirično preveril v poglavjih 2-4 na različnih ravneh raziskovanja. Preučil sem namreč izmenjavo znanja v obliki skrivanja znanja na individualni ravni v četrtem poglavju in v obliki notranjega prenosa znanja ali virov znanja na ravni podjetja v tretjem ter četrtem poglavju. Raziskal sem tudi najpomembnejše dejavnike, vezane na družbeno plat, kateri sem se posvetil v obliki podpore nadzornika in motivacijske klime v četrtem poglavju ter v obliki individualizma/kolektivizma v tretjem poglavju. Ugotovitve dodajajo empirično podporo teoretičnim temeljem, ki odkrivajo pomen navedenih dejavnikov, kot so bili opredeljeni v kvantitativnem pregledu literature.

Drugi teoretični prispevek disertacije kot celote vključuje premostitev disciplinske vrzeli med odkrivanjem in izkoriščanjem (angl. *exploration and exploitation*). To je najbolj očitno na individualni ravni iz četrtega poglavja, kjer sem skušal združiti ločene raziskovalne tokove ustvarjalnosti in inovativnosti (Woodman et al., 1993;. Dionne, 2008). Omenjeno temo sem preučeval z namenom zagotavljanja integriranega raziskovanja odnosa med ustvarjalnostjo in inovativnostjo. Vzporednice pa lahko povlečemo tudi na višjih ravneh. V drugem in tretjem poglavju lahko vsebinsko povežemo razliko med odkrivanjem in izkoriščanjem z razliko med inovacijami v managementu in tehnološkimi inovacijami (Jansen et al., 2006). Celovito in ponavljajoče preverjanje vzporednih perspektiv na različnih ravneh omogoča vključevanje raznolikih spoznanj na različnih poddisciplinah inovativnosti ter ustvarjalnosti, kar omogoča obogatitev znanja z omenjenih področij.

Dodaten pomemben prispevek doktorske disertacije kot celote je v sintezi in razširitvi predhodnega dela glede razvoja večnivojske teorije na področju netehnoloških inovacij. Pristop ob upoštevanju različnih ravni, ki združuje mikro in makro perspektive, ima za rezultat bolj integrirano znanost (Kozlowski & Klein, 2000) o netehnoloških inovacijah. S poudarkom na pomembnih in perečih vsebinah netehnoloških inovacij ter njihovih dejavnikov (izmenjava znanja in družbena plat), konceptualizaciji in analizi na več ravneh ter upoštevanjem tako procesov od zgoraj navzdol kot od spodaj navzgor (v manjši meri) sem prispeval h gradnji znanosti netehnoloških inovacij v organizacijah na teoretično bogat in aplikativno pomemben način. Večnivojski pristop je še posebej pomemben, saj predstavlja velik izziv za raziskovalce s področja organizacijskih ved. Zanje se namreč zdi, da večinoma razmišljajo mikro ali makro, ne pa mikro in makro, torej večnivojsko (Kozlowski & Klein, 2000). Mikro raven sem v disertaciji razširil z uporabo dveh pristopov, ki jih priporoča Rousseau (2011): 1) aktivna uporaba alternativnih pristopov (uporaba več podatkovnih virov in metod) ter 2) sistematično primerjanje ugotovitev po in prek ravni, ki izhajajo iz rezultatov poglavij 1–4.

V povezavi s tem je naslednji prispevek pričujoče disertacije povezan z njenim obsegom. Podobna razmerja med konstrukti sem preučil v različnih kontekstih in z uporabo različnih metod (npr. merjenje inovacij v managementu tako z zbranimi primarnimi kot tudi s sekundarnimi mikro podatki iz Popisa inovacijske dejavnosti). V vseh poglavjih disertacije sem sledil okviru za raziskovanje na več ravneh (Rousseau, 1985) in opisanim ravnem teorije, merjenja ter analize. To zagotavlja natančnejšo oceno preučevanih konstruktov brez pogostih napak, značilnih za posamezne ravni analize. Da bi ustrezno upošteval različne ravni teorije, sem v različnih poglavjih postregel z opredelitvami obravnavanih konstruktov netehnoloških inovacij na različnih ravneh. Namenoma sem jih preučeval ločeno na različnih ravneh, da ne bi zakrivil teoretičnih zmot. Zaradi upoštevanja ustreznih ravni merjenja in analize sem raziskoval s preverjenimi lestvicami, ki ne vsebujejo dvoumnih elementov ali elementov, ki bi se nanašali na različne ravni, kar bi zmanjšalo njihovo veljavnost (Mathieu & Chen, 2011).

V skladu s kontingenčnimi (npr. Damanpour, 1996; Oldham & Cummings, 1996) in interakcionističnimi teorijami (npr. Tushman & Rosenkopf, 1992; Woodman et al., 1993) sem prispeval k področju netehnoloških inovacij ter področju inovacij na splošno s preučevanjem vplivov višjega konteksta na inovacijske procese ter primerjavo njegove vloge z vlogo dejavnikov na osnovni ravni analize. To sem naredil tako na ravni posameznika (z raziskovanjem kontekstualnih (klima in podpora nadzornika) in individualnih (skrivanje znanja in usmerjenost v cilje) dejavnikov kot tudi na ravni organizacije (z raziskovanjem državnih (dimenzije nacionalne kulture) in organizacijskih (notranja izmenjava znanja, velikost podjetij, razvoj IT sistemov) dejavnikov. S sprejetjem večnivojske perspektive prek uporabe hierarhičnega linearnega modeliranja sem skušal uporabljati mikro sofisticiranost pri analizi makro področja raziskovanja inovacij na ravni podjetij in države.

Odnose med spremenljivkami sem preučeval z uporabo ustreznega analitičnega pristopa, ki upošteva odvisnost med enotami na nižjih ravneh, njihovo gnezdenje in grupiranje ter vplive prek ravni (Mathieu & Chen, 2011). Metode modeliranja naključnih koeficientov (angl. *random coefficient modeling*) namreč ponujajo učinkovite načine za testiranje različnih vidikov večnivojskih modelov. Vključujejo Bayesianske uteži učinkov na nižjih ravneh in sofisticirano obravnavanje distribucije napak na več ravneh (Snijders & Bosker, 1999; Raudenbush & Bryk, 2002). OLS regresija ali standardni hierarhični regresijski postopki ne bi bili primerni zaradi kršitve predpostavk o homoskedastičnosti (kar pomeni, da imajo vse naključne spremenljivke v zaporedju enako končno varianco) in neodvisnosti značilnosti enot (Hofmann, 1997; Raudenbush & Bryk, 2002). Odvisnost med enotami, ki se je ne upošteva, je lahko problematična, saj to vpliva na standardne napake ocen, ki so uporabljene za ugotavljanje statistične značilnosti (Bliese in Hanges, 2004). Z uporabo HLM lahko podamo natančnejšo statistično oceno, saj ta analitična tehnika uporablja metodo splošnih najmanjših kvadratov ocene za spremenljivke na višji ravni. Metoda zagotavlja prilagojene regresije tako, da so skupine z natančnejšimi ocenami na nižjih ravneh (tako naklonov kot višin) deležne večje teže v regresijski enačbi na višji ravni (Hofmann, 1997). To velja, kadar raziskovalci zbirajo podatke pri hierarhičnih strukturah, čeprav nimajo posebnega interesa za modeliranje vpliva višjih ravni spremenljivk (Bliese in Hanges, 2004). Omenjeno sem storil v smislu preučevanja razmerja med ustvarjalnostjo in inovativnostjo na ravni posameznika v četrtem poglavju.

Še en prispevek mojega dela obsega sofisticirano uporabo nabora različnih metod in tehnik za statistično analizo. Uporaba različnih metod (raziskave na podjetjih ter eksperimentalne študije, uporaba primarnih in sekundarnih podatkov) in tehnik za analizo podatkov (npr. analiza sosklicevanja, strukturno modeliranje (SEM), mediacijsko SEM, hierarhična moderacijska regresijska analiza, modeliranje prek ravni in interakcije z naključnimi koeficienti, analiza trojnih interakcij, MANOVA, analiza krivulje, analiza ujemanja, veljavnosti ter zanesljivosti) na različnih ravneh analize omogoča empirični prispevek, ki dodaja k veljavnosti mojih sklepanj.

Pričujoča disertacija dokazuje, kako pomembna je uporaba večnivojskega pristopa za nadaljnje raziskovanje na področju netehnoloških inovacij in preučevanje njihove vsebine, konteksta ter dejavnikov. Uporaba ene ali druge (mikro ali makro) perspektive ne more ustrezno predstaviti organizacijskega vedenja in procesov, ki so osnova za netehnološke inovacije. Makro perspektiva zanemarja vplive in interakcije na nižjih ravneh: vedenje ter zaznavanje posameznikov in delovnih skupin. Organizacije se ne obnašajo; ljudje se (Kozlowski & Klein, 2000). V nasprotju s tem mikro perspektiva zanemarja vsebinski kontekst na ravni organizacij ali celo držav, ki lahko močno vpliva na procese in rezultate netehnološkega inoviranja v podjetjih.

Glede na moje raziskovanje lahko z gotovostjo trdim, da bi morali prihodnji teoretični in empirični modeli netehnoloških inovacij imeti koristi od sprejetja in uporabe večnivojskega pristopa. Ta predstavlja most za prečkanje vrzeli med različnimi strokami in disciplinami, kar vodi v kombiniranje spoznanj in napredka ter je koristno z različnih vidikov. S praktičnega vidika bi imeli managerji in organizacije koristi od natančnejšega razumevanja individualnih ter kontekstualnih vplivov pri oblikovanju delovnih okolij, ki bi lahko spodbujali ustvarjalnost in inovativnost na ravni posameznika, skupine ali organizacije. S teoretičnega vidika se z uporabo večnivojskega pristopa približamo k natančnejšemu opisovanju in raziskovanju pojavov ter njihovih soodvisnosti, kar vodi v natančnejše teoretične modele in boljše empirične analize.