Corporate Venture Management in SMEs

EVIDENCE FROM THE GERMAN IT CONSULTING INDUSTRY

JÉRÔME GARD

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To my parents for their support

throughout my entire academic career

Preface

Joseph Schumpeter (1883-1950) describes in his famous textbook "The Theory of Economic Development" the phenomenon of 'creative destruction' – the development of new solutions that cause significant change in whole industries. As a student, I recognized the power of creative destruction when following the downfall of global players such as Kodak and Nokia. I asked myself how these corporations should have organized innovation to adapt successfully to the technological shifts that caused their collapse. Inspired by this question, I decided to pursue a PhD study at the Leiden University with the aim to examine how corporations renew their business portfolio in anticipation of changing business conditions.

Soon, I read about a form of self-organized innovation that enables corporations to effectively renew their business portfolio – corporate ventures. The idea that corporations renew their business portfolio by continuously entering novel business domains with small entrepreneurial teams was fascinating. However, I could not find any empirically evaluated management model that would tell corporate executives how to manage corporate ventures effectively. As an engineer, I was curious to investigate corporate venture management, not knowing that my research would provide a first empirical model that reveals essential principles for effective corporate venture management.

For accomplishing my PhD research I received support from many people who I would like to acknowledge in the following. First, I had the honor to receive optimistic, motivating and thorough guidance from my first promotor Professor Bernhard Katzy and my co-promotor Professor Guido Baltes. Then the team was broadened by my second promotor Professor Jaap van den Herik. In particular, I own many thanks to Bernhard Katzy for supporting my research and providing the freedom to follow my own path. A special gratitude goes to Guido Baltes for providing a great

work environment, promoting my work, teaching me how to write scientific texts and qualifying me as a senior manager. Furthermore, I owe many thanks to Jaap van den Herik for his precise and accurate guidance throughout the final stage of my PhD. In particular, I would like to mention his enthusiasm and professional way to improve my writing skills.

Throughout the whole PhD process, I received support from the international graduate school on Networks, Information Technology & Innovation Management (NITIM). During the summer schools in Rijeka, Constance, Tampere and Munich, the faculty provided great feedback and guidance. I would like to thank particularly, Paola Bielli from the Bocconi University, Ozgur Dedehayir from the Tampere University of Technology, Peter Harland from the IHI Zittau, Stefan Klein from the University Münster, Ulrike Lechner from the University Bw Munich, Nathalie Mitev from the London School of Economics, Andras Nemeslaki from the Corvinus University, Roland Ortt from the TU Delft and Klaus Sailer from the Strascheg Center for Entrepreneurship. In particular, I had the pleasure to work with Francesc Miralles from the La Salle Ramon Llull University who provided constructive feedback on the first draft of my thesis.

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support in a challenging period in my PhD research, I acknowledge Marieke Stamm. Finally, I am grateful to my parents for their unconditional support with respect to my career development.

CONTENTS

LIST OF ABBREVIATIONS

The list below contains the abbreviations that are used in this thesis. Normal lexical abbreviations, such as, ‘e.g.’ and ‘i.e.’, are not listed. The same applies for the names of corporations, such as SAP.

FTE	Full-time equivalent
GDP	Gross Domestic Product
HR	Human Resource
IT	Information Technology
KMO	Kaiser-Meyer-Olkin
KPI	Key Performance Indicator
NACE	Nomenclature Générale des Activités Économiques dans les Communautés Européennes
OEM	Original Equipment Manufacturer
PCA	Principal Component Analysis
PLM	Product-Lifecycle Management
PS	Problem Statement
PV	Photovoltaic
R&D	Research and Development
ROA	Return on Assets
ROE	Return on Equity
ROI	Return on Investment
RQ	Research Question
SME	Small and Medium Enterprise
SPSS	Statistical Package for Social Science
VIF	Variance Inflation Factor

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Chapter 1

Understanding Successful Corporate Venture Management

The thesis investigates the challenge of corporations around the globe to develop new businesses. They do so in order to adapt their business portfolio to the changing environmental conditions (i.e., new technologies, new competitions and changing market demands). The failure of corporations to adapt their business portfolio caused many economic tragedies in the past. The downfall of Nokia's market leadership in the cell phone industry is a calling example. All tragedies together illustrate that the development of new businesses in anticipation of future environmental changes is essential and not easy to achieve.

The ongoing booming of founding international start-ups demonstrates that small entrepreneurial teams are an effective means to develop new businesses (see, e.g., Fritsch & Schroeter, 2011). Large corporations as well as Small and Medium Enterprises (SMEs) should be able to benefit from this form of self-organized innovation when entering novel business domains. However, entrepreneurial teams established by corporations often fail (cf. Birkinshaw & Hill, 2005). The high failure rates are, among others, attributed to the complexity that is inherent in the relationship between corporations and their entrepreneurial teams. Two examples of this complexity are given below.

First, corporations need to provide their entrepreneurial teams with *sufficient freedom* to act successfully. Freedom allows entrepreneurial teams to engage effectively in explorative activities (i.e., search, experimentation and improvisation) through which the new businesses evolve to a

mature part of the corporation (McGrath, 2001). Second, we see that these entrepreneurial teams clearly differ from independent start-ups as they are still in any form *related to the corporation* (i.e., controlled, supported or integrated). In summary, the challenge for corporate management is thus to grant entrepreneurial teams with sufficient freedom without losing control over their activities. So far, it remains however debatable how corporate management may master this challenge. Therefore, in this thesis, I investigate the guiding question: how are entrepreneurial teams managed successfully by corporate management?

The course of the first chapter is as follows. Section 1.1 gives the author's motivation for the research topic. In Section 1.2, the problem statement and the three research questions are presented. Section 1.3 provides the research objective and the research methodology. The structure of the thesis is presented in Section 1.4.

1.1 MOTIVATION

In my research, I am motivated by the *dynamic reality* in which corporations have to compete nowadays. In our globalized economy, there is an obvious need for corporations to respond rapidly when business opportunities emerge. Really, it is necessary to do so before someone else takes the chance and realizes competitive advantage. Establishing entrepreneurial teams aside the mainstream business is a legitimate path for corporations to generate organizational settings that allow them to capitalize responsively on emerging business opportunities (cf. Kuratko, 2010). However, there are two obstacles. The first obstacle is that these entrepreneurial teams often fail and the second obstacle is that it remains unclear how their success may be improved (see, e.g., Kuratko, Covin, & Garrett, 2009). The success of entrepreneurial teams is among others associated with the organizational form chosen by the corporate managers. They do establish the teams (a) as *external* subunits that operate independent from other business units or (b) as *internal* subunits that

are integrated with other business units. Below a general definition of corporate venture is provided in order to define how the term entrepreneurial team is used throughout the thesis.

Definition 1.1: A **Corporate Venture** *"is an entrepreneurial team that develops a new business for the corporation, often following the purpose to enter a novel business domain" (cf. Garrett & Covin, 2013).*

Both organizational forms (external and internal) have their merits. Establishing corporate ventures as external subunits provides the freedom and flexibility necessary to develop new capabilities. Establishing corporate ventures as internal subunits facilitates the exploitation of capabilities that do already exist in the corporation, allowing corporate ventures to take advantage of corporate strengths by achieving synergetic effects. The well-developed business intuition of the reader may lead to the preliminary conclusion that corporate ventures will achieve best results when being established as semi-autonomous subunits that are independent, yet integrated (cf. Burgers, Jansen, Van den Bosch, & Volberda, 2009).

However, it remains ambiguous how to manage corporate ventures successfully as semi-autonomous subunits (Johnson, 2012; Garrett & Covin, 2013). Research acknowledges that examining the relationship between the corporation and the corporate venture (henceforth called corporation-venture relations) will contribute to a proper understanding of effective venture management (Thornhill & Amit, 2000). Prior studies have investigated corporation-venture relations by applying (a) the resource-based view (see, e.g., Sorrentino & Williams, 1995) and (b) the organizational design-based view (see, e.g., Hill & Birkinshaw, 2012) as analytical frameworks. However, such research does not (sufficiently) take into consideration the current dynamics of the technological developments in combination with their competitive consequences.

1.2 PROBLEM STATEMENT AND RESEARCH QUESTIONS

While it is promising for corporate management to enter a novel business domain with a corporate venture, corporations often fail when taking these initiatives. The costly mistakes are attributed mostly to the mismanagement of corporate ventures (cf. Ginsberg & Hay, 1994; Birkinshaw & Hill, 2005). As stated in Section 1.1, prior research has followed (a) the resource-based view (cf. Penrose, 1959; Pitelis, 2007) and (b) the organizational design-based view (cf. Lawrence & Lorsch, 1967; Burgers et al., 2009) in an attempt to explore effective venture management practice. Alternatively, this thesis builds on (c) the dynamic capability-based view (cf. Teece & Pisano, 1994; Helfat & Peteraf, 2009). The reasoning leading to this choice is briefly given below by comparing the three views. An extensive reasoning is later provided in the literature review (Chapter 2).

Ad (a), the resource-based view assumes that an organization achieves competitive advantage through its ability to protect the resources it possesses from imitation, transfer and substitution (cf. Barney, 1991). Proponents following this view consider that venture management is associated with the effective management of resources (i.e., stocks of available factors owned and controlled by an organization) being shared among corporations and their ventures (see, e.g., Sorrentino & Williams, 1995).

Ad (b), the organizational design-based view assumes that organizations achieve competitive advantage by matching high levels of differentiation (i.e., subdivision of tasks) with high levels of integration (Lawrence & Lorsch, 1967). Proponents following this view consider that venture management is attributed to designing corporate ventures as separated subunits and integrate them at the same time with other corporate subunits (see, e.g., Burgers et al., 2009; Hill & Birkinshaw, 2012). Both views have motivated studies that explored principles for transferring resources effectively (see, e.g., Garrett & Covin, 2013) and that identified mechanisms to integrate corporate

ventures (see, e.g., Burgers et al., 2009). However, the literature review (Chapter 2) shows that studies building on either of the two views have *not yet explained corporate venture success sufficiently*. Guidelines for effective corporate venture management are consequently not provided so far by studies that follow the resource-based view or the organizational design-based view. One explanation for this lack of managerial implications may be associated with the key shortcoming of both views, viz. the dynamics in the business environment.

Ad (c), the dynamic capability-based view is chosen in the thesis as it addresses this shortcoming by assuming that organizations achieve competitive advantage through the continuous reconfiguration of their resource base in adaptation to changes in the business environment (see Teece, 2012). The reconfigurations are the outcome of routines (Eisenhardt & Martin, 2000) which are in this thesis defined as the regular and recurring meetings between the corporate management and the venture management. The terms corporate management and venture management are defined below.

Definition 1.2: **Corporate Management** *is the group of executive managers of the corporation supervising venture managers, sometimes also referred to as corporate managers.*

Definition 1.3: **Venture Manager** *is the leader of a corporate venture team, sometimes also referred to as venture management.*

Although the context is specified and it is clear to which outcome the routines refer to in this thesis, it is still difficult, if not impossible to measure the routines directly, e.g., for investigating their effects on corporate venture success (cf. Strehle, Katzy, & Davila, 2010). The best we can state is that the interaction between corporate management and venture management reflects the routines (cf. Becker, 2004). Corporate managers exercise oversight and control (tight or loose) over venture managers through the interactions carried out in the routines. Corporate management defines thereby the autonomy that is granted to venture managers at various degrees and dimensions.

Autonomy is thus an essential aspect of the routinized interaction among corporate management and venture management, on which my research is focused. Correspondingly, the thesis investigates (1) what kind of autonomy is granted by corporate management to venture managers and (2) how the distinct autonomy dimensions influence corporate venture success. The research approach chosen promises to explore how corporate ventures are managed effectively by corporate management.

Considering the fact that so far guidelines for effective corporate venture management are missing, the following problem statement (PS) is formulated.

PS: How can corporate management effectively manage corporate ventures?

In order to answer the problem statement, three research questions (RQs) are formulated. The research questions are guiding the research carried out in this thesis.

An essential assumption in this thesis is that autonomy is the authority of individuals to make decisions without approval (cf. Brock, 2003). The authority to make decisions may be associated with a broad range of conditions (cf. Birkinshaw & Hill, 2005). However, the literature review (Chapter 2) shows that the autonomy dimensions reflecting these conditions are not determined properly. In order to generate a comprehensive conceptual understanding of the autonomy that venture managers may enjoy, I formulate the first research question as follows.

RQ1: What are the dimensions reflecting the autonomy that corporate management grants to venture managers?

Having the autonomy dimensions at my disposal, I noticed that a construct (a measurement instrument) that enables us to measure the autonomy dimensions is not yet available. Therefore, I formulate the second research question as follows.

RQ2: *How can the autonomy dimensions identified by RQ1 be operationalized in a construct that enables us to measure the autonomy of venture managers?*

Having operationalized a construct for measuring, I noticed that the autonomy of venture managers does not indicate to what extent and in which dimension the autonomy is relevant for effective corporate venture management. To make an assessment based on the impact that the autonomy dimensions have on corporate venture success, I formulate the third research question as follows.

RQ3: *How are the autonomy dimensions related to the success of the corporate ventures?*

Answering the three research questions will lead to an answer of the PS. For achieving an answer to the RQs we need a clear research objective and a research methodology.

1.3 RESEARCH OBJECTIVE AND RESEARCH METHODOLOGY

The research objective of this thesis is to understand *how* corporate ventures should be managed by the corporate management in order to obtain the qualification of 'successful' corporate venture. For addressing the research objective, the thesis performs empirical research according to the following four steps:

(1) Exploring the autonomy of corporate ventures

(2) Operationalizing a multidimensional autonomy construct

(3) Evaluating and adapting the autonomy construct

(4) Applying the autonomy construct

The results of each research step forms a part of the outcome that answers the research questions (RQs) and the problem statement (PS). The research steps are described in Subsections 1.3.1 to

1.3.4 . An overview of the four research steps together with the research methodology and the data sets applied is given in Table 1.1.

1.3.1 EXPLORING THE AUTONOMY OF CORPORATE VENTURES

In the first step, case study research is carried out (see Chapter 3). The aim is to answer RQ1 by exploring the dimensions that determine the autonomy of venture managers based on qualitative research. A series of thirteen interviews is conducted with corporate managers (CEOs) and venture managers of seven technology-based German SMEs in order to examine the autonomy that corporate management grants to venture managers in real-life settings. Using grounded theory as an analytical methodology (cf. Glaser & Strauss, 1967; Turner, 1983), interviews are transcribed and coded. The explored autonomy dimensions are compared with those in literature for further characterization.

1.3.2 OPERATIONALIZING A MULTIDIMENSIONAL AUTONOMY CONSTRUCT

The second step is carried out in Chapter 4 with the aim to operationalize an initial multidimensional construct that allows to measure the autonomy of venture managers. Results contribute to answer RQ2. A theoretical model is developed that associates the explored autonomy dimensions (Step 1) with corporate venture success. The measures of the theoretical model are subsequently operationalized. For evaluating the appropriateness of the operationalizations in the context of corporate ventures, twelve managers involved in corporate venture management (corporate managers and venture managers) are interviewed to assess the relevance of each measure. The outcome of the second step is an initial multidimensional autonomy construct.

Definition 1.4: **Construct** *describes in this thesis a measurement instrument. In particular, the term multidimensional (autonomy) construct refers to an instrument that measures the autonomy of venture managers at various dimensions.*

1.3.3 EVALUATING AND ADAPTING THE CONSTRUCT

In the third step performed in Chapter 5, the validity and the reliability of the initial multidimensional autonomy construct (Step 2) is evaluated. Therefore, the evaluation procedure as described by Field (2013) is applied. The procedure includes four stages. In the *first stage*, the correlation matrix is inspected, the Kaiser-Meyer-Olkin index is calculated and the Bartlett's test of sphericity is conducted in order to test whether data is appropriate for Principal Component Analysis. In the *second stage*, Principal Component Analysis is performed in order to extract the components from the data. Therefore, the eigenvalues of the (a) extracted components are checked according to the Kaiser's Criterion, (b) the Scree Plot of the eigenvalues is inspected and (c) Parallel Analysis is conducted to cross check the visual inspections. In the *third stage*, Varimax Rotation is performed with the extracted components. General threshold criteria (cross-loadings <.0 and component loadings >.6) are checked for each item in the rotated component solution. Items not fulfilling these thresholds are excluded. In the *fourth stage*, Cronbach's Alpha coefficients are calculated to evaluate the reliability of the component solution.

1.3.4 APPLYING THE AUTONOMY CONSTRUCT

In the fourth step carried out in Chapter 6, the evaluated autonomy construct is applied to answer RQ3. Linear multiple regression analysis is performed in two stages by using a data set of 87 venture managers of distinct SMEs in the German IT consulting industry. *First*, regression analysis is conducted to investigate the relation between corporate venture success and the autonomy that corporate management grants to venture managers at distinct dimensions. *Second*, interaction terms are included in the multiple regression analysis to illustrate how the relations between the

autonomy dimensions and corporate venture success are influenced when corporate management pushes venture managers to achieve exploitative objectives.

Table 1.1: Research Steps

Research Steps		Ch.	Research Methodology	Data Set	PS	RQ1	RQ2	RQ3
Introduction		1	-		✓	✓	✓	✓
		2	Literature Review		✓	✓	✓	✓
Step 1	Exploring the Autonomy of Corporate Ventures	3	Case Studies and Literature Review	A		✓		
Step 2	Operationalizing a Multidimensional Autonomy Construct	4	Literature Review and Interviews	B			✓	
Step 3	Evaluating and Adapting the Autonomy Construct	5	Statistical Analysis	C			✓	
Step 4	Applying the Autonomy Construct	6	Statistical Analysis	C				✓
Discussion and Conclusion		7	-		✓	✓	✓	✓

Data set

A: 13 interviews in 7 SMEs in high-tech industries with corporate managers and venture managers (see Appendix A)

B: 12 interviews in 6 SMEs in high-tech industries with managers involved in corporate venture management either as corporate managers or venture managers (see Appendix B)

C: 87 valid survey responses from venture managers of SMEs in the German IT consulting industry (see Appendix C)

In my research I focus on SMEs. This implies that I do not take into account the conditions of large corporations. I focus on SMEs because they are the main drivers of innovation across many industries (cf. World Economic Forum, 2015). The innovation capacity is known to be associated with dynamic capabilities (routines) (cf. Teece, 2012). It is therefore reasonable to assume that dynamic capabilities are well developed within SMEs. Correspondingly, it seems promising to focus on SMEs to investigate corporate venture management from a dynamic capability-based view. Moreover, the assumptions of (a) the resource-based view and (b) the organizational design-

based view are of limited relevance for SMEs due to the small size of these firms. Ad (a), SMEs have fewer resources to share than large firms which limits the opportunity for corporate ventures to benefit from corporate strengths. Ad (b), SMEs are also less diversified in itself which questions the necessity to integrate corporate ventures with other corporate subunits. Hence, the effects assumed by the resource-based view and the organizational design-based view seem to be of limited relevance to explain corporate venture management in SMEs.

1.4 STRUCTURE OF THE STUDY

The thesis consists of seven chapters. They are described briefly below. The structure of the thesis is illustrated in Figure 1.1.

Chapter 1: **Understanding Successful Corporate Venture Management.** The chapter introduces the reader to the thesis by presenting the motivation, the problem statement and three research questions. It further defines the research objective and the research methodology applied to answer the research questions and the problem statement. An overview of the structure of the thesis is also given.

Chapter 2: **Related Work and Theoretical Embedding.** In this chapter the literature review conducted for the thesis is provided. First, the chapter discusses related research that positions corporate ventures as a means for corporations to realize a dual structure to achieve ambidexterity. Second, the chapter gives an overview of the analytical frameworks applied in prior research to investigate the management of corporate ventures. The dynamic capability-based view is discussed as an alternative analytical framework that defines corporation-venture relations in the form of routines.

Chapter 3: **Exploring the Autonomy of Corporate Ventures.** RQ1 is addressed in this chapter. The qualitative research carried out to explore the autonomy of corporate ventures is

presented. Case studies demonstrate that venture managers have a pivotal role to develop new business by engaging in explorative learning with their teams. Four autonomy dimensions, namely functional autonomy, decision autonomy, job autonomy and strategic autonomy are revealed.

Chapter 4: Operationalizing a Multidimensional Autonomy Construct. This chapter contributes to RQ2 by operationalizing the four autonomy dimensions (explored in Chapter 3) in an initial four-dimensional autonomy construct. This autonomy construct is an instrument that allows to measure a broad spectrum of autonomy that venture managers may enjoy.

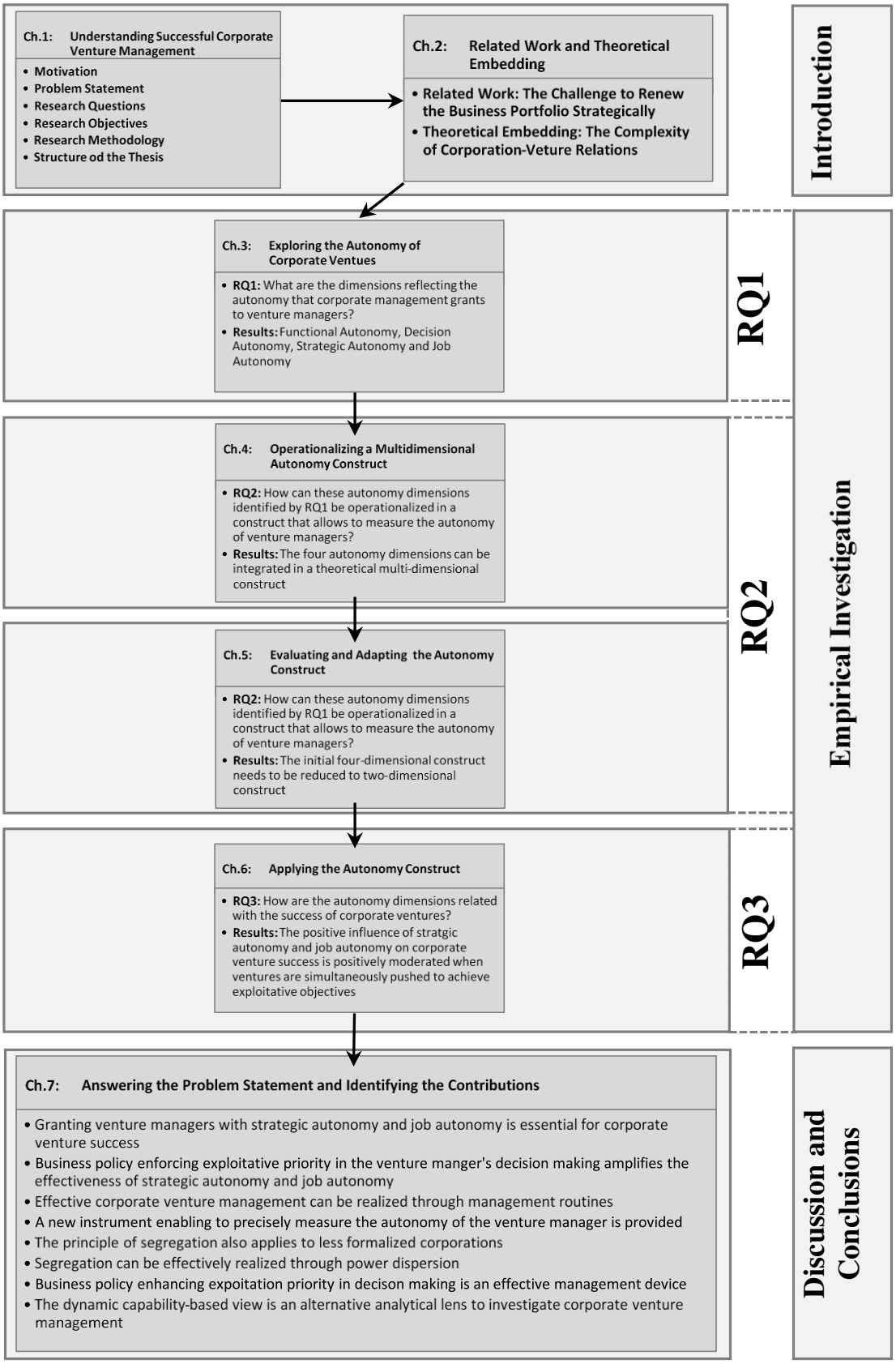
Chapter 5: Evaluating and Adapting the Autonomy Construct. This chapter provides a conclusive answer to RQ2. The initial four-dimensional autonomy construct (operationalized in Chapter 4) is evaluated and adapted statistically in Chapter 5. The scale evaluation procedure described in Subsection 1.3.3 is therefore applied. As a result of this procedure, two autonomy dimensions were excluded for ensuring the validity and reliability of the autonomy construct. Thus, a two-dimensional construct is evaluated.

Chapter 6: Applying the Autonomy Construct. This chapter answers RQ3 by testing quantitatively the power of the two-dimensional autonomy construct to explain corporate venture success. In general, the results confirm the relevance of the autonomy construct. Based on the statistical results of the analysis, a model for effective corporate venture management is evaluated, which gives an answer to the problem statement.

Chapter 7: Answering the Problem Statement and Identifying the Conclusions. The three research questions are answered in the first section, which contributes to answering

the problem statement. The final answer to the problem statement is given in the second section. The theoretical and practical contributions are identified as conclusions in the third section. The fourth section reports the limitations of the research. The last section concludes with recommendations for future research directions.

Figure 1.1: Thesis Structure



Chapter 2

Related Work and Theoretical Embedding

This chapter provides the literature review conducted for the research. Section 2.1 (Related Work) introduces the reader to the challenge of corporations to renew their business portfolio strategically by establishing corporate ventures alongside the mainstream business. Section 2.2 (Theoretical Embedding) reveals the complexity of corporation-venture relations. The dynamic capability-based view is discussed as an analytical framework that defines corporation-venture relations in the form of management routines.

2.1 The Challenge to Renew the Business Portfolio Strategically

The strategic renewal of the business portfolio is a well-known challenge for corporations in innovation-driven industries where market parameters quickly change. The changing conditions erode and sometimes disrupt current businesses (cf. D'Aveni, 1994). Renewing the business portfolio strategically is therefore a core challenge for corporations confronted with changing environmental conditions (cf. Volberda, Baden-Fuller, & Van den Bosch, 2001). For this reason, corporations need simultaneously (1) to improve existing businesses and (2) to create new ones (see Phan, Wright, Ucbasaran, & Tan, 2009). Exploiting established businesses to ensure current profits and explore new businesses to ensure future incomes requires a dual capacity (see Raisch & Birkinshaw, 2008), which is described in 2.1.1. Dual capacity calls for a dual structure (see 2.1.2). In Subsection 2.1.3, the emergence of dual structures through corporate ventures are discussed.

2.1.1 DUAL CAPACITY

The term dual capacity refers to the ability of corporations (1) to engage concurrently in *exploitative* learning for improving existing businesses and (2) to invent new businesses by engaging in *explorative* learning (e.g., March, 1991a; McGrath, 1995). Corporations that achieve both simultaneously are characterized as ambidextrous organizations (see O'Reilly & Tushman, 2013). These organizations achieve a superior long-term performance as they are prepared for today's and tomorrow's business environments (cf. Burgers & Jansen, 2008; Raisch & Birkinshaw, 2008). However, ambidexterity is not easy to achieve because exploitative and explorative modes of learning are associated with negative externalities (Gupta, Smith, & Shalley, 2006). Exploitation is associated with levering the existing knowledge base (i.e., improve existing capabilities) whereas the purpose of exploration is to enlarge the current knowledge base (i.e., develop new capabilities) (see Raisch & Birkinshaw, 2008). They are mutually *incompatible* as exploitative learning modes involve refinement, selection and improvement, whereas explorative learning refers to modes of search, variation and experimentation (March, 1991). Both are associated with a self-reinforcing behavioral tendency that may cause corporations to be trapped into the overemphasis of either mode to the detriment of the other (cf. Levinthal & March, 1993). Overemphasis may have negative performance implications as it reflects the trade-off to generate short-term profits by focusing on the exploitation of established businesses instead of creating long-term benefits by focusing on the exploration of emerging alternatives (see March, 1991b; He & Wong, 2004). Corporations therefore face the challenge to balance both modes in order to achieve superior long-term performance (see Andriopoulos & Lewis, 2009).

2.1.2 DUAL STRUCTURES

For realizing the balance between the exploitation and exploration modes, dual structures are proposed (cf. Duncan, 1976: 167). Establishing such structures refers to "the subdivision of tasks

into distinct organizational units that tend to develop appropriate contexts for exploitation and exploration" (Raisch, Birkinshaw, Probst, & Tushman, 2009: 686). The structural differentiation or separation of tasks into distinct subunits creates "pragmatic boundaries" (Carlile, 2004) that allow the two incompatible learning modes to coexist within one organization (Jansen, Tempelaar, Van den Bosch, & Volberda, 2009). The separation of exploitative and explorative tasks enables corporations to improve capabilities for the mainstream business and to develop new capabilities for entering novel business domains simultaneously (Raisch, 2008). Corporations may realize dual structures by establishing explorative subunits alongside the mainstream business (cf. Jansen et al., 2009).

The mainstream business is generally formalized in order to maximize efficiency and control through process management (Benner & Tushman, 2002; Benner & Tushman, 2003). Such a formalized organizational context is ill-suited for explorative subunits which are established typically as small teams with flexible routines that facilitate explorative learning modes such as experimentation or improvisation (Lavie, Stettner, & Tushman, 2010). Hence, explorative subunits are often separated from the mainstream business to avoid cultural and procedural spillovers that may constrain their explorative task (Christensen, 1997).

2.1.3 DUAL STRUCTURES THROUGH CORPORATE VENTURES

Large corporations generally establish explorative subunits such as corporate ventures as separated subunits (see Birkinshaw, van Basten Batenburg, & Murray, 2002). Corporate ventures are small entrepreneurial teams focused on the explorative task to develop new businesses for the corporation (Garrett & Covin, 2013). Separation protects the corporate ventures from the managerial cognitions (Gilbert, 2005), inertia (Simon & Houghton, 1999) and short-term pressure (McGrath, Keil, & Tukiainen, 2012) of the mainstream business (Kanter, 1985; Block & MacMillan, 1993; Jansen et al., 2009). The prevailing yet normative view is that the extent of

separation thus increases the corporate venture's success as it enables ventures to mould their own "processes, structures, and cultures" (O'Reilly & Tushman, 2004: 3) that suit their new task environment (Dess, Lumpkin, & McGee, 1999; Simon & Houghton, 1999).

While common wisdom follows the normative assumption that corporate ventures should be separated from the mainstream business (Burgelman, 1983; Kanter, 1985; Schuler, 1986; Birkinshaw et al., 2002; Burgers et al., 2009), empirical evidence associating separation with corporate venture success is yet to be provided (e.g., Birkinshaw et al., 2002). Rather than that, empirical findings contradict the common wisdom and show that separation may also influence corporate venture success negatively (Johnson, 2012) or may have no impact at all (Kuratko et al., 2009; Garrett & Covin, 2013).

The evidence that separation may have negative performance implications shows that establishing corporate ventures as fully autonomous subunits may not be the optimal form. Instead, the relationship between corporations and their ventures is more complex (cf. Thornhill & Amit, 2000). For example, studies show that corporate ventures are subject to subtle control (Simon & Houghton, 1999). With subtle control, corporate management allows ambiguity for creative problem-solving. At the same time corporate management exercises sufficient control to ensure that product-market offerings fit corporate strategy and competences (Brown & Eisenhardt, 1995). Subtle control puts corporate ventures into a somewhat semi-autonomous position (Kuratko, 2010). Thus, corporation-venture relations are more complex than it may appear at first glance.

2.2 RESOLVING THE COMPLEXITY OF CORPORATION-VENTURE RELATIONS

Untangling the complexity of corporation-venture relations, Thornhill and Amit (2000) assume that corporate ventures are tight and loose coupled with their corporations. Tight and loose coupling mirror the challenge of corporate ventures (1) to benefit simultaneously from existing

corporate strengths and (2) to develop something new. Tight coupling facilitates corporate ventures to exploit capabilities that already exist in the corporation (MacMillan, Block, & Narasimha, 1986; Dougherty, 1995). Loose coupling, in contrast, facilitates freedom and flexibility required to develop new capabilities (Burgelman, 1983; Simon & Houghton, 1999). Research acknowledges the relevance to resolve the complexity that is inherent in corporation-venture relations and have shed light from different viewpoints. The literature review highlights three different viewpoints by which we can manage this complexity. These are the resource-based view, the organizational design-based view and the dynamic capability-based view. They are discussed in the Subsections 2.2.1 to 2.2.3.

2.2.1 A RESOURCE-BASED VIEW

An organization seen from a *resource-based view* is considered as a bundle of resources (Penrose, 1959). Competitive advantage is explained based on the characteristics of the organization's resources and its ability to protect them from imitation, transfer and substitution (Barney, 1991). Resources include (a) tangible assets such as machinery, infrastructure or skilled personnel, (b) intangible assets such as knowledge of technologies, reputation or brand names and (c) financial assets such as capital (Wernerfelt, 1984). Following the resource-based view, corporation-venture relations may be regarded as being formed through the relatedness of corporations and their ventures (Sorrentino & Williams, 1995).

In theory, relatedness reflects the extent to which corporate ventures share corporate resources. The extent to which resources are shared defines how tight or loose corporate ventures are coupled with their corporations (MacMillan et al., 1986; Campbell, Goold, & Alexander, 1995a). Synergetic effects may emerge when ventures utilize corporate resources (MacMillan et al., 1986). It is believed that high levels of relatedness or tight coupling influence corporate venture success positively when the corporate and venture businesses are similar, for example, with respect to

products, markets or technologies (see, e.g., Campbell, Goold, & Alexander, 1995b). In contrast, other studies find that tight coupling is antithetical to corporate venture success as the purpose of ventures is rather explorative. Thus, the proponents proposed to share a minimum of resources or low levels of relatedness (Burgelman, 1983; Ginsberg & Hay, 1994).

In practice, Sorrentino and Williams (1995) report however that (1) there is no significant association between relatedness and corporate venture success in either form. Garret and Neubaum (2013) find that (2) low levels of relatedness (referring to the venture's initial resource base) exhibit a positive association with corporate venture success. However, they further show that business similarity (referring to the product lines) has a negative impact on the positive association between low levels of relatedness and corporate venture success. The explanation for that may be that (3) the share of resources reduces "the venture's ability or willingness to think outside the box and pursue disruptive innovations" (Garrett & Neubaum, 2013: 911). In summary, the limited empirical evidence indicates that the impact of relatedness on corporate venture success remains discussed. In any case, the literature review shows that the resource-based view has not yet provided sound managerial implications for successful corporate venture management.

2.2.2 AN ORGANIZATIONAL DESIGN-BASED VIEW

The *organizational design-based view* assumes that diversified firms should match high levels of differentiation with high levels of integration in order to achieve superior performance (Lawrence & Lorsch, 1967; Thompson, 1967). Differentiation is defined as the subdivision of tasks (e.g., marketing and R&D) into distinct subunits. Integration includes mechanisms such as liaison roles, temporary teams or common goals (Galbraith, 1973; Gupta & Govindarajan, 2000). Independent of its form, it is agreed that integration facilitates the coordination of activities and resource in diversified organizations (Ghoshal & Nohria, 1989; Bartlett & Ghoshal, 1999; Gupta & Govindarajan, 2000). Proponents of the organizational design-based view allocate corporation-

venture relations to design arrangements of differentiation and integration (Hill & Birkinshaw, 2012). Both design arrangements are seen as complementing. Tight relations are referred to integration whereas loose relations are associated with differentiation, which positions corporate ventures as loosely-coupled subunits (Burgers et al., 2009).

In theory, it is assumed that differentiation provides ventures with the freedom required to develop new knowledge and integration facilitates the transfer of knowledge already existing in the corporation which may stimulate cross-fertilization and enforce strategic coherence (Jansen et al., 2009; McGrath et al., 2012). Research suggests accordingly that differentiated corporate ventures should be integrated with the rest of the corporation (Hill & Birkinshaw, 2012). Integration may be achieved through formal and informal integration mechanisms (Gupta & Govindarajan, 2000).

In practice, a study confirms that informal integration mechanisms pursue "corporate venturing" (the extent to which corporations enter novel product/market domains by creating corporate ventures) whereas formal integration mechanisms are found to be ineffective (Burgers et al., 2009). While this study highlight the relevance to integrate corporate ventures informally, we do not know whether the matching of differentiation and integration is associated with corporate venture success (see Hill & Birkinshaw, 2012). Hence, the organizational design-based view has so far not provided insights into successful venture management practice.

2.2.3 A DYNAMIC CAPABILITY-BASED VIEW

The *dynamic capability-based view* evolved as an analytical framework in consequence of the paradigmatic change from stable to dynamic environmental conditions (D'Aveni, 1994) in which corporations compete today (Li & Liu, 2014). The analytical framework assumes that corporations accomplish competitive advantage by reconfiguring their resource base quickly in adaptation to the business environment (cf. Teece, 2012). The reconfiguration of resources is realized through

routines (e.g., Eisenhardt & Martin, 2000). Routines are defined generally as the recurrent interaction patterns carried out by multiple actors (Becker, 2004). An organization's routines are embedded in individual processes and thus specific to the context (see Cohen et al., 1996). Below, management routines are defined in order to specify the context in which the term routine is used in this thesis.

Definition 2.1: **Management Routines** *are the regular and recurring meetings among corporate management and venture management.*

Building on this definition, the thesis assumes *in theory* that corporation-venture relations are formed through management routines. This assumption is reasonable as the interaction between corporate management and venture management is carried out through the management routines. Although it seems promising to investigate management routines to explain effective corporate venture management, it is not yet tested *in practice* whether this research attempt explains corporate venture success. One reason for the lacking evidence may be that it is difficult or even impossible to measure routines directly in order to quantify their effects on corporate venture success (see, e.g., Strehle et al., 2010).

Therefore, I focus on the interaction among corporate management and venture management which is carried out through the management routines. More specifically, I investigate a particular part of this interaction, namely, the oversight and control that corporate management exercises over venture management. Similar to prior studies, oversight and control is measured in this thesis through the degree and types of autonomy that corporate management disperses to venture management (Crockett, McGee, & Payne, 2013). Investigating the impact of autonomy on corporate venture success seems promising to explore effective venture management practice. However, the remainder of this section demonstrates that a construct to measure the autonomy of

venture managers is not yet satisfactorily developed. Therefore, I propose a multidimensional autonomy construct.

A construct to measure autonomy is still to be developed

Prior research has measured the autonomy of venture managers based on two constructs (see Thornhill & Amit, 2000; Birkinshaw & Hill, 2005; Kuratko et al., 2009). The first construct gathers the extent to which venture managers operate independent from the rest of the corporation (Kuratko et al., 2009). The second construct measures the extent to which venture decision-making is separated from the corporation in the sense that corporate management disperses decision power to venture managers.

The first autonomy construct is known as venture planning autonomy and measures "the extent to which venture managers are responsible for establishing goals, timetables, event milestones, and strategy for the venture" (Kuratko et al., 2009: 465). However, studies aligning this type of autonomy with corporate venture success are inconclusive. Kuratko et al. (2009) find that venture planning autonomy exhibits a positive association with corporate venture success. Garret and Neubaum (2013) confirm these results reporting that venture planning autonomy exhibits a positive influence on corporate venture success. In contrast, Johnson (2012) reports a negative relation between venture planning autonomy and corporate venture success. The contradicting results of these studies demonstrate that the relevance of the first construct to explain corporate venture success is discussed controversially.

Studies applying the second autonomy construct for investigating the association between autonomy and corporate venture success are similarly inconclusive. Birkinshaw and Hill (2005) report that venture managers with increased decision authority concerning "investment and management matters" outperform their counterparts with low decision authority (Birkinshaw &

Hill, 2005: 251). Crockett et al. (2013) come to a similar conclusion and find that venture managers enjoying high decision authority are more likely to achieve strategic milestones. In contrast, Thornhill and Amit (2000) find that corporate venture success is influenced negatively when venture managers have the authority to make decisions. The contradicting findings of these studies illustrate that the relevance of the second autonomy construct for explaining corporate venture success may also be questioned.

A multidimensional autonomy construct is proposed

The ambiguous evidence concerning the relevance of both autonomy constructs supports the previous assumption that the construct reflecting the autonomy of venture managers is not yet well understood (see, e.g., Lumpkin, Cogliser, & Schneider, 2009; Johnson, 2012). The ambiguity of available autonomy constructs to explain corporate venture success suggests that it may be fruitful to establish a more detailed view on autonomy (Johnson, 2012). The suggestion to measure autonomy more precisely is consistent with the notion that further conceptual work is required to generate a more comprehensive understanding of the autonomy construct (see Birkinshaw & Hill, 2005; Lumpkin et al., 2009; Johnson, 2012; Crockett et al., 2013; Garrett & Covin, 2013).

All in all, we have shown that research suggests a multidimensional construct to measure the autonomy of venture managers more precisely (Johnson, 2012: 473). The autonomy that venture managers may enjoy, reflects many conditions such as loose versus tight corporate control (Crockett et al., 2013), centralized versus decentralized decision making (Birkinshaw & Hill, 2005), independent versus dependent venture operations (Garrett & Covin, 2013) or dependency versus independency on corporate resources (Sathe, 1985). The distinct conditions reflecting autonomy imply that different constructs are required to measure the full spectrum of autonomy. Johnson (2012) proposes accordingly that it might be best to measure autonomy based on a multidimensional construct, which is however missing so far. Following the recommendation to

develop such a construct, a first multidimensional autonomy construct is developed and applied in this thesis.

Chapter 3

Exploring the Autonomy of Corporate Ventures

This chapter investigates *RQ1: What are the dimensions reflecting the autonomy that corporate management grants to venture managers?* The prevailing view in the ongoing scientific discussion is that corporate ventures require a high level of autonomy in order to develop new businesses successfully (see, e.g., Kuratko et al., 2009).

This chapter is based on the following two publications[1]:

Gard, J., Baltes, G., & Katzy, B. (2012). **Towards a Concept of Autonomy for Teams Developing a New Business within Existing Companies**. In the proceedings of the 18th International ICE Conference on Engineering, Technology and Innovation (ICE), pp. 226-238. Munich, Germany.

Gard, J., Baltes, G., & Katzy, B. (2013). **Managing Autonomy of Teams in Corporate Entrepreneurship – Evidence from Small to Medium Firms**. In the proceedings of the 22nd International Conference on Management of Technology (IAMOT), pp. 134-154. Porto Alegre, Brazil.

While it is recognized that autonomy may be associated with many conditions, the dimensions reflecting the autonomy of venture managers are not well understood so far in studies by corporate venture scholars (cf. Birkinshaw & Hill, 2005; Crockett et al., 2013). Thirteen interviews are

[1] The author would like to thank his co-authors and the publishers of the ICE 2012 and IAMOT 2013 proceedings for their permission to reuse relevant parts of the articles in this thesis.

conducted in seven SMEs with corporate managers and venture managers (see Appendices A1 and A2) to understand (a) how SMEs renew the business portfolio through corporate ventures and (b) how the autonomy works that venture managers may enjoy. Literature research is conducted to explore the dimensions reflecting the autonomy to be observed. The chapter is structured as follows. Section 3.1 presents related work. The research methodology is given in Section 3.2. Section 3.3 describes two case studies contrasting the level of autonomy that venture managers may enjoy. In Section 3.4, literature research is conducted in order to explore the dimensions reflecting the autonomy observed in the cases. Section 3.5 summarizes the results of the study.

3.1 THE RELEVANCE OF AUTONOMY TO EXPLORE NEW BUSINESSES

Innovative products are generated through new product development teams involving representatives from different functional areas (e.g., experts on sales, manufacturing and design). Concurrent engineering is applied broadly as a management philosophy for these cross-functional teams (cf. Susman & Dean, 1992; Gerwin & Moffat, 1997). The basic requirement for concurrent engineering is that the product development team is able to work in an autonomous manner. The required level of autonomy can be described through two types. First, the team needs to be functional autonomous from the rest of the corporation, thus incorporate all experts on function required to perform their task. Second, the team needs to be able to make job-related decisions without approval (cf. Gulowsen, 1972 ; Klein, 1991; Gerwin & Moffat, 1997; Boyle, Kumar, & Kumar, 2005).

Such cross-functional teams are known by scholars in corporate entrepreneurship as corporate ventures (see, e.g., Hill & Hlavacek, 1972; Alterowitz, 1988; Christensen, 2004; Kuratko et al., 2009). Similar to the new product development team, the corporate venture team is interdisciplinary as it involves distinct experts on function (see, e.g., Christensen, 2004). In contrast

to the new product development teams, innovation is however not limited to product development but also requires to build the business for commercialization. For instance, the corporate venture team may develop a new product to enter a novel business domain where collaborations, customer contacts or distribution channels are yet to be established. Thus, for successful commercialization the corporate venture team has the challenge to develop a new product as well as the business around the product. At this point we should see the relevance of autonomy in exploring new businesses. Corporations providing adequate support to their corporate ventures are able to capitalize on emerging business opportunities and thereby achieve superior long-term performance by introducing strategic renewal to the business portfolio (see, e.g., Stopford & Baden-Fuller, 1994; Zahra & Hayton, 2008; Kuratko, 2010; Simsek & Heavey, 2011).

Adequate support involves however more than money and people, but also requires a certain level of autonomy that enables corporate ventures to behave in an entrepreneurial manner (cf. Simon & Houghton, 1999). Lumpkin and Dess (1996) highlight that autonomy is the "freedom granted to individuals and teams who can exercise their creativity and champion promising ideas that is needed for entrepreneurial behavior to occur" (Lumpkin & Dess, 1996: 140). However, the concept of autonomy is complex for two reasons: (1) corporate ventures are in contrast to independent ventures (i.e., start-ups) not fully autonomous and (2) autonomy may reflect many conditions such as oversight, dependence or decision authority (cf. Johnson, 2012).

It is criticized that the label autonomy is often "too simplified" (Lumpkin et al., 2009) as corporate ventures cannot simply be characterized as autonomous or not autonomous (cf. Hill & Hlavacek, 1972; Thornhill & Amit, 2000; Kuratko, 2010). Instead, it is assumed that the autonomy of corporate ventures differentiates among distinct dimensions and degrees of autonomy (e.g., Johnson, 2012). This understanding is critical. Corporate venture research assumes generally that autonomy is essential for corporate venture success (see, e.g., Simon & Houghton, 1999;

Birkinshaw & Hill, 2005). Organizational life-cycle theory supports this view and finds that growth can only be achieved when corporate management disperses an adequate level of autonomy throughout the corporation (cf. Greiner, 1997). However, the understanding of the dimensions reflecting the autonomy of corporate ventures remains ambiguous (see, e.g., Lumpkin et al., 2009; Crockett et al., 2013).

The purpose of this chapter is to contribute to the conceptual understanding of autonomy by exploring the multiple dimensions that reflect the autonomy of venture managers. We conduct case study research in combination with literature research in order to identify distinct dimensions that determine the autonomy of venture managers. The research methodology is presented in the following section.

3.2 RESEARCH METHOD

The research is based on an explorative methodology in combination with literature research. The research approach is described in the Subsection 3.2.1. The data collection is reported in the Subsection 3.2.2 and the data analysis is described in the Section 3.2.3.

3.2.1 RESEARCH APPROACH

Initially, we aimed to understand how SMEs renew their business portfolio by developing new strategies. It is acknowledged by scholars in strategic management that the development of new strategies is a social interaction process that involves various actors (see, e.g., Ansoff, 1967; Andersen, 2000). Researchers have recognized that such "social processes are not captured in hypothetical deductions, covariances and degrees of freedom (thus quantitative research). Instead, understanding a social process involves getting inside the world of those generating it" (Rosen, 1991:9). Therefore, we have given priority to qualitative research. More specifically, explorative case study research is carried out. This approach enables to examine the social process of strategy

making (a) in its full complexity from a holistic perspective and (b) in real-life settings (Yin, 2009). Following an interpretive approach, we focus on the perception of individuals to generate our insights into the phenomenon of business portfolio renewal (cf. Patton, 2002).

While the scientific value of qualitative research is sometimes questioned, a literature review provides evidence that the qualitative research methodology is well established in publications by management scholars (see, e.g., Bluhm, Harman, Lee, & Mitchell, 2011). Nevertheless, the author is aware of the limitations associated with qualitative research. Most notably, the generalizability of the qualitative research results is questionable for two reasons: (a) the perception of people is gathered, which is not objective and (b) in our case the sample size is quite small. Therefore, we carry out literature research in order to bring our qualitative results into line with prior studies (see Section 3.4). Moreover, it is important to note that the qualitative research presented in this chapter is only the first of four research steps carried out in the thesis. An overview of the four research steps is reported in Section 1.3. The following subsection describes the data collection that is carried out in this chapter.

3.2.2 DATA COLLECTION

Data was collected from May 2011 to April 2012 through two series of semi-structured interviews (overall thirteen) in seven SMEs with a time frame between 1 and 2.5 hours. The *first series* of six interviews (see Appendix A1) was conducted with corporate managers (in the role of the CEO) in six different SMEs (Company 1 to 6) across three German high-tech industries (Photovoltaic Industry, Information Technology and Automotive Supplier). In order to obtain initial insights, the first interviews were guided by the research question: “how do SMEs develop new strategies to renew their business portfolio?” The research question that guided the *second series* of interviews was more specific, well informed by the answers to the first research question. The second series of interviews (see Appendix A2) was guided by the following research question: “how do SMEs

enter novel business domains in order to diversify their business portfolio?" In order to answer the second research question, seven interviews were conducted with three corporate managers (in Company 2, 5 and 7) and three venture managers (in Company 3, 4 and 5) in four out of the initial six SMEs (Company 1, 2, 3, 4, 5 and 6) and one additional SME (Company 7). An overview of the overall thirteen interviews (six plus seven) is given in the Appendices A1 and A2. The analysis of the interview data is described in the Subsection 3.2.3.

3.2.3 ANALYSIS OF THE INTERVIEW DATA

We used grounded theory as a methodology to analyze the interview data (cf. Strauss & Corbin, 1994). Therefore, the interviews were transcribed and coded. The coded data was used to write case descriptions (final cases are presented in Subsections 3.3.1 and 3.3.2) and to compare the cases (in Subsection 3.3.3). The detailed data analysis procedure is described in the following.

The interview data of the first six interviews (Company 1 to 6) was coded in order to gain initial insights into how SMEs develop new strategies to renew their business portfolio. Based on the coded interview data, discussions were conducted between the researchers (the authors of the two publications on which this chapter builds) in weekly Skype conferences. The outcome of these discussions were rough case descriptions which summarized the observations. The case descriptions showed that the real-world problem of the CEOs (corporate managers) was not related to the strategy-making associated with the established businesses. Instead, the challenge of the corporate management was to develop new strategies to enter novel business domains, outside the scope of the established businesses.

The first series of interviews

Building on these initial insights, the business portfolios of the six corporations (first series of interviews) were examined based on the interview data and through web research. The results

showed that the business portfolio of four (Company 2, 3, 4 and 5) out of six corporations was diversified (more than three business domains where established) whereas the portfolio of two corporations was limited to one or two business domains only (Company 1 and 6). Interview data indicated that the four diversified companies attempted to systematically enter novel business domains. The two other companies had no history of systematical new business development.

The second series of interviews

Accordingly, the second series of interviews was conducted with the four diversified corporations (Company 2, 3, 4 and 5) in order understand how corporations systematically diversify the business portfolio by entering novel business domains. An additional interview was conducted with one further SME. This company (Company 7) was not part of the first series of interviews. Nevertheless, it was promising to incorporate the company in the second series of interviews as its business portfolio was also diversified. Correspondingly, the second series of interviews was conducted with five SMEs (Company 2, 3, 4, 5 and 7).

The interviews were transcribed and coded in the same manner as the first interviews. The discussions between the researchers based on the coded interview data was continued through weekly skype conferences. The coding of the data revealed a common pattern through which three of the five corporations entered novel business domains (Company 4, 5, and 7). They did so by establishing small entrepreneurial teams (corporate ventures). Two of them were able to establish successfully new businesses through the corporate ventures (Company 4 and 7) whereas one corporation tried to do so but was not successful (Company 5). Essential differences were not found between the two successful corporations. However, one aspect distinguished fundamentally between the two successful corporations and the one unsuccessful corporation: the level of autonomy that was granted to the venture manager was contrasting.

The assumption arrived at

Based on the interview data, the researchers carefully developed the assumption that "the level of autonomy which the venture manager enjoys will influence the success of the corporate venture". Some evidence for our assumption is provided in the two case descriptions reported in the Subsections 3.3.1 and 3.3.2. The first case (Company 4) refers to one of the two corporations that successfully entered novel business domains with corporate ventures. Only one of the two successful cases is reported since the autonomy granted to the venture manager was quite similar in Company 4 and 7. Describing the cases of both successful corporations would thus not have provided further insights into the formulated assumption. The second case (Company 5) refers to the corporation that was unsuccessful with entering a novel business domain with corporate ventures. Both cases are reported in Section 3.3.

3.3 CASE STUDIES

Two cases of new business development through corporate ventures are described in this section. The first case (Company 4) describes an SME within the photovoltaic industry that levers growth by entering successfully novel business domains with a corporate venture. The second case (Company 5) refers to an SME within the information technology industry that exploits successfully existing businesses but is rather unsuccessful to enter novel business domains with corporate ventures. The two cases are described in the Subsections 3.3.1 and 3.3.2, respectively. In Subsection 3.3.3, the two cases are compared with respect to the autonomy that the corporate managers grant to the venture managers.

3.3.1 THE CASE OF COMPANY 4 (PHOTOVOLTAIC INDUSTRY)

The case study on Company 4 refers to a company in the photovoltaic (PV) industry with around 130 employees and a turnover of about 25 million Euro. The company's solutions focus on the

improvement of production processes for PV wafers, cells and modules. The company provides quality measurement equipment, chemical additives for production and consultancy for quality management. Despite the consolidation and fierce price competition in the PV industry, the company was able to generate continuous growth by developing a new business domain through a corporate venture. The case of successful new business development is described below in seven stages.

Stage 1: Company 4 started as a distributor

Founded in 1999 as a university spin-off, Company 4 had high knowledge related to production processes for PV cells and modules, resulting from university research. At this early phase, the business was based on production process consultancy. Some time later, consultancy was combined with hardware sales of quality measurement equipment. Therefore, a partner was identified who had developed quality measurement equipment, i.e., for production processes in the semiconductor industry. Cooperation between the two firms was started with the aim of combining the process knowledge of Company 4 with the hardware knowledge of the partner. The outcome yielded quality measurement equipment for laboratories and in-line production processes in the PV industry. Company 4 acted as a representative and received a sales commission, whereas the partner signed the contracts and provided the equipment.

Stage 2: The turnkey business was explored as a new business opportunity

Involved in sales activities, the interviewee (leader of the team that developed the new turnkey business), still working part-time at the university, became more and more involved in business development activities. Based on his interaction with customers when conducting sales activities, he recognized that the customer's knowledge related to PV quality management was low. This was not only the case for the equipment that Company 4 provided but also for third-party equipment (e.g., scales or microscopes). He perceived this lack of knowledge as a business opportunity and

developed the business idea to combine Company 4's process know-how with market-available quality measurement equipment in order to offer a turnkey package to the customers. The package included the equipment, service and operational training related to the equipment.

Stage 3: A small team developed the turnkey business, guided by a powerful team leader

Driven by this idea, the interviewee initiated and coordinated several team activities for developing the new business. First, a marketing concept was developed. Based on the different customer needs (e.g., high quality vs. high quantity production), differentiated standard packages were developed and productized as hybrid products (e.g., brochures, flyers, sales presentations and the webpage were redesigned). Second, the interviewee initiated business partnerships and signed cooperation contracts with the different manufacturers of equipment (e.g., Carl Zeiss AG). Third, a training concept was developed in order to support the end-customer in implementing the equipment into their production processes. Fourth, a team was built to train end-customers and provide field service. These activities were conducted by a cross-functional team (i.e., team members from marketing, sales and service) that the interviewee supervised and coordinated.

The newly established business was unique in the PV industry. Company 4 offered a productized hybrid bundle or a comprehensive set of quality measurement equipment, implementation service, field service and training. As the partner only provided one part of the range of this bundle, the interviewee was in a good position for re-negotiating contractual conditions. Based on the argument that the customer requires turnkey offerings that only Company 4 could offer, the authority for signing the contracts was transferred to Company 4. Thereby the interviewee was put in the position to establish relationships with customers based on intensified interaction (e.g., conducted training and provided service). The interactions provided deeper customer understanding that was important for further developing the market solution, which subsequently improved Company 4's market position.

This new position paved the way for reaching a new customer group – PV turnkey manufacturers (companies providing ready-for-operating production facilities for solar cells and modules). The new business enabled Company 4 to establish a temporary monopoly in this market segment, leading to contracts with every turnkey manufacturer in Germany. Before building the new business in 2005, Company 4 was still small (with less than 20 employees), many projects were conducted with external consultants and production capacity did not expand beyond prototype level. The business was changed through the new business fundamentally. Sales as well as sales margins increased significantly. Similarly, the number of customer relations as well as the number of employees increased.

Stage 4: The turnkey business was internationalized

In 2006, the demand for turnkey solutions began to decrease in Germany and to increase in Asia, simultaneously. Consequently, the turnkey manufacturers entered the Asian markets. The interviewee recognized this development due to his intensive interactions with these customers. Accordingly, he perceived entering the Asian market as another business opportunity. Based on this idea, he initiated a deal with turnkey manufacturers that Company 4 would provide a comprehensive quality measurement bundle (e.g., providing the equipment, consultancy, training and service) in the turnkey projects. As the agreement was settled, the first projects (three at the same time) were conducted in Taiwan. To deliver the contract volume, the interviewee set up a small team of experts, most of them worked earlier for Company 4 as external consultants (now hired fulltime). The team started with the three parallel projects and initiated further sales and service activities. According to the interviewee, “the team was the nucleus for the sales and service organization that was built later on”.

These projects opened access to the Asian markets. The interviewee engaged in further sales activities and was able to sign contracts for follow-up projects as well as projects with new

customers without the support of the turnkey manufacturers. Ultimately, the interviewee established a stand-alone position (with an own market presence) in the Asian market which was the basis for further growth. Retrospectively, the interviewee stated: "We would have never managed to enter the Asian markets without the turnkey partners. We had not even been present at a single trade fair."

Subsequently, sales increased significantly in 2006 and the interviewee hired local employees (from Asia) and invested in their qualifications in order to be able to manage the increasing number of projects. While the initial team members were sent to Asia with German employment contracts in a freelancer's scheme, international employment and business law became more relevant with the international employees. Since 2006, Company 4 spent tens of thousands of Euros on consultancy in order to sort out these legal aspects. In this context the interviewee stated: "If we had done everything strictly following international employment and business law, we could never have afforded to enter the Asian markets. Today, we have of course solved these legal issues, but the required consultants were very expensive."

Stage 5: The turnkey business turned into an international sales and service organization

In order to scale sales and service, the team in Asia was expanded into a new organization. The interviewee had the choice to build their own sales and service organization or to outsource sales and service to one of the local organizations specializing in these fields. When the first projects were conducted, the interviewee immediately recognized that it was of significant importance to guarantee reliable service because only good service would ensure production stability for the customers. He further realized that "there is nothing better than a reliable service if you want to sell again and again to the same customer". He therefore decided to build the company's own sales and service organization based on the existing team. More than that, engaged in sales in Asia, the interviewee realized that their customers utilized the trademark "Made in Germany" of their

quality measurement equipment as a marketing aspect. He decided that a unique product design, highlighting the German brand, would be helpful. To achieve a new product design, the interviewee initiated the redesign of the hardware, the webpage, brochures, sales presentations and so forth.

Stage 6: Research and development was insourced

In line with that, the CEO and the interviewee decided that it was time to no longer rely on the equipment of the partner company but develop their own equipment: "Thus, with a forerun of 1 to 2 years, we invested several millions in product development." Software development was the core activity of the hired engineers whereas the production of hardware was outsourced. In 2010, the development department comprised more than 20 engineers. In product development, it was decided to develop equipment for high quality production processes instead of high quantity production processes. The interviewee stated that "the customers asked to have the equipment at a lower price, but customers always have a tendency to get things cheaper in order to increase their margins". It was expected that production process optimization towards high-end products would become the key success factor for manufacturers of wavers, modules and cells. Years later, this anticipation of market demand turned out to be true as was seen in 2011 when high-end modules achieved at least a 50% higher price than average modules and manufacturers of high-end products seemed to be secure whereas others went bust (e.g., German producers such as Q-Cells or Sunways collapsed).

Stage 7: The turnkey business achieved significant growth

When the crisis in the PV industry hit Germany around 2008 to 2009, the international run of solar cell and module manufacturers in the Asian market started. This crisis was based on the fact that the Chinese government subsidized Chinese PV manufacturers with billions of Euro. Thus, Chinese manufacturers were able to provide solar cells and modules for one third of the price

compared to their competitors in Europe (some offers even below factor costs). Company 4 took advantage from this crisis situation because they were able to provide mature quality measurement equipment solutions (e.g., sets of equipment, training and service) to these companies. Well in time, market-ready equipment was just produced when sales increased. High sales rates in combination with significantly increased sales margins determined the company's growth. In 2011, the interviewee stated that entering the Asian market has been essential for survival. Most companies with a similar business model were squeezed out of the market at that time. In contrast, Company 4 grew from around 20 employees in 2005 to 130 employees in 2010 and the company's major revenue was generated in Asia.

Lessons learned

Our research describes the case of a company in the photovoltaic industry that performed corporate venturing successfully and was thereby able to achieve significant growth when the industry shifted from boom to bust. The following four lessons can be concluded based on the case description.

- Establishing corporate ventures is an effective means for corporation to enter novel business domains for realizing strategic renewal and growth
- A venture manager that thinks entrepreneurial and acts proactively is required to pursue business opportunities through to completion
- Venture managers require a significant level of autonomy to engage effectively in explorative activities for inventing the new business
- Venture managers should be established as cross-functional teams with experts on distinct business functions

3.3.2 THE CASE OF COMPANY 5 (INFORMATION TECHNOLOGY INDUSTRY)

The case study on Company 5 refers to an IT consulting company with a turnover of around 2 to10 million Euro. The company provides solutions for visualization in management control systems, product-life-cycle management (PLM) and collaboration platforms. Due to fierce price competition the company had to cash-out the mainstream business (PLM) and develop new businesses. Below, we first describe the company's situation in four stages with respect to the mainstream business (PLM). We then report on two trials through which the company engaged with the aim to develop new businesses with corporate ventures.

Stage 1: The PLM business was successfully exploited

Around 1996, the CEO had the vision that web-based technologies would change the way people work: "Everybody laughed at me these days but I went my way." He developed a solution for integrating product-life-cycle relevant applications (PLM) in firm-specific portals. The value proposition for the customer was, for example, that the integration of different engineering applications enabled internationally distributed engineers to operate as a team. The solution was so innovative that Company 5 won competitions with global players such as HP and IBM for projects with the major OEMs within the automotive industry (Germany). Highly customized projects with a timeframe sometimes between 10 and 15 years were conducted successfully. These projects materialized in solutions that were tailored perfectly to the customer's requirements which resulted in high customer satisfaction. Consequently, the company grew to a level of complexity (e.g., number of projects and employees) where the CEO alone was not able to manage the company by himself. Accordingly, he qualified managers responsible for the respective business units. These managers became strategic assets for the company. Based on their experience, they developed their own vision for the respective business units.

Stage 2: Managers left Company 5 to found their own company

In order to develop their respective businesses accordingly, they required a level of autonomy that the CEO was not able to provide. The interviewee said: "There were demands expressed, a demand for autonomy which I was not able to fulfill … I had debts which I needed to pay back to the investor … there was a large list of prohibitions (enforced by the investors)… my people required a level of autonomy that I didn't even have myself." In fact, the CEO was unable to provide his managers with the requested level of autonomy as the investor enforced harsh contractual conditions in order to avoid any uncontrolled activities, such as investments in other firms or inter-firm cooperation. Due to the limited autonomy, the managers were unable to develop their business units according to their vision and perceived the conditions in Company 5 as an obstacle rather than being supportive. As a consequence, the managers left and founded their own company in 2000. The drain of managerial competence was not constrained by binding instruments such as contractual clauses (e.g., a non-competition clause was not included in employment contracts).

In order to build their business, the managers recruited some of the best people from Company 5 as well as specialists that at the time were in the job application process at Company 5. Company 5's CEO stated: "I have invested a lot in qualifying managers, with the effect that I generated my own competition. I qualified every chief executive manager including some executive managers of the company my own people founded." The company they founded has grown to more than 100 employees successfully and is in a good market position.

Stage 3: In consequence the CEO cut the competences of his employees

As a result, Company 5's CEO decided to cut the competences of his employees in order to avoid such events in the future. For example, employees were only trained in competences which were at the core of their job (e.g., sales). Moreover, the CEO found out that an employee of Company 5 worked secretly for the newly founded company. The employee had full access to Company 5's

intranet which was a repository for business-relevant knowledge. Subsequently, some of the stored information was used by the employees of the new company (e.g., sales presentations). The CEO of Company 5 limited his employees' access to the intranet to a minimum immediately when he realized that the knowledge was leaking.

The cutting short of competences as well as the limiting of access to business-relevant knowledge, however, caused new problems after a while. The CEO stated: "I seriously cut the competences of my employees. It seemed to work. However, the company lost its ability to generate further growth … this was simply too extreme." He created a rather "mechanistic" organization in which employees followed documented guidelines, working procedures, regulations and business processes in order to do their job.

The organization was sufficient for managing existing projects efficiently. But as the CEO claimed later, the company lost its ability to generate innovative solutions for customers and to generate new business. The lacking ability to generate new solutions was particularly tremendous for the PLM business where the company transformed gradually from a tier-1 supplier to a tier-2 supplier. A long-term customer in the automotive industry even refused follow-up projects with the argument that the degree of innovation on offer was too low.

The economic outcome displayed its full effect when the economic crisis hit the automotive industry in 2008. The PLM business that had provided steady growth for the past 10 to 15 years started to stagnate. The CEO was not surprised as he had noticed standard solutions dominating the market whereas prices for specialized programmers (Java) had been dropping continuously. In contrast, Company 5 focused on individualized solutions. At a point before the financial crisis in 2008, he decided that it was time to cash-out the old business and create a new business.

Stage 4: The mainstream business was unable to develop new businesses

Correspondingly, the CEO forced his employees to work on developing new business ideas. However, he stated: "I failed. I seriously tried everything but the company was neither moving forward nor backwards. I would never have believed it if I hadn't seen it with my own eyes … Everybody was used to coming to work and to having work … The Company needed that shock if you ask me today." The shock was that no new business was developed. Instead, employees stuck with "business-as-usual". As a result, around 25 specialized programmers had no project when some of the long-term projects ended. Subsequently, the CEO downsized the business over a two-year period from around 75 to 30 employees without generating losses. The result was surprising because the company generated exactly the same (absolute) profit with 30 employees as it had before with 75 employees. After that, the CEO managed the remaining projects himself.

The CEO recognized that new businesses (e.g., in new business domains) would not emerge from the mechanistic type of organization (mainstream business) that had evolved over the years. Therefore, the CEO engaged into two trials (A and B) to develop new businesses with corporate ventures, outside the scope of the mainstream business. In trial A, two subsidiaries were established. The hope was that the subsidiary/venture managers were able to enter novel business domains (other than the known automotive industry) with the established PLM solutions. In trial B, a small team was established at the company's headquarter some time later for the purpose to develop the new "collaboration platform" business. The two trials are reported below.

Lessons learned:

So far, our research describes the case of a company that capitalized successfully on the mainstream business while failing to renew the business portfolio strategically. The following five lessons can be concluded based on the case description.

- Corporations require strategic renewal to achieve long-term survival

- A lack of autonomy limits the ability of employees to act proactively
- Managers that think entrepreneurial require supportive organizational settings
- Cutting the competences of employees reduces their ability to think entrepreneurial
- The corporate mainstream business is not necessarily a good place to pursue the development of new businesses

Trial A – Stage 1: Two small teams were established to enter novel business domains

The CEO recognized that his executive managers needed more autonomy and decided for organizational change. Two of his executive managers were given the opportunity to establish their own businesses in a new environment. For that, subsidiaries were established in Ingolstadt and Stuttgart with the executive managers in charge. Each executive manager was provided with one major customer (automotive industry) and a small team of programmers and consultants. The aim of both initiatives was to maintain existing customers and gain new customers in industries other than the automotive industry. In fact, the teams were allowed to conduct projects with existing customers, engage in further sales efforts (70% of the executive manager's work time) and human resource development activities for building their own team. Every other business function (e.g., R&D, marketing and controlling) was provided by Company 5 and the executive managers were controlled tightly by the CEO.

In the interviews it became clear that basic decisions (e.g., how brochures and other marketing material should be utilized, when and where an offer should be made and which customer should be contracted) were basically made by the CEO. Similarly, the influence of the team leaders on the current concept of strategy was rather low. The CEO stated that he discussed strategic issues with three employees (chief of development, chief of product management and chief of finance). The team leaders were, however, not part of this group.

Not surprisingly, new business did not emerge and one of the subsidiaries was closed. It was argued that the team leader did not have the ability to acquire new customers and the nearly 10-year-old project with the main customer ended without a follow-up project. At the beginning, things went wrong in the second subsidiary as well. The team leader had trouble managing the programmers in his team. He was a consultant, and thus struggled to provide constructive feedback on the technical side and to guide programming activities. The team leader agreed with the CEO that it would be best to abandon programming activities for his business. Accordingly, the business was adapted with the focus on process consultancy. The business started running when after a while the team acquired a new OEM in the automotive industry and several smaller customers. Strategically, however, the CEO still saw the initiative in a cash-out position for cross-financing the development of new businesses.

Trial B – Stage 1: A new business opportunity was explored

Over the years, the CEO recognized that business process integration in a "collaboration platform" is not only a topic for large companies but also for SMEs. However, he knew that individual solutions (which his company developed in the PLM business) were not marketable because they were simply not affordable for SMEs. Nevertheless, technology in this field advanced and standard solutions (such as Microsoft SharePoint) appeared on the market. Thus, business-process integration became suddenly affordable for SMEs and a new business idea was born. The value proposition was to generate individualized collaboration platforms (based on the standard software) that integrated information and applications from different systems in a short time and at low cost.

Trial B – Stage 2: A small team was established to develop the new business

However, the CEO argued that the mechanistic part of his company would not be able to develop such a new business. He stated that this team was good for administrating and conducting projects

but unable to think outside the box and not willing to enter unknown terrain. It was further argued that the guidelines, regulations, procedures and processes that were helpful for the mechanistic team hindered innovative people to create something new. The CEO stated: "I want to create a team that is completely detached from the rest of the organization, so they can create their own culture, their own spirit. And I don't want to be their leader in terms that I pull them like I have done in the past … honestly, I am tired … they can get every support they require but they need to generate growth themselves. This is now something new, a trial … but I believe that it will work."

With this basic idea in mind, the CEO established a small team of around four full-time employees with the aim of developing the new business. In the beginning, the team members developed the conceptual design of the new business. While the business solution matured, the team engaged increasingly in sales activities and human resource development. Questions such as what activities to pursue and how to develop the business were made primarily by the team members. Even strategic issues (e.g., research focus, development activities, which solutions should be developed, and issues of qualification) were decided by the team. The CEO stated: "I don't want to tell them what to develop or give them other directions for the content of their business as long as the business is moving forward … The only guideline they have is the vision to generate collaborative solutions for SMEs and their budgets."

Still, the new business was causing trouble with the key performance indicators and controlling procedures derived from those in the established businesses at an early stage. Targets (e.g., budgets and turnover) were planned but did not reflect real-world conditions. Milestones such as number of customer acquisitions and cost coverage seemed to be more valid and were implemented. After a period of excessive customer acquisition, first projects were initiated and turnover started to increase around two years after initial investments were made (break even was not yet achieved).

Lessons learned:

Our research continued with describing the two trials of corporate venturing through which the CEO pursued the development of new businesses. The CEO learned five lessons from these trials which are concluded in the following.

- Establishing corporate ventures as separated subunits is not necessarily effective
- A venture manager that thinks and acts entrepreneurial is required to purse the new business in a novel business domain
- Corporate management should not expect that corporate ventures reach profitability in a short time
- Corporate management should disperse autonomy to the corporate venture for enabling to learn how the new business works
- Small teams with limited budget are already sufficient to test new business ideas

3.3.3 COMPARING THE AUTONOMY OF THE VENTURE MANAGERS IN THE TWO CASES

In this subsection, the case of successful new business development in Company 4 is compared with the case of Company 5 where new business development was rather unsuccessful (which is at least evident in the first trial). Both cases are meticulously analyzed with emphasis on the contrasting level of autonomy that was granted to the venture managers.

Company 4 – Enabling corporate venturing through autonomous action

The case of Company 4 (Photovoltaic Industry) describes how a new business was developed successfully through a small team (corporate venture). The team leader (venture manager) developed the new business by adapting the business model various times, in accordance with the opportunities that he explored by interacting with customers (market stimuli). The business model was adapted four times. *First*, the distributor business was turned into the turnkey business (Stage

3), which increased growth in terms of both sales and employment. *Second*, the venture manager internationalized the turnkey business (Stage 4) and was able to achieve a stand-alone position (while first contracts were not made with the end-customers but with the turnkey manufacturers). *Third*, the venture manager established an own sales organization in Asia (Stage 5), which resulted in further growth. *Fourth*, own equipment was developed instead of relying on the supplies of the partner company (Stage 6).

Empowered by the corporate manager, the venture manager was able to adapt the business in all four cases (Stage 3 to Stage 6) through autonomous action. In *Stage 3*, the venture manager (a) developed a new marketing concept, (b) initiated business partnerships, (c) developed a training concept and (d) built a team to train end-customers and provide field service. These business development activities were decided and implemented without the approval of corporate management. In *Stage 4*, also autonomously, the venture manager (a) initiated a deal with turnkey manufacturers, (b) set up a team in Asia, (c) engaged in sales and service activities in Asia and (d) sign contracts for follow-up projects. In *Stage 5*, the venture manager decided without consensus seeking (a) that is was necessary to build an own sales and service organization based on the existing team and (b) to establish a new product design for the Asian markets. In *Stage 6*, several million Euros were invested to establish an own product development department, a decision which was made in consensus with the corporate manager.

In a summary, the case of Company 4 highlights that the venture manager was able to act autonomously, which was essential to develop the new business in accordance to the experiences that the venture manager made through interaction with market stimuli.

Company 5 – Impeding corporate venturing due to lacking autonomy

The case of Company 5 (Information Technology Industry) illustrates that the lack of autonomy can have tremendous negative effects on the ability of an organization to development new

businesses. The following three situations that were observed in Company 5 describe the negative effects of lacking autonomy.

First, the business unit managers developed their own vision for their business unit in Stage 2. They recognized the necessity to collaborate with other firms in order to realize their vision. However, the corporate manager had to prohibit any collaboration (which would have implied investments though other corporations) due to the contract concluded with his investor. As a consequence of the lacking freedom to act, the business unit managers left and founded their own company, which has grown to more than 100 employees. This growth potential could have had also materialized in Company 5 if the business unit managers would have had sufficient autonomy to act.

Second, the corporate manager reduced the autonomy of his employees significantly in Stage 3 when the business unit managers founded their own company and recruited therefore some of the best employees of Company 5. The reduction of autonomy is indicated through the following three reactions. Reaction 1: the corporate manager enforced directive leadership as all projects were managed by himself. The projects were before managed rather autonomously by the project managers. Reaction 2: employees were now treated as functional specialists with restricted qualification, training, strict job descriptions and limited access to the intranet. Reaction 3: rather than treating employees as independent decision-makers, decisions were now almost exclusively made by the corporate manager. Consensus exists that directive leadership (reaction 1), limitations concerning the employee's competences (reaction 2) and centralized decision making (reaction 3) indicate limited autonomy which decreases the organizational ability to generate innovation (cf. Burns & Stalker, 1961; Lawrence & Lorsch, 1967). Confirming this assumption, it is described in Stage 4 that the reactions of the corporate manager (a, b and c) had negative effects on the ability

of his company to generate innovation. The corporate manager stated, that due to his reactions, the employees at his company were unable to invent new business ideas.

Third, the corporate manager learned that the ability to generate a new business is directly associated with an increase of autonomy. He initiated two trials to develop new businesses through corporate ventures. In the first trial, two corporate venture (subsidiaries) were established in Stuttgart and Ingolstadt in order to enable the venture managers (subsidiary managers) to act autonomously. In fact however, sales targets were set by the corporate manager mindful of tight budgets, basic decisions (e.g., which commercials to provide or where to place an offer) were made by the corporate manager and the operational business influenced through close project plan reviews and other controlling instruments. New businesses did not emerge and the corporate manager engaged in a second trial where he established a corporate venture that should develop the collaboration business rather autonomously. In contrast to the first trial, the corporate manager stated that he would like the team to act autonomously in order to develop the new business.

Although, the new business was at an early stage when interviews ended, we may conclude that the corporate manager recognized through his learning experience (the three described situations) that sufficient autonomy is a prerequisite for the ability to develop new businesses successfully through corporate ventures.

3.4 ABSTRACTING FOUR DISTINCT AUTONOMY DIMENSIONS FROM THE CASES

The two cases of Company 4 and Company 5 give a first idea to how the autonomy of the venture manager is characterized. Literature research was conducted to explore the dimensions of autonomy that were observed in the cases. In the Subsections 3.4.1 to 3.4.4, we identified four autonomy dimensions, namely, (1) functional autonomy, (2) decision autonomy, (3) strategic autonomy and (4) job autonomy.

3.4.1 FUNCTIONAL AUTONOMY

Literature research: In the engineering literature, functional autonomy is an established concept. Consensus exists that new product development teams should be functional autonomous, thus incorporate all experts on function in order to perform their tasks concurrently (cf. Clark & Fujimoto, 1991; Susman & Dean, 1992; Gerwin & Moffat, 1997). Corporate ventures are similar to new product development teams cross-functional. Corporate venture teams generally involve representatives from distinct functional areas (e.g., sales, marketing, R&D) (cf. Hill & Hlavacek, 1972; Burgelman, 1983; Alterowitz, 1988; Brazeal, 1993). Corporate ventures with full functional autonomy would operate independent from the corporation as functional complete subunits.

Refection: In the case of Company 4, the level of functional autonomy was rather low, which is evident from a high sharing of experts on function (e.g., marketing and sales) between the corporation and the corporate venture team. For example, the turnkey business was developed and internationalized through a cross-functional team (e.g., experts in marketing, sales, training and service). However, many of these experts on function (e.g., concerning sales, training or marketing) worked actually for Company 4 and were only involved in some venture activities. In contrast, the sharing of experts on function was rather low in the case of Company 5. Only one expert on function (sales) was temporarily provided by the corporation in the first trial. In the second trial, the team was functionally complete.

3.4.2 DECISION AUTONOMY

Literature research: Decision autonomy is described in prior studies as the authority to make operational decisions without consensus seeking or the freedom from excessive control (see, e.g., Hornsby, Kuratko, & Zahra, 2002a; Kuratko, Ireland, Covin, & Hornsby, 2005). Decision autonomy is seen as one major antecedent for entrepreneurial initiatives to emerge and thrive (cf. Kanter, 1989; Lumpkin & Dess, 1996; Hornsby et al., 2002a; Kuratko et al., 2005; Lumpkin et al.,

2009). Negative implications on corporate venture success are expected when corporate management does not provide venture managers with the authority to make operational decisions (e.g., Quinn, 1985; Crockett et al., 2013).

Reflection: High levels of decision autonomy enabled the venture manager in Company 4 to act with greater flexibility when developing the new business. For example, the venture manager recognized the turnkey business opportunity and made several decisions responsively in order to develop the business. He decided which third party equipment manufacturers to collaborate with, to develop marketing and training concepts and to establish training and service teams. These decisions were made basically by the venture manager (interviewee) without time-consuming approval meetings with the corporate manager. Thus, decisions related to business development activities were made flexible and free from direction and limitation enforced by the corporation. In Company 5, the decision autonomy granted to the venture managers in charge for the teams in Stuttgart and Ingolstadt (first trail) was rather low as only some decisions referring to project management and human resource development could be made without the approval of the corporate manager.

3.4.3 STRATEGIC AUTONOMY

Literature research: In strategic management, strategic autonomy is a further measure underpinning the concept of autonomy (Floyd & Lane, 2000). This dimension of autonomy can be characterized as the authority to make strategic decision without approval (Andersen, 2004). One stream of research in strategic management builds on the assumption that new strategic influence evolves bottom-up (cf. Mintzberg, 1973, 1978; Mintzberg & Waters, 1985; Bower, 1986; Mintzberg, 1994; Burgelman & Grove, 1996). It is acknowledged that such a bottom-up approach requires autonomous strategic decision-making across the corporation in order to enable new strategic influence to emerge (cf. Hart, 1992; Andersen, 2000). Accordingly, strategic influence

may be achieved by allowing venture managers to make strategic decisions without approval (cf. Burgelman, 1983; Andersen, 2004).

Reflection: In Company 4, high levels of strategic autonomy enabled the venture manager to develop the strategic direction of the turnkey business. The strategy to enter the Asian markets and to establish a sales and service organization subsequently was not intended when the venture manager decided to develop the turnkey business in the first place. Rather, the venture manager recognized the tendency of turnkey manufacturers to enter the Asian market through close interaction with these customers. Perceiving this tendency as an opportunity, he made the strategic decision to enter the Asian market in cooperation with the turnkey manufacturers. Similarly, the strategic decision to establish an own sales and service organization in Asia emerged when the venture manager recognized (when he engaged in first sales activities) that service reliability was one major value proposition for Asian end-customers. Another strategic decision referred to the strategic direction of R&D activities. Here the venture manager decided without approval to focus on quality measurement equipment for high quality instead of high quantity production processes (based on experience gained from trade fairs). Thus, the level of strategic autonomy was rather high in Company 4. In Company 5, the venture managers (Stuttgart and Ingolstadt) had a rather low influence on the strategic direction of their businesses. They were not part of the group in which strategic issues were discussed and strategic decisions were made by the corporate manager.

3.4.4 JOB AUTONOMY

Literature research: In work design scholars, job autonomy can be described as the authority to make work-mode decisions without approval or the authority that one holds in his job (cf. Hackman & Oldham, 1975a; Hackman, 1990). Work-mode decisions refer to the legitimacy to autonomously choose the work methods, define the scheduling of the work and select the work criteria (cf. Gulowsen, 1972 ; Breaugh, 1985). Job autonomy alludes to the independence of

individuals to fulfill a job free from restrictions (see, e.g., Lumpkin & Dess, 1996), which is a major motivation for people to perform their job (cf. Spector, 1986) and show creative work involvement (Volmer, Spurk, & Niessen, 2012).

Reflection: The case of Company 4 shows that the venture manager was the only driver for making work-mode decisions. When it was decided to adapt the business model towards the turnkey business, he decided how to do the job and coordinated marketing experts, composed a training team, mobilized experts that worked for the company beforehand and managed the work of these experts when conducting first projects in Asia. Similarly, the job to establish the sales and service organization in Asia was also conducted autonomously by the venture manager. In the case of Company 5, the level of job autonomy (Stuttgart and Ingolstadt) was moderate. The corporate manager took over the work-mode decisions for both teams when the business showed bad performance (i.e., lost key customers and where not able to acquire new projects). For example, the corporate manager decided how the teams should go over the job and rescheduled the activities of programmers (Stuttgart) and sales experts (Ingolstadt). The insights that can be drawn from these characterizations are concluded in the following.

3.5 CHAPTER CONCLUSION

This chapter answers *RQ1: What are the dimensions reflecting the autonomy that corporate management grants to venture managers?* The dimensions reflecting the autonomy of venture managers were explored and characterized. The results indicate that the venture manager's ability to launch a new business for the corporation is determined through four autonomy dimensions: (1) functional autonomy, (2) decision autonomy, (3) strategic autonomy and (4) job autonomy. The identification of the four autonomy dimensions provides the conceptual framework for Chapter 4

where the autonomy dimensions are operationalized in an initial four-dimensional autonomy construct that reflects the autonomy of venture managers.

Chapter 4

Operationalizing a Multidimensional Autonomy Construct

This chapter contributes to answering *RQ2: How can the autonomy dimensions identified by RQ1 be operationalized in a construct that enables us to measure the autonomy of venture managers?* The attempt for providing an answer to this research question is supplemented by the corresponding partial answer given in Chapter 5. The research presented in Chapter 3 identified that the autonomy of venture managers is reflected in four dimensions, namely, functional autonomy, decision autonomy, strategic autonomy and job autonomy. In this chapter, a theoretical model is developed that associates the four autonomy dimensions with corporate venture success. The model is operationalized in such a way that it provides an initial construct reflecting the autonomy of venture managers.

This chapter is based on the following publication[2]:

Gard, J., Baltes, G., & Katzy, B. (2013). **An Integrating Model of Autonomy in Corporate Entrepreneurship**. In the proceedings of the 19th ICE & IEEE-ITMC International Conference, pp. 221-235. The Hague, Netherlands.

The structure of the study is as follows. Section 4.1 sheds light on the semi-autonomous nature of corporate ventures and the necessity to measure autonomy at various dimensions. Section 4.2

[2] The author would like to thank his co-authors and the publishers of the ICE & IEEE-ITMC 2013 proceedings for their permission to reuse relevant parts of the articles in this thesis.

highlights the prevailing theoretical assumption that autonomy is essential for successful corporate venture creation and discusses established autonomy constructs. In Section 4.3, the theoretical model is designed and further developed. It is operationalized in Section 4.4. The chapter conclusion in Section 4.5 provides a partial answer to RQ2.

4.1 THE SEMI-AUTONOMOUS NATURE OF CORPORATE VENTURES

Corporate ventures develop new businesses for the corporation and are therefore separated typically from the mainstream business (see, e.g., Kuratko, 2010). They are entrepreneurial teams with the explorative task to invent a new business for entering novel business domains (Garrett & Covin, 2013). The new business evolves essentially through explorative learning efforts, such as experimentation, improvisation and search for alternatives (Simon & Houghton, 1999; McGrath, 2001). However, the corporate mainstream business is built generally around formalization and rigid hierarchies with the aim to achieve organizational efficiency (cf. Jansen et al., 2009). The organizational settings are usually ill-suited to support the explorative learning efforts through which the corporate venture thrives to a mature subunit (Dess et al., 1999). It is therefore assumed that corporate ventures should be separated from the corporation (see, e.g., Birkinshaw et al., 2002) in order to protect them from the rigid managerial cognitions and organizational inertia of the mainstream business (Block, 1989; Dougherty, 1995; Gilson, Mathieu, Shalley, & Ruddy, 2005; McGrath et al., 2012). Building on this logic, it is acknowledged that corporate venture success is associated positively with separation/autonomy (see Schuler, 1986; Kanter, 1989; Simon & Houghton, 1999; Birkinshaw et al., 2002; Burgers et al., 2009).

However, autonomy needs to be balanced carefully. Autonomy may (a) provide corporate ventures with the freedom and flexibility required to engage effectively in explorative learning modes for exploring new capabilities (Thornhill & Amit, 2000; Garrett & Neubaum, 2013). It may, however,

also (b) hamper the exploitation of those capabilities already existing in the corporation as separation isolates corporate ventures from the rest of the corporation (Garrett & Covin, 2013). Building on the assumption that corporate ventures are most successful when having the ability to simultaneously develop new capabilities and capitalize on those that already exist in the corporation (cf. Hill & Birkinshaw, 2012), it does not seem promising to establish corporate ventures as fully autonomous subunits.

Therefore, it is considered that establishing corporate ventures with suitable autonomy is more complex than simple physical separation would imply (see, e.g., Kuratko, 2010). Studies show that the autonomy of corporate ventures may reflect many conditions, such as loose versus tight control (Crockett et al., 2013), centralized versus decentralized decision-making (Birkinshaw & Hill, 2005) or dependent versus independent venture operations (Garrett & Covin, 2013). Capturing these distinct conditions involves multiple measures. It is therefore assumed that a multidimensional construct is necessary to measure the autonomy of corporate ventures precisely (see Johnson, 2012). However, research highlights that such a construct is yet to be developed (Kuratko et al., 2009; Lumpkin et al., 2009; Johnson, 2012; Crockett et al., 2013). This chapter contributes to the current body of knowledge by operationalizing an initial multidimensional construct that reflects the autonomy of venture managers.

4.2 AUTONOMY OF CORPORATE VENTURES

Corporate ventures are established by corporations for the purpose to develop a new business, tailored to enter novel business domains (e.g., Block & MacMillan, 1993; Garrett & Covin, 2013). Separation or autonomy allows corporate ventures to operate outside the established managerial cognitions (Gilbert, 2005), restrictive control systems (Simon & Houghton, 1999) and standard operating procedures of the mainstream business, all of which is necessary to invent the new

business (Block & MacMillan, 1993; Kuratko et al., 2009). Autonomy is particularly essential because prior knowledge concerning the market parameters (i.e., costumers or technologies) in the novel business domains is generally low (Kanter, 1985; Birkinshaw, 2005). This lack of prior knowledge involves that the task environment of corporate ventures is highly unpredictable (e.g., McGrath et al., 2012). Business development activities emerge and thrive under these conditions, essentially through explorative learning (Simon & Houghton, 1999). Autonomy is acknowledged as a prerequisite for effective explorative learning and thus essential for corporate venture success (McGrath, 2001).

Although scholars hold the prevailing view that autonomy is critical for the success of corporate ventures (see, e.g., Simon & Houghton, 1999; Birkinshaw & Hill, 2005; Crockett et al., 2013). It is however criticized by some that autonomy is often oversimplified (e.g., establishing corporate ventures as separated subunits) which may result in quick but not necessarily effective implementation of autonomy (see Lumpkin et al., 2009; Johnson, 2012). The autonomy of corporate ventures was measured previously through the extent to which (1) venture decision making is separated from the corporation and (2) venture operations are separated from the corporation (cf. Birkinshaw & Hill, 2005; Kuratko et al., 2009). However, these measures were severely criticized. Consequently, the discussion of the relationship between these two autonomy measures and corporate venture success falls prey to great controversy (Garrett & Covin, 2013). We illustrate the controversy by two examples. First, whereas some studies show that corporate venture success increases when venture managers enjoy high levels of decision authority (Birkinshaw & Hill, 2005; Crockett et al., 2013), others have found an inverse relationship (Thornhill & Amit, 2000). Second, studies investigating the separation of venture operations have been similarly inconclusive as they also show contradicting relations with corporate venture success (cf. Kuratko et al., 2009; Johnson, 2012; Garrett & Covin, 2013).

These findings highlight that the autonomy determining corporate venture success may not be well understood and that further conceptual work, in particular refining the ideas of autonomy, is required to generate a comprehensive understanding of the measurement construct (cf. Johnson, 2012). An explorative study was therefore conducted in Chapter 3. The results indicate that the autonomy of venture managers is mainly determined through the following four autonomy dimensions: functional autonomy, decision autonomy, strategic autonomy and job autonomy. These four autonomy dimensions are discussed in the following and propositions are developed that associate them with corporate venture success.

4.3 MODEL DEVELOPMENT

In this section, our theoretical model is presented. Therefore, propositions are developed for each autonomy dimension. In the Subsections 4.3.1 to 4.3.4 the propositions that integrate the autonomy dimensions as distinct measures in the theoretical model are developed. The propositions are summarized in Subsection 4.3.5 and illustrated in Figure 4.7.

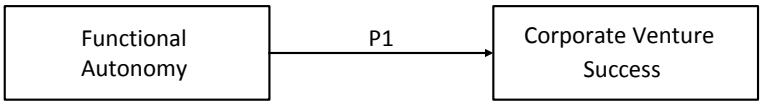
4.3.1 FUNCTIONAL AUTONOMY

In early studies, corporate ventures are characterized as cross-functional teams (e.g., with its own sales, marketing and controlling experts) that are functional autonomous from their corporations (cf. Hill & Hlavacek, 1972; Alterowitz, 1988). Later studies acknowledge that it may be beneficial to establish corporate ventures as (autonomous) cross-functional teams in order to enter new business domains successfully, in particular when the degree of novelty is high (Hitt, Nixon, Hoskisson, & Kochhar, 1999). In these cases, concurrent engineering is known as a means to coordinate the parallel work activities of the multiple experts effectively (McDonough, 2000; Koufteros, Vonderembse, & Jayaram, 2005). New business development requires multi-functional expertise and research demonstrates that it is essential for corporate venture success to pursue these

multidisciplinary activities concurrently (Katzy, Baltes, & Gard, 2014). An essential principle of concurrent engineering is that the team should consist of all experts on function that are required to perform the task (Hauptman & Hirji, 1999). Otherwise, the multiple experts on function need to be coordinated across the boundaries of functional departments (i.e., marketing, sales, R&D etc.), which is inappropriate for concurrent engineering. Building on the principle of concurrent engineering that cross-functional teams are essential to coordinate the parallel work effectively, I develop the proposition that functional autonomy (reflecting cross-functional teams) is associated positively with corporate venture success.

Proposition 1: Functional autonomy is related positively to corporate venture success.

Figure 4.1: The Impact of Functional Autonomy on Corporate Venture Success



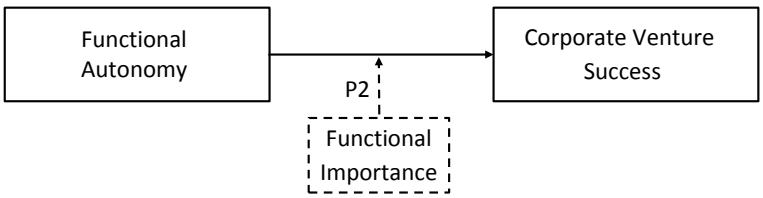
Whether it is more beneficial for corporate ventures to develop their own functional expertise (e.g., knowledge and competences concerning marketing, R&D and sales) or corporate ventures should instead utilize the expertise that is already existing in the corporation remains open for discussion (cf. Newburry & Zeira, 1999; Briody, Cavusgil, & Miller, 2004; Crockett, Payne, & McGee, 2007). Corporate ventures relying on corporate expertise increase unwittingly their dependence on the corporation (Christensen, 1997). Depending on corporate expertise restricts the venture's flexibility as ventures need to rely on rigid corporate rules to acquire corporate expertise, known as core incompetencies (Dougherty, 1995). These core incompetencies make it more unlike that new capabilities are developed and may therefore have a negative influence on corporate venture success (Garrett & Neubaum, 2013). However, it is also acknowledged that the redeployment of corporate resources (e.g., expertise) in novel business domains triggers the development of

innovative products and solutions, which may increase corporate venture success (see Baker & Nelson, 2005; McGrath et al., 2012).

While this debate continues, it is recognized that the benefits corporate ventures gain from corporate expertise may depend on how critical particular functional expertise (e.g., marketing expertise) is for corporate ventures to perform their task well (cf. Crockett et al., 2007; Garrett & Neubaum, 2013). Crocket et al. (2007) assume that corporate ventures should possess their own expertise on function (e.g., marketing) that are critical to perform their task successfully. Building on this prior assumption, I consider that the impact of functional autonomy on corporate venture success may be stronger when corporate ventures possess their own functional expertise in functional areas that are critical (functional importance) to achieve their task.

Proposition 2: *The relation between functional autonomy and corporate venture success is stronger when expertise in critical functional areas are possessed by corporate ventures.*

Figure 4.2: Functional Importance Amplifies the Impact of Functional Autonomy



The *moderation* effect that functional importance (business functions that are critical for corporate venture success) has on the relationship between functional autonomy and corporate venture success is not to be confused with a mediation effect. The moderation effect has a direct impact on the relationship between functional autonomy and corporate venture success whereas mediation would imply an indirect impact on the relationship (cf. Field, 2013).

4.3.2 DECISION AUTONOMY

Decision autonomy refers to the authority of venture managers to make decisions without seeking consensus with corporate management (e.g., Birkinshaw & Hill, 2005). Decision autonomy enhances venture managers to become more proactive and willing to take risks (cf. Bruining & Wright, 2002), which is attributed to entrepreneurial behavior (cf. Lumpkin & Dess, 1996; Hornsby, Kuratko, & Zahra, 2002b). The authority to make decisions without consensus seeking allows venture managers further to respond quickly to changes in their task environment (cf. Ginsberg & Hay, 1994) which allows them to pursue novel business opportunities more effectively (cf. Oates, 1971; Jones & Wilemon, 1973; McGrath et al., 2012). In contrast, venture managers without the authority to make decisions autonomously are unlikely to engage in innovative problem-solving and to foster new ideas (cf. McGrath, 2001).

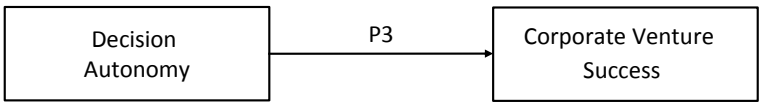
However, some research indicates that too much decision autonomy may increase the risk of failure (cf. Block & MacMillan, 1993; Simon & Houghton, 1999; Gebert, Boerner, & Lanwehr, 2003). Thornhill and Amit (2000) provide evidence that high levels of decision autonomy have a negative impact on corporate venture success. For example, such negative impact may occur due to opportunistic behavior, which can shift the vision of the new business towards individual interests (cf. Weinzimmer & Nystrom, 2015) and manifest inconsistencies with corporate strategy (cf. Feldman, 1989).

Further studies show that decision autonomy varies among functional areas, meaning for example that venture managers may have the authority to make decisions in marketing whereas corporate management makes R&D-related decisions (cf. Hill & Hlavacek, 1972; Crockett et al., 2007). Research illustrates that it is beneficial to grant decision autonomy in business functions that allow market adaptation through close interaction with market stimuli, such as customers (see Garnier, 1982; Harzing, 1999; Edwards, Ahmad, & Moss, 2002). In line with these findings, I argue that

corporate venture success is increased when venture managers are granted with decision autonomy in market-related business functions (e.g., marketing and sales).

Proposition 3: *Decision autonomy in business functions enabling market interaction is associated positively with corporate venture success.*

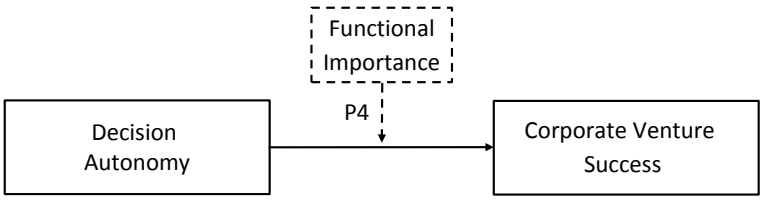
Figure 4.3: The Impact of Decision Autonomy on Corporate Venture Success



Moreover, the following proposition assumes that functional importance (business functions that are critical for corporate venture success) *moderates* the relationship between decision autonomy and corporate venture success. A positive association is found when decisions in critical business functions are made by venture managers (see Crockett et al., 2007). I build on this previous finding and argue that the impact of decision autonomy on corporate venture success depends on the importance of the respective business function (functional importance) to which decisions refer.

Proposition 4: *The relation between decision autonomy and corporate venture success increases when decisions in critical business functions are made by venture managers without approval.*

Figure 4.4: Functional Importance Amplifies the Impact of Decision Autonomy



The moderation effect of functional importance is not to be confused with a mediation effect, which would imply an indirect impact on the relationship between decision autonomy and corporate venture success (cf. Field, 2013).

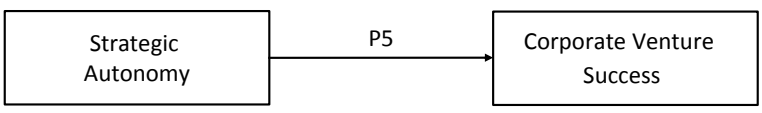
4.3.3 STRATEGIC AUTONOMY

Strategic autonomy can be defined as the authority of venture managers to make strategic decisions without seeking consensus (cf. Andersen, 2004). The relevance of strategic autonomy is rooted in the emergent nature of strategy, adhering that strategic initiatives emerge from and thrive through the managerial grassroots, i.e., middle management such as venture managers (see, e.g., Mintzberg, 1973, 1978; Mintzberg & Waters, 1985; Bower, 1986; Floyd & Wooldridge, 1992; Mintzberg, 1994; Burgelman & Grove, 1996). Emerging strategy entails that strategic initiatives can evolve unhindered from the current concept of corporate strategy (cf. Burgelman, 1983), and may even be unintended by corporate management (cf. Mintzberg & Waters, 1985). Correspondingly, it is argued in prior studies that managers should be allowed to define the means and ends of strategy autonomously (cf. Bouchard, 2002; Lumpkin et al., 2009).

Research provides evidence that strategic autonomy influences corporate success positively, especially in dynamic environments (cf. Burgelman, 1983; Andersen, 2004; Kuratko et al., 2005; Andersen & Knudsen, 2006). Thus, strategic autonomy seems to be particularly essential in uncertain task conditions where the cost for increased informal coordination of resources for mutual adjustments are outweighed by increased adaptability (cf. Thompson, 1966; Perrow, 1967). Corporate venturing is associated generally with high levels of task uncertainty (McGrath & Kim, 2013). It is therefore reasonable to assume that corporate venture success increases when venture managers are granted strategic autonomy. Correspondingly, I posit the following proposition.

Proposition 5: Strategic autonomy is related positively to corporate venture success.

Figure 4.5: The Impact of Strategic Autonomy on Corporate Venture Success

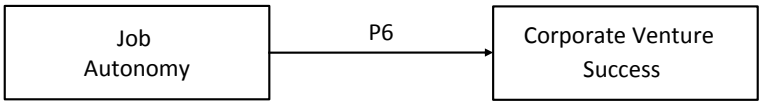


4.3.4 JOB AUTONOMY

Job autonomy is an essential characteristic of job design and refers to the discretion that the venture manager enjoys in his job (see, e.g., Hackman & Oldham, 1975b; Breaugh, 1985). Individuals with increased job autonomy are found to feel more motivated and responsible to achieve their tasks (see Parker & Sprigg, 1999; Volmer et al., 2012) which may explain the positive association between job autonomy and job performance (cf. Hackman & Oldham, 1976). It is further acknowledged that job autonomy enables self-determination (cf. Deci & Ryan, 2000; Niemiec, Ryan, & Deci, 2010), fosters creativity (cf. Hennessey & Amabile, 2010; Unsworth & Clegg, 2010), inspires creative work involvement (cf. Volmer et al., 2012), and role breath self-efficacy (cf. Axtell & Parker, 2003). These findings indicate that job autonomy allows venture managers to break out of established work procedures and think outside the box, which is essential to invent effective work methods for the new business (see Block & MacMillan, 1993; Kuratko, 2010). I therefore assume that corporate venture success increases when venture managers are granted with high levels of job autonomy.

Proposition 6: Job autonomy is related positively to corporate venture success.

Figure 4.6: The Impact of Job Autonomy on Corporate Venture Success

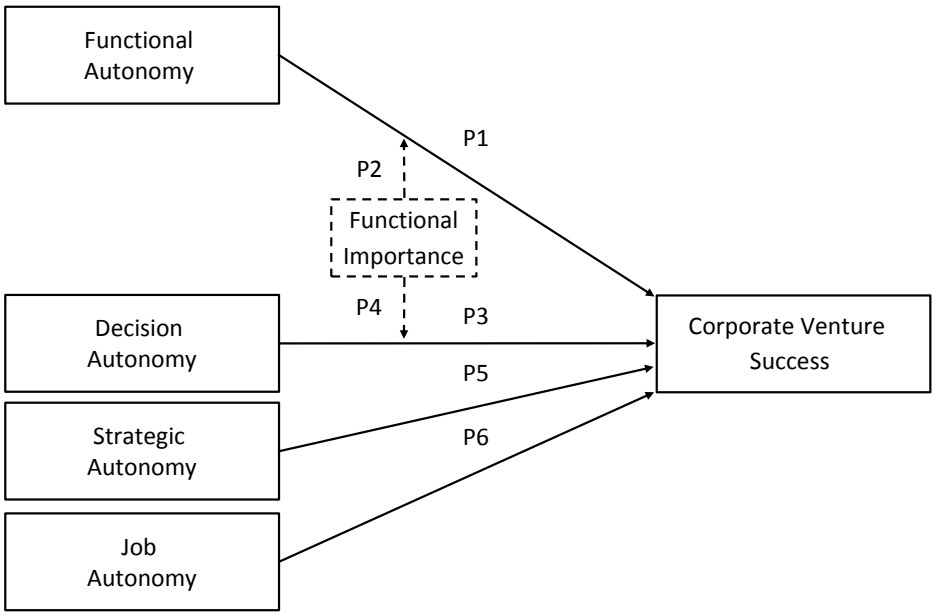


4.3.5 SUMMARIZING THE MODEL

The six propositions integrate the four autonomy dimensions into a theoretical model that relates functional autonomy, decision autonomy, strategic autonomy and job autonomy with corporate venture success. Functional importance is considered to moderate the relationships of functional

autonomy and decision autonomy with corporate venture success. The propositions are illustrated in Figure 4.7 and summarized below.

Figure 4.7: A Theoretical Model Associating Autonomy with Corporate Venture Success



Functional autonomy refers to the extent that functional expertise is available in the corporate venture team and may thus be seen as an indicator for cross-functionality. *Proposition 1 (P1)* assumes that venture creation involves the concurrent coordination of multidisciplinary activities (cf. Katzy et al., 2014) and cross-functionality has positive implications on corporate venture success. *Proposition 2 (P2)* builds on prior research which indicates that the impact of functional autonomy on corporate venture success may be enforced when functional expertise in critical business functions is available in the corporate venture team.

Decision autonomy reflects the authority of venture managers to make decisions in distinct business functions without approval. *Proposition 3 (P3)* acknowledges that new business development activities emerge and thrive through market interaction. Venture managers require therefore the ability to make responsive decisions in business functions that enable market interaction (e.g., marketing and sales) (cf. Edwards et al., 2002). Thus, it is assumed that corporate

venture success is enforced when venture managers are authorized to make decisions in market-related business functions without approval. *Proposition 4 (P4)* considers that corporate venture success may be influenced positively when the venture manager enjoys the authority to make decisions in business functions that are critical for new business development (cf. Crockett et al., 2007).

Strategic autonomy is the extent to which venture managers have the authority to make strategic decisions without approval (cf. Andersen, 2004). This authority underpins the ability of venture managers to undertake autonomous strategic initiatives (see Burgelman, 1983). The ability to do so is particularly important when environmental conditions are unpredictable, which is generally the case for corporate ventures (cf. Garrett & Covin, 2013). *Proposition 5 (P5)* therefore considers that corporate venture success is increased when venture managers are granted strategic autonomy.

Job autonomy defines the extent to which venture managers enjoy the authority to make work-mode decisions without seeking consensus with corporate management (cf. Breaugh, 1985). This authority allows venture managers to operate outside the established work procedures, which is essential to invent effective work methods (cf. Block & MacMillan, 1993; Kuratko, 2010). Correspondingly, *Proposition 6 (P6)* assumes a positive relationship between job autonomy and corporate venture success. The measures of the model are operationalized in the following section.

4.4 OPERATIONALIZATION OF THE MEASUREMENT SCALES

The measurement scales associated with the variables highlighted in Figure 4.7 are operationalized in this section. Although established measurement scales are utilized, the scales needed to be adapted in order to ensure their appropriateness to the context of corporate ventures. Therefore, an evaluation study is conducted with five venture managers and six corporate managers (overall twelve interviews as one manager is interviewed twice). On overview is given as an information

example in Appendix B. The measures are operationalized (questionnaire) by Jérôme Gard, Bernhard Katzy and Guido Baltes and finally approved by the latter two. The operationalized measurement scales are reported in the Subsections 4.4.1 to 4.4.6. The measures are operationalized on a 6-point Likert scale, which is chosen for two reasons. First, the 6-point Likert scale is consistent with the German school grading system, which ensures that the participants are familiar with the meaning of the scale. Second, a neutral answer is not possible on a 6-point Likert scale as there is no central point, which would be the case on a 5-point and 7-point Likert scale.

4.4.1 FUNCTIONAL IMPORTANCE

Definition 4.1: **Functional Importance** "*refers to the relevance of the eight business functions (1) marketing, (2) human resource development, (3) sales, (4) service, (5) finance and controlling, (6) legal affairs, (7) project management and (8) research and development to develop a new business successfully" (cf. Crockett et al., 2013).*

The scale for measuring functional importance is adapted from Crocket et al. (2007). A list of ten business functions (Marketing, HR, Sales, Customer Service, Technical Support, Strategy, Finance and Controlling, Legal Affairs, Production and R&D) is presented to the participants of the evaluation study while they are asked to select the most critical business functions for successful new business development. Out of ten, the following eight business functions are identified as critical: Marketing (e.g., marketing of new products and services), Human Resource Development (e.g., training and recruiting), Sales (e.g., sales activities), Service (e.g., support and service), Finance and Controlling (e.g., project-controlling and profit-loss accounting), Legal Affairs (e.g., cooperation and patents), Project Management (e.g., definition of milestones and key performance indicators) as well as Research and Development (e.g., development- and programming activities).

We adapted the original scale for the following four reasons. First, we consolidated the two business functions Customer Service and Technical Support to Service. The reason is that the two

business functions can often not be distinguished when the product is a service itself. This is particularly the case in the IT consulting industry for which the questionnaire is developed (see Subsection 1.3.4). Second, we question that Production in the sense of manufacturing products is relevant in the IT consulting industry where products are often software, thus manufacturing is not required. Third, we find that Project Management is an essential business function in the IT-industry, where the project business is dominating the product business. We therefore consider Project Management as an import business function and operationalized it in our measurement scale. Fourth, we rejected Strategy as we do not perceive strategy making as a business function. We rather consider it as a competence of the venture manager as it is later described in Subsection 4.4.4.

Corresponding to the four reasons, the original ten-item measurement scale is reduced to the eight-item scale. Our scale is summarized in Table 4.1. There, participants are asked to indicate the importance of each of the eight business functions for the success of the new business on a 6-point Likert scale. A score of 1 means that the function has very little influence on success and a score of 6 means that the function is critical for the success of the new business. The measurement scale is also presented in Table 4.1.

Table 4.1: Functional Importance Measurement Scale adapted from Crockett et al. (2007)

Functional Importance adapted from Crockett et al. (2007)						
Participants are asked to indicate the importance of each of the eight business functions for the success of the new business.						
	Very little influence on success					Critical for success
	1	2	3	4	5	6
1. Marketing	○	○	○	○	○	○
2. Human Resource Development	○	○	○	○	○	○
3. Sales	○	○	○	○	○	○
4. Service	○	○	○	○	○	○
5. Finance and Controlling	○	○	○	○	○	○
6. Legal Affairs	○	○	○	○	○	○
7. Project Management	○	○	○	○	○	○
8. Research and Development	○	○	○	○	○	○

4.4.2 FUNCTIONAL AUTONOMY

Definition 4.2: **Functional Autonomy** "*reflects the extent to which corporate ventures rely on functional experts that are provided externally from the corporation or elsewhere, with respect to the eight business functions (1) marketing, (2) human resource development, (3) sales, (4) service, (5) finance and controlling, (6) legal affairs, (7) project management and (8) research and development" (cf. Crockett et al., 2013).*

The scale for measuring functional autonomy is also adapted from Crocket et al. (2007). The original measurement scale is adapted in such a way that participants are asked to indicate whether expertise in each of the eight business functions (highlighted in 4.4.1) is available in the corporate venture team or provided externally through the parent company or elsewhere. Therefore, a 6-point Likert scale is used. A score of 1 indicates that expertise is primarily provided externally and a score of 6 indicates that expertise is primarily available within the corporate venture team. The measurement scale is presented in Table 4.2. We adapted the measurement scale as we did in Subsection 4.4.1 with the same reasoning mentioned in 4.4.1.

Table 4.2: Functional Autonomy Measurement Scale adapted from Crockett et al. (2007)

Functional Autonomy adapted from Crockett et al. (2007)						
Participants are asked whether expertise with respect to the following business functions is available within the team or provided externally.						
	Expertise is primarily provided externally 1	2	3	4	5	Expertise is primarily available in the team 6
1. Marketing	○	○	○	○	○	○
2. Human Resource Development	○	○	○	○	○	○
3. Sales	○	○	○	○	○	○
4. Service	○	○	○	○	○	○
5. Finance and Controlling	○	○	○	○	○	○
6. Legal Affairs	○	○	○	○	○	○
7. Project Management	○	○	○	○	○	○
8. Research and Development	○	○	○	○	○	○

4.4.3 DECISION AUTONOMY

Definition 4.3: **Decision Autonomy** "*is the authority of the venture manager to make decision concerning the eight business functions (1) marketing, (2) human resource development, (3) sales, (4) service, (5) finance and controlling, (6) legal affairs, (7) project management and (8) research and development" (cf. Crockett et al., 2013).*

The scale for measuring decision autonomy is also adapted from Crocket et al. (2007). The measurement scale indicates how frequently the venture manager relies on the approval of corporate management when making decisions in each of the eight business functions (highlighted in 4.4.1 and 4.4.2) on a 6-point Likert scale. A score of 1 means that approval through corporate management is almost always required and a score of 6 means that approval through corporate management is almost never required. Similar measures are applied previously in numerous studies (see, e.g., Hill & Hlavacek, 1972; Hedlund, 1979; Birkinshaw, 1997; Birkinshaw & Hood, 1998; Edwards et al., 2002; Manolopoulos, 2006; Crockett et al., 2007). Table 4.3 presents the

measurement scale. We adapted the measurement scale as we did in the Subsections 4.4.1and 4.4.2 with the same reasoning given in 4.4.1

Table 4.3: Decision Autonomy Measurement Scale adapted from Crockett et al. (2007)

Decision Autonomy adapted from Crockett et al. (2007)						
Participants are asked to indicate how frequently they need to seek the approval of their corporate supervisor(s) when making decisions in the following business functions.						
	Approval though my supervisor is almost always necessary					Approval though my supervisor is almost never necessary
	1	2	3	4	5	6
1. Marketing	○	○	○	○	○	○
2. Human Resource Development	○	○	○	○	○	○
3. Sales	○	○	○	○	○	○
4. Service	○	○	○	○	○	○
5. Finance and Controlling	○	○	○	○	○	○
6. Legal Affairs	○	○	○	○	○	○
7. Project Management	○	○	○	○	○	○
8. Research and Development	○	○	○	○	○	○

4.4.4 STRATEGIC AUTONOMY

Definition 4.4: **Strategic Autonomy** "*is the authority of the venture manager to make strategic decisions without approval" (cf. Andersen, 2004).*

The measurement scale of strategic autonomy builds on the construct developed by Aiken and Hage (1967; 1971) for measuring centralization. Andersen (2004) modified the scale by considering strategic issues such as "market activities, product and service developments, change in practices and policies" (Miller, 1987). For the context of corporate ventures, these strategic issues are adapted, considering the following six strategic decisions: research and development initiatives, new products and services, qualification of employees for future projects, new market segments, new customer segments and new business practices. Thus, the strategic issues highlighted by Miller (1987) are applied and enlarged through the qualification of the employees.

The six items to measure strategic autonomy are operationalized on a 6-point Likert scale. A score of 1 means that the venture manager almost never makes strategic decisions without the approval of corporate management whereas 6 means that the venture manager makes almost always strategic decisions without approval. The measurement scale is listed in the Table 4.4.

Table 4.4: Strategic Autonomy Measurement Scale adapted from Andersen (2004)

Strategic Autonomy adapted from Andersen (2004)						
Participants are asked how frequently they make decisions concerning the development of the new business without the approval of their corporate supervisor(s).						
	Is almost never true 1	2	3	4	5	Is almost always true 6
1. I can start research and development activities without the approval of my supervisor(s)	○	○	○	○	○	○
2. I am able to develop new products and services without the approval of my supervisor(s)	○	○	○	○	○	○
3. I can qualify employees for new projects without the approval of my supervisor(s)	○	○	○	○	○	○
4. I can decide without the approval of my supervisor(s) in which market segments future activities are conducted	○	○	○	○	○	○
5. I can decide without the approval of my supervisor(s) which customer segments are targeted in the future	○	○	○	○	○	○
6. I can introduce new policies and practices without the approval of my supervisor(s)	○	○	○	○	○	○

4.4.5 JOB AUTONOMY

Definition 4.5: **Job Autonomy** "*is the authority of the venture manager to make work-mode decisions without approval" (cf. Breaugh, 1985).*

The measurement scale for job autonomy builds on the work by Breaugh (1985), which highlights three major aspects that one enjoys in a job (Breaugh, 1985, 1999). The aspects are method autonomy ("the degree of discretion/choice individuals have regarding the procedures/methods

they utilize in going about their work"), scheduling autonomy ("the extent to which individuals feel they can control the scheduling/sequencing/timing of their work activities") and criteria autonomy ("the degree to which individuals have the ability to modify or choose the criteria used for evaluating their performance"). The three aspects are reflected in the seven-item measure given by Breaugh (1985). The measure indicates to what extent the venture manager is authorized to make decisions considering work procedures/methods, scheduling/sequencing/timing and the key performance indicators of his team, without approval. Participants are therefore asked to indicate how frequently the venture manager may act without the approval of corporate management concerning the identified aspects, on a 6-point Likert scale. A score of 1 means that approval is almost always required and a score of 6 means that approval is almost never required. The measurement scale is listed in Table 4.5.

Table 4.5: Job Autonomy Measurement Scale adapted from Breaugh (1985)

Job Autonomy adapted from Breaugh (1985)						
Participants are asked how autonomous from their corporate supervisor(s) they can act to develop the new business.						
	Is almost never true 1	2	3	4	5	Is almost always true 6
1. I can decide how to go about getting a job done without the approval of my supervisor(s)	○	○	○	○	○	○
2. I choose the way the team goes about a job without the approval of my supervisor(s)	○	○	○	○	○	○
3. I decide how the team reaches its goals without the approval of my supervisor(s)	○	○	○	○	○	○
4. I can schedule the work of the team without the approval of my supervisor(s)	○	○	○	○	○	○
5. I decide without the approval of my supervisor(s) when the team conducts particular work activities	○	○	○	○	○	○
6. My job allows to modify the way work is evaluated, so I can emphasize some aspects of the work and play down others	○	○	○	○	○	○
7. I have control over what the team is supposed to accomplish	○	○	○	○	○	○

4.4.6 CORPORATE VENTURE SUCCESS

Definition 4.6: **Corporate Venture Success** "*reflects the extent to which corporate management is satisfied with performance of the corporate venture" (cf. Venkatraman & Ramanujam, 1986; Brush & Vanderwerf, 1992).*

A subjective measurement scale is chosen for measuring the success of corporate ventures. This choice is made as financial performance measures (that are applied typically when businesses are established) are inadequate for new businesses. Particularly at an early stage when the new business is founded, turnover may not be the primary aim. Furthermore, profitability would be inadequate because the business did not have sufficient time to reach break-even. Subjective performance measures are therefore applied generally to measure the success of new businesses (cf. Dess & Robinson, 2006). Subjective performance measures enable one to distinguish the perception of managers (cf. Bantel, 1998) as well as their satisfaction with the performance of an organization (cf. Covin, Slevin, & Covin, 1990). Two performance issues are chosen, namely (a) perceived financial performance and (b) overall satisfaction. The measures for perceived financial performance refer to (1) satisfaction with turnover, (2) satisfaction with the time in which break-even is reached as well as (3) satisfaction with the increase of the sales margin. Overall satisfaction refers to (4) general meeting of expectations, (5) overall success of the new business, (6) achievement of milestones as well as (7) achievement of defined performance criteria. Participants are asked to indicate to what extent corporate management agrees with each of the seven items on a 6-point Likert scale. A score of 1 indicates total disagreement and a score of 6 means that corporate management agrees fully. Table 4.6 below shows the measurement scales.

Table 4.6: Corporate Venture Success Measurement Scale adapted from Brush & Vanderwerf (1992) and Venkatraman & Ramanujam (1986)

Corporate venture success adapted from Brush & Vanderwerf (1992) and Venkatraman & Ramanujam (1986)						
Participants are asked to assess the extent to what the following aspects concerning the development of the new business are true.						
	Is not true					Is true
	1	2	3	4	5	6
1. Corporate management is satisfied with the turnover that our team achieves	○	○	○	○	○	○
2. Corporate management is satisfied with the time that our team has reached (or will reach) break-even	○	○	○	○	○	○
3. Corporate management is satisfied with the sales margins that our team achieves	○	○	○	○	○	○
4. Our team generally fulfills the expectations of the corporate management	○	○	○	○	○	○
5. Overall corporate management perceives the development of the new business as being successful	○	○	○	○	○	○
6. Corporate management finds that our team fulfills the planned milestones as scheduled						
7. Corporate management finds that our team performs well according to the defined key performance indicators (KPIs)	○	○	○	○	○	○

4.5 CHAPTER CONCLUSION

The chapter provides a partial answer to *RQ2: How can the autonomy dimensions identified by RQ1 be operationalized in a construct that enables us to measure the autonomy of venture managers?* A theoretical model is developed that associates the four autonomy dimensions, namely, functional autonomy, decision autonomy, job autonomy and strategic autonomy with corporate venture success (see Figure 4.7). The model is subsequently operationalized, which provides an initial multidimensional construct that enables us to measure the autonomy of venture managers at various degrees and dimensions. The validity and reliability of the initial autonomy construct are evaluated statistically in Chapter 5.

Chapter 5

Evaluating and Adapting the Autonomy Construct

This chapter attempts to answer *RQ2: How can the autonomy dimensions identified by RQ1 be operationalized in a construct that enables us to measure the autonomy of venture managers?* For this task, the validity and the reliability of the initial multidimensional autonomy construct, presented in Chapter 4, are statistically evaluated and adapted. The resultant construct is the answer to RQ2. The chapter proceeds as follows. Section 5.1 presents the data set that is used to evaluate the initial autonomy construct. The procedure described by Field (2013) is followed in Section 5.2 in order to evaluate the validity and the reliability of the autonomy construct. The results of the chapter are summarized in Section 5.3. There the answer to RQ2 is formulated.

Parts of this chapter are based on the following publication[3]:

Gard, J., Baltes, G., Andersen, T. J., & Katzy, B. (Forthcoming 2016). **Corporate venture management in small-medium sized enterprise: The roles and effects of autonomy and corporate policy**. In the Journal of Business Venturing.

[3] The author would like to thank his co-authors and the publishers of the Journal of Business Venturing for their permission to reuse relevant parts of the articles in this thesis.

5.1 DATA SET USED TO EVALUATE THE AUTONOMY CONSTRUCT

The data set used to evaluate the validity and the reliability of the initial autonomy construct (provided in Chapter 4) is presented in this section. The section proceeds as follows. The Subsection 5.1.1 reports on the sample framing. The Subsection 5.1.2 describes the data collection. The Subsection 5.1.3 reports on the identification of the target population in the collected sample.

5.1.1 SAMPLE FRAMING

Corporate ventures are in contrast to independent ventures (i.e., start-ups) not visible from the outside. There is nothing like an ultimate source that would enable one to identify venture teams of corporations. So, the first action is already critical for the sample framing, viz. to identify corporations that are engaged in corporate venturing. The German IT consulting industry is recognized as an adequate industry for collecting corporate venture-related data (Fincham, 2006). The industry is facing continuous technological development and market change. Corporations competing in such an innovation-driven industry are required to renew continuously their businesses in order to establish long-time survival and profitability. Thus, the rate of corporate venture initiatives is expected to be rather high.

Database used to collect firm information

Firm information is gathered via the Hoppenstedt firm database[4]. More than 850,000 firms are listed and information, such as address, contact details, legal forms, NACE codes, size in number of employees and annual sales, names and positions of top and middle management, is available in the database (NACE is the European industry standard classification system; it

[4] http://www.hoppenstedt-firmendatenbank.de/

means Nomenclature Générale des Activités Économiques dans les Communautés Européennes). With respect to the sample framing, the Hoppenstedt database is chosen to identify small-size to medium-size IT consulting firms in Germany and to gather information concerning managers that are potentially involved in corporate venture initiatives.

Gathering information on the target firms

Data collection is restricted to SMEs for the reasons given in Subsection 1.3.4. According to the classification of the European Commission (Commission, 2003), a firm size between 30 to 400 employees and a turnover above 4 million Euro are chosen as selection criteria. SMEs in the German IT-industry are identified through NACE codes. The codes are captured by using secondary databases provided by Oracle, Microsoft and SAP. The secondary databases contain IT consulting firms that are certified distribution partners and implementation partners of the three global players. The analysis of the databases reveals that IT consulting firms can be identified by the following 5-digit NACE codes: 72100, 72221, 72223, 72305, 72602 and 74141. According to the German Classification of Economic Activities (WZ2003), the NACE codes have the following meanings: hardware consultancy (72100), software consultancy (72221), other software development (72223), other data processing (72223), other computer related activities n.e.c. (72602) as well as business and management consulting activities (74141).

14451 corporations are identified in the Hoppenstedt database using the five identified NACE codes as selection criteria. 11495 of these firms are classified as micro firm (<30 employees) and 184 as large firms (>400 employees). The remaining 2772 (14451-11495-184) are identified as SMEs and retained for the study. Firm profiles are checked online and firms excluded when related to other industries. In total, 2649 German IT consulting firms remained and are identified in the database as SMEs.

The target population

The target population are the managers of the 2649 firms that are involved in corporate venture management. However, there is no ultimate source that would clearly identify those managers. In fact, every top- and middle manager might or might have been involved in corporate venture management. In order to create a comprehensive list of potentially involved managers, the researcher and his support staff went through the Hoppenstedt firm database and extracted the names and email addresses of the top- and middle managers. In the 2649 firms, the names and email addresses of 15420 managers could be extracted from the Hoppenstedt database. All email addresses were checked by the support staff using google as a search engine, whereby only those email addresses were recorded that were found via google search. Overall, 14850 (of the 15420) email addresses were found, thus evaluated.

As a result of our sample framing approach based on available information in the Hoppenstedt database in combination with google search, the resulting sample population of 14850 (the collected sample) may differ fundamentally from the target population. The difference is the result of an over-coverage of the target population. It can be expected that not all managers in the sample are/were involved in corporate venture management. The reason is that the Hoppenstedt database does not provide the exact job description so that for example project managers or assistants may be included in the sample. Thus, not all people in the sample population are part of the target population. In the following, the data collection is described before the method applied to extract the target population from the sample population is described in Subsection 5.1.3.

5.1.2 DATA COLLECTION

Data is collected via an online survey, using the web 2.0-based software Qualtrics. The data collection was started on November 5, 2012 and ended on January 10, 2013. Using the email template given in Appendix D1, the 14850 managers were invited via email to participate in the

study. Following the web link provided in the email, participants were directed automatically to the starting page of the online survey (see Appendix D2). By entering the access code, which was also provided in the email, they could start the survey.

Overall, 2322 emails could not be delivered and were returned to the sender, primarily with the message that the email address did not exist. It was checked whether (a) the email addresses were outdated or (b) a mistake was made in the collection of email addresses or the sending of email. In fact, all email addresses could be found via google. A sample of 100 email addresses were cross-checked by searching on the homepage of the respective company whether the email addresses could be found. It was found that the email addresses were outdated as they could primarily not be found on the companies' homepages.

Although a certain number of email were invalid, the collection and the email sending was sound and 12528 emails reached their addressees. In total, 607 responses were received during the data collection period. These responses refer to fully completed surveys only. As invitations to the online survey where sent to several managers in the same firm, it is not surprising that several answers were received from the same firm. The 607 responses were received from 473 distinct firms. In addition to the fully completed surveys, 553 partially completed surveys were received. They are however not considered as relevant for this thesis and excluded from data analysis.

Particular care was taken to ensure that the respondents refer their answers to corporate ventures. Therefore, the following four steps are taken. *First*, a cover letter is provided to each participant on the start page of the online survey (see Appendix D2). The cover letter explains the aim of the study and gives a definition of the term corporate venture. *Second*, the first part of the survey is a Screener that includes (a) a question to identify whether participants are currently involved in corporate venturing or (b) participants were involved in corporate

venturing in the past (see the questions 3 and 4 in Appendix E2.1). Depending on their answers given, the questions of the survey are formulated in present of past tense. Those participants who had not experience with corporate ventures were directed to a different survey, which is not part of this study. *Third*, those participants with corporate venture experience are requested to make reference to a specific corporate venture team when responding to the survey. *Fourth*, the participants are asked to state their role in the corporation with respect to the relation they have with corporate ventures (see the question 8 in Appendix E2.1).

Although, particular care was taken to ensure that participants refer their answers to corporate ventures, it is expected that not all of them are part of the target population. Therefore, the following approach is applied to identify the target population in the collected sample.

5.1.3 IDENTIFICATION OF THE TARGET POPULATION IN THE COLLECTED SAMPLE

Three questions are included in the first part of the survey (Screener) that enable us to identify the target population in the collected data.

The first question (see the questions 1 in Appendix E2.1) aims to identify participants in a management position. Therefore, respondents are asked to state their current position in the company. Possible answers are, (1) Board of Directors, (2) Executive Board, (3) Chief Executive, (4) Head of the Business Development Department, (5) Head of another Department, (6) Project Manager/ Team Leader, (7) Employee and (8) another position. Only responses of participants in a management position (1-6) are considered.

In a second question (see the questions 3 in Appendix E2.1), participants need to state whether there is a team in their company that currently develops a new business, or did so during the past 3 years. Possible answers are, (1) yes, there are one or more teams that are currently developing a new business; (2) yes, we had one or more teams that developed a new business

in the past 3 years; (3) no, there are no such teams in our company. Responses are only considered when the answer is: yes, there are one or more teams that are currently developing a new business.

A third question (see the questions 8 in Appendix E2.1) identifies the relation that participants have with corporate ventures. Participants are asked to state which of the statements applies to them personally. Possible answers are: (1) I am currently the leader of a team that has the task to develop a new business; (2) I am currently the leader of a team that already has developed a new business in the past 3 years, (3) I am currently the supervisor of the leader of a team that currently develops a new business, (4) I am the supervisor of the leader of a team that already developed a new business in the past 3 years, (5) I am currently member of a team that currently develops a new business or that already did so in the past 3 years. (6) I have currently no relation with a team that develops a new business. However, I have made some experience in the past. (7) I have never made any experience with a team that develops a new business. Based on the respective answer, participants are differentiated in the seven respondent groups given in Table 5.1.

Table 5.1: Respondent Groups in the Sample Frame

Respondent Group	
1 Venture manager currently involved in new business development	**87**
2 Venture manager with past involvement in new business development	53
3 Corporate manager currently supervising the venture manager	297
4 Corporate manager supervising the venture manager in the past	43
5 Employee of a corporate venture team	62
6 Respondent who had a relation with a corporate venture in the past	34
7 Respondent who has no experience with corporate venturing	31

Responses (606) are received from all of the four respondent groups highlighted in Table 5.1. Ad (1), 87 participants are venture managers that are currently responsible for new business

development. Ad (2), 53 responses are received from venture managers that were responsible for new business development in the past. Ad (3), 297 respondents are corporate managers that are currently supervising venture managers. Ad (4), 43 responses refer to corporate managers that were responsible for corporate ventures in the past. Ad (5), 62 participants are/were employees (not in a management position) of a corporate venture team. Ad (6), 34 answers are given by participants that had a relation with corporate ventures in the past. Ad (7), 31 participants have no experience with new business development through corporate ventures.

Only the responses of group 1 (venture manager currently involved in new business development) are considered for data analysis in this thesis. The three reasons for this choice are given in the following.

Judgment on the responses used for data analysis

The first reason refers to the target population that is defined in Subsection 5.1.1. It is expected that only those respondents in a management position provide valid information on corporate venture management and are thus relevant for data analysis. It can be expected that at least some of the respondents of group 5 (employees of corporate venture) and group 7 (respondents with no experience with corporate venturing) are or were not in a management position. Their answers are consequently excluded from data analysis.

The second reason refers to the general method validity. Data that managers provide on past experience may be subject to incorrect information due to loss of memory and re-interpretation, which is known as hindsight bias. In order to eliminate the possibility that data analysis is constrained through hindsight bias, the answers of the group 2 (venture manager with past involvement in new business development), group 4 (corporate manager supervising the venture manager in the past) and group 6 (respondent who had a relation with a corporate

venture in the past) are not considered for data analysis. These participants were involved in corporate venturing in the past.

The third reason draws on the experiences made during the interviews (see Chapter 3). In the interviews (see Appendix A) it was observed that corporate managers may provided incorrect information on the autonomy that venture managers enjoy. For example, one corporate manager stated that the venture manager was granted with high strategic autonomy. However, subsequent interviews showed that the corporate manager made most strategic decisions himself and guided the strategic direction of the corporate venture, even without the participation of the venture manager. Such biased perception of corporate managers are also found in previous studies (see, e.g., Glaister, Husan, & Buckley, 2003).

In order to test our observation statistically, we conducted an analysis of variance (ANOVA) in order to compare the assessment of autonomy among the corporate managers and the venture managers. Our results confirm that the assessment is significantly different. Venture managers assess strategic autonomy with 18.32 (s.d.=5.69) and job autonomy with 33.25 (s.d.=5.77). Corporate managers assess strategic autonomy with 14.68 (s.d.= 5.91) and job autonomy with 31.11 (s.d.= 5.74). The results of the ANOVA given in the Appendix J2 and the Appendix J3 show that the differences are significant ($p<.00$). Thus, the corporate managers assess autonomy on average lower than the venture managers. The results confirm our observation (made during the interviews) that corporate managers have the potential to generate biased results with respect to the assessment of the autonomy that venture managers enjoy. In order to avoid that data analysis is constrained through the biased perception of the corporate manager, the responses of group 3 (corporate manager currently supervising the venture manager) are not considered for data analysis.

For the three reasons given above, only those 87 responses of the venture managers that are currently involved in new business development are considered as valid for data analysis. Compared to the targeted sample of 2649 firm, our final response rate of 3.3% is not uncommon in empirical studies with our target group of middle managers (cf. Lepak, Takeuchi, & Snell, 2003; Ozgen & Baron, 2007). The average size of the firms was 279.11 (SD=691.85) full-time employees whereas one firm had less than 30 employees and five firms had more than 400 employees. The average team size of the corporate venture was 9.55 (SD=15.14) full-time employees. A list of the corporations from which the responses were received is provided in the Appendix C. The data set of the 87 venture managers is applied in Section 5.2 in order to evaluate the autonomy construct that was operationalized in Chapter 4.

Remarks on the sample size

The author of this thesis is aware that we live today in an age of big data and a sample size of 87 is not acceptable in research domains where terabytes and petabytes of data are available. However, big data that would allow to analyze corporate venture management is not available to the author's best knowledge. As it is later discussed in the limitations of the thesis (see Section 7.4), a sample size of 87 was the research standard in corporate venture scholars when the data was collected for this thesis in 2012. In order to inform the reader, the sample size of the most recent studies are given in the following: Johnson (2012) with a sample size of n=64, Crockett et al. (2013) with a sample size of n=78, Thornhill and Amit (2000) with a sample size of n=102, Birkinshaw and Hill (2005) with a sample size of n=95 and Garrett and Covin (2013), Garrett and Neubaum (2013) as well as Kuratko et al. (2009) with a sample size of n=145. Thus, studies with a sample size that would fulfill the criteria of big data are not available in the research domain of this thesis.

5.2 CONSTRUCT VALIDITY AND CONSTRUCT RELIABILITY

The validity and the reliability of the autonomy construct developed in Chapter 4 are evaluated following the procedure described by Field (2010). The procedure includes the four steps (1) evaluating the appropriateness of the data set to apply variable reduction techniques, (2) component extraction, (3) component rotation and (4) computation of Cronbach's Alphas. The construct validity is evaluated in the first three steps which are reported in the Subsections 5.2.1 to 5.2.3. The construct reliability is evaluated in the fourth step which is reported in the Subsection 5.2.4. The results of the validity and reliability analyses are summarized in the Subsection 5.2.5.

Table 5.2 shows how the items (questions) are distributed over the measurement scales (autonomy dimensions). A detailed overview of the items is given in the Appendix E.

Table 5.2: List of Items Referring to the Four Autonomy Scales

Measurement Scale (Autonomy Dimension)	Questionnaire Items
Job Autonomy	1-7
Strategic Autonomy	8-13
Decision Autonomy	14-21
Functional Autonomy	22-29

5.2.1 EVALUATING THE APPROPRIATENESS OF THE DATA

In the *first step,* it is tested whether the data is appropriate to apply variable reduction techniques (e.g., principal factor analysis and principal component analysis).

Definition 5.1: **Variable Reduction Techniques** "*are multivariate statistical procedures to determine the number of variables that account for the variation and covariation among a set of observed measures" (Brown, 2015).*

The following three criteria are checked to evaluate whether the data is appropriate to perform variable reduction techniques: (1) the correlation matrix, (2) the Kaiser-Meyer-Olkin index (KMO) and (3) the Bartlett's test of sphericity. The three criteria are defined below.

Definition 5.2: **Correlation Matrix** "*is a matrix giving the correlations between all items. The correlation is a standardized measure of the strength of a relationship between two items on a scale from -1 to +1" (cf. Field, 2013).*

Definition 5.3: **Kaiser-Meyer-Olkin** "*is an index for comparing the magnitudes of observed correlation coefficients with the magnitude of partial correlation coefficients. The smaller the value of the index, the less appropriate the model" (cf. Henry, 2003).*

Definition 5.4: **Bartlett's Test of Sphericity** *"indicates whether the correlation matrix is an identity matrix, which would indicate that the variable are unrelated. Very small values (less than 0.05) indicate that there are probably significant relationships among the variables" (cf. Sobh, 2008).*

To be considered suitable for variable reduction techniques, the correlation matrix should show (1) at least some correlation coefficients with a value of $r > .3$, (2) the KMO index should show a scores of .60 or higher, (3) the Bartlett's Test of Sphericity should be significant at $p < .05$. The results of the inspections with respect to the three criteria are reported in the following.

- The correlation matrix associating the items reported in Table 5.2 with each other is reported in the Appendix F. The inspection of the correlation matrix shows that 74 coefficients are above the $r \geq .3$ threshold criteria, which indicates that some of the 23 items of functional autonomy, decision autonomy, strategic autonomy and job autonomy are correlated.

- The KMO index was computed to measure the adequacy of the sample. The KMO index is computed with a value of .654, which is above the .60 threshold. Thus, the KMO criteria verifies the sampling adequacy for the analysis.
- The Bartlett's test of sphericity is significant at p<.000, which supports that common component are present in the correlation matrix.

Based on the inspections of the correlation matrix, the KMO index and the Bartlett's test of sphericity, we may conclude that the data is suitable for variable reduction techniques. So, we continue the procedure with the second step.

5.2.2 COMPONENT EXTRACTION

In the *second step*, it is evaluated (a) which variable reduction techniques is suitable to the data set and (b) how many variables should be extracted.

Judgment on the suitable variable reduction technique

Principal Factor Analysis (also known as Principal Axis Factoring) and Principal Component Analysis are the commonly used variable reduction techniques. The Principal Factor Analysis should be applied when the variables (here called factors) are correlated. In contrast, Principal Component Analysis should be performed when the variables (here called components) are correlated with each other. Therefore, the correlations of the variables (i.e., the four autonomy dimensions) are computed in order to assess whether Principal Factor Analysis or Principal Component Analysis is an appropriate technique. The correlation matrix of the four expected variables, namely, functional autonomy, decision autonomy, strategic autonomy and job autonomy is given in Table 5.3. The item operationalization of the four autonomy measures is given in the Appendix E.

Table 5.3: Correlation Matrix of Expected Variables

	Functional Autonomy	Decision Autonomy	Strategic Autonomy	Job Autonomy
Functional Autonomy	1			
Decision Autonomy	.171	1		
Strategic Autonomy	.144	**.420***	1	
Job Autonomy	.007	**.213***	**.462***	1

*. Correlation is significant at level of p≤.05

The correlation matrix (Table 5.3) shows significant correlations between decision autonomy and strategic autonomy (r = .420), between decision autonomy and job autonomy (r = .213) as well as between strategic autonomy and job autonomy (r = .462). Thus, we may conclude that some of the variables (to be extracted) are correlated with each other. Accordingly, Principal Component Analysis is chosen instead of Principal Factor Analysis.

Definition 5.5: **Principal Component Analysis** *"A Principal Component Analysis is a mathematical procedure that transforms a number of (possibly) correlated variables into a (smaller) number of uncorrelated variables called principal components. It is a multivariate analysis technique for identifying the linear components of a set of variables" (cf. Field, 2013; Pallant, 2013).*

Judgment on the number of variables extracted

The initial Principal Component Analysis is performed (with the 29 items shown in Table 5.2) in order to identify the number of components to extract from the data set. The Principal Component Analysis is based on the computation of Eigenvalues.

Definition 5.6: **Eigenvalues** *"represent the total variance that is explained by each component. The eigenvalue of a given component measures the variance in all the items which is accounted for by that component that can be computed as the sum of its squared component loadings for all the items under a particular component. The eigenvalue explains the relative importance of the component with respect to the items" (cf. Tam, Thomas, & Zhang, 2007).*

The following three criteria on information are inspected to identify the number of components that should be retained for the final Principal Component Analysis:

- (1) Kaiser's criterion
- (2) Point of inflexion in the Scree Plot of Eigenvalues
- (3) Significant Eigenvalues computed by the Parallel Analysis.

The three criteria are defined at the beginning of the discussions of the corresponding observations.

(1) Kaiser's Criterion

Definition 5.7: **Kaiser's Criterion** *"is the rule to drop all components with eigenvalues under 1.0" (cf. Kaiser, 1960).*

The results of the initial Principal Component Analysis allow to obtain the Eigenvalues of the components present in the data. The results show that ten components with an Eigenvalue greater than 1 are present in the data (see Table 5.4, second column), which fulfills the Kaiser's criterion (Kaiser, 1960). The ten components explain 19.87%, 10.79%, 9.41%, 8.32%, 5.49%, 4.73%, 4.33%, 3.93%, 3.56% and 3.49% of variance (see Table 5.4, third column). In total, the components explain a variance of 73.91 %. The components 11 to 29 should be rejected as they show Eigenvalues below 1. The results are summarized in Table 5.4.

Table 5.4: Eigenvalues Extracted through the Initial Principal Component Analysis

Component	Actual eigenvalue from PCA		
	Eigenvalue	% of Variance	Cumulative %
1	**5.763**	**19.873**	**19.873**
2	**3.129**	**10.789**	**30.662**
3	**2.728**	**9.408**	**40.070**
4	**2.412**	**8.319**	**48.389**
5	1.592	5.489	53.878
6	1.371	4.729	58.607
7	1.254	4.325	62.932
8	1.138	3.926	66.858
9	1.031	3.556	70.414
10	1.014	3.496	73.910
11	0.899	3.099	77.008
…			
29	.112	.385	100.000

It is acknowledged that the Kaiser's criterion (Eigenvalues greater than 1) is not the most accurate criterion to determine the number of components to be retained in the Principal Component Analysis (cf. O'Connor, 2000). Applying the Kaiser's criterion alone may misguide researchers to extract too many components. The initial results should therefore be compared with the Scree Plot of the extracted Eigenvalues of the component and the results of the Parallel Analysis (cf. Pallant, 2010), which is done in the following.

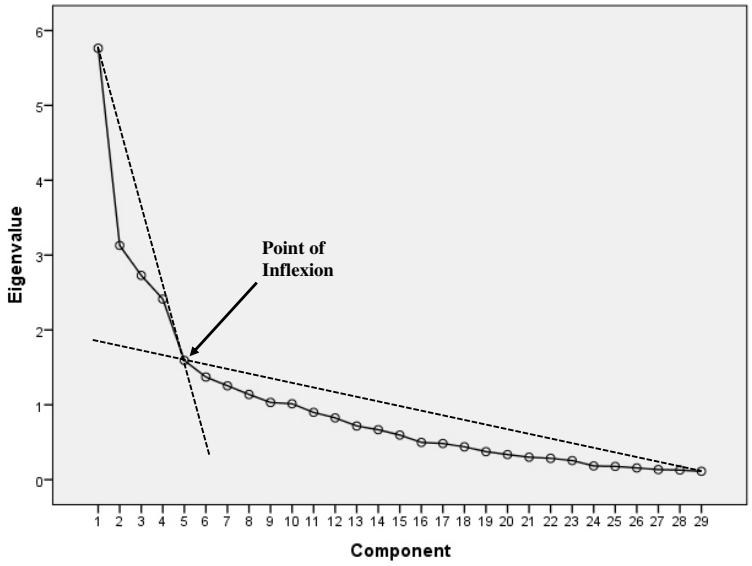
(2) Scree Plot

Definition 5.8: **Scree Plot** *"is a graph that plotting each eigenvalue (Y-axis) against the components with which it is associated (X-axis). The scree plot indicates the relative importance of each component" (cf. Field, 2013).*

The Scree Plot illustrated in Figure 5.1 is checked for a change in its shape (i.e., elbow), described as the point of inflexion (cf. Field, 2013). The visual inspection indicates that four components should be retained as the components 1, 2, 3 and 4 are above the point of inflexion (illustrated in Figure 5.1). This judgment is however not accurate as it is not determined

statistically. Therefore, Parallel Analysis is conducted to determine statistically the number of components that should be retained for the final analysis.

Figure 5.1: Scree Plot of the Component Eigenvalues



(3) Parallel Analysis

Definition 5.9: **Parallel Analysis** *"is a Monte-Carlo-Simulation-based method that allows to determine the number of components to retain in the Principal Component Analysis. The method compares the observed Eigenvalues (raw data) extracted from the correlation matrix to be analyzed with those obtained from uncorrelated normal variables. Parallel Analysis implies a Monte-Carlo simulation process, since 'expected' eigenvalues are obtained by simulating normal random samples that parallel the observed data in terms of sample size and number of variables" (cf. Horn, 1965; Ledesma & Valero-Mora, 2007).*

Parallel analysis is conducted to determine the statistically significant Eigenvalues of the components. Significant Eigenvalues indicate more accurately the number of components to retain for Principal Component Analysis than the Kaiser's criterion (cf. O'Connor, 2000). Research shows that the accurate number of components should be carefully evaluated to

differentiate between major and minor components (cf. Fabrigar, Wegener, MacCallum, & Strahan, 1999). Studies comparing different kinds of methods that allow to make informed retaining decisions (see, e.g., Kaiser's criterion, Bartlett's chi-square test, average partial method and parallel analysis) found that parallel analysis produces the most accurate results (cf. Zwick & Velicer, 1986).

Correspondingly, parallel analysis is conducted to determine the number of components. The syntax developed by O'Connor (2000) is therefore used. The full syntax is available online[5] and can be found in the Appendix G. The results of the parallel analysis are presented in Table 5.5.

Table 5.5: Results of the Parallel Analysis

Components	Raw Data	Random Data	Decision
1	**5.404**	**1.841**	**Accept**
2	**2.773**	**1.559**	**Accept**
3	**2.342**	**1.389**	**Accept**
4	**1.989**	**1.247**	**Accept**
5	1.114	1.119	Reject
6	0.999	1.001	Reject
7	0.796	0.900	Reject
8	0.679103	0.809881	Reject
…			Reject
29	-0.271326	-0.400754	Reject

Table 5.5 shows the Eigenvalues extracted from the raw data (column 2) and the Eigenvalues extracted from the random data set at the significance-level of p=.05 (column 3). Correspondingly, Eigenvalues extracted from the raw data set (original data) that exceed the

[5] https://people.ok.ubc.ca/brioconn/nfactors/nfactors.html

significant Eigenvalues of the random data set can be interpreted as meaningful. The results of the parallel analysis show that the Eigenvalues of four components (raw data) exceed the significant Eigenvalues of the random data set. Thus, the results of the parallel analysis provide evidence that the number of components to retain for further analysis should be four.

The four components explain a variance of 19.87%, 10.79%, 9.41%, 8.32% (see Table 5.4, third column). In total the four components explain a variance of 48.38% (see Table 5.4, fourth column). Having evaluated the number of components, the procedure continuous with the component rotation.

5.2.3 COMPONENT ROTATION

In the *third step*, component rotation is conducted. Before component rotation is performed, the correlations between the four components are inspected in order to evaluate whether orthogonal or oblique rotation methods should be used. Orthogonal rotation methods (e.g., Varimax) assume that the components are uncorrelated in the analysis. In contrast, oblique rotation methods assume that the variables are correlated in the analysis. Following the procedure described by Field (2013), Principal Component Analysis is performed with Oblimin as a rotation method in order to compute the component correlation matrix.

Definition 5.10: **Oblimin** *"is a method of oblique rotation that allows the underlying factors to be correlated. The method is used when the researcher wishes a non-orthogonal (oblique) solution" (Field, 2013).*

The results are presented in Table 5.6. The highest correlation coefficient is with a value of r = .155 below the threshold criteria (r > .3) which shows that the components are uncorrelated (cf. Field, 2013). Thus, we may conclude that orthogonal rotation is the appropriate rotation method.

Table 5.6: Component Correlation Matrix

	Functional Autonomy	Decision Autonomy	Strategic Autonomy	Job Autonomy
Functional Autonomy	1			
Decision Autonomy	.155	1		
Strategic Autonomy	.151	.112	1	
Job Autonomy	-.011	.062	.046	1

Varimax rotation is the most commonly used orthogonal rotation method (cf. Field, 2013) and is therefore chosen to perform the component rotation.

Definition 5.11: **Varimax Rotation** *"is an orthogonal rotation of the component axes to maximize the variance of the squared loadings of a component (column) on all the items (rows) in a component matrix, which has the effect of differentiating the original items by extracted components" (cf. Tam et al., 2007).*

Table 5.7 shows the Varimax rotated solution. The component loadings and the cross-loadings of the items are checked to evaluate the construct validity. Good construct validity is given when the following two criteria are achieved. First, component loadings should be greater than .60. Second, cross-loadings should be below .30. The result of the initial component rotation shows that four items associated with component 1 and five items associated with component 2 show component loadings above .60 and cross-loadings below .30 (highlighted in Table 5.7). In contrast, only two items associated with component 3 and one item associated with component 4 adhere to the threshold criteria. However, at least three items for each component are recommended to perform further data analysis (cf. Field, 2013). Thus, the components 3 and 4 should be rejected. As the components 3 and 4 are mainly loaded through the items of the measurement scales for functional autonomy and decision autonomy (see Table 5.2), it is decided to exclude these two measurement scales in order to improve the results of the component rotation.

Table 5.7: Component Matrix after Initial Component Rotation [a,b]

Item	Component			
	1	2	3	4
1	.531			
2	**.743**			
3	**.747**			
4	**.682**			
5	**.612**			
6	.624			.312
7	.570			
8	.383			
9	.403	.434		
10	.478			
11		**.617**		
12		**.606**		
13		.595		
14		**.600**		
15			.478	
16		**.643**		
17		.466	.606	
18			**.680**	
19			.512	
20			**.672**	
21			.544	
22		.361	-.374	.358
23				.460
24		**.638**		
25		.341		
26				**.690**
27				.301
28				.544
29				.418

[a] Varimax rotated component matrix
[b] Table includes all component loadings above the .30 cut-off point

Correspondingly, the component rotation is performed with the items of the two measurement scales strategic autonomy and job autonomy retained. After excluding the items that still did not show component loadings greater than .60 and cross-loadings below .30, the component solution presented in Table 5.8 is found.

Table 5.8: Rotated Component Solution [a,b c]

Item	Component	
	1	2
2	**.800**	
3	**.789**	
4	**.794**	
5	**.695**	
6	**.640**	
7	**.627**	
9		**.681**
11		**.851**
12		**.832**
13		**.787**

[a] Varimax rotated component matrix
[b] Table includes all component loadings above the .30 cut-off point
[c] Results after erasing item 1 for job autonomy and items 1 and 3 for strategic autonomy

The final component rotation confirm the presence of two distinct autonomy measures, namely, strategic autonomy and job autonomy. In order to ensure good construct validity, the items with component loadings below .60 and cross-loadings above .30 were excluded. Consequently, item 1 of component 1 (job autonomy) was excluded for the component rotation. Also, the items 8 and 10 referring to component 2 (strategic autonomy) were exclude. Thus, the original seven-item scale for job autonomy is reduced to a six-item scale and the original six-item scale for strategic autonomy is reduced to a four-item scale. Having validated the component solution, it is continued with the last step in which the reliability of the construct is evaluated. Therefore, Cronbach's Alpha coefficients are calculated for the two remaining components.

5.2.4 CRONBACH'S ALPHA

In *step four*, Cronbach's Alpha coefficients are computed for the two validated components in order to evaluate the reliability of the autonomy construct.

Definition 5.12: **Cronbach's Alpha** *"is a coefficient for measuring the internal consistency of a group of items. The coefficient is useful to understand the extent to which the rating from a group of items hold together to measure a common component" (cf. Cronbach, 1951; Osborne, 2008).*

Cronbach's Alpha (α) can range from a scale of .0 (low internal consistency) to 1.0 (high internal consistency). The interpretation of alpha coefficients is as follows: "α > .9 is excellent, α > .8 is good, α > .7 is acceptable, α > .6 is questionable, α > .5 is poor, and α < .5 is unacceptable" (Gliem & Gliem, 2003). Results show that the Alpha coefficient of the component 2 (strategic autonomy) is α=.81 and the Alpha coefficient of the component 1 (job autonomy) is α=.82. These results show that the autonomy construct has a good internal consistency as the Alpha coefficients are above .8. With this last step, the evaluation of the autonomy construct is completed. The results of the validation and reliability analysis are summarized in the following subsection.

5.2.5 RESULTS OF THE VALIDITY ANALYSIS AND RELIABILITY ANALYSIS

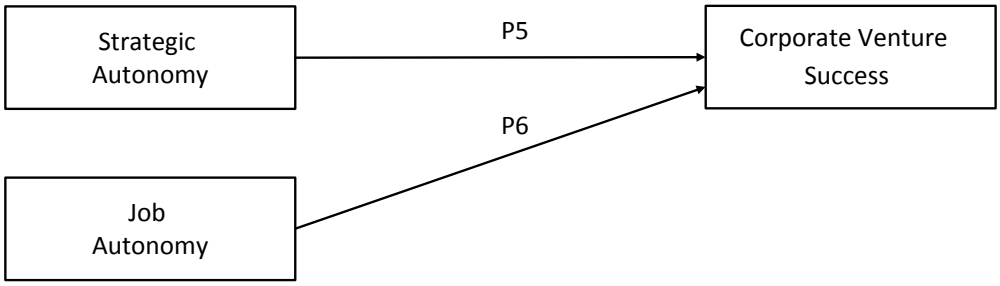
The data analyses reveal a two-dimensional autonomy construct with a good validity and a good reliability. The rotated two-component solution (Table 5.8) shows that the retained items to measure strategic autonomy (items 9, 11, 12 and 13) and job autonomy (items 2, 3, 4, 5, 6 and 7) achieve cross-loadings <.30 and component loadings >.6. Good construct validity is evident as these two threshold criteria are fulfilled. Good construct reliability is confirmed as Cronbach's Alpha coefficients for the strategic autonomy scale and the job autonomy scale are both above .8.

5.3 CHAPTER CONCLUSION

The chapter answers *RQ2: How can the autonomy dimensions identified by RQ1 be operationalized in a construct that enables us to measure the autonomy of venture managers?* Four autonomy dimensions (components) are initially extracted from the data using Principal Components Analysis in combination with Parallel Analysis. However, the results of the component rotation show that the construct validity of the initial four-dimensional autonomy construct (including the items of the four measurement scales, namely, functional autonomy,

decision autonomy, strategic autonomy and job autonomy) is problematic. The general threshold criteria that would confirm construct validity are not achieved. The scales of functional autonomy and decision autonomy are removed as most of these scale-items do not load appropriately. The Varimax-rotated two-dimensional autonomy construct (two-component solution), with the scales of strategic autonomy and job autonomy retaining, produces good construct validity. Subsequent reliability analysis shows also good construct reliability of the two-dimensional autonomy construct. Therefore, the original four-dimensional autonomy construct is reduced to a two-dimensional autonomy construct (see Figure 5.2) in order to ensure construct validity and construct reliability. The two-dimensional autonomy construct is applied in the following Chapter 6.

Figure 5.2: The Adapted Autonomy Construct



Chapter 6

Applying the Autonomy Construct

This chapter aims to answer *RQ3: How are the autonomy dimensions related to the success of the corporate ventures?* For this purpose, the two-dimensional autonomy construct (validated in Chapter 5) will be applied (see Figure 5.2). A survey study with 87 venture managers of SMEs is conducted in the German IT consulting industry. Multiple linear regression analysis is performed to analyze the relationship of the two autonomy dimensions strategic autonomy and job autonomy with corporate venture success. Additionally, two interaction effects (moderation) are included in the regression analysis in order to evaluate how the relationship between autonomy (strategic autonomy and job autonomy) and corporate venture success is influenced when venture managers are enforced to emphasize exploitative priorities in their decision making.

Parts of this chapter are based on the following publication[6]:

Gard, J., Baltes, G., Andersen, T. J., & Katzy, B. (Forthcoming 2016). **Corporate venture management in small-medium sized enterprise: The roles and effects of autonomy and corporate policy**. In the Journal of Business Venturing.

The chapter proceeds as follows. Section 6.1 highlights the challenge for corporate management to manage corporate ventures in a way that (a) the new business is invented and (b) made profitable at the same time. Following the organizational ambidexterity theory, we assume that an essential

[6] The author would like to thank his co-authors and the publishers of the Journal of Business Venturing for their permission to reuse relevant parts of the articles in this thesis.

managerial challenge is to balance the corporate venture's engagement in explorative activities and exploitative activities. In Section 6.2, we acknowledge the exploration objective of corporate ventures to invent the new business and highlight the relevance of exploitative priorities to achieve profitability at some point. In Section 6.3, we operationalize an empirical model for effective corporate venture management. Our model assumes that effective corporate venture management requires corporate management: (1) to grant the venture manager with broad decision authority (strategic autonomy and job autonomy) in order to enable effective explorative activities (as described in Chapter 3); and (2) to ensure at the same time some exploitation priority in the venture manager's decision making to also emphasize exploitative activities. The research design to test our model is presented in Section 6.4, which enables us to answer the *RQ3* and after that the *PS*. The results of the model testing are reported in Section 6.5 and discussed in Section 6.6. The chapter conclusions are given in Section 6.7.

6.1 THE CHALLENGE TO MANAGE CORPORATE VENTURES

Establishing corporate ventures is a promising approach for corporations to generate strategic renewal (cf. Christensen, 2004). The small entrepreneurial teams are an effective means to create new businesses aside the mainstream activities in which corporations capitalize on their existing businesses (cf. Kuratko et al., 2009). Researchers assume that corporate venturing on average has positive implications on firm performance (cf. Dushnitsky & Lenox, 2006; Covin & Miles, 2007; Covin, Garrett, Kuratko, & Shepherd, 2010; McGrath et al., 2012). However, it is not obvious how corporate ventures are managed successfully (cf. Ginsberg & Hay, 1994; Hill & Birkinshaw, 2012; Garrett & Neubaum, 2013). Burgelman and Valikangas (2005) argue that failure is not just attributable to the novel task environment but is linked to the challenge to manage corporate ventures effectively.

An essential challenge for corporate management is to ensure that corporate ventures achieve at the same time (a) the exploration objective to invent the new business and (b) the exploitation objective to reach profitability with the new business (cf. Garvin, 2004). Achieving the former objective is associated with explorative modes of search and experimentation whereas the latter objective is reached through exploitative modes of refinement and improvement (March, 1991a). However, too much emphasis on either mode of activities may have negative implications for the corporate venture as either the exploration objective or the exploitation objective may remain unfulfilled (cf. He & Wong, 2004). Following the organizational ambidexterity theory, we assume that an essential challenge for corporate management is to balance the engagement of corporate ventures in explorative modes and exploitative modes so that the new business is invented and reaches profitability (cf. Junni, Sarala, Taras, & Tarba, 2013).

Two prior studies support our assumption. Thornhill and Amit (2000) highlight the necessity of corporate ventures to develop new capabilities (explore) and simultaneously utilize those already existing in the corporation (exploit). A second study shows that the ability to develop new capabilities and simultaneously to lever existing corporate capabilities increases the longevity of corporate venture divisions that large enterprises typically implement to manage corporate ventures (cf. Hill & Birkinshaw, 2012). Without any doubt, the development of new capabilities (to invent the business) involves explorative modes of search and experimentation whereas the utilization of existing corporate capabilities (to increase profitability) involves exploitative modes of refinement and improvement for adaptation to the venture's new task environment (see, e.g., March, 1991a). Nevertheless, it remains unclear how corporate management may balance the engagement of corporate ventures in both modes.

We propose a management model through which corporate management may master the challenge to achieve the balance between the exploration objective and the exploitation objective. The model

builds on two considerations. *First*, Burgers et al. (2009: 208) highlight that corporate ventures require a "sense of freedom and ownership over their activities" to invent the new business (explore). Providing corporate ventures with the "freedom of activities", viz. autonomy, assumes that corporate management has delegated decision authority to the venture manager. Considering our findings in the Chapters 3-5 (see Figure 5.2), two types of autonomy are at play: (a) the freedom of the venture manager to make work-mode decisions without approval (job autonomy); (b) the freedom to make strategic decisions without approval (strategic autonomy). This broad autonomy enable the venture manager to engage effectively in exploration modes of search and experimentation for inventing the new business (cf. McGrath, 2001). *Second*, there is little hope that corporate ventures achieve profitability without exploitative priorities in decision making (cf. Hill & Birkinshaw, 2012). Corporate management may ensure such priorities by enforcing business policies that emphasize the exploitation objective to achieve profitability (see, e.g., Lubatkin, Simsek, Ling, & Veiga, 2006). Building on the two considerations, we develop an empirical model for effective corporate venture management in Section 6.3. The model (illustrated in Figure 6.1) assumes that corporate ventures are most successful when corporate management grants venture managers with broad decision authority in combination with business policies that ensure exploitation priority in the decision making of venture managers.

In order to test our model, we apply our autonomy construct (Figure 5.2) for measuring the decision authority (strategic autonomy and job autonomy) that corporate management grants to the venture managers. The two-dimensional autonomy construct is further developed by including the measure exploitation priority which captures the business policy that corporate management enforces (see Figure 6.1). The definitions for strategic autonomy and job autonomy are already given in Chapter 4 (see definitions 4.4 and 4.5). Exploitation priority is introduced as a new measure and defined as follows.

Definition 6.1: **Exploitation Priority** *"measures the extent to which corporate management forces venture managers to prioritize the exploitative objective to gain profit over the explorative objective to invent" (cf. Lubatkin et al., 2006).*

The overall aim of the study in this chapter is to test empirically the effectiveness of our management model by evaluating its power to predict corporate venture success. Therefore, we test two considerations. *First*, we consider that two types of autonomy are essential for effective corporate venture management. One is associated with strategic freedom (strategic autonomy) and the other is associated with operational freedom (job autonomy), which give the venture manager leeway to effectively invent the new business. We apply our autonomy construct to evaluate how the strategic freedom and the operational freedom of venture managers are related with corporate venture success, thereby answering RQ3. Results will show whether power dispersion is essential for effective corporate venture management (see Crockett et al., 2013). *Second*, we introduce business policy as an integrating management device to enforce exploitative priority in the venture manager's decision making (cf. Lubatkin et al., 2006). We investigate whether the management device is effective for corporate venture management. The first and the second consideration are tested in combination for answering the PS.

6.2 THE RELEVANCE OF EXPLOITATION PRIORITY

Initially, a corporate venture is established by corporations following the exploration objective to invent a new business, often in a novel business domain (cf. Garrett & Covin, 2013). Early studies by corporate venture scholars highlight the necessity to separate corporate ventures from the corporate mainstream business (see Kanter, 1985; Sathe, 1989). The mainstream activities rather focuses on the exploitation objective to improve established businesses for increasing profitability, which may constrain the explorative activities of corporate ventures (cf. Jansen et al., 2009). By

keeping the corporate venture separate from the mainstream business, the ventures can operate outside the formal corporate constraints (cf. Garrett & Covin, 2013) with the flexibility necessary to explore new knowledge in the novel task environment (cf. McGrath, 2001). This call for separation is consistent with the notion to establish dual structures for achieving organizational ambidexterity. The notion builds on the consideration that explorative activities and exploitative activities are mutually incompatible (see March, 1991a), which necessitates to separate the two modes of activities in distinct organizational entities (cf. Duncan, 1976).

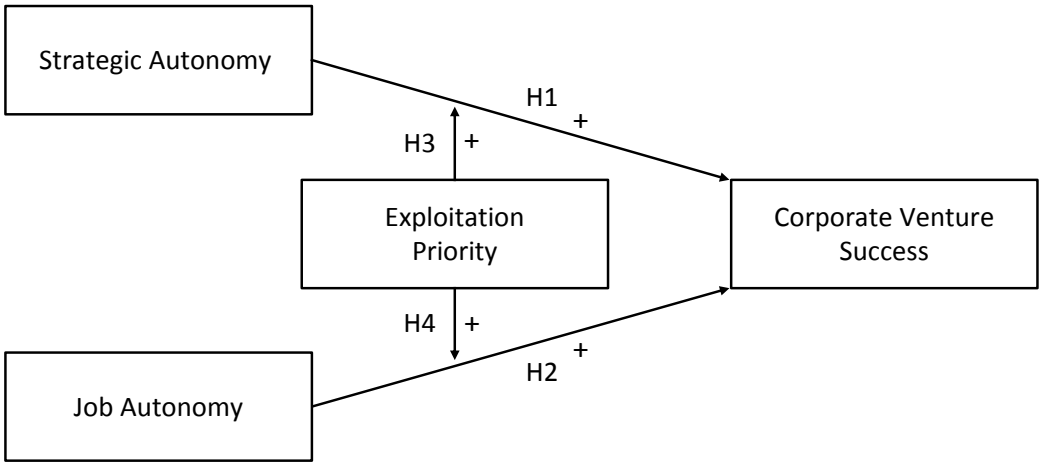
However, it is also acknowledged that corporate ventures do not singularly engage in explorative activities for the purpose to invent the new business. Corporate ventures also need to engage in exploitative activities to reach profitability (see Hill & Birkinshaw, 2012). Without exploitation priority, corporate ventures may invent the new business (explore) but may fail to lever resources to gain scale and scope economies when the venture is commercialized as a new strategic businesses (exploit). We may therefore conclude that corporate ventures require at least some exploitation priory in their decision making.

The current study assumes that corporate ventures are most successful when corporate management (a) delegates decision power to enable effective exploration of the new business and (b) enforces some exploitation priority in the venture manager's decision making to ensure that profitability is also reached at some point. To test if the managerial influence of corporate management has an impact, the three independent variables, namely strategic autonomy, job autonomy and exploitation priority, are used to investigate the two assumptions (a and b) to explain corporate venture success. This way corporate management enhances exploration for new knowledge by granting both strategic autonomy and job autonomy to the venture manager while giving strategic priority to the exploitation objective to increase profitability.

6.3 THEORY AND HYPOTHESES DEVELOPMENT

This section continues the research on our autonomy construct (see Figure 5.2) to study the theoretical background and to develop the hypotheses. Therefore the outcomes of the Sections 6.1 and 6.2 are used. In the Subsections 6.3.1 to 6.3.3 we discuss prior theoretical rationales and empirical findings as underpinnings for the development of our hypotheses. The hypotheses reflect the two suggested managerial assumptions (see Sections 6.1 and 6.2) for corporate venture success. For readability we show the outcome as a guideline for understanding the hypotheses. So, Figure 6.1 illustrates the hypothesized relations H1 to H4, which are to be developed in the subsections below.

Figure 6.1: The Hypothesized Model Relationships



6.3.1 STRATEGIC AUTONOMY AND CORPORATE VENTURE SUCCESS

Strategic autonomy refers to the authority delegated to venture managers on decisions that can influence strategic outcomes without obtaining prior approval from corporate management. These types of decisions go beyond concerns about job design for operational freedom. They rather deal with aspects such as (1) initiating specific R&D activities, (2) generating internal competencies, (3) engaging in new product-development efforts, (4) seeking new markets, (5) customer segments

as well as (6) qualification for new strategic moves. The operationalization of the original strategic autonomy measures (1 to 6) is described in Chapter 5. The results are briefly summarized in Subsection 6.4.1.

According to the measures, strategic autonomy provides venture managers with the freedom to act independently and take advantage of opportunities in the new business environment, essentially in the form of autonomous actions (cf. Burgelman, 1983; Andersen, 2000). One stream of research by strategic management scholars illustrates the importance of autonomous action (i.e., resource-committing decisions) across different parts of the organization as an important source of business initiatives that have longer-term implications for corporate strategy development and strategic adaptation (see, e.g., Mintzberg, 1978; Bower, 1986; Floyd & Wooldridge, 1992; Mintzberg, 1994). Five complementing core findings extracted from the stream of research are provided below, which lead to the first hypothesis.

First, autonomous responsive actions represent the explorative component of strategy making that Mintzberg (1994) associates with emergent strategy initiated by actors operating throughout the organization. *Second*, autonomous responsive actions constitute the individual initiatives that form new internal ventures as the evolutionary element of strategy making that create variation in potential business activities for strategic renewal (see, e.g., Burgelman, 1983; Burgelman, 1996). *Third*, it is argued that the autonomous actions constitute a "form of efficient low-risk strategy probing based on active search" which generates new business opportunities through experimentation (cf. Andersen & Nielsen, 2007: 22). *Fourth*, this explorative component of strategy-making is found to have a positive association to firm performance in dynamic environments (cf. Andersen, 2000; Andersen, 2004). *Fifth*, Kuratko and Audretsch (2009) find that the success of corporate ventures is enhanced when the venture managers have authority to develop

the strategic direction of the new business. The five complementing findings lead to the following hypothesis.

H1: Higher strategic autonomy granted to the venture manager is associated with higher corporate venture success.

6.3.2 JOB AUTONOMY AND CORPORATE VENTURE SUCCESS

Autonomy is also recognized as an important feature when designing jobs characterized by, e.g., skill variety, task identity, significance and feedback (cf. Hackman & Oldham, 1975a). In this context it is often labeled "job autonomy", indicating the discretion venture managers have when they set up (1) the job (work method) including scheduling, (2) the sequencing and timing (work scheduling) and (3) the performance evaluation (work criteria) (cf. Breaugh, 1985). The operationalization of the three original job autonomy measures (1 to 3) is described in Chapter 5. The results are briefly summarized in Subsection 6.4.1. The effects of job autonomy are reported in three research streams. The three key results of the three research streams that lead us to the second hypothesis are reported below.

First, some key results suggest that job autonomy has a positive influence on (a) work effectiveness (cf. Hackman & Oldham, 1976; Langfred & Moye, 2004; Zhang & Bartol, 2010) and (b) fosters creative work involvement (cf. Volmer et al., 2012) as well as (c) role breadth self-efficacy (cf. Parker, 1998; Axtell & Parker, 2003; Unsworth & Clegg, 2010). There is little hope that good results are achieved when (ad a) the work of venture teams is organized ineffectively, (ad b) venture teams do not engage in creative processes at work and (ad c) teams are not carrying out broader work tasks beyond the prescribed technical requirements.

Second, it is recognized that job autonomy has an inherent motivational effect that improves job performance (cf. Hackman & Oldham, 1976; Hackman, 2002). In a similar vein, studies find that

individuals with high job autonomy feel more responsible for their ideas and are therefore more likely to complete their jobs successfully (cf. Parker & Sprigg, 1999; Volmer et al., 2012). There is little hope that venture managers will create the new business successfully without having the motivation and/or feeling responsible to do so.

Third, Parker (2014) finds a link between job autonomy and explorative behavior that drives actions to modify work methods in adaptation to changes in the task environment. This exploration enforcing effect of job autonomy is also noted in research on creativity (cf. Amabile, 1983). Here it is observed that managers with high job autonomy generate more ideas (cf. Hennessey & Amabile, 2010), engage in broader proactive activities (cf. Unsworth & Clegg, 2010) and are more motivated to develop new work tasks (cf. Wang & Cheng, 2010). In this sense, job autonomy enables venture managers to break out of established routines and norms (cf. Shalley & Gilson, 2004). Such explorative behavior is necessary to overcome organizational constraints of formalized organizations which is essential to pursue corporate venture activities (cf. Kanter, 1989; Rauch, Wiklund, Lumpkin, & Frese, 2009). The evidence and reasoning in the three research streams leads us to the following hypothesis.

H2: Higher job autonomy granted to the venture manager is associated with higher corporate venture success.

6.3.3 THE MODERATING ROLE OF EXPLOITATION PRIORITY

A business policy that gives strategic priority to exploitation describes the emphasis that corporate management puts on the exploitation objective to increase profitability to the detriment of the exploration objective to invent. Exploitation priority forces the venture manager to focus on (1) committing to improve quality and lower cost, (2) improving the process efficiency and (3) penetrating more deeply into existing customer base *instead of* (4) creating products or services that are innovative to the firm, (5) looking for novel ideas by thinking “outside the box” and (6)

bringing ventures aggressively into new market segments (cf. Lubatkin et al., 2006). The operationalization of the exploitation priority measures (1 to 6) is given in Subsection 6.4.1 (see also Appendix E). It is not expected that a priority on exploitation by itself will have a direct effect on corporate venture success because, if anything, it will tend to make activities conform to existing norms, thereby limiting search and experimentation. However, it is expected that imposing a business policy with exploitation priority will have a positive impact on the effectiveness of both strategic autonomy and job autonomy. The reasoning for the positive moderation effect of exploitation priority on the influence of strategic autonomy and job autonomy on corporate venture success is given below.

Amplifying the effectiveness of strategic autonomy

The ability to take autonomous actions by making strategic decisions without approval makes it possible to gain new knowledge about the new business through search and experimentation. However, there is also a risk that the search and experimentation will incur excessive costs without generating knowledge about mature solutions that can be commercialized (cf. March, 1991a). In other words, search and experimentation where resources are deployed too broadly towards diverse opportunities increases the risk that the profitability demand is left unchecked (cf. Gupta et al., 2006).

Levinthal and March (1993) characterize this potential risk as a self-reinforcing threat caused by the behavioral traits of individuals. They argue that search and experimentation is associated with increasing failure rates which can encourage individuals to intensify their search, thus leading towards an endless circle of search and failure referred to as the "failure trap" (cf. Levinthal & March, 1993: 106). By extension, strategic autonomy in the extreme may lead to a "garbage can" of new initiatives (cf. Cohen, March, & Olsen, 1972) that diverts the strategic focus and dilutes corporate resources. Hence, it is argued that emergent strategy evolving from autonomous strategic

decision making should be intertwined with a business policy that promotes, or induces, the exploitation priority to increase profitability (cf. Mintzberg & Waters, 1985; Burgelman & Grove, 2007).

Correspondingly, we suppose that it is essential for corporate venture success to provide strategic autonomy that enables exploration activities (search and experimentation). At the same time however, we expect that a business policy imposing exploitation priority will have a positive impact on the effectiveness of strategic autonomy because it will focus on the exploration activities in areas linked to existing market offerings. In contrast, the enforcement of a business policy that enforces exploration priority would diverge explorative activities. Thus, the following hypothesis is developed.

H3: The positive relationship between strategic autonomy and corporate venture success is higher when corporate management imposes exploitation priority.

Amplifying the effectiveness of job autonomy

We expected that imposing a business policy with exploitation priority will amplify the impact of job autonomy on corporate venture success. The studies leading to hypothesis 2 provide evidence that job autonomy promotes explorative behavior (cf. Parker, 2014). By granting job autonomy, corporate management enables venture managers to show the necessary explorative behavior for achieving the explorative objective to invent the new business.

However, this way, the exploitative objective to increase profitability may remain unchecked due ineffective goal attainment (cf. Biron & Bamberger, 2010; Lanaj, Hollenbeck, Ilgen, Barnes, & Harmon, 2012). So even though job autonomy provides the venture managers with the freedom to explore, there is no doubt that the work tasks of corporate ventures must be accomplished efficiently to also reach profitability (cf. Junni et al., 2013). Corporate management can ensure some exploitation priority in the venture manager's work-mode decisions by encouraging him do

to so by enforcing the appropriate business policy (cf. Lubatkin et al., 2006). We suspect that corporate venture success is obtained not only when corporate management grants job autonomy, but when they concurrently promote a business policy that emphasizes exploitation priority in the venture manager's work-mode decisions. Thus, we formulate the following hypothesis.

H4: The positive relation between job autonomy and corporate venture success is higher when corporate management imposes exploitation priority.

We have now described the hypothesized assumptions illustrated in Figure 6.1. The arguments leading to the hypotheses are not tested in this study. The hypotheses themselves are tested on the possibility that they must be rejected or they cannot be rejected (cf. Popper, 1954). In order to do so, we operationalize the measures for the two independent variables (strategic autonomy, job autonomy), the moderator variable (exploitation priority) and the dependent variable (corporate venture success) in the Section 6.4.

6.4 RESEARCH DESIGN

The hypothesized relationships are tested using multiple regression analysis. The data set and the procedure applied to collect the data for testing the hypotheses are already presented in Chapter 5 (Section 5.1). Now, the measures used to operationalize our management model (Figure 6.1) are presented (6.4.1) and the research method is validated (6.4.2). Finally, model diagnostics are performed in Subsection 6.4.3 (1) to evaluate statistically whether linear regression techniques are appropriate for the data set and (2) to test whether data analysis is constrained through heteroscedasticity, multicollinearity or outliers.

6.4.1 MEASURES

This subsection presents the dependent variable, the independent variables, the moderator variable and the control variables that are used in the regression analysis. The measures of the dependent variable and the independent variables are already operationalized in Chapter 4 and therefore briefly summarized in this subsection. Also, the subsection provides the measures of the moderator variable and the control variables. The measurement scales of all variables are also reported in the Appendix E.

Dependent Variable

The dependent variable we use is corporate venture success. The measure assesses the subjective perception of distinct success-related criteria. Subjective performance measures are used instead of objective financial performance measures for the following reason. While objective financial performance measures, such as (a) growth-related criteria and (b) profitability-related criteria are generally applied in corporate strategy studies, they are not reliable to evaluate corporate venture success. Ad (a), growth-related criteria (e.g., sales growth) may be appropriate for established businesses. However, corporate ventures are non-established businesses and start with zero sales, which are factors that greatly skew and render incomparable the year-to-year growth rate computation. Ad (b), profitability-related criteria (e.g., return on assets), are equally troublesome due to the variety of accounting methods and decision policies that corporations can adopt when allocating costs to corporate ventures. Moreover, young corporate ventures have not yet reached break-even (cf. Garrett & Covin, 2013).

Therefore, subjective measures of perceived success are commonly applied in corporate venture research and are acknowledged as an appropriate alternative to objective performance measures (cf. Thornhill & Amit, 2000; Johnson, 2012; Garrett & Covin, 2013; Garrett & Neubaum, 2013). Measures of perceived success are based on the perceptions gathered from corporate managers

and their individual judgments on corporate venture success (cf. Covin et al., 1990; Kuratko et al., 2009). Subjective measures are found to be valid performance indicators (cf. Brush & Vanderwerf, 1992; Chandler & Hanks, 1993) that reflect both the current economic outcomes and the fulfillment of expectations (cf. Gimeno, Folta, Cooper, & Woo, 1997).

As already outlined in Subsection 4.4.6, a seven-item scale of perceived success is used as a measure of *corporate venture success* (α=0.93). The measure reflects the extent to which (a) corporate management is satisfied with the financial performance of the corporate venture (cf. Brush & Vanderwerf, 1992) and (b) corporate management is overall satisfied with the performance of the corporate venture (cf. Venkatraman & Ramanujam, 1986). Four items are used to assess the satisfaction with financial performance (see the first four items in Table 4.6) and three items are used to assess the overall satisfaction with performance (see the last three items in Table 4.6). Chandler and Hanks (1993) tested our measure of "satisfaction with performance index" for new businesses and found good internal consistency and high inter-rater reliability (cf. Chandler & Hanks, 1993). It is therefore reasonable to assume that the measure is appropriate to assess the success of corporate ventures.

Independent Variables

In this study we use two main variables (strategic autonomy and job autonomy) and one moderator variable (exploitation priority). The *strategic autonomy* measure builds on the construct developed by Andersen (2000, 2004). The six-item scale is provided in Table 4.4 (Chapter 4). It captures the extent to which the venture manager can make decisions of potential strategic importance without approval from corporate management. The *job autonomy* measure builds on a seven-item scale developed by Breaugh (1985). The measure is provided in Table 4.5 (Chapter 4). The measure reflects the freedom of venture managers with respect to work methods, including procedures

adopted by the team, the scheduling of the team's work activities and the criteria used to evaluate work performance of the team.

As presented in Chapter 5, we applied Principal Component Analysis to the questionnaire items of strategic autonomy and job autonomy which confirmed the presence of two distinct autonomy measures (Table 5.8). Results are briefly summarized. The six items for strategic autonomy and the seven items for job autonomy were included in the Varimax rotation and both constructs had Eigenvalues greater than one and included items with component loadings greater than .60 and cross-loadings below .30. The items one and three of the strategic autonomy scale (see Table 4.4) and the item one of the job autonomy scale (see Table 4.5) showed component loadings below .60. The three items were therefore excluded from further analysis. Thus, the original six-item scale for strategic autonomy (α=.81) was reduced to a four-item scale the original seven-item scale for job autonomy was reduced to a six-item scale (α=.82).

The component scores from the Principal Component Analysis (see Chapter 5) were used to weigh the items for the constructs applied in the regression analysis. Alternative regressions were run based on constructs assigning equal weight to the items (sum scores) but did not lead to materially different results. In addition, an extended Principal Component Analysis was also performed, including the reduced four-item scale for strategic autonomy, the reduced six-item scale for job autonomy and the seven-item scale for corporate venture success. The results are provided in the Appendix H. The three components had Eigenvalues greater than one with component loadings greater than .60 and cross-loadings below .30, thus confirming three distinct components. The seven items used to measure corporate venture success were retained in the ensuing analysis. The exploitation priority measure was not included in the Principal Component Analysis. As it is described as follows, the measure is based on a ranking scale and not on a Likert scale. It is

therefore not feasible to include the exploitation priority measure in the Principal Component Analysis.

The moderator variable *exploitation priority* builds on a construct developed by Lubatkin et al. (2006) and measures the extent to which corporate management forces venture managers to prioritize exploitative objectives. The additive twelve-item measure identified by Lubatkin et al. (2006) was reduced to six-items, three indicating explorative objectives and another three indicating exploitative objectives, that were then converted into a ranking measure. The venture managers were asked to rank the six items where 1 indicated the lowest priority and 6 indicated the highest priority. The ranks of the three exploitation items were added to a sum score measuring the extent to which corporate management prioritizes exploitative objectives. The measurement scale is presented in Table 6.1.

Table 6.1: Exploitation Priority Measurement Scale adapted from Lubatkin et al. (2006)

Exploitation Priority adapted from Lubatkin et al. (2006)	
Participants were asked to order the following aspects to which corporate management (supervisor) prioritizes them. (1=not important to my supervisor, 6= important to my supervisor).	
1	My team is forced to identify new market segments
2	My team is forced to explore innovative solution or services for commercialization
3	My team is forced to look for novel ideas by thinking "outside the box"
4	My team is forced to penetrate more deeply into the existing customer base
5	My team is forced to increase the levels of routinization of operations
6	My team is forced to improve quality and lower cost

Control Variables

Six control variables are used in our study in order to control for possible confounding effects of the hypothesized assumptions. The reasoning for including the control variables in the regression analysis is given below where each variable is discussed. The six control variables are (1)

environmental dynamism, (2) maturity stage, (3) team experience, firm size which is captured through the two variables, (4) total number of employees as well as (5) total sales and (6) team size. Concerning references are given below. The control variables are also reported in the Appendix E.

Ad (1), *Environmental dynamism* is expected to influence the need for autonomy, which is considered important when business conditions are changing (cf. Bruining, 1992). Technological discontinuity, intensity of competition and change of market demand are used to indicate the level of environmental dynamism (cf. Miller, 1987). Respondents were accordingly asked to evaluate technology shifts, pace of innovation, competitive intensity and changes in market demand over the past five to ten years. Environmental dynamism was included as a control variable to account for the potential effects of environmental change.

Ad (2), *maturity stage* is found to be positively related with corporate venture success, with large differences between high- and low-performing corporate ventures at the early stage and small differences at the middle and established stages (cf. Thornhill & Amit, 2000). Hence, we included maturity stage as an escalating variable. The participants were asked to indicate the maturity stage of the corporate venture according to three classifications: (1) the corporate venture is at the *early stage* when initial financial investment is made by the parent company or external partners but revenue is not yet generated, (2) the corporate venture is at the *middle stage* when the new business generates sales revenue but has not yet achieved profitability, (3) the corporate venture is at the *established stage* when the revenue of the new business exceeds the costs, thus the business generates profits. The control variable is included in the regression analysis by the use of a dummy variable whereas the value 1 indicates the early stage, the value 2 indicates the middle stage and the value 3 indicates a venture at the established stage (cf. Thornhill & Amit, 2000).

Ad (3), *team experience* reflects the experience of the corporate venture team. Team experience is included as it may influence corporate venture success (cf. Delmar & Shane, 2006). This influence may be present as some studies assume that experience has a positive effect on venture performance (cf. Taylor, 1999; Klepper, 2001) whereas others did not find such a relation (Shane & Stuart, 2002; Van Praag, 2003; Bosma, Van Praag, Thurik, & De Wit, 2004). Team experience is measured as the sum of years the members of the corporate venture have been engaged in venture activities.

Ad (4), *total employees* reflects the size of the firm in terms of full time equivalent employees (FTEs). The total number of employees is the amount of human resources that are potentially available to support the corporate venture, which may have a direct impact on corporate venture success (cf. Garrett & Neubaum, 2013). Large corporations have more human resources both in terms of quantity and variety to support venture creation compared to smaller firms. To account for this effect, we include the total number of employees as a control variable. As it is later described in Subsection 6.4.3, the measure is subject to significant skewness. Therefore, the measure is log transformed (natural logarithm) in order to correct skewness before it is included in the regression.

Ad (5), *total sales* also reflect the size of the firm. The measure is included in the regression by the use of a dummy variable that takes the value of 1 when sales are below 2 million Euro, 2 when sales are between 2 and 10 million Euro, 3 when sales are between 10 and 50 million Euro and 4 when sales exceed 50 million Euro. The measure is included in the regression analysis as the amount of financial resources (reflected in total sales) indicates the extent to which corporations can support corporate ventures. As such financial support may have direct influence on corporate venture success (cf. Garrett & Neubaum, 2013), we include total sales in the regression analysis.

Ad (6), *team size* can also influence corporate venture success because large teams have more resources available and may accomplish business development activities faster and better. Large teams can involve more and more diverse functional specialists, which has a positive effect on innovation (cf. Leonard & Sensiper, 1998). Hence, team size measured as the number of employees (FTEs) in the corporate venture team is included as a control variable. However, it is shown in Subsection 6.4.3 that the skewness of total number of employees is problematic. In order to correct skewness, the measure is log transformed (natural logarithm) before it is included in the regression models.

6.4.2 METHOD VALIDITY

In this subsection, five potential limitations are discussed with which corporate venture research is generally confronted. The potential limitations are (1) hindsight bias, (2) success bias, (3) social desirability bias, (4) non-response bias and (5) common source bias.

Ad (1) *hindsight bias* is present when participants provide incorrect information due to loss of memory and re-interpretation. The study eliminated hindsight bias by only considering responses from venture managers that were currently operating and thus provided real-time information (see Section 5.1).

Ad (2) s*uccess bias* may be present when only those responses of successful cases are captured, which may blindside the reasons for which corporate ventures failed. The success bias is minimized in our study as 71.3% of corporate ventures in the sample are at the early stage or middle stage. These corporate ventures have not yet achieved profitability. More specifically, 22 (25.3%) corporate ventures are at the early stage, 40 (46.0%) corporate ventures are at the middle stage and 25 (28.7%) are at the established stage. The period until the venture reaches the established stage (break-even point) is referred to as the "valley of death" (Murphy & Edwards,

2003). Accordingly, two-thirds of the corporate ventures in the dataset are at the critical stage before break-even is reached (early stage and middle stage). This means that the data contains information about corporate ventures that will both fail and succeed in the future. Thus, we may conclude that the success bias is not problematic in our study.

Ad (3) *social desirability bias* would be present when respondents answer questions in a manner that is favored by others. Potential social desirability bias is minimized in our study as it was guaranteed to the respondents that the collected data is kept confidential, thus not communicated to others in any way (cf. Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

Ad (4) *non-response bias* occurs when the answers of respondents are different from the potential answers of those that did not provide an answer. Analysis of variance was conducted to test for potential non-response bias. Therefore, the total sales and the total number of employees was compared between the responding and the non-responding firms (considering the database of all 2649 SMEs in the IT consulting industry in Germany). Results are presented in the Appendix I. The responding firms had on average turnover of 13.3 million Euro (s.d.=11.64) and 93.6 employees (s.d.=65.35) whereas non-responding firms had an average turnover of 15.1 million Euro (s.d.=27.33) and 86.0 employees (s.d.=70.03). The analysis of variance shows that these minor differences between the responding firms and non-responding firms are not significant. These results provide evidence that data is not constrained through non-response bias.

Ad (5) *common source bias* can be problematic when subjective performance measures are used because the assessment of success may be skew. Analysis of variance was performed in order to test for common source bias. Therefore, the subjective assessment of corporate ventures success was compared among the venture managers and the corporate managers. Results are presented in the Appendix J1. The venture managers assessed corporate venture success on average with 30.39 (s.d.=6.85) whereas corporate managers assessed corporate venture success on average with 29.56

(s.d.=6.82). Thus, the analysis of variance shows that venture managers assess the corporate venture success slightly better than the corporate managers. However, the differences are not significant, which provides evidence that data is not constrained through common source bias. Our findings are consistent with those of a prior study which shows that corporate managers and venture managers have a similar perception when assessing corporate venture success. Garrett and Covin (2013) find a high inter-rater reliability ($r = .82$, $p < .001$) for the measure of perceived success, which is also used in our study.

6.4.3 MODEL DIAGNOSTICS

In this subsection, it is tested whether the data is suitable for linear regression techniques and to test for potential constraints. Four analytical tests are therefore performed, namely, (A) skewness analysis, (B) residual analysis, (C) heteroscedasticity analysis and (D) multicollinearity analysis. These four statistical test are defined below. In (E) we summarize the results of the model diagnostics.

A: Skewness Analysis

Definition 6.2: **Skewness Analysis** *"measures the degree to which a distribution is asymmetric. It describes how the distribution of a data set departs from the normal distribution (cf. Postawa, 2012).*

Descriptive statistics including histograms were carried out for each variable used in the study in order to check distributions of the variables. Visual inspections of the distributions indicated that the variables were in range for linear regression with some exceptions. Therefore, statistical tests were conducted for analyzing the significance of the skewness.

Table 6.2 lists all variables used in the study (column 1) and their skewness scores. Significant skewness is indicated when (a) the skewness score is lower than -1.0 or higher than 1.0; or (b)

the skewness is higher than three times the standard error (Field, 2013). Although these criteria are not met for the three main variables, it was tested whether skewness could be corrected in order to improve the quality of the data analysis. Therefore, the variables were log transformed. Before performing the log transformation, the date was reflected for those variables with negative skewness scores. However, the log transformation increased skewness. The corrections were therefore discarded.

Table 6.2: Results of the Skewness Analysis

Variable	Skewness	Standard Error of Skewness
Main Variable		
Strategic Autonomy	.062	.258
Job Autonomy	-.535	.258
Exploitation Priority	-.469	.258
Corporate Venture Success	-.616	.258
Control Variable		
Environmental Dynamism	-.317	.258
Maturity Stage	-.053	.257
Team Experience	.267	.258
Total Employees	**4.928**	.258
Total Sales	.064	.257
Team Size	**4.253**	.257

In contrast, significant skewness is indicated for the two control variables, total employees and team size, as both threshold criteria (a and b) are exceeded. Log transformation corrected the skewness of both variables to a slight skewness of .661 (from 4.928) for total employees and of 1.027 (from 4.253) for team size. Thus, the log transformation corrected the skewness significantly for both variables. The log transformed variables were used for further data analysis as these corrections improve the quality of the data analysis.

B: Residual Analysis

Definition 6.3: **Residual Plots** "*show the residuals on the vertical axis and the independent variable on the horizontal axis"(cf. Edwards, 2013).*

Furthermore, residual plots (using standardized residuals with standardized predictor values) were generated for the two main variables (strategic autonomy and job autonomy), the moderator variable (exploitation priority) and the control variables (environmental dynamism, maturity stage, team experience, total employees, total sales and team size), using corporate venture success as the predictor value. The nine resulting residual plots are given in the Appendix K. The residual plots were analyzed visually (a) to identify potential outliers, (b) to test whether data is appropriate to apply linear regression techniques and (c) to identify potential heteroscedasticity concerns. The three remarks on the residual plots were in order, which is reported in the following.

Ad (a), the nine residual plots indicate that the cases (87 cases) were in range. Those cases that were locate slightly outside the point clouds were examined to check whether the questionnaire was answered through repeated patterns (e.g., 12341234) that would indicate any error or bias. Such patterns were not examined. As all cases were in range and patterns that would indicated any error or bias were not observed, all 87 cases were retained for further analysis.

Ad (b), residual plots showed random scattering of cases around the residual-zero line. Such scattering provides evidence that the standard deviation of the response variable y is constant over x and that linear regression models do not under- or overestimate results. It was therefore assumed that linear regression techniques are appropriate for analyzing the data.

Ad (c), residual plots were further used to examine the scattering for identifying potential heteroscedasticity constraints. The plots showed consistent and flat scattering of cases along

the residual-zero line. These results indicate homoscedasticity (cf. Field, 2013). In order to cross-check the results of the visual inspections that the data is homoscedastic, heteroscedasticity analysis was performed. The procedure and the results are described in the following.

C: Heteroscedasticity Analysis

Definition 6.4: **Heteroscedasticity** "*is present if the variability of a variable is unequal across the range of values of a second variable that predicts it. Accordingly, the scattering (variability) of a dependent variable against an independent variable widens or narrows along their regression line if data is heteroscedastic" (cf. Field, 2013).*

The Koenker tests were performed for identifying potential heteroscedasticity. The Koenker test was chosen as it is more accurate than the Breusch-Pagan test when the small sample size is small (cf. Field, 2013). The sample size of the data used in the thesis is n=87. The term Koenker test is defined below.

Definition 6.5: **Koenker Test** "*is a method to test for heteroscedasticity in linear models based the regression quantiles" (cf. Koenker & Bassett Jr, 1982; Field, 2013).*

Evaluated syntax was used for the analysis (see Pryce, 2002). The syntax is provided in Appendix L. It can also be found online[7]. The Koenker tests showed that Chi-Square values were non-significant for any of the variables listed in Table 6.2. Chi-Square values are reported in Table 6.4 (Section 6.5). These results provided evidence that data analysis is not constrained

[7] http://www.spsstools.net/Syntax/RegressionRepeatedMeasure/Breusch-PaganAndKoenkerTest.txt

through heteroscedasticity. Thus, the initial results of the visual inspections of the residual plots were supported.

D: Multicollinearity Analysis

Definition 6.6: **Multicollinearity** *"is a statistical phenomenon in which two or more independent variables in a regression model are highly correlated. In this situation the coefficient estimates may change erratically in response to small changes in the model or the data. Multicollinearity does not reduce the predictive power of the model as a whole; it only affects calculations regarding individual independent variables" (cf. Swanson & Tayman, 2012).*

Multicollinearity analysis was conducted with all variables because multicollinearity effects may lead to misinterpretation and cause problems when conducting linear regression analysis. The analysis is based on the computation of the Variance Inflation Factor which is defined in the following.

Definition 6.7: **Variance Inflation Factor** *"quantifies the severity of multicollinearity in an ordinary least squares regression model" (cf. Webster, 2013).*

Variance Inflation Factors (VIF) were calculated according to the procedure described by Aiken, West and Reno (1991). Results showed that the highest VIF was 2.17, which is far below the critical value of 10 or higher that would indicate multicollinearity effects (see, e.g., Tabachnick & Fidell, 2007). Therefore, we may conclude that data analysis is not constrained through multicollinearity effects. The results of the model diagnostics are summarized in the following.

E: Results of the Model Diagnostics

The results of the model diagnostics show that data is appropriate to apply linear regression techniques. Skewness analysis confirms that all variables are in range for linear regression.

However, the skewness of the two control variables total employees (number of FTEs employed the firm) and team size (number of FTEs employed at corporate venture) needed to be corrected through log transformation. Inspections of the residual plots show that outliers are non-problematic, linear regression is appropriate and heteroscedasticity constraints are not present. Heteroscedasticity analysis was conducted to cross-check the visual inspections. The results confirm that data is homoscedastic. Finally, multicollinearity analysis shows that data analysis is not constrained through multicollinearity concerns. Thus, the model diagnostics confirm that the data is appropriate for linear regression analyses and data is not constrained through heteroscedasticity, multicollinearity or outliers. Having evaluated the appropriateness of linear regression techniques, the study proceeds with the (linear) multiple regression analysis.

6.5 RESULTS OF THE DATA ANALYSIS

Table 6.3 reports the mean values, standard deviations and correlation coefficients for all variables in the study. Not surprisingly, we observe high correlations between total employees, total sales and team size. Results show further that team size generally increases as the venture matures. As one might expect, there is a high correlation of strategic autonomy with maturity stage. Also not surprising, team experience increases as the venture matures. We observe strong positive correlations between job autonomy, strategic autonomy and corporate venture success whereas the correlation between exploitation priority and corporate venture success is negative but statistically insignificant.

Table 6.3: Descriptive Statistics and Correlation Analysis

	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Environmental Dynamism	17.87	3.23									
(2) Maturity Stage	2.03[1]	.73	.060								
(3) Team Experience	6.32	3.68	.232*	.218*							
(4) Total Employees (Log Transformed)	4.89[2]	1.13	-.037	-.001	-.031						
(5) Total Sales	2,81[1]	.69	-.016	.058	.129	.802**					
(6) Team Size (Log Transformed)	1.77[2]	.89	.-.001	.289**	.078	.338**	.262*				
(7) Strategic Autonomy	10.85	3.87	.156	.357**	.018	-.110	-.182	.144			
(8) Job Autonomy	29.32	4.93	.173	.086	.203	-.021	.035	.042	.293**		
(9) Exploitation Priority	11.45	2.84	-.065	-.030	.128	-.123	-.124	.076	.093	.176	
(10) Corporate Venture Success	33.39	6.85	.125	.273	.023	.068	.096	.139	.440**	.447**	-108

**. Correlation is significant at the .01 level (2-tailed). *. Correlation is significant at the .05 level (2-tailed).
[1]. This value is represented through a dummy variable (see 6.4.1).
[2]. The natural logarithm is used in the regression analysis in order to correct skewness (see 6.4.1). The average size of the firms was 279.11 (SD=691.85) full-time employees. The average size of the corporate venture was 9.55 (SD=15.14) full-time employees.

The results of the step-wise multiple regression analyses on corporate venture success are reported in Table 6.4. In Model 1 (as the first step) the control variables are regressed on the dependent variable. The two main effect variables are added in Model 2 in the second step to test the hypothesized effects of job autonomy (Hypothesis 1) and strategic autonomy (Hypothesis 2) on corporate venture success. Finally, the interaction effects on corporate venture success between the autonomy constructs and the policy variable exploitation priority are assessed in Model 3 (Hypotheses 3 and 4). As described in Subsection 6.4.3, the regressions are tested for potential heteroscedasticity influence. We performed Koenker tests on all regressions reporting Chi-squares that show no significant effects, which provides evidence that heteroscedasticity is not present. It is also tested whether multicollinearity effects are present. Therefore, variance inflation factors (VIF) were calculated for each regression (cf. Aiken, West, & Reno, 1991). The highest score of 2.17 is well below the critical value of 10 that would indicate multicollinearity effects (cf.

Tabachnick & Fidell, 2007). To properly assess multicollinearity constraints in the interaction terms, the variables were mean-centered before multiplication (cf. Hayes, 2009).

Table 6.4: Results from Multiple Regression Resting Effects on Corporate Venture Success [a]

Variables	Model 1	Model 2	Model 3
Control Variables			
Environmental Dynamism	.101	.022	-.097
Maturity Stage	.257*	.149	.127
Team Experience	-.101	-.130	-.076
Total Employees	-.124	-.136	-.171
Total Sales	.144	.200	.212
Team Size	.081	.040	-.018
Main Effects			
Strategic Autonomy		.327**	.357**
Job Autonomy		.416***	.499***
Moderating Variable			
Exploitation Priority			-.158
Interaction Effects (Moderation)			
Strategic Autonomy * Exploitation Priority			.264**
Job Autonomy * Exploitation Priority			.249**
R^2	.098	.348	.502
Adjusted R^2	.028	.278	.426
F	1.391	5.003***	6.597***
Chi-Square (Koenker Test)	2.400	8.467	13.858

* p<.05; **p<.01; ***p<.001.
[a] N=87; Standardized coefficients

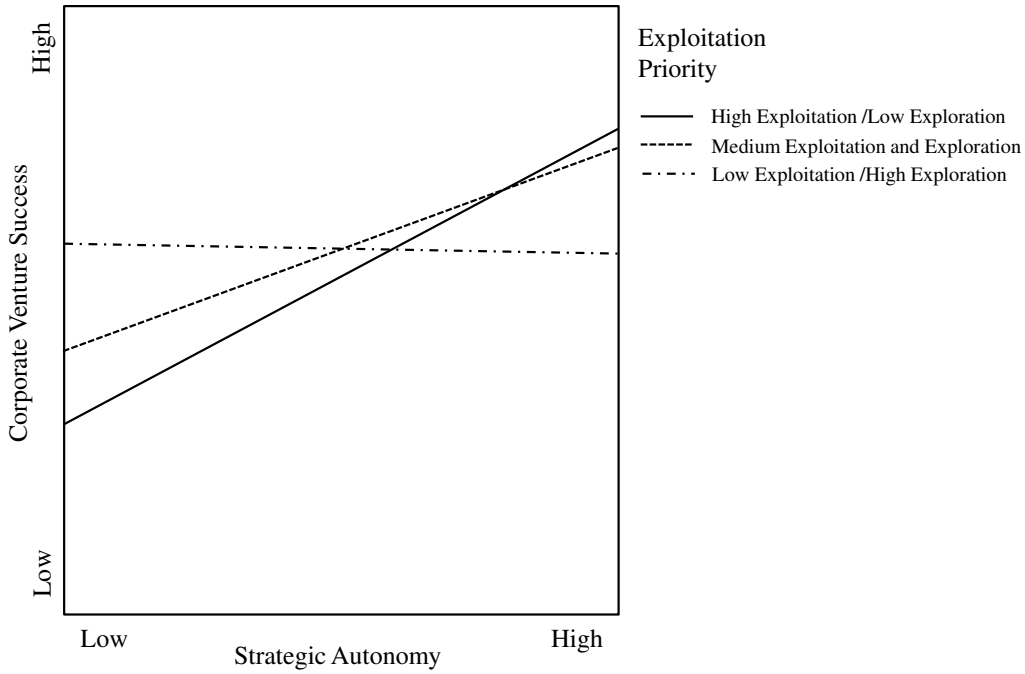
Model 1 only shows one significant regression coefficient indicating a positive relationship between maturity stage and venture success (β=.257, p<.05). Model 2 shows two significantly positive regression coefficients on corporate venture success for strategic autonomy (β=.327, p<.01) and job autonomy (β=.416, p<.001), which leads to the conclusion that the Hypothesis 1 and Hypothesis 2 cannot be rejected. The explanatory power of Model 2 is highly significant (p<.001), showing a significant improvement compared to Model 1 (p<.05). Model 3 retains the significance of the two regression coefficients on strategic autonomy (β=.357, p<.01) and job

autonomy (β=.499, p<.001). Moreover, the model shows positive moderation effects of exploitation priority with a significant regression coefficient on the interaction term between strategic autonomy and exploitation priority (β=.264, p<.01) and the interaction term between job autonomy and exploitation priority (β=.249, p<.01). These results lead to the conclusion that Hypothesis 3 and Hypothesis 4 cannot be rejected. Model 3 has a significant increase in explanatory power compared to Model 2 (p<.05).

Hence, the regression analyses find outcomes consistent with Hypothesis 1 and Hypothesis 2, which predicts that strategic autonomy and job autonomy are positively associated with corporate venture success as strategic autonomy facilitates explorative venture development based on the ability to take responsive initiatives (cf. Nonaka, 1988; Andersen & Nielsen, 2007) and job autonomy enhances venture managers to develop work methods fitting the novel task environment (cf. Hennessey & Amabile, 2010; Unsworth & Clegg, 2010).

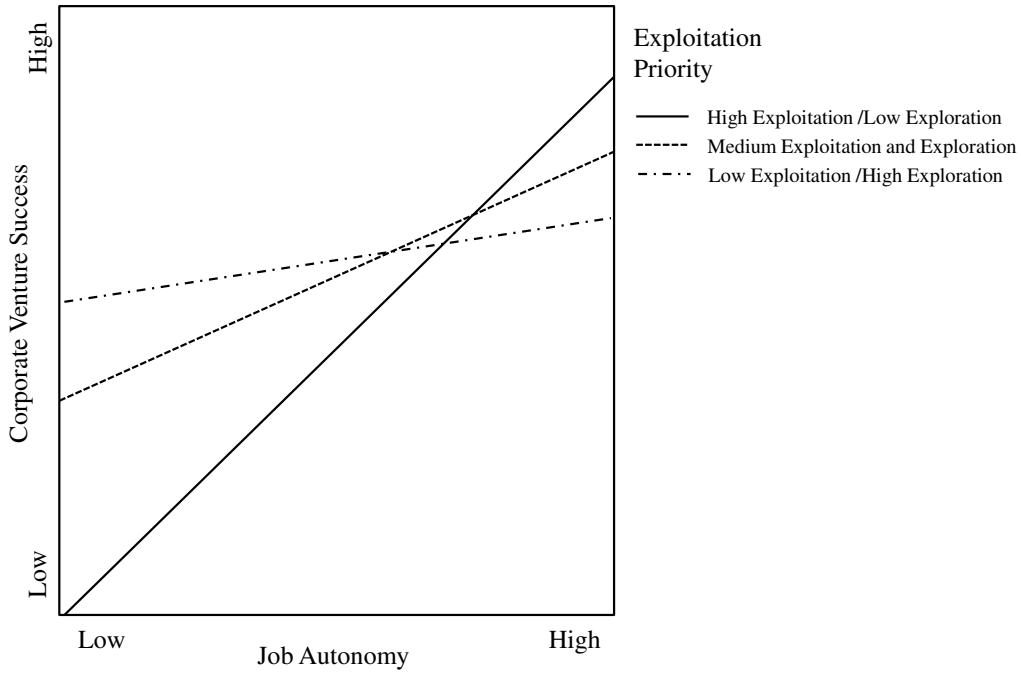
The outcomes are also consistent with Hypothesis 3 and Hypothesis 4, which predict that a business policy with a priority for exploitation will enforce the positive effects of strategic autonomy and job autonomy. A corporate policy with an exploitation priority may enhance the positive effect of strategic autonomy on corporate venture success. That is, the performance effect of strategic autonomy can be substantially higher in situations with high exploitation priority compared to situations with low or medium exploitation priority (Figure 6.2). The illustration below is computed based on the statistical data.

Figure 6.2: Interaction Effect between Strategic Autonomy and Exploitation Priority



Similarly, a corporate policy with an exploitation priority may have incremental positive effects on corporate venture success when corporate management simultaneously grants job autonomy to the venture manager. Hence, the positive performance effect of job autonomy can be substantially higher in situations with high exploitation priority compared to situations with low or medium exploitation priority (Figure 6.3). The interaction effect of Figure 6.3 is computed based on the statistical data.

Figure 6.3: Interaction Effect between Job Autonomy and Exploitation Priority



These findings indicate that the effectiveness of both strategic autonomy and job autonomy increase significantly when corporate management simultaneously emphasizes exploitation priority in the venture manager's work-mode decisions.

6.6 DISCUSSION

It was stated that corporate venturing is an effective way for corporations to develop opportunities that extend the corporate business portfolio as a basis for ongoing strategic renewal and adaptation for long-term survival (cf. Kuratko, 2010). Approximately at the same time it was proposed that effective corporate venture management is linked to (a) semi-autonomous structures (cf. Covin et al., 2010) with (b) loose corporation-venture relations (cf. Burgers et al., 2009). From these two statements we may derive that the freedom of action that the corporations grant to their ventures and the business policy they impose affect corporate venture success (cf. Thornhill & Amit, 2000). In accordance with the conclusions drawn from the two statements, (1) we analyzed how corporate venture success is influenced by job autonomy and strategic autonomy that is granted by corporate

management to the venture managers. We also (2) investigated the moderating effects of corporate business policy that forces exploitation priority in the venture manager's decision making. In the following, we discuss the research results guided by our four hypotheses.

Ad (1), the results are consistent with *Hypothesis 1* whereby it is indicated that corporate venture success is enhanced when corporate management provides venture managers with higher levels of job autonomy. Job autonomy can enable the ventures to break out of established routines, procedures and norms (cf. Shalley & Gilson, 2004; Parker, 2014) to develop new capabilities that fit the task environment of the novel business environment (cf. Kanter, 1989). The results are also consistent with *Hypothesis 2* as it is indicated that strategic autonomy is positively related to corporate venture success. Strategic autonomy can trigger exploration as it provides venture managers the freedom to take responsive strategic initiatives and thereby engage in experimental learning about new effective ways to achieve market impact (cf. Andersen, 2004). We may state that the empirical study is consistent with the hypothesized assumption that the job autonomy of venture managers can be beneficial for developing new capabilities and that the strategic autonomy of the venture manager can be beneficial to explore new market opportunities.

Ad (2) we also tested the proposed moderation effect of business policy on the relations of strategic autonomy and job autonomy on corporate venture success. Consistent with *Hypothesis 3*, our results indicates that the positive effect of strategic autonomy on corporate venture success can be amplified when corporate management simultaneously emphasizes a business policy that forces venture managers to consider exploitation priority in their work-mode decisions. In line with *Hypothesis 4,* the regression results show also that the positive effect of job autonomy on corporate venture success can be increased by corporate management when simultaneously enforcing a business policy that forces venture managers to consider exploitation priority in their strategic decision making.

Main contribution of the study

In conclusion, our results indicate that corporate venture success is positively affected by both job autonomy and strategic autonomy, which is amplified by a business policy that simultaneously imposes exploitation priority in the strategic decisions and work-mode decisions of the venture manager. These findings lead us to the main contribution of the study.

So, our study provides a management model that shows how corporate management may master the challenge to balance the corporate venture activities such that the new business can be invented and reaches profitability. Our results offer fairly straightforward recommendations for corporate venture management by generally acknowledging the positive influence of a "guided hands-off strategy". The findings show that corporate management can gain significantly greater corporate venture success by (1) granting venture managers with the authority to make autonomous strategic decisions and (2) to make autonomous work-mode decisions. This broad decision authority enables venture managers to engage effectively in explorative activities to invent the new business. However, corporate management should (3) at the same time impose a business policy that enforces the exploitation objective to increase profitability.

Prior research suggested that effective exploration may depend on a balance between tight and loose corporation-venture relations (cf. Thornhill & Amit, 2000) with a certain relatedness between the corporation and the ventures (cf. Kuratko et al., 2009; Crockett et al., 2013) reflecting differentiation-integration design aspects (cf. Burgers et al., 2009). Consistent with our findings, these prior studies highlight the need to provide some freedom to enable effective explorative activities for inventing the new business but also emphasize to ensure that corporate ventures also engage to a certain degree in exploitation activities to increase profitability. In line with these prior findings, our results indicate that corporate ventures are most successful when corporate management grants venture managers with the autonomy to effectively engage in explorative

activities and simultaneously promotes a business policy emphasizing exploitative venture activities. Our study allows us to also draw further conclusions.

Further contributions of the study

The study contributes to the venture management literature in five further ways. *First*, it shows that corporate venture autonomy fundamentally depends on the dispersion of power from corporate management to the venture manager. The finding indicates that corporate venture autonomy is not necessarily created by separating corporate venture activities from the corporate mainstream activities (structural differentiation) (see, e.g., Burgers et al., 2009), but may also be sufficiently generated through power dispersion. *Second,* our study extends the conceptual understanding of the role and effect of different kinds of decision authority providing operational freedom (job autonomy) and strategic freedom (strategic autonomy) to the venture manager for effective corporate venture management. In contrast, prior research has not differentiated between strategic and work-mode aspects in the decision making of corporate ventures (see, e.g., Thornhill & Amit, 2000; Crockett et al., 2013). Thus, we contribute a new construct that enable researchers to measure the decision authority of corporate ventures more precisely. *Third*, the study identifies business policy as a strategic integration device where exploitation priority enforces the positive effects of autonomous strategic and operational action by enhancing economic efficiencies. *Fourth,* the proposed corporate venture management model is tested on a sample of SMEs and thereby updates the limited pool of empirical studies supporting the assumption that it is beneficial to establish corporate ventures as (semi-)autonomous subunits even in less formalized organizations (cf. Johnson, 2012; Garrett & Covin, 2013). *Fifth*, our results hold methodological implications to future research endeavors as the thesis shows that the autonomy of corporate ventures can effectively be measures by capturing the decision authority of the venture managers. Prior studies have often measured the independence of the corporate venture operations (i.e.,

workflows, procedures and processes) from the corporation as an indicator for corporate venture autonomy (see, e.g., Kuratko et al., 2009; Johnson, 2012; Garrett & Covin, 2013).

6.7 CHAPTER CONCLUSION

The chapter answers RQ3 and provides an answer to the PS. The answers are briefly summarized in the following two subsections.

6.7.1 ANSWER TO THE RQ3

The results of the performed multiple regression analysis enable us to answer *RQ3: How are the autonomy dimensions related to the success of the corporate ventures?* Model 2 (shown in Table 6.4) supports our assumption that strategic autonomy and job autonomy are both positively related with corporate venture success. Also, the study further developed the autonomy construct (Figure 5.2) evaluated in Chapter 5. Exploitation priority is included as a variable that moderates the positive impact of strategic autonomy and job autonomy on corporate venture success (see Figure 6.1). The hypothesized moderation effects were tested and could not be rejected.

6.7.2 ANSWER TO THE PS

The study in this chapter provides also an answer to the *PS: How can corporate management effectively manage corporate ventures?* The results of the multiple regression analysis reveal an empirical management model (Model 3 in Table 6.4) which shows how corporate management can effectively manage corporate ventures by following three principles. Corporate management should grant the venture managers with both, (1) the authority to make work-mode decisions without approval (job autonomy) and (2) the authority to make strategic decisions without approval (strategic autonomy). Corporate management should at the same time (3) enforce a

business policy that forces the venture manager to consider exploitation priority in their strategic decisions and work-mode decisions.

Chapter 7

Answering the Problem Statement and Identifying the Contributions

This chapter provides the conclusive answers to the research questions (RQs) and to the problem statement (PS), formulated in Chapter 1. The answers to the three research questions RQ1 to RQ3 are given in the Chapters 3 to 6 and are summarized in Section 7.1. The problem statement is answered in Section 7.2 based on the empirical model (Table 6.4, Model 3) that is evaluated statistically in Chapter 6. The theoretical and practical implications of the thesis are presented in Section 7.3. The limitations of the research results are reported in Section 7.4. Recommendations for future research endeavors are given in Section 7.5.

7.1 Answers to the Three Research Questions

In this section, the three research questions (RQs) are answered. Guided by the research questions, the thesis seeks to explore the dimensions that are underpinning the autonomy of venture managers (RQ_1) and operationalize these autonomy dimensions into a multidimensional measurement instrument (RQ_2) that enables to investigate the relations between the autonomy dimensions and corporate ventures success (RQ_3). The answers that are given to the three research questions throughout the thesis are summarized in the Subsections 7.1.1 to 7.1.3.

7.1.1 The Dimensions Reflecting the Autonomy of Venture Managers

Chapter 2 highlights that corporate ventures are an effective means for corporations to enter novel business domains as an attempt to renew the corporate business portfolio strategically. However,

corporations often fail with these initiatives which is attributed to mismanagement through corporate management (cf. Ginsberg & Hay, 1994; Birkinshaw & Hill, 2005). Managing corporate ventures is a challenge as corporate ventures are semi-autonomous subunits (cf. Kuratko, 2010). While corporate ventures are somehow related to the corporation, it is essential that corporate management grants venture managers with sufficient autonomy to enable effective engagement in venture activities (cf. McGrath, 2001). However, the literature review (see Chapter 2) shows that it is not well understood what kind of autonomy should be granted to venture managers. In order to shed some light upon this matter, we formulated three research questions that built on one another. The first research question intending to explore what kind of autonomy venture managers may enjoy is formulated as follows.

RQ1: What are the dimensions reflecting the autonomy that corporate management grants to venture managers?

Chapter 3 provides an answer to the RQ1. The chapter shows that venture managers have a pivotal role to enter novel business domains with their corporate venture teams. Consistent with the literature, we found that venture managers develop the new business through explorative activities (i.e., experimentation, improvisation and search) which is workable when venture managers are granted with sufficient autonomy (cf. McGrath, 2001). In addition to what is already known in literature, we provide some evidence that the autonomy of venture managers is reflected in the following four autonomy dimensions: (a) functional autonomy, (b) decision autonomy, (c) strategic autonomy and (d) job autonomy. The autonomy dimensions are described in the following.

Ad (a), corporate ventures with full functional autonomy would represent a cross-functional team that includes representatives from all business functions (e.g., sales, marketing, R&D) which are required to develop the new business. Correspondingly, functional autonomy indicates the extent

to which the venture managers can act autonomously with their teams without relying on external expertise on function.

Ad (b), decision autonomy is the authority of venture managers to make operational decisions without approval through corporate management. This authority enables venture managers to bypass hierarchical analytical decision procedures which are often associated with time consuming approval meetings with corporate management. Thus, decision autonomy may provide venture managers with the flexibility that is necessary for responsive decision making.

Ad (c), strategic autonomy is the authority of venture managers to make strategic decisions without approval. Strategic decisions may refer to strategic issues such as new market activities, new product and service developments as well as change in practices and policies (cf. Andersen, 2004). Granting venture managers with strategic autonomy enables venture managers to engage in strategy probing (cf. Andersen, 2004) which provides the necessary space for new and effective strategic action to evolve.

Ad (d), job autonomy is the authority of venture managers to make work-mode decisions without approval. This authority reflects the freedom that venture managers hold in their job with respect to work methods, including the choice of procedures adopted by the team, the scheduling of the team's work activities and the choice of criteria used to evaluate the work performance of the team. Thus, job autonomy enables the venture manager to perform his jobs outside the corporate standard procedures.

The following research question is addressed in order to operationalize an instrument that enables to measure the autonomy of the venture managers based on the four autonomy dimensions.

7.1.2 INTEGRATING THE AUTONOMY DIMENSIONS IN A MULTIDIMENSIONAL CONSTRUCT

As shown in Chapter 4 (Section 4.1), the autonomy of venture managers may reflect various conditions, such as loose versus tight control, centralized versus decentralized decision-making, dependent versus independent venture operations and dependency versus independency on corporate resources. A multidimensional autonomy construct (measurement instrument) is accordingly proposed to precisely measure the autonomy of venture managers. However, the literature review conducted in Chapter 2 highlights that an appropriate measurement instrument is yet to be provided. Building on the answers given to RQ1, an initial four-dimensional measurement instrument (functional autonomy, decision autonomy, strategic autonomy and job autonomy) is operationalized in Chapter 4. The initial measurement instrument is evaluated statistically and adapted in Chapter 5. Thereby, the thesis provides an answer to the following research question.

RQ2: How can the autonomy dimensions identified by RQ1 be operationalized in a construct that enables us to measure the autonomy of venture managers?

In Chapter 4, a theoretical model (Figure 4.7) is developed based on literature research. The model positions the four autonomy dimensions, namely, functional autonomy, decision autonomy, strategic autonomy and job autonomy as distinct (unrelated) dimensions and associates them with corporate venture success. The variables of the model are operationalized which provides an initial four-dimensional measurement instrument that allows to measure the autonomy of venture managers at various dimensions and degrees.

In Chapter 5, the validity and the reliability of the initial four-dimensional measurement instrument (developed in Chapter 4) is evaluated. The initial measurement instrument had to be adapted in order to ensure good validity and reliability. Variable reduction techniques are applied to evaluate and adapt the instrument. The study follows therefore the four step procedure described by Field (2013). *In the first step*, it is shown (based on the correlation matrix, the Kaiser-Meyer-Olkin

index and the Bartlett's test of sphericity) that the data is suitable to apply variable reduction techniques (e.g., Principal Component Analysis or Principal Factor Analysis). *In the second step*, Principal Component Analysis is found to be the appropriate technique and Parallel Analysis provides evidence that the number of components to extract should be four. *In the third step*, it is evaluated that Varimax rotation is the appropriate rotation method. The results of the Varimax rotation show that most of the items of the functional autonomy measure and the decision autonomy measure do not load appropriately as the component loadings are below the .6 threshold and the cross-loadings are above the .3 threshold (Table 5.7). Therefore, the items of both measures are excluded to test whether results can be improved. The Varimax rotation with the items for the strategic autonomy measure and the job autonomy measure retained provides a two-dimensional component solution (Table 5.8) with good construct validity (with component loadings above .6 and cross-loadings below .3). *In the fourth step*, Cronbach's Alpha coefficients are computed for the measures of strategic autonomy and job autonomy. Results confirm good internal consistency for both autonomy measures (with Alpha coefficient above .8). Thus, Chapter 5 reveals a two-dimensional instrument that enables to measure the autonomy of the venture manager.

7.1.3 REVEALING THE IMPACT OF AUTONOMY ON CORPORATE VENTURE SUCCESS

RQ3 is addressed to evaluate whether strategic autonomy and job autonomy are associated with corporate venture success. The evaluated measurement instrument (Chapter 5) enables us to investigate the association of strategic autonomy and job autonomy with corporate venture success. For that purpose, a questionnaire is distributed in the German IT consulting industry. The answers of 87 venture managers are analyzed through multiple regression analysis in Chapter 6. The results provide an answer the following research question.

RQ3: How are the autonomy dimensions related to the success of the corporate ventures?

Before linear multiple regression analysis is conducted to answer the question, (1) the general methodology is evaluated, (2) it is tested whether linear regression analysis is appropriate and if data analysis is constrained through potential outliers and (3) whether heteroscedasticity and multicollinearity effects are present. Ad (1), corporate venture research may generally be subject to the following five methodological limitations: hindsight bias, success bias, social desirability bias, non-response bias and common source bias. It is however shown in Subsection 6.4.2 that none of these limitations constrains the data analysis in such a way that further analysis is impossible. Ad (2), skewness analysis and residual analyses are performed in Subsection 6.4.3 and confirm that data analysis is not constrained through outliers in a way that data analysis is impossible and the data is appropriate for linear regression analysis, after the skewness of two control variables (number of FTEs employed the firm and number of FTEs employed at corporate venture) is corrected through log transformation. Ad (3), heteroscedasticity analysis and multicollinearity analysis are performed in Subsection 6.4.3 and confirm that data is homoscedastic and multicollinearity is not present. Having evaluated the research methodology and the appropriateness of the data to apply linear regression analysis, the relationships of strategic autonomy and job autonomy with corporate venture success is analyzed in Section 6.5. The results of the regression analysis reveal an empirical model (Model 2 of Table 6.4) which shows that strategic autonomy and job autonomy are both positively related with corporate venture success. These regression results provide an answer to RQ3.

7.2 ANSWER TO THE PROBLEM STATEMENT

In the following, the problem statement (PS) is answered based on the results of the regression analysis performed in Chapter 6. The consecutive research carried out to answer the three research questions (RQ1 to RQ3) led to the empirical results reported in Chapter 6, which enable us to answer the problem statement. The problem statement reads as follows.

PS: How can corporate management effectively manage corporate ventures?

The research results of Chapter 6 reveal an empirical model (Model 3 of Table 6.4, illustrated in Figure 6.1) that shows how corporate management can effectively manage corporate ventures. The answer to the problem statement is given in Subsection 7.2.1 where the empirical model is described and the essence of the model is summarized in three principles. Additionally, it is discussed in Subsection 7.2.2 how corporate managers may realize the model through management routines.

7.2.1 THE MODEL FOR SUCCESSFUL CORPORATE VENTURE MANAGEMENT

The empirical model provides evidence that strategic autonomy and job autonomy are both positively associated with corporate venture success. The model shows further that the positive relations of strategic autonomy and job autonomy with corporate venture success are further amplified when the achievement of exploitative objectives is emphasized at the same time. The essence of these empirical model is summarized below in order to provide an answer the problem statement.

First, corporate managers should allow venture managers to make strategic decisions without their approval (strategic autonomy). The authority to make autonomous strategic decisions (i.e., new market activities, new product and service developments and change in practices and policies)

provides venture managers with the freedom to act independently and engage in autonomy actions (cf. Andersen, 2004). Autonomous actions are a "form of efficient low-risk strategy probing based on active search" which enables effective strategic influence to emerge from the venture manager (cf. Andersen & Nielsen, 2007: 22).

Second, corporate managers should grant venture managers with the authority to make work-mode decisions without their approval (job autonomy). Work-mode decisions refer to the work methods including the procedures the venture adopts, the scheduling of venture activities and the criteria used to evaluate work performance of venture activities. Job autonomy provides venture managers with the freedom necessary to break out of established routines, procedures and norms of the corporate mainstream business in order to develop work methods that fit the novel task environment of the new business domain.

Third, granting venture managers with essential freedom to act (i.e., strategic autonomy and job autonomy) does not imply that corporate management should reduce the influence on the activities of venture managers to a minimum. In fact, our model shows that the positive influence of strategic autonomy and job autonomy on corporate venture success is amplified when venture managers are simultaneously enforced through business policy to consider exploitation priority (e.g., improving achieved solutions, penetrate more deeply in existing customer segments and routinize established operations) in their strategic and work-mode decisions. It is therefore concluded that corporate management (a) should grant venture managers with essential freedom to act for inventing the new business and (b) should ensure at the same time that general efficiency requirements are also achieved.

7.2.2 REALIZING EFFECTIVE VENTURE MANAGEMENT THROUGH MANAGEMENT ROUTINES

While the principles of the empirical model provides straight forward recommendations, it is not obvious how corporate managers may effectively realize them. As is reported in Chapter 2 (Subsection 2.2.3), I build on the dynamic capability-based view to address the challenge of corporate management to manage corporate ventures effectively. The dynamic capability-based view associates effective management with routines (cf. Strehle, 2006; Teece, 2012) which are described as the recurrent interaction patterns carried out among multiple actors (cf. Becker, 2004). The routines refer in the context of corporate venture management to the regular and recurring meetings between the corporate management and the venture managers (management routines). The corporate management can exercise influence and control over the venture managers in the management routines. Correspondingly, corporate managers can realize effective corporate venture management (according to our empirical mode) by establishing management routines in which they: (a) limit their control to provide venture managers with the authority to make strategic decisions (strategic autonomy) as well as work-mode decisions (job autonomy) without their approval and simultaneously (b) exercise sufficient influence on the venture manager to ensure some exploitation priority in the venture manager's decision making.

7.3 CONTRIBUTIONS

The contributions of the thesis are twofold. *First*, our results hold essential theoretical implications that contribute to the current body of knowledge meant for corporate venture scholars. *Second*, the study contributes important practical implications that are of relevance for corporate management in charge for supervising venture managers. In the Subsections 7.3.1 and 7.3.2, I summarize the theoretical and practical contributions.

7.3.1 THEORETICAL CONTRIBUTIONS

The results of this thesis contributes to the theoretical discussion in four ways. *First*, the research contributes to the current conceptual understanding of the instrument that allows to measure the autonomy of venture managers. The literature review (Chapter 2) shows that the autonomy of venture managers is primarily measured through the extent to which venture managers are authorized to make decisions without approval (see, e.g., Crockett et al., 2013). We explore the relevance of two distinct aspect of decision authority (strategic autonomy and job autonomy). The distinction between strategic decisions and work-mode decisions is not made before by corporate venture scholars. Thus, we contribute a new instrument that enables researchers to measure more precisely the autonomy of venture managers than the established instruments. Applying our measurement instrument in future research may essentially contribute to the controversial discussion (see Chapter 2) concerning the relationship between decision authority and corporate venture success.

Second, the thesis is among the first research products that investigate whether the principles of segregation also applies to SMEs. Even though SMEs are less formalized organizations, still our results provide evidence that the segregation of corporate ventures from mainstream business in terms of power dispersion (strategic autonomy and job autonomy) can have a positive influence on the success of corporate ventures. So far, the necessity to segregate corporate ventures has only been shown in the context of large, formalized corporations (cf. Johnson, 2012).

Third, our findings show further how to realize the segregation of corporate ventures. The dispersion of decision power grants autonomy to corporate ventures and thereby contributes to segregation. Our results provide missing evidence that the segregation of corporate ventures through the dispersion of power concerning strategic decisions as well as work-mode decisions can positively influence the success of corporate ventures. So far, prior research has associated

segregation of corporate ventures with the structural differentiation of venture activities from corporate mainstream activities (cf. Burgers et al., 2009).

Fourth, following the dynamic capability-based view, we acknowledge that management routines through which corporate management and venture managers interact are essential for effective venture management. Corporate managers can realize effective venture management by limiting their control (i.e., grant venture managers with decision authority) and exercising influence (i.e., pushing venture managers to achieve exploitative objectives) in the management routines. As shown in Chapter 2, prior research has followed the resource-based view and the organizational design-based view without providing a sound explanation for effective corporate venture management. Thus, our research results contribute to the current body of knowledge by corporate venture scholars as we reveal that the dynamic capability-based view may provide an alternative analytical lens to investigate the management of corporate ventures.

7.3.2 PRACTICAL CONTRIBUTIONS

The research conducted in this thesis reveals an empirical model that provides straight forward recommendations for corporate managers to evaluate/improve their venture management practice. Corporate venture activities and their outcomes are associated with increased unpredictability. Corporate managers may, as a result, follow their intuition to increase control in order to reduce the information asymmetry that generally exists between them and the venture managers. However, increased control chokes the explorative behavior of venture managers. Corporate managers should therefore give up excessive control and pass on the authority to make strategic decisions as well as work-mode decisions to the venture managers in order to increase the probability for corporate venture success.

Granting increased decision authority may allow venture managers to effectively engage in venture activities (cf. McGrath, 2001) but also increases the risk that general efficiency requirements (i.e., profitability) are left unfulfilled. Our empirical model shows that corporate managers should not only grant venture managers with increased decision authority but should simultaneously enforce venture managers to achieve exploitative objectives. Correspondingly, we may conclude that a "guided hands-off strategy" which combines decision authority with continuous pushes towards exploitative objectives is promising to manage corporate ventures effectively.

7.4 LIMITATIONS OF THE RESEARCH

While we have taken reasonable precaution to ensure the reliability and the validity of our research results, the generalizability of our findings may be limited due to the following five aspects.

First, the research carried out throughout the thesis (data set A, B and C) has focused on SMEs. Future research is necessary to evaluate whether our findings also hold for large multinational corporations (MNCs).

Second, the three data sets (A, B and C) on which this thesis builds are collected in Germany. The German 'Mittelstand' (SMEs) is known for its international competitiveness (e.g., the hidden champions which are globally market leadership in niches). Correspondingly, SMEs in other countries may potentially learn from the practice of German SMEs. Nevertheless, cross-cultural differences may exist that limit the transferability of our findings. It is recognized that cultural differences across countries may influence entrepreneurial behavior within corporations (cf. Morris, Davis, & Allen, 1994). Future research is required to evaluate whether our findings are also applicable to other national and geographical contexts.

Third, the sample (data set C) of the research carried out in Chapter 6 is limited to corporations in the IT consulting industry. Thus, the results associated with our empirical model may not reflect effective corporate venture management in other industries. Cross-industry research may provide clarity.

Fourth, the level of dynamism in the German IT consulting industry is relatively high with a mean value of 17.87 (s.d. 3.23) on a maximum scale of 24. Prior research has shown that the effectiveness of autonomy is increased in industries with high levels of dynamism relatively to industries with low levels of dynamism (cf. Andersen, 2004). Thus, our findings may not be transferable to corporations that operate in industries with low levels dynamism.

Fifth, the generalizability of our results may also be limited due to the sample size (87 observations only). However, it is acknowledged that an ultimate source which would allow to identify corporate ventures does not exist (cf. Birkinshaw & Hill, 2005). Multiple studies by corporate venture scholars state that it is particularly difficult to collect large data sets on corporate ventures (Kuratko et al., 2009; Johnson, 2012; Crockett et al., 2013; Garrett & Covin, 2013; Garrett & Neubaum, 2013). As already discussed in Section 5.1, small sample sizes are acceptable as no other source is available. The following studies published in corporate venture scholars provide evidence that our sample size of n=87 is acceptable in our research domain. The study by Johnson (2012) has a sample size of n=64, the study published by Crockett et al. (2013) has a sample size of n=78, the study of Thornhill and Amit (2000) has a sample size of n=102, the study of Birkinshaw and Hill (2005) has a sample size of n=95 and the studies published by Garrett and Covin (2013), Garrett and Neubaum (2013) and Kuratko et al. (2009) have a sample size of n=145.

7.5 DIRECTIONS FOR FUTURE RESEARCH

This section provides three recommendations for future research. *First*, our regression results show a positive relationship of strategic autonomy and job autonomy with corporate venture success. Although the validity and the reliability of these results are carefully checked, it is also true that our results do not provide evidence for a causal relationship between the two autonomy dimensions and corporate venture success. A longitudinal study is therefore recommended in which the interplay of strategic autonomy and job autonomy with corporate venture success can be examined over time. Such a longitudinal study may further benefit from including a variable (e.g., as a dependent variable) that measures the explorative behavior of corporate venture teams. The link between decision authority and explorative activities has been made in previous studies (cf. McGrath, 2001). However, the interaction of strategic autonomy and job autonomy (as distinct aspects of decision authority) and explorative behavior may be essential to understand the causal linkage between autonomy and corporate venture success.

Second, the power of strategic autonomy and job autonomy to predict corporate venture success may be influenced by internal and external factors as it is indicated in prior studies. As highlighted in the limitations (Section 7.4), external factors, such as industry characteristics and cultural aspects may have an influence on the relation between autonomy and corporate venture success. Cross-cultural and cross-industry studies may thus provide a valuable contribution to further understand the conditions in which strategic autonomy and job autonomy are effective. Future research should also include internal factors such as top management team characteristics, trust between corporate management and venture management as well as the entrepreneurial orientation of a firm, as these internal factors may also influence the effectiveness of autonomy.

Third, the thesis demonstrates that corporate venture management is associated with the management routines in which corporate management and venture manager engage in interaction.

While our research results enable us to describe parts of this interaction, we also acknowledge that the total interaction patterns are not well understood. The research design of the thesis does not enable us to provide an extensive and detailed description of the entire interaction patterns of corporate management and venture managers. Qualitative research might be the most promising research methodology to broadly observe and describe the interaction patterns. Qualitative research is known for its appropriateness to carry out in-depth observations, which is required to generate an extensive and detailed understanding of the interaction carried out in management.

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APPENDICES

The list of Appendices consists of sixteen parts as given below.

APPENDIX A1: FIRST SERIES OF INTERVIEWS FOR THE CASE STUDY RESEARCH

The table below shows the first series of interviews that was conducted for the research outlined in Chapter 3. Interviews were conducted with six corporate managers in six companies in three industries (Information Technology, Automotive Supplier and Photovoltaic Industry). The date of the interviews are given in the last column.

Company	Interviewee	Industry	Date
Company 1	Corporate Manager	Information Technology	27.05.2011
Company 2	Corporate Manager	Automotive Supplier	06.09.2011
Company 3	Corporate Manager	Information Technology	24.05.2011
Company 4	Corporate Manager	Photovoltaic Industry	31.05.2011
Company 5	Corporate Manager	Information Technology	30.05.2011
Company 6	Corporate Manager	Information Technology	18.07.2011

APPENDIX A2: SECOND SERIES OF INTERVIEWS FOR THE CASE STUDY RESEARCH

The table below shows the second series of interviews that was conducted for the research outlined in Chapter 3. Interviews were conducted with three corporate managers and four venture managers in 5 companies. The companies 2, 3 4 and 5 are the same than in the first series of interviews. Company 7 was interviewed for the first time.

Company	Interviewee	Industry	Date
Company 2	Corporate Manager	Automotive Supplier	14.03.2012
Company 3	Venture Manager	Information Technology	07.09.2011
Company 4	Venture Manager	Photovoltaic	14.09.2011
Company 4	Venture Manager	Photovoltaic	02.11.2011
Company 5	Corporate Manager	Information Technology	06.09.2011
Company 5	Venture Manager	Information Technology	30.04.2012
Company 7	Corporate Manager	Information Technology	16.05.2012

APPENDIX B: LIST OF INTERVIEWS TO EVALUATE THE MEASURES

The table below shows the managers that were interviewed to evaluate the measurement scales as described in Chapter 4. The interviews are conducted with corporate managers and venture managers in six companies. The companies 4, 5 and 7 were already part of the interviews conducted for the Chapter 3 (see Appendices A1 and A2). The companies 8, 9 and 10 were interviewed for the first time. In company 7, interviews were conducted with two corporate managers (corporate manager 1 and corporate manager 2) and two venture managers (venture manager 1 and venture manager 2). The companies are part of four industries (Information Technology, Media Industry, Consulting Industry and Photovoltaic Industry). The date of the interviews are given in the last column.

Company	Evaluation Study	Industry	Date
Company 7	Venture Manager 1	Information Technology	16.05.2012
Company 5	Venture Manager	Information Technology	22.05.2012
Company 8	Corporate Manager	Media Industry	29.05.2012
Company 8	Venture Manager	Media Industry	29.05.2012
Company 9	Corporate Manager	Information Technology	30.05.2012
Company 10	Corporate Manager	Consulting Industry	30.05.2012
Company 7	Corporate Manager 1	Information Technology	31.05.2012
Company 7	Corporate Manager 2	Information Technology	31.05.2012
Company 7	Venture Manager 1	Information Technology	01.06.2012
Company 7	Venture Manager 2	Information Technology	01.06.2012
Company 4	Venture Manager	Photovoltaic Industry	26.06.2012
Company 5	Corporate Manager	Information Technology	26.06.2012

APPENDIX C: LIST OF CORPORATIONS

The following table lists the names of the companies that are part of the data set used for data analysis performed in the Chapters 5 and 6. The data refers to the survey answers given by the venture managers. In six cases (marked in italics), two answers were received from the same company. In all six cases, the survey was answered by different respondents. This is evaluated (a) by the entered access codes and (b) the email address that the respondents entered at the end of the questionnaire to receive the results of the study. The access code (individually created for each participant and thus linked to a specific name) in combination with the entered email address enabled us to clearly identify the participants.

1.	4C Group AG	*22.*	*Devoteam Danet GmbH*
2.	7P ERP Consulting GmbH	*23.*	*Devoteam Danet GmbH*
3.	Abilis GmbH	24.	d-fine GmbH
4.	ABIT GmbH	25.	ECG Erdgas-Consult GmbH
5.	*Albat + Wirsam Software GmbH*	26.	EFK Entwicklungsgesellschaft für Kommunikationssysteme mbH
6.	*Albat + Wirsam Software GmbH*	27.	Empalis Consulting GmbH
7.	ALPHA Business Solutions AG	28.	EXCON Externe Controlling Services GmbH
8.	ams.Solution AG	29.	FAS AG
9.	Artundweise GmbH	30.	Fun Communications GmbH
10.	ASCAD GmbH	31.	GFOS Gesellschaft für Organisationsberatung und Softwareentwicklung mbH
11.	Avantgarde Business Solutions GmbH	32.	goetzpartners Management Consultants GmbH
12.	b+m Informatik AG	33.	Hönigsberg & Düvel Datentechnik GmbH
13.	Bauserve GmbH	34.	Habel GmbH & Co. KG
14.	BINSERV Gesellschaft für interaktive Konzepte und neue Medien mbH	35.	HGV Hanseatische Gesellschaft für Verlagsservice mbH
15.	Binserv GmbH	36.	IKOR Management- und Systemberatung GmbH
16.	CAS Software AG	37.	Incadea GmbH
17.	CGI Deutschland Ltd. & Co. KG	38.	Interbrand Zintzmeyer & Lux GmbH
18.	COC AG	39.	iTEC Services GmbH
19.	Consileon Business Consultancy GmbH		
20.	CTI Consulting AG		
21.	DAKOSY Datenkommunikationssystem AG		

CONTINUING THE LIST OF CORPORATIONS

40. iteratec GmbH
41. ITZ Informationstechnologie GmbH
42. iXOS Software AG
43. J&M Management Consulting GmbH
44. Janz IT AG
45. KCS.net Deutschland GmbH
46. *Kerkhoff Consulting GmbH*
47. *Kloepfel Consulting GmbH*
48. Koch Media GmbH
49. Korn Ferry International GmbH
50. *KWP team HR GmbH*
51. *KWP team HR GmbH*
52. matrix technology AG
53. Miebach Consulting GmbH
54. Moser GmbH & Co. KG
55. Namics (Deutschland) GmbH
56. ODAV AG Gesellschaft für Informatik und Telekommunikation
57. OPITZ CONSULTING München GmbH
58. ORBIS AG
59. PanDacom Networking AG
60. parameta Projektberatung GmbH & Co. KG
61. pit-cup GmbH
62. prevero AG
63. PRION GmbH
64. PROFI Engineering Systems AG
65. realtime AG
66. Renostar GmbH
67. Sachsen DV Betriebs- und Servicegesellschaft mbH
68. Sage bäurer GmbH
69. SanData Solutions GmbH
70. Schema Consulting GmbH
71. *Schleupen AG*
72. *Schleupen AG*
73. SEAL Systems AG
74. secunet Security Networks AG
75. SimPlan AG
76. Star Cooperation GmbH
77. Tagueri AG
78. Telecomputer Gesellschaft für Datenverarbeitung mbH
79. arxes-tolina GmbH
80. TriFinance GmbH
81. TTS Training GmbH
82. TXS GmbH
83. UBH Software & Engineering GmbH
84. *VEDA GmbH*
85. *VEDA GmbH*
86. Weiss IT Solutions GmbH
87. WERBAS AG

APPENDIX D1: INVITATION E-MAIL

Appendix D1 provides the invitation email that was send to the participants of the study. The invitation introduces the study, highlights the benefits for participants, defines corporate ventures, provides the link that directs to the questionnaire and provides the code to access it.

Sehr geehrter Damen und Herren,

der Aufbau neuer Geschäftsfelder ist für mittelständische, deutsche IT- und Beratungsdienstleister im globalen Wettbewerb existentiell. Wie diese Fähigkeit verbessert werden kann – das untersuchen die Hochschule Konstanz und die Universität Leiden. Auftraggeber ist das Bundesministerium für Bildung und Forschung (BMBF).

- Wir laden Sie ein sich an unserer Untersuchung zu beteiligen. Als Gegenleistung bieten wir Ihnen:
- Die Studienergebnisse, die das optimale Maß an Autonomie für den Geschäftsaufbau zeigen
- Eine individuelle Analyse der Situation Ihres Unternehmens
- Ein Benchmark mit dem „Best in Class“ deutscher IT- und Beratungsdienstleiter
- Ermäßigte Teilnehmergebühren für einen internationalen Expertenworkshop in Den Haag

Eine Einladung zu einem exklusiven Roundtable in München mit Geschäftsführern namhafter deutscher Unternehmen des Mittelstandes

Aktuelle Untersuchungen zeigen, dass neue Geschäftsfelder im Mittelstand erfolgreich durch teilautonome Teams aufgebaut werden können. Diese Teams werden zu Beginn oftmals provisorisch besetzt, mit der Aufgabe eine Geschäftsidee zu prüfen und weiterzuentwickeln. Im Laufe des Projekts etablierten sich daraus oftmals Business Units mit zusätzlichem Wachstumspotential. Je nachdem in welcher Phase sich die Geschäftsentwicklung befindet, benötigen diese Teams unterschiedlich stark ausgeprägte Autonomie.

In dieser Studie untersuchen wir, welche Art von Autonomie in welchem Maß optimal für die Geschäftsentwicklung in den einzelnen Reifephasen ist.

Hierzu bitten wir Sie um Ihr Expertenwissen und 15-20 Minuten Ihrer Zeit.

Kopieren Sie diesen Sicherheitscode **BAFsyUfV** und beginnen Sie unter folgendem Link mit der Umfrage:
https://qtrial.qualtrics.com/SE/?SID=SV_3eXPjl6dvbw1Zhr

Ihre Angaben werden selbstverständlich vertraulich behandelt und anonymisiert. Für Rückfragen stehen wir Ihnen jederzeit gerne zur Verfügung. Sie erreichen uns per e-mail unter jeromegard@htwg-konstanz.de oder telefonisch unter +49 7531 206 412.

Mit freundlichen Grüßen

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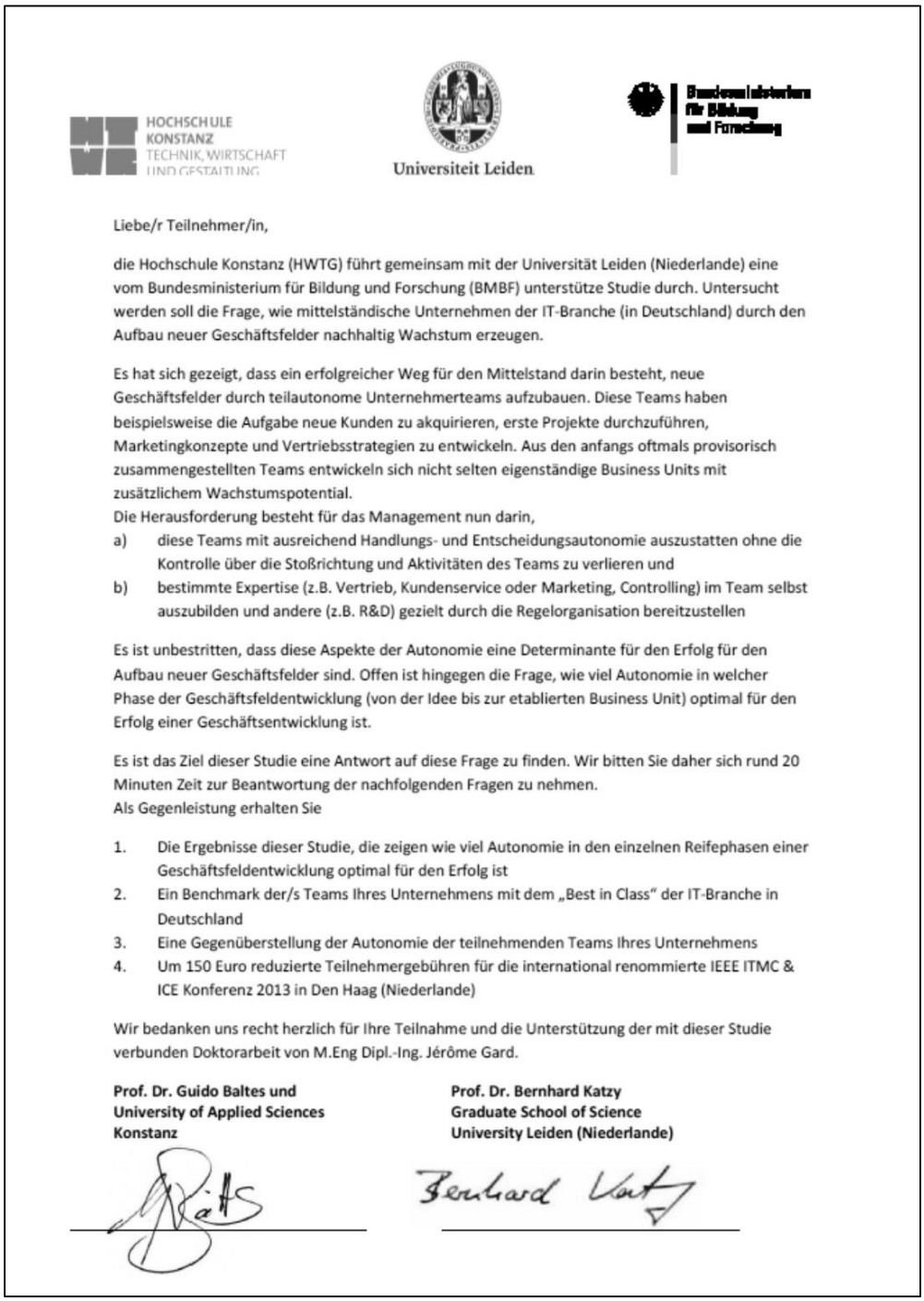
Graduate School of Science

APPENDIX D2: COVER LETTER

Appendix D2 shows the start page of the survey. It defines the focus of the study, defines corporate ventures and the challenge to manage them successfully and highlights the benefits for participants.



HOCHSCHULE KONSTANZ TECHNIK, WIRTSCHAFT UND GESTALTUNG

Universiteit Leiden

Bundesministerium für Bildung und Forschung

Liebe/r Teilnehmer/in,

die Hochschule Konstanz (HWTG) führt gemeinsam mit der Universität Leiden (Niederlande) eine vom Bundesministerium für Bildung und Forschung (BMBF) unterstütze Studie durch. Untersucht werden soll die Frage, wie mittelständische Unternehmen der IT-Branche (in Deutschland) durch den Aufbau neuer Geschäftsfelder nachhaltig Wachstum erzeugen.

Es hat sich gezeigt, dass ein erfolgreicher Weg für den Mittelstand darin besteht, neue Geschäftsfelder durch teilautonome Unternehmerteams aufzubauen. Diese Teams haben beispielsweise die Aufgabe neue Kunden zu akquirieren, erste Projekte durchzuführen, Marketingkonzepte und Vertriebsstrategien zu entwickeln. Aus den anfangs oftmals provisorisch zusammengestellten Teams entwickeln sich nicht selten eigenständige Business Units mit zusätzlichem Wachstumspotential.
Die Herausforderung besteht für das Management nun darin,

a) diese Teams mit ausreichend Handlungs- und Entscheidungsautonomie auszustatten ohne die Kontrolle über die Stoßrichtung und Aktivitäten des Teams zu verlieren und
b) bestimmte Expertise (z.B. Vertrieb, Kundenservice oder Marketing, Controlling) im Team selbst auszubilden und andere (z.B. R&D) gezielt durch die Regelorganisation bereitzustellen

Es ist unbestritten, dass diese Aspekte der Autonomie eine Determinante für den Erfolg für den Aufbau neuer Geschäftsfelder sind. Offen ist hingegen die Frage, wie viel Autonomie in welcher Phase der Geschäftsfeldentwicklung (von der Idee bis zur etablierten Business Unit) optimal für den Erfolg einer Geschäftsentwicklung ist.

Es ist das Ziel dieser Studie eine Antwort auf diese Frage zu finden. Wir bitten Sie daher sich rund 20 Minuten Zeit zur Beantwortung der nachfolgenden Fragen zu nehmen.
Als Gegenleistung erhalten Sie

1. Die Ergebnisse dieser Studie, die zeigen wie viel Autonomie in den einzelnen Reifephasen einer Geschäftsfeldentwicklung optimal für den Erfolg ist
2. Ein Benchmark der/s Teams Ihres Unternehmens mit dem „Best in Class" der IT-Branche in Deutschland
3. Eine Gegenüberstellung der Autonomie der teilnehmenden Teams Ihres Unternehmens
4. Um 150 Euro reduzierte Teilnehmergebühren für die international renommierte IEEE ITMC & ICE Konferenz 2013 in Den Haag (Niederlande)

Wir bedanken uns recht herzlich für Ihre Teilnahme und die Unterstützung der mit dieser Studie verbunden Doktorarbeit von M.Eng Dipl.-Ing. Jérôme Gard.

Prof. Dr. Guido Baltes und
University of Applied Sciences
Konstanz

Prof. Dr. Bernhard Katzy
Graduate School of Science
University Leiden (Niederlande)

APPENDIX E1: QUESTIONNAIRE – GERMAN VERSION

Appendix E1 shows the questionnaire used to collect data. The survey was conducted in German. The questionnaire is therefore provided in its original language. An English version is reported in Appendix E2. The questionnaire consists of two parts. E1.1 is the screener which gathers general information on the participant. E1.2 gathers information on corporate venture management.

E1.1 – Screener (8 Fragen)

Screener – Frage 1	
Bitte geben Sie Ihre aktuelle Position im Unternehmen an:	
○	Aufsichtsrat
○	Vorstand
○	Geschäftsführer
○	Leiter der Abteilung Business Development
○	Abteilungs- oder Divisionsleiter
○	Teamleiter/Projektleiter○
○	Mitarbeiter
○	Sie haben eine andere Position. Bitte geben Sie diese nachfolgend an:

Screener – Frage 2	
Wie lange sind Sie in Ihrer jetzigen Position in diesem Unternehmen bereits tätig?	
○	weniger als 1 Jahr
○	zwischen 1-2 Jahren
○	zwischen 2-3 Jahren
○	zwischen 3-5 Jahren
○	Länger als 5 Jahre

Screener – Frage 3	
Gibt es in Ihrem Unternehmen Teams, die aktuell ein neues Geschäftsfeld aufbauen oder Teams, die in den letzten 3 Jahren ein neues Geschäftsfeld aufgebaut haben?	
○	Ja, es gibt ein oder mehrere Teams, die aktuell ein neues Geschäftsfeld aufbauen
○	Ja, wir haben ein oder mehrere Teams die in den letzten 3 Jahren ein Geschäftsfeld aufgebaut haben
○	Nein, solche Teams gibt es in meinem Unternehmen aktuell nicht

Screener – Frage 4	
Haben Sie in der Vergangenheit Erfahrungen mit dem Aufbau eines neuen Geschäftsfelds durch Teams gemacht?	
○	Ja, ich habe den Aufbau eines neuen Geschäftsfelds in der Vergangenheit mitbegleitet
○	Nein, ich habe keine Erfahrung mit dem Aufbau eines neuen Geschäftsfelds durch Teams

Screener – Frage 5	
Wie groß ist die Anzahl der Teams, die in Ihrem Unternehmen derzeit ein neues Geschäftsfeld aufbauen?	
Anzahl der Teams:	
○	1
○	2
○	3
○	4
○	5
○	6
○	7
○	8
○	9
○	10
○	>10

Screener – Frage 6	
Wie groß ist die Anzahl der Teams, die in Ihrem Unternehmen in den letzten 3 Jahren ein neues Geschäftsfeld aufgebaut haben?	
Anzahl der Teams:	
○	1
○	2
○	3
○	4
○	5
○	6
○	7
○	8
○	9
○	10
○	>10

Screener – Frage 7	
Wie groß ist die Anzahl der Teams, die in den letzten 5 Jahren den Aufbau eines neuen Geschäftsfelds abgebrochen haben?	
Anzahl der Teams:	
○	1
○	2
○	3
○	4
○	5
○	6
○	7
○	8
○	9
○	10
○	>10

Screener – Frage 8	
Welche der nachfolgenden Aussagen trifft eher auf Sie zu?	
○	Ich bin aktuell Leiter eines Teams, das die Aufgabe hat ein neues Geschäftsfeld aufzubauen
○	Ich bin aktuell Leiter eines Teams bzw. einer Business Unit das/die in den letzten 3 Jahren bereits ein Geschäftsfeld aufgebaut hat
○	Ich bin aktuell der Vorgesetzte des Leiters eines Teams das aktuell ein neues Geschäftsfeld aufbaut
	Ich bin der Vorgesetzte des Leiters eines Teams das in den letzten 3 Jahren bereits ein neues Geschäftsfeld aufgebaut hat
○	Ich bin aktuell Mitarbeiter in einem Team das aktuell ein neues Geschäftsfeld aufbaut oder in den letzten 3 Jahren aufgebaut hat
○	Mit dem Aufbau eines Geschäftsfelds durch ein Team habe ich aktuell nichts zu tun. Allerdings habe ich dazu in der Vergangenheit Erfahrungen gemacht
○	Mit dem Aufbau eines Geschäftsfelds durch ein Team habe ich noch nie Erfahrungen gemacht

E1.2 – Venture Manager (16 Fragen)

Venture Manager – Frage 1	
Bitte geben Sie an, in welcher Beziehung Ihr Team (verantwortlich für den Aufbau des neuen Geschäftsfelds) mit Ihrem Unternehmen steht.	
○	Das neue Geschäftsfeld wird im Unternehmen aufgebaut
○	Das neue Geschäftsfeld wird außerhalb des Unternehmens aufgebaut und ist im Grunde eine eigene Organisation
○	Das neue Geschäftsfeld wird in Kooperation mit einem oder mehreren anderen Unternehmen aufgebaut
○	Das Geschäftsfeld wurde ursprünglich von einem anderen Unternehmen aufgebaut und später von uns übernommen
○	Gibt es eine andere Art der Beziehung? Bitte nachfolgend kurz beschreiben:

Venture Manager – Frage 2 (# der Mitarbeiter des Corporate Ventures)
Aus welcher Anzahl an Vollzeitmitarbeitern besteht Ihr Team aktuell?
Anzahl der Mitarbeiter:

Venture Manager – Frage 3 (Umsatz des Corporate Venture)	
In welchem Bereich lag der Umsatz (in €) Ihres Teams im letzten abgelaufenen Geschäftsjahr?	
Umsatzbereich im letzten abgelaufenen Geschäftsjahr:	
○	0-50 T-€
○	50-100 T-€
○	100-500 T-€
○	500-1000 T-€
○	1 Mio.-3 Mio. €
○	3 Mio.-10 Mio. €
○	über 10 Mio. €

Venture Manager – Frage 4 (# der Mitarbeiter des Unternehmens)
Wie hoch ist die Anzahl der Vollzeitmitarbeiter, die aktuell in Ihrem Unternehmen beschäftigt sind?
Anzahl der Mitarbeiter:

Venture Manager – Frage 5 (Umsatz des Unternehmens)	
In welchem Bereich lag der Umsatz (in €) Ihres Unternehmens im letzten abgelaufenen Geschäftsjahr?	
Umsatzbereich des Unternehmens im letzten abgelaufenen Geschäftsjahr	
○	< 2 Mio. €
○	2 Mio. – 10 Mio. €
○	10 Mio. – 50 Mio. €
○	> 50 Mio. €

Venture Manager – Frage 6 (Reifegrad)	
Bitte geben Sie an, bis zu welcher Reifephase Ihr Team bis heute gekommen ist.	
○	Erste Reifephase: Es wurden erste Investitionen getätigt
○	Zweite Reifephase: Es wurden erste Umsätze erwirtschaftet
○	Dritte Reifephase: Das Geschäftsfeld wurde profitabel

Venture Manager – Frage 7 (Reifegrad)		
Bitte geben Sie ungefähr an, wann Ihr Team die nachfolgenden Reifephasen erreicht hat.		
	Jahr	Quartal
Erste Reifephase (A): Die Entscheidung wurde getroffen das neue Geschäftsfeld aufzubauen		
Erste Reifephase (B): Es wurden erste Investitionen getätigt		
Zweite Reifephase: Es wurden erste Umsätze erwirtschaftet		
Dritte Reifephase: Das Geschäftsfeld wurde profitabel		

Venture Manager – Frage 8 (Erfahrung)	
Wie viele Jahre Erfahrung hat Ihr Team in Summe bis heute (Sie eingeschlossen, Ihre Vorgesetzten ausgeschlossen) mit dem Aufbau neuer Geschäftsfelder?	
○	weniger als1 Jahr
○	1-2 Jahre
○	2-3 Jahre
○	3-4 Jahre
○	4-5 Jahre
○	5-6 Jahre
○	6-7 Jahre
○	7-8 Jahre
○	8-9 Jahre
○	9-10 Jahre
○	10-15 Jahre
○	15-20 Jahre
○	Mehr als 20 Jahre

Venture Manager – Frage 9 (Dynamik des Umfelds)						
Vor dem Hintergrund des Geschäftsumfeldes in dem der Geschäftsaufbau stattfindet, geben Sie bitte an, wie schnell sich die unteren Aspekte in den letzten 5- 10 Jahren verändert haben.						
	Überhaupt keine Veränderung					Sehr schnelle Veränderung
	1	2	3	4	5	6
Technologie	○	○	○	○	○	○
Wettbewerb	○	○	○	○	○	○
Innovationsrate	○	○	○	○	○	○
Marktumfeld	○	○	○	○	○	○

Venture Manager – Frage 10 (Job Autonomie)						
Wie unabhängig von Ihren Vorgesetzten können Sie agieren, um das neue Geschäftsfeld aufzubauen?						
	Trifft fast nie zu					Trifft fast immer zu
	1	2	3	4	5	6
Ich gehe unabhängig von meinen Vorgesetzten meinen Weg, um Projekte durchzuführen	○	○	○	○	○	○
Ich entscheide unabhängig von meinen Vorgesetzten, wie ich mit meinem Team Aufgaben bewältige	○	○	○	○	○	○
Ich entscheide unabhängig von meinen Vorgesetzten, wie ich mit meinem Team definierte Ziele erreiche	○	○	○	○	○	○
Ich entscheide unabhängig von meinen Vorgesetzten, wann die Mitglieder meines Teams welche Arbeiten verrichten	○	○	○	○	○	○
Ich kann meine Arbeit unabhängig von meinen Vorgesetzten terminieren	○	○	○	○	○	○
Ich habe maßgeblich Einfluss auf die Definition der Indikatoren (Key Performance Indikatoren), nach denen meine Arbeit beurteilt wird	○	○	○	○	○	○
Ich habe maßgeblich Einfluss auf die Definition der Ziele, die ich mit meinem Team erreichen soll	○	○	○	○	○	○

Venture Manager – Frage 11 (Strategische Autonomie)						
Wie häufig treffen Sie Entscheidungen hinsichtlich des Aufbaus des neuen Geschäftsfelds ohne Zustimmung Ihrer Vorgesetzten?						
	Trifft fast nie zu					Trifft fast immer zu
	1	2	3	4	5	6
Ich kann ohne Zustimmung meiner Vorgesetzten Forschungs- und Entwicklungsaktivitäten durchführen	○	○	○	○	○	○
Ich kann ohne Zustimmung meiner Vorgesetzten neue Produkte oder Dienstleistungen entwickeln	○	○	○	○	○	○
Ich kann ohne Zustimmung meiner Vorgesetzten Mitarbeiter für zukünftige Projekte qualifizieren	○	○	○	○	○	○
Ich kann ohne die Zustimmung meiner Vorgesetzten entscheiden, in welchen Marktsegmenten zukünftig Vermarktungsaktivitäten durchgeführt werden	○	○	○	○	○	○
Ich kann ohne die Zustimmung meiner Vorgesetzten entscheiden, mit welchen Kundensegmenten ich zukünftig Geschäfte mache	○	○	○	○	○	○
Ich kann ohne Zustimmung meiner Vorgesetzten neu Geschäftspraktiken einführen (z.B. Vertriebs- und Vermarktungspraktiken oder Praktiken des Controllings)	○	○	○	○	○	○

Venture Manager – Frage 12 (Wichtigkeit der Funktionsbereiche)						
Bitte geben Sie an, für wie wichtig Sie die nachfolgenden Bereiche für den erfolgreichen Aufbau neuer Geschäftsfelder halten.						
	Sehr geringen Einfluss auf den Erfolg					Kritisch für den Erfolg
	1	2	3	4	5	6
Marketing (z.B. Vermarktung neuer Produkte und Dienstleistungen)	○	○	○	○	○	○
HR (z.B. Qualifizierung, Recruiting neuer Mitarbeiter)	○	○	○	○	○	○
Sales (z.B. Vertriebsaktivitäten)	○	○	○	○	○	○
Kundenservice (z.B. Support und Service)	○	○	○	○	○	○
Controlling (z.B. Projekt-Controlling, Erfolgsrechnung)	○	○	○	○	○	○
Juristische Belange (z.B. Geschäftsbeziehungen, Patente)	○	○	○	○	○	○
Projektmanagement (z.B. Definition von Meilensteinen und Key Performance Indikatoren)	○	○	○	○	○	○
Forschung und Entwicklung (z.B. Entwicklungs- und Programmierungsaktivitäten)	○	○	○	○	○	○

Venture Manager – Frage 13 (Entscheidungs-Autonomie)						
Wie häufig sind Sie bei Entscheidungen hinsichtlich des Geschäftsaufbaus in den nachfolgenden Bereichen auf die Zustimmung von Vorgesetzten angewiesen.						
	Die Zustimmung meines Vorgesetzten ist fast nie notwendig					Die Zustimmung meines Vorgesetzten ist fast immer notwendig
	1	2	3	4	5	6
Marketing (z.B. Vermarktung neuer Produkte und Dienstleistungen)	○	○	○	○	○	○
HR (z.B. Qualifizierung, Recruiting neuer Mitarbeiter)	○	○	○	○	○	○
Sales (z.B. Vertriebsaktivitäten)	○	○	○	○	○	○
Kundenservice (z.B. Support und Service)	○	○	○	○	○	○
Controlling (z.B. Projekt-Controlling, Erfolgsrechnung)	○	○	○	○	○	○
Juristische Belange (z.B. Geschäftsbeziehungen, Patente)	○	○	○	○	○	○
Projektmanagement (z.B. Definition von Meilensteinen und Key Performance Indikatoren)	○	○	○	○	○	○
Forschung und Entwicklung (z.B. Entwicklungs- und Programmierungsaktivitäten)	○	○	○	○	○	○

Venture Manager – Frage 14 (Functionale Autonomie)						
Bitte geben Sie an, ob Expertise bezüglich der nachfolgenden Bereiche eher in Ihrem Team vorhanden ist, oder eher extern vom Unternehmen oder anderweitig bereitgestellt wird.						
	Expertise wird primär extern bereitgestellt					Expertise ist primär im Team vorhanden
	1	2	3	4	5	6
Marketing (z.B. Vermarktung neuer Produkte und Dienstleistungen)	○	○	○	○	○	○
HR (z.B. Qualifizierung, Recruiting neuer Mitarbeiter)	○	○	○	○	○	○
Sales (z.B. Vertriebsaktivitäten)	○	○	○	○	○	○
Kundenservice (z.B. Support und Service)	○	○	○	○	○	○
Controlling (z.B. Projekt-Controlling, Erfolgsrechnung)	○	○	○	○	○	○
Juristische Belange (z.B. Geschäftsbeziehungen, Patente)	○	○	○	○	○	○
Projektmanagement (z.B. Definition von Meilensteinen und Key Performance Indikatoren)	○	○	○	○	○	○
Forschung und Entwicklung (z.B. Entwicklungs- und Programmierungsaktivitäten)	○	○	○	○	○	○

Venture Manager – Frage 15 (Priorität exploitativer Ziele)	
In welcher Reihenfolge priorisieren Ihre Vorgesetzten die nachfolgenden Aspekte in der aktuellen Reifephase Ihrer Geschäftsentwicklung. Ordnen Sie die nachfolgenden Aspekte der Priorität nach, nutzen Sie dazu die Drag & Drop Funktion (klicken und ziehen). (1=unwichtig für meine Vorgesetzten, 6=wichtig für meine Vorgesetzten).	
1	Mein Team soll neue Marktsegmente identifizieren
2	Mein Team soll innovative Produkte und Dienstleistungen finden und nutzbar machen
3	Mein Team soll neue Ideen entwickeln, indem wir außerhalb gängiger Lösungsansätze denken
4	Mein Team soll die bestehende Kundenbasis tiefer durchdringen
5	Mein Team soll Routinen für Abläufe und Tätigkeiten entwickeln, damit wir effizienter arbeiten
6	Mein Team soll die Qualität verbessern und die Kosten reduzieren

Venture Manager – Frage 16 (Corporate Venture Erfolg)						
Bitte geben Sie an, inwiefern die nachfolgenden Punkte zutreffen bzw. nicht zutreffen für den Aufbau Ihres Geschäftsfelds sind.						
	Trifft überhaupt nicht zu					Trifft voll zu
	1	2	3	4	5	6
Die Unternehmensführung ist mit dem Umsatz zufrieden, den unser Team erzielt	○	○	○	○	○	○
Die Unternehmensführung ist damit zufrieden, in welcher Zeit wir (Team) den Break-Even-Point erreichen werden bzw. erreicht haben	○	○	○	○	○	○
Die Unternehmensführung ist mit der Steigerung unserer Umsatzmarge zufrieden	○	○	○	○	○	○
Unser Team erfüllt generell die Erwartungen der Unternehmensführung	○	○	○	○	○	○
Insgesamt sieht die Unternehmensführung den Aufbau des Geschäftsfelds als erfolgreich an	○	○	○	○	○	○
Die Unternehmensführung sieht, dass unser Team die definierten Meilensteine (entsprechend der jeweiligen Reifephase) planmäßig erfüllt	○	○	○	○	○	○
Unser Team erfüllt die Leistungen, entsprechend der definierten Erfolgskriterien (z.B. Umsatz, Lernen, Marktpositionierung...)	○	○	○	○	○	○

APPENDIX E2: QUESTIONNAIRE – ENGLISH VERSION

Appendix E2 provides the English version of the questionnaire used to collect data. The survey was originally conducted in German. The German version is reported in Appendix E1. The questionnaire consists of two parts. E1.1 is the screener which gathers general information on the participant. E1.2 gathers information on corporate venture management.

E2.1 – Screener (8 Questions)

Screener – Question 1	
Please indicate your current position in the company:	
○	Board of Directors
○	Executive Board
○	Chief Executive
○	Head of the Business Development Department
○	Head of another Department
○	Project Manager/ Team Leader○
○	Employee
○	You are in another position? Please describe below:

Screener – Question 2	
How long are you in the current position in the company?	
○	Less than 1 year
○	Between 1-2 years
○	Between 2-3 years
○	Between 3-4 years
○	Longer than 5 years

Screener – Question 3	
Is there a teams in your company that currently develops a new business, or did so during the past 3 years?	
○	Yes, there are one or more teams that are currently developing a new business
○	Yes, we had one or more teams that developed a new business in the past 3 years.
○	No, there are no such teams in our company

Screener – Question 4	
Have you made experience in the past with teams that development a new business?	
○	Yes, I have accompanied teams that developed a new businesses in the past.
○	No, I don't have any experience with the development of a new business through teams.

Screener – Question 5	
What is the number of teams that are currently developing a new business in your company?	
Number of Teams:	
○	1
○	2
○	3
○	4
○	5
○	6
○	7
○	8
○	9
○	10
○	>10

Screener – Question 6	
What is the number of teams that developed a new business in your company in the past 3 years?	
Number of Teams:	
○	1
○	2
○	3
○	4
○	5
○	6
○	7
○	8
○	9
○	10
○	>10

Screener – Question 7	
What is the number of teams that terminated the development of a new business in the past 5 years?	
Number of Teams:	
○	1
○	2
○	3
○	4
○	5
○	6
○	7
○	8
○	9
○	10
○	>10

Screener – Question 8	
Which of the following statements applies to you personally?	
○	I am currently the leader of a team that has the task to develops a new business
○	I am currently the leader of a team that already has developed a new business in the past 3 years
○	I am currently the supervisor of the leader of a team that currently develops a new business
	I am the supervisor of the leader of a team that already developed a new business in the past 3 years
○	I am currently member of a team that currently develops a new business or that already did so in the past 3 years
○	I have currently no relation with a team that develops a new business. However, I have made some experience in the past
○	I have never made any experience with a team that develops a new business

E2.2 –Venture Managers (16 Questions)

Venture Manager – Question 1	
What relation does your team (developing a new business) have with the company?	
○	The new business is developed within the company
○	The new business is developed outside the company and is basically an own organization
○	The new business is developed in cooperation with one or more other companies
○	The new business was initially developed by another company and was later acquired by our company
○	Does the team have another relation with the company? Please describe the relationship below:

Venture Manager – Question 2 (# of Employees in the Corporate Venture)
What is the total number of the full time equivalent employees (FTEs) of your team?
Number of Employees:

Venture Manager – Question 3 (Turnover of the Corporate Venture)	
Which of the following ranges applies to the turnover (€) that your team has made in the previous year?	
Turnover in the previous year:	
○	0-50 K-€
○	50-100 K-€
○	100-500 K-€
○	500-1000 K-€
○	1-3 Mio. €
○	3-10 Mio. €
○	über 10 Mio. €

Venture Manager – Question 4 (# of Employees in the Corporation)
What is the total number of the full time equivalent employees (FTEs) in your company?
Number of Employees:

Venture Manager – Question 5 (Turnover of the Corporation)	
Which of the following ranges applies to the turnover (€) that your company has made in the previous year?	
Turnover in the previous year:	
○	< 2 Mio. €
○	2 Mio. – 10 Mio. €
○	10 Mio. – 50 Mio. €
○	> 50 Mio. €

Venture Manager – Question 6 (Maturity Stage)	
Please indicate the maturity stage that your team reaches today.	
○	First Stage: Investments in the new business were made
○	Second Stage: First turnover was achieved
○	Third Stage: The new business reached break-even

Venture Manager – Question 7 (Maturity Stage)		
Please indicate when your team has reached the following stages.		
	Year	Quarter
First Stage (A): The decision was made to develop a new business		
Second Stage (B): First investments in the new business were made		
Second Stage: First turnover was achieved		
Third Stage: Break-even was reached		

Venture Manager – Question 8 (Experience)	
How many years of experience (including you and excluding your supervisor) does your team have with the development of a new business?	
○	Less than 1 year
○	1-2 years
○	2-3 years
○	3-4 years
○	4-5 years
○	5-6 years
○	6-7 years
○	7-8 years
○	8-9 years
○	9-10 years
○	10-15 years
○	15-20 years
○	More than 20 years

Venture Manager – Question 9 (Environmental Dynamism)						
Considering the business environment in which the new business is developed, please indicate how quickly the following aspects have changed in the past 5-10 years.						
	No change at all					Very quick change
	1	2	3	4	5	6
Technology	○	○	○	○	○	○
Competition	○	○	○	○	○	○
Pace of Innovation	○	○	○	○	○	○
Market conditions	○	○	○	○	○	○

Venture Manager – Question 10 (Job Autonomy)						
How independent from your supervisor(s) can you act to develop the new business?						
	Is almost never true					Is almost always true
	1	2	3	4	5	6
I can decide how to go about getting a job done without the approval of my supervisor(s)	○	○	○	○	○	○
I choose the way the team goes about a job without the approval of my supervisor(s)	○	○	○	○	○	○
I decide how the team reaches its goals without the approval of my supervisor(s)	○	○	○	○	○	○
I can schedule the work of the team without the approval of my supervisor(s)	○	○	○	○	○	○
I decide without the approval of my supervisor(s) when the team conducts particular work activities	○	○	○	○	○	○
My job allows to modify the way work is evaluated, so I can emphasize some aspects of the work and play down others	○	○	○	○	○	○
I have control over what the team is supposed to accomplish	○	○	○	○	○	○

Venture Manager – Question 11 (Strategic Autonomy)						
How frequently can you make decisions concerning the development of the new business without the approval of your supervisor(s)?						
	Is almost never true					Is almost always true
	1	2	3	4	5	6
I can start research and development activities without the approval of my supervisor(s)	○	○	○	○	○	○
I am able to develop new products and services without the approval of my supervisor(s)	○	○	○	○	○	○
I can qualify employees for new projects without the approval of my supervisor(s)	○	○	○	○	○	○
I can decide without the approval of my supervisor(s) in which market segments future activities are conducted	○	○	○	○	○	○
I can decide without the approval of my supervisor(s) which customer segments are targeted in the future	○	○	○	○	○	○
I can introduce new policies and practices without the approval of my supervisor(s)	○	○	○	○	○	○

Venture Manager – Question 12 (Functional Importance)						
Please indicate the importance of each of the eight business functions for the successful development of the new business						
	Very little influence on success					Critical for success
	1	2	3	4	5	6
Marketing	○	○	○	○	○	○
Human Resource Development	○	○	○	○	○	○
Sales	○	○	○	○	○	○
Service	○	○	○	○	○	○
Finance and Controlling	○	○	○	○	○	○
Legal Affairs	○	○	○	○	○	○
Project Management	○	○	○	○	○	○
Research and Development	○	○	○	○	○	○

Venture Manager – Question 13 (Decision Autonomy)						
How frequently do you need to seek the approval of your supervisor(s) when making decisions in the following business functions?						
	Approval though my supervisor is almost always necessary					Approval though my supervisor is almost never necessary
	1	2	3	4	5	6
Marketing	○	○	○	○	○	○
Human Resource Development	○	○	○	○	○	○
Sales	○	○	○	○	○	○
Service	○	○	○	○	○	○
Finance and Controlling	○	○	○	○	○	○
Legal Affairs	○	○	○	○	○	○
Project Management	○	○	○	○	○	○
Research and Development	○	○	○	○	○	○

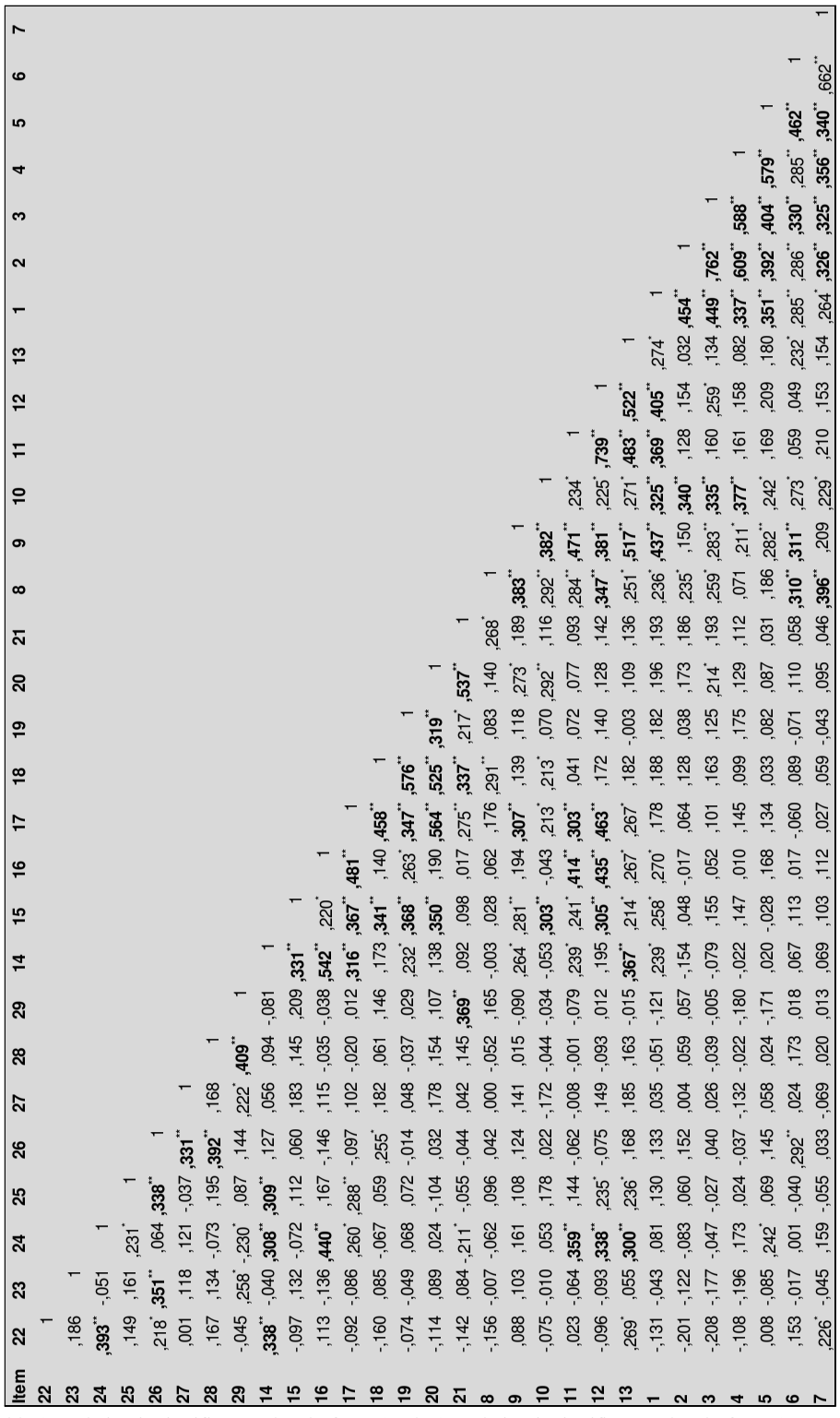
Venture Manager – Question 14 (Functional Autonomy)						
Please indicate whether expertise with respect to the following business functions is available within the team or provided externally						
	Expertise is primarily provided externally					Expertise is primarily available in the team
	1	2	3	4	5	6
Marketing	○	○	○	○	○	○
Human Resource Development	○	○	○	○	○	○
Sales	○	○	○	○	○	○
Service	○	○	○	○	○	○
Finance and Controlling	○	○	○	○	○	○
Legal Affairs	○	○	○	○	○	○
Project Management	○	○	○	○	○	○
Research and Development	○	○	○	○	○	○

Venture Manager – Question 15 (Exploitation Priority)	
In which order does your supervisor prioritize the following aspects in the current maturity stage of the new business. Please use the Drag & Drop function to order the following aspects according to the priority of your supervisor. (1=not important to my supervisor, 6= important to my supervisor).	
1	My team is forced to identify new market segments
2	My team is forced to explore innovative solution or services for commercialization
3	My team is forced to look for novel ideas by thinking "outside the box"
4	My team is forced to penetrate more deeply into the existing customer base
5	My team is forced to increase the levels of routinization of operations
6	My team is forced to improve quality and lower cost

Venture Manager – Question 16 (Corporate Venture Success)						
Please assess the extent to which the following aspects concerning the development of the new business are true						
	Is not true					Is true
	1	2	3	4	5	6
Corporate management is satisfied with the turnover that our team achieves	○	○	○	○	○	○
Corporate management is satisfied with the time that our team has reached (or will reach) break-even	○	○	○	○	○	○
Corporate management is satisfied with the sales margins that our team achieves	○	○	○	○	○	○
Our team generally fulfills the expectations of the corporate management	○	○	○	○	○	○
Overall corporate management perceives the development of the new business as being successful	○	○	○	○	○	○
Corporate management finds that our team fulfills the planned milestones as scheduled	○	○	○	○	○	○
Corporate management finds that our team performs well according to the defined key performance indicators (KPIs)	○	○	○	○	○	○

APPENDIX F: CORRELATION MATRIX OF THE FOUR AUTONOMY SCALES

The following table reports the correlations between the items of the four autonomy scales functional autonomy (items 22-29), decision autonomy (items 14-21), strategic autonomy (items 8-13) and job autonomy (items 1-7).



Item	22	23	24	25	26	27	28	29	14	15	16	17	18	19	20	21	8	9	10	11	12	13	1	2	3	4	5	6	7
22	1																												
23	,186	1																											
24	,393**	-,051	1																										
25	,149	,161	,231*	1																									
26	,218*	,351**	,064	,338**	1																								
27	,001	,118	,121	-,037	,331**	1																							
28	,167	,134	-,073	,195	,392**	,168	1																						
29	-,045	,258*	-,230*	,087	,144	,222*	,409**	1																					
14	,338**	-,040	,308**	,309**	,127	,056	,094	-,081	1																				
15	-,097	,132	-,072	,112	,060	,183	,145	,209	,331**	1																			
16	,113	-,136	,440**	,167	-,146	,115	-,035	-,038	,542**	,220*	1																		
17	-,092	-,086	,260*	,288**	-,097	,102	-,020	,012	,316**	,367**	,481**	1																	
18	-,160	,085	-,067	,059	,255*	,182	,061	,146	,173	,341**	,140	,458**	1																
19	-,074	-,049	,068	,072	-,014	,048	-,037	,029	,232*	,368**	,263*	,347**	,576**	1															
20	-,114	,089	,024	-,104	,032	,178	,154	,107	,138	,350**	,190	,564**	,525**	,319**	1														
21	-,142	,084	-,211*	-,055	-,044	,042	,145	,369**	,092	,098	,017	,275**	,337**	,217*	,537**	1													
8	-,156	-,007	-,062	,096	,042	,000	-,052	,165	-,003	,028	,062	,176	,291**	,083	,140	,268*	1												
9	,088	,103	,161	,108	,124	,141	,015	-,090	,264*	,281**	,194	,307**	,139	,118	,273*	,189	,383**	1											
10	-,075	-,010	,053	,178	,022	-,172	-,044	-,034	-,053	,303**	-,043	,213*	,213*	,070	,292**	,116	,292**	,382**	1										
11	,023	-,064	,359**	,144	-,062	-,008	-,001	-,079	,239*	,241*	,414**	,303**	,041	,072	,077	,093	,284**	,471**	,234*	1									
12	-,096	-,093	,338**	,235*	-,075	,149	-,093	,012	,195	,305**	,435**	,463**	,172	,140	,128	,142	,347**	,381**	,225*	,739**	1								
13	,269*	,055	,300**	,236*	,168	,185	,163	-,015	,367**	,214*	,267*	,267*	,182	-,003	,109	,136	,251*	,517**	,271*	,483**	,522**	1							
1	-,131	-,043	,081	,130	,133	,035	-,051	-,121	,239*	,258*	,270*	,178	,188	,182	,196	,193	,236*	,437**	,325**	,369**	,405**	,274*	1						
2	-,201	-,122	-,083	,060	,152	,004	,059	,057	-,154	,048	-,017	,064	,128	,038	,173	,186	,235*	,150	,340**	,128	,154	,032	,454**	1					
3	-,208	-,177	-,047	-,027	,040	,026	-,039	-,005	-,079	,155	,052	,101	,163	,125	,214*	,193	,259*	,283**	,335**	,160	,259*	,134	,449**	,762**	1				
4	-,108	-,196	,173	,024	-,037	-,132	-,022	-,180	-,022	,147	,010	,145	,099	,175	,129	,112	,071	,211*	,377**	,161	,158	,082	,337**	,609**	,588**	1			
5	,008	-,085	,242*	,069	,145	,058	,024	-,171	,020	-,028	,168	,134	,033	,082	,087	,031	,186	,282**	,242*	,169	,209	,180	,351**	,392**	,404**	,579**	1		
6	,153	-,017	,001	-,040	,292**	,024	,173	,018	,067	,113	,017	-,060	,089	-,071	,110	,058	,310**	,311**	,273*	,059	,049	,232*	,285**	,286**	,330**	,285**	,462**	1	
7	,226*	-,045	,159	-,055	,033	-,069	,020	,013	,069	,103	,112	,027	,059	-,043	,095	,046	,396**	,209	,229*	,210	,153	,154	,264*	,326**	,325**	,356**	,340**	,662**	1

**. Correlation is significant at level of $p \leq .01$; *. Correlation is significant at level of $p \leq .05$

APPENDIX G: SYNTAX USED TO RUN THE PARALLEL ANALYSIS

Appendix G provides the Syntax used to perform the parallel analysis. The syntax is developed and published by Brian O'Connor. The publication of the syntax can be found in the following reference: O'Connor, B. P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. *Behavior Research Methods*, Instrumentation, and Computers, 32, 396-402. The syntax reads as follows.

```
* Parallel Analysis Program For Raw Data and Data Permutations.
* To run this program you need to first specify the data for analysis and then RUN, all at once, the commands from the MATRIX statement to the END MATRIX statement.
* This program conducts parallel analyses on data files in which the rows of the data matrix are cases/individuals and the columns are variables;  Data are read/entered into the program  using the GET command (see the GET command below);  The GET command reads an SPSS data file, which can be either the current, active SPSS data file or a previously saved data file; A valid filename/location must be specified on the GET command; A subset of variables for the analyses can be specified by using the "/ VAR =" subcommand with the GET statement;  There can be no missing values.
* You must also specify:
the # of parallel data sets for the analyses; the desired percentile of the distribution and random data eigenvalues; whether principal components analyses or principal axis/common factor analysis are to be conducted, and whether normally distributed random data generation or permutations of the raw data set are to be used in the parallel analyses.
* Permutations of the raw data set can be time consuming; Each parallel data set is based on column-wise random shufflings of the values in the raw data matrix using Castellan's (1992, BRMIC, 24, 72-77) algorithm; The distributions of the original raw variables are exactly preserved in the shuffled versions used in the parallel analyses; Permutations of the raw data set are thus highly accurate and most relevant, especially in cases where the raw data are not normally
```

distributed or when they do not meet the assumption of multivariate normality (see Longman & Holden, 1992, BRMIC, 24, 493, for a Fortran version); If you would like to go this route, it is perhaps best to (1) first run a normally distributed random data generation parallel analysis to familiarize yourself with the program and to get a ballpark reference point for the number of factors/components; (2) then run a permutations of the raw data parallel analysis using a small number of datasets (e.g., 100), just to see how long the program takes to run; then (3) run a permutations of the raw data parallel analysis using the number of parallel data sets that you would like use for your final analyses; 1000 datasets are usually sufficient, although more datasets should be used if there are close calls.

* These next commands generate artificial raw data (500 cases) that can be used for a trial-run of the program, instead of using your own raw data; Just select and run this whole file; However, make sure to delete the artificial data commands before attempting to run your own data.

```
set mxloops=9000 printback=off width=80  seed = 1953125.
matrix.

* Enter the name/location of the data file for analyses after "FILE ="; If you specify "FILE = *",
then the program will read the current, active SPSS data file; Alternatively, enter the name/location
of a previously saved SPSS data file instead of "*"; you can use the "/ VAR =" subcommand after
"/ missing=omit" subcommand to select variables for the analyses. GET raw / FILE = * /
missing=omit / VAR = Q34.16_1, Q34.16_2, Q34.16_3, Q34.16_4, Q34.16_5, Q34.16_6,
Q34.16_7, Q34.16_8
Q34.10_1, Q34.10_2, Q34.10_3, Q34.10_4, Q34.10_5, Q34.10_6, Q34.10_7
Q34.11_1, Q34.11_2, Q34.11_3, Q34.11_4, Q34.11_5, Q34.11_6
Q.15_1u, Q.15_2u, Q.15_3u, Q.15_4u, Q.15_5u, Q.15_6u, Q.15_7u, Q.15_8u.

* Enter the desired number of parallel data sets here.
compute ndatsets = 1000.
* Enter the desired percentile here.
compute percent  = 95.
* Enter either
  1 for principal components analysis, or
  2 for principal axis/common factor analysis.
compute kind = 2 .
```

```
* Enter either
  1 for normally distributed random data generation parallel analysis, or
  2 for permutations of the raw data set.
compute randtype = 2.

****************** End of user specifications. ******************

compute ncases   = nrow(raw).
compute nvars    = ncol(raw).

* principal components analysis & random normal data generation.
do if (kind = 1 and randtype = 1).
compute nm1 = 1 / (ncases-1).
compute vcv = nm1 * (sscp(raw) - ((t(csum(raw))*csum(raw))/ncases)).
compute d = inv(mdiag(sqrt(diag(vcv)))).
compute realeval = eval(d * vcv * d).
compute evals = make(nvars,ndatsets,-9999).
loop #nds = 1 to ndatsets.
compute x = sqrt(2 * (ln(uniform(ncases,nvars)) * -1) ) &*
          cos(6.283185 * uniform(ncases,nvars) ).
compute vcv = nm1 * (sscp(x) - ((t(csum(x))*csum(x))/ncases)).
compute d = inv(mdiag(sqrt(diag(vcv)))).
compute evals(:,#nds) = eval(d * vcv * d).
end loop.
end if.

* principal components analysis & raw data permutation.
do if (kind = 1 and randtype = 2).
compute nm1 = 1 / (ncases-1).
compute vcv = nm1 * (sscp(raw) - ((t(csum(raw))*csum(raw))/ncases)).
compute d = inv(mdiag(sqrt(diag(vcv)))).
compute realeval = eval(d * vcv * d).
compute evals = make(nvars,ndatsets,-9999).
loop #nds = 1 to ndatsets.
compute x = raw.
loop #c = 1 to nvars.
loop #r = 1 to (ncases -1).
compute k = trunc( (ncases - #r + 1) * uniform(1,1) + 1 )  + #r - 1.
compute d = x(#r,#c).
compute x(#r,#c) = x(k,#c).
compute x(k,#c) = d.
```

```
end loop.
end loop.
compute vcv = nm1 * (sscp(x) - ((t(csum(x))*csum(x))/ncases)).
compute d = inv(mdiag(sqrt(diag(vcv)))).
compute evals(:,#nds) = eval(d * vcv * d).
end loop.
end if.

* PAF/common factor analysis & random normal data generation.
do if (kind = 2 and randtype = 1).
compute nm1 = 1 / (ncases-1).
compute vcv = nm1 * (sscp(raw) - ((t(csum(raw))*csum(raw))/ncases)).
compute d = inv(mdiag(sqrt(diag(vcv)))).
compute cr = (d * vcv * d).
compute smc = 1 - (1 &/ diag(inv(cr)) ).
call setdiag(cr,smc).
compute realeval = eval(cr).
compute evals = make(nvars,ndatsets,-9999).
compute nm1 = 1 / (ncases-1).
loop #nds = 1 to ndatsets.
compute x = sqrt(2 * (ln(uniform(ncases,nvars)) * -1) ) &*
        cos(6.283185 * uniform(ncases,nvars) ).
compute vcv = nm1 * (sscp(x) - ((t(csum(x))*csum(x))/ncases)).
compute d = inv(mdiag(sqrt(diag(vcv)))).
compute r = d * vcv * d.
compute smc = 1 - (1 &/ diag(inv(r)) ).
call setdiag(r,smc).
compute evals(:,#nds) = eval(r).
end loop.
end if.

* PAF/common factor analysis & raw data permutation.
do if (kind = 2 and randtype = 2).
compute nm1 = 1 / (ncases-1).
compute vcv = nm1 * (sscp(raw) - ((t(csum(raw))*csum(raw))/ncases)).
compute d = inv(mdiag(sqrt(diag(vcv)))).
compute cr = (d * vcv * d).
compute smc = 1 - (1 &/ diag(inv(cr)) ).
call setdiag(cr,smc).
compute realeval = eval(cr).
compute evals = make(nvars,ndatsets,-9999).
compute nm1 = 1 / (ncases-1).
loop #nds = 1 to ndatsets.
```

```
compute x = raw.
loop #c = 1 to nvars.
loop #r = 1 to (ncases -1).
compute k = trunc( (ncases - #r + 1) * uniform(1,1) + 1 )  + #r - 1.
compute d = x(#r,#c).
compute x(#r,#c) = x(k,#c).
compute x(k,#c) = d.
end loop.
end loop.
compute vcv = nm1 * (sscp(x) - ((t(csum(x))*csum(x))/ncases)).
compute d = inv(mdiag(sqrt(diag(vcv)))).
compute r = d * vcv * d.
compute smc = 1 - (1 &/ diag(inv(r)) ).
call setdiag(r,smc).
compute evals(:,#nds) = eval(r).
end loop.
end if.

* identifying the eigenvalues corresponding to the desired percentile.
compute num = rnd((percent*ndatsets)/100).
compute results = { t(1:nvars), realeval, t(1:nvars), t(1:nvars) }.
loop #root = 1 to nvars.
compute ranks = rnkorder(evals(#root,:)).
loop #col = 1 to ndatsets.
do if (ranks(1,#col) = num).
compute results(#root,4) = evals(#root,#col).
break.
end if.
end loop.
end loop.
compute results(:,3) = rsum(evals) / ndatsets.

print /title="PARALLEL ANALYSIS:".
do if (kind = 1 and randtype = 1).
print /title="Principal Components & Random Normal Data Generation".
else if (kind = 1 and randtype = 2).
print /title="Principal Components & Raw Data Permutation".
else if (kind = 2 and randtype = 1).
print /title="PAF/Common Factor Analysis & Random Normal Data Generation".
else if (kind = 2 and randtype = 2).
print /title="PAF/Common Factor Analysis & Raw Data Permutation".
end if.
```

```
compute specifs = {ncases; nvars; ndatsets; percent}.
print specifs /title="Specifications for this Run:"
 /rlabels="Ncases" "Nvars" "Ndatsets" "Percent".
print results
 /title="Raw Data Eigenvalues, & Mean & Percentile Random Data Eigenvalues"
 /clabels="Root" "Raw Data" "Means" "Prcntyle"  /format "f12.6".

do if   (kind = 2).
print / space = 1.
print /title="Warning: Parallel analyses of adjusted correlation matrices".
print /title="eg, with SMCs on the diagonal, tend to indicate more factors".
print /title="than warranted (Buja, A., & Eyuboglu, N., 1992, Remarks on parallel".
print /title="analysis. Multivariate Behavioral Research, 27, 509-540.).".
print /title="The eigenvalues for trivial, negligible factors in the real".
print /title="data commonly surpass corresponding random data eigenvalues".
print /title="for the same roots. The eigenvalues from parallel analyses".
print /title="can be used to determine the real data eigenvalues that are".
print /title="beyond chance, but additional procedures should then be used".
print /title="to trim trivial factors.".
print / space = 2.
print /title="Principal components eigenvalues are often used to determine".
print /title="the number of common factors. This is the default in most".
print /title="statistical software packages, and it is the primary practice".
print /title="in the literature. It is also the method used by many factor".
print /title="analysis experts, including Cattell, who often examined".
print /title="principal components eigenvalues in his scree plots to determine".
print /title="the number of common factors. But others believe this common".
print /title="practice is wrong. Principal components eigenvalues are based".
print /title="on all of the variance in correlation matrices, including both".
print /title="the variance that is shared among variables and the variances".
print /title="that are unique to the variables. In contrast, principal".
print /title="axis eigenvalues are based solely on the shared variance".
print /title="among the variables. The two procedures are qualitatively".
print /title="different. Some therefore claim that the eigenvalues from one".
print /title="extraction method should not be used to determine".
print /title="the number of factors for the other extraction method.".
print /title="The issue remains neglected and unsettled.".
end if.

compute root      = results(:,1).
compute rawdata = results(:,2).
compute percntyl = results(:,4).
```

```
save results /outfile= 'C:\Users\jgard\Desktop\Dissertation\Daten\Business Developer\Parallel Analysis\screedata.sav' / var=root rawdata means percntyl .
end matrix.

* plots the eigenvalues, by root, for the real/raw data and for the random data; This command works in SPSS 12, but not in all earlier versions.

GET file= 'C:\Users\jgard\Desktop\Dissertation\Daten\Business Developer\Parallel Analysis\screedata.sav'.

TSPLOT VARIABLES= rawdata means percntyl /ID= root /NOLOG.
```

APPENDIX H: PRINCIPAL COMPONENT ANALYSIS WITH THREE VARIABLES

Appendix H provides the results of the principal component analysis, including the reduced six-item scale for job autonomy (items 2-7), the reduced four-item scale for strategic autonomy (items 9, 11, 12 and 13) and the seven items measuring corporate venture success (items 14-20).

Item	Component		
	1	2	3
2	.805		
3	.764		
4	.783		
5	.655		
6	.620		
7	.619		
9			.604
11			.863
12			.843
13			.748
14		.850	
15		.752	
16		.765	
17		.831	
18		.782	
19		.776	
20		.831	

[a] Varimax rotated component matrix
[b] Table includes all component loadings above the .30 cut-off point
[c] Results after erasing item 1 for job autonomy and items 1 and 3 for strategic autonomy
[d] The items 8 to 13 refer to the strategic autonomy scale, the items 1 to 7 refer to the job autonomy scale and the items 14 to 20 refer to the strategic autonomy scale

APPENDIX I: ANOVA FOR TESTING NON-RESPONSE BIAS

The analysis of variance (ANOVA) compares (a) the turnover and (b) the number of employees of firms that did not respond to the survey and of those firms that responded to the survey. The descriptive statistics (Table 1) show that non-responding firms have with 15.1 million Euro on average (mean) a higher turnover and are with 86 employees smaller than responding firms. Responding firms have on average a turnover of 13.3 million Euro and 93 employees. However, the analysis of variance (Table 2) shows that these differences are not significant. Thus, we may state that non-responding firms and responding firms are not different.

Descriptives

					95% Confidence Interval for Mean			
Turnover	**N**	**Mean**	**Std. Deviation**	**Std. Error**	**Lower Bound**	**Upper Bound**	**Min.**	**Max.**
Non-Responding Firms	2097	15.1245	27.3320	.5968	13.9540	16.2950	.03	549.30
Responding Firms	72	13.3086	11.6406	1.3718	10.5732	16.0440	3.30	60.00
Total	2169	15.0642	26.9588	.5788	13.9290	16.1993	.03	549.30
# of Employees								
Non-Responding Firms	2363	86.02	70.031	1.441	83.20	88.85	0	650
Responding Firms	77	93.62	65.346	7.447	78.79	108.46	27	335
Total	2440	86.26	69.889	1.415	83.49	89.03	0	650

Analysis of Variance

Turnover	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	229.524	1	229.524	.316	.574
Within Groups	1575423.354	2167	727.007		
Total	1575652.878	2168			
# of Employees					
Between Groups	4310.641	1	4310.641	.882	.348
Within Groups	11908747.103	2438	4884.638		
Total	11913057.744	2439			

APPENDIX J1: ANOVA TO TEST SOURCE BIAS ON CORPORATE VENTURE SUCCESS

The analysis of variance (ANOVA) compares the venture manager's and corporate manager's assessment of corporate venture success. The descriptive statistics (Table 1) shows that venture managers assess corporate venture success with 30.4 on average higher that the corporate managers with 29.6. However, the analysis of variance (Table 2) shows that these differences are not significant. Thus, we may conclude that the assessment of corporate venture success does not distinguish among venture managers and corporate managers.

Descriptives

Corporate Venture Success	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Venture Manager	87	30.3908	6.8528	.7347	28.9303	31.8513	7.00	42.00
Corporate Manager	287	29.5645	6.8194	.4025	28.7721	30.3568	14.00	42.00
Total	374	29.7567	6.8270	.3530	29.0625	30.4508	7.00	42.00

Analysis of Variance

Corporate Venture Success	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	45.588	1	45.588	.978	.323
Within Groups	17339.270	372	46.611		
Total	17384.858	373			

APPENDIX J2: ANOVA FOR TESTING SOURCE BIAS ON STRATEGIC AUTONOMY

The analysis of variance (ANOVA) compares the assessment of the strategic autonomy venture managers enjoy, given by the venture managers and the corporate managers. The descriptive statistics (Table 1) shows that venture managers assess the strategic autonomy on average higher (18.3) that the corporate managers (14.6). The analysis of variance (Table 2) shows that these differences are significant at $p < .001$. Thus, we may conclude that the assessment of strategic autonomy differs between venture managers and corporate managers.

Descriptives

Corporate Venture Success	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Venture Manager	87	18.3218	5.6967	.6107	17.1077	19.5360	5.00	30.00
Corporate Manager	289	14.6851	5.9191	.3481	13.9998	15.3704	5.00	30.00
Total	376	15.5266	6.0587	.3124	14.9122	16.1410	5.00	30.00

Analysis of Variance

Corporate Venture Success	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	884.400	1	884.400	25.678	.000
Within Groups	12881.335	374	34.442		
Total	13765.734	375			

APPENDIX J3: ANOVA FOR TESTING SOURCE BIAS ON JOB AUTONOMY

The analysis of variance (ANOVA) compares the assessment of the job autonomy venture managers enjoy, given by the venture managers and the corporate managers. The descriptive statistics (Table 1) shows that venture managers assess the job autonomy on average higher (33.3) that the corporate managers (31.1). The analysis of variance (Table 2) shows that these differences are significant at $p < .01$. Thus, we may conclude that the assessment of job autonomy differs between venture managers and corporate managers.

DESCRIPTIVES

Corporate Venture Success	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Venture Manager	87	33.2529	5.7712	.6187	32.0229	34.4829	15.00	42.00
Corporate Manager	289	31.1142	5.7455	.3379	30.4490	31.7794	10.00	42.00
Total	376	31.6090	5.8143	.2998	31.0194	32.1986	10.00	42.00

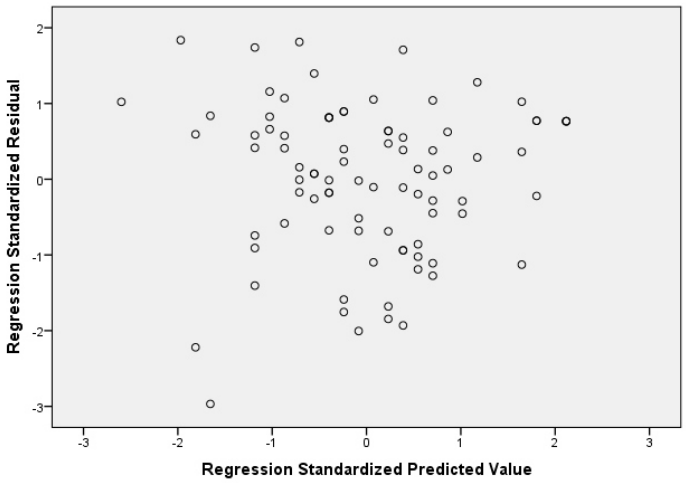
Analysis of Variance

Corporate Venture Success	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	305.861	1	305.861	9.246	.003
Within Groups	12371.669	374	33.079		
Total	12677.529	375			

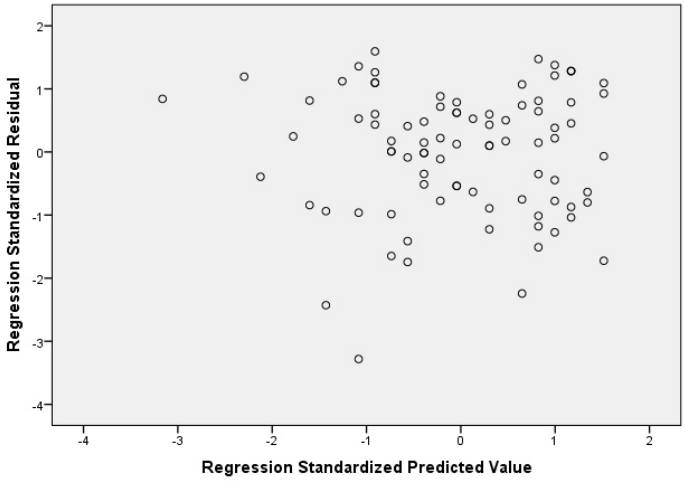
APPENDIX K: RESIDUAL PLOTS OF THE VARIABLES USED IN THE REGRESSION ANALYSIS

Residual plots using standardized residuals (y-axis) with standardized predictor values (x-axis) are generated for the two main variables (strategic autonomy and job autonomy), the moderator variable (exploitation priority) and the control variables (environmental dynamism, maturity stage, team experience, total employees, total sales and team size) using corporate venture success as the independent variable. The nine residual plots are illustrated below.

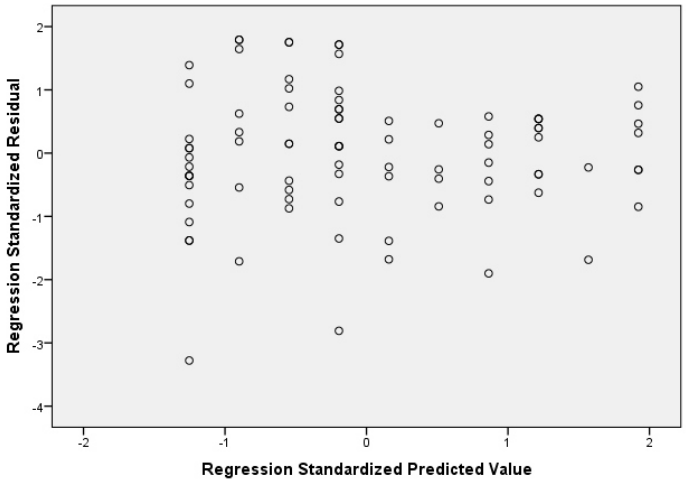
K1: Strategic autonomy on corporate venture success



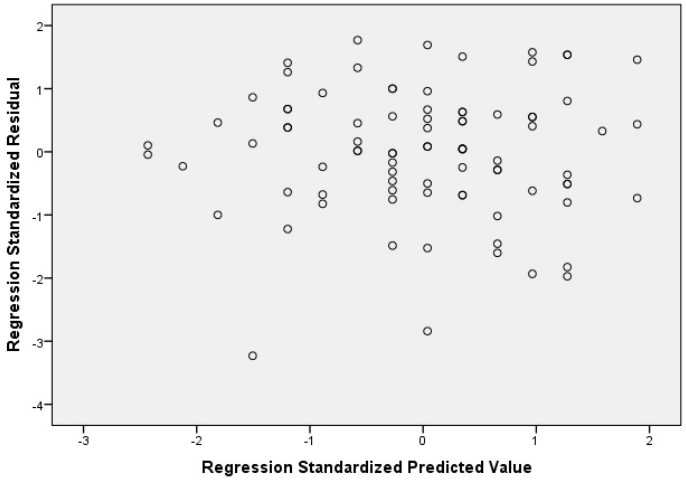
K2: Job autonomy on corporate venture success



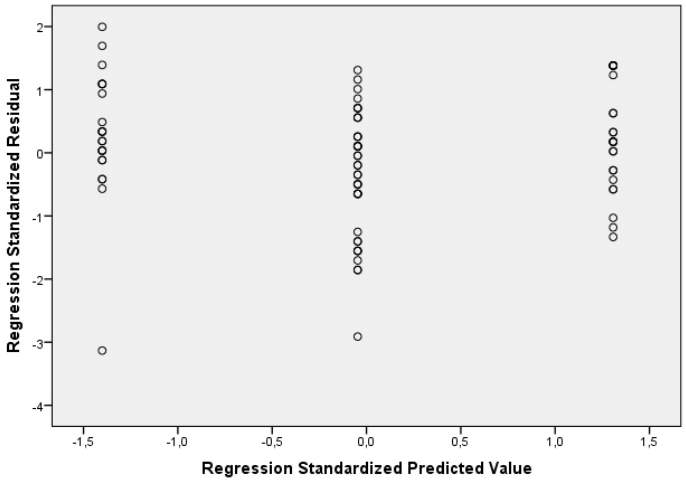
K3: Exploitation Priority on corporate venture success



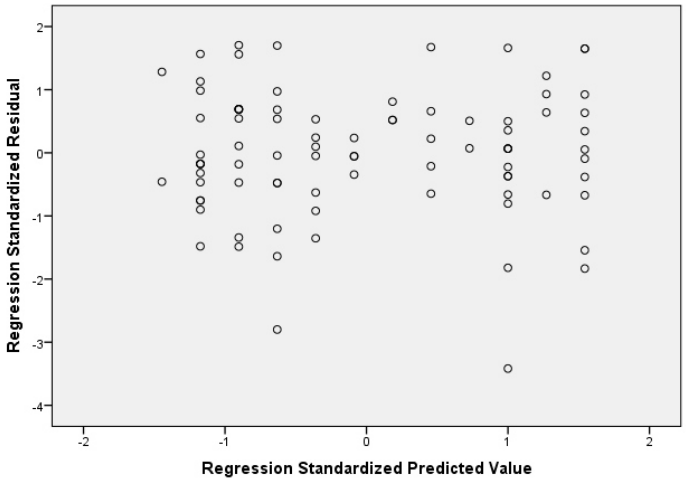
K4: Environmental Dynamism on corporate venture success



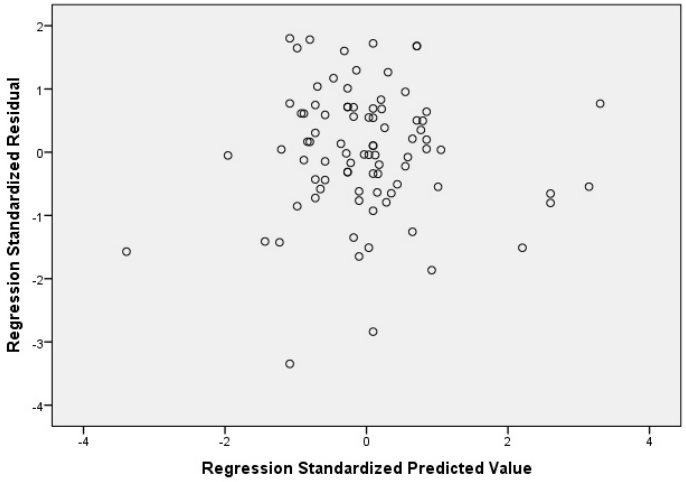
K5: Maturity Stage on corporate venture success



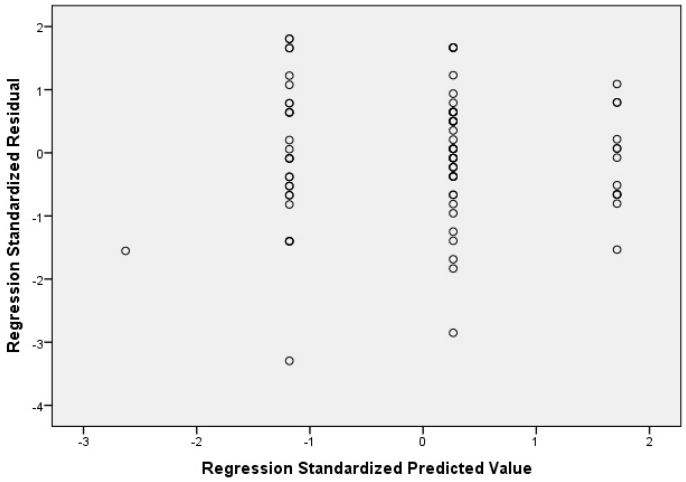
K6: Team Experience on corporate venture success



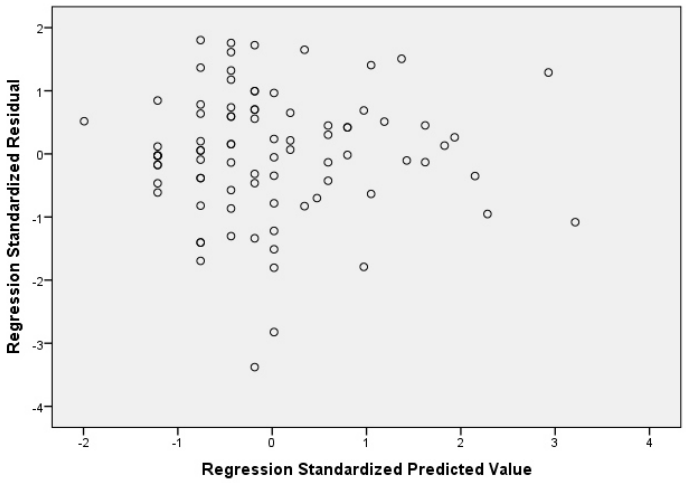
K7: Total employees on corporate venture success



K8: Total sales on corporate venture success



K9: Team Size on corporate venture success



APPENDIX L: SYNTAX USED TO RUN THE HETEROSCEDASTICITY ANALYSIS

Appendix K provides the Syntax used to perform the heteroscedasticity analysis. The syntax is developed by Gwilym Pryce and acknowledged as an official SPSS macro. The syntax reads as follows.

```
* BREUSCH-PAGAN & KOENKER TEST MACRO *
* See 'Heteroscedasticity: Testing and correcting in SPSS'
* by Gwilym Pryce, for technical details.
* Code by Marta Garcia-Granero 2002/10/28.

* The MACRO needs 3 arguments:
* the dependent, the number of predictors and the list of predictors
* (if they are consecutive, the keyword TO can be used) .

* (1) MACRO definition (select an run just ONCE).

DEFINE bpktest(!POSITIONAL !TOKENS(1) /!POSITIONAL !TOKENS(1) /!POSITIONAL
!CMDEND).
* Regression to get the residuals and residual plots.
REGRESSION
/STATISTICS R ANOVA
/DEPENDENT !1
/METHOD=ENTER !3
/SCATTERPLOT=(*ZRESID,*ZPRED)
/RESIDUALS HIST(ZRESID) NORM(ZRESID)
/SAVE RESID(residual) .
do if $casenum=1.
print /"Examine the scatter plot of the residuals to detect"
/"model misspecification and/or heteroscedasticity"
/""
/"Also, check the histogram and np plot of residuals "
/"to detect non normality of residuals "
/"Skewness and kurtosis more than twice their SE indicate non-normality ".
end if.
* Checking normality of residuals.
DESCRIPTIVES
VARIABLES=residual
/STATISTICS=KURTOSIS SKEWNESS .
* New dependent variable (g) creation.
COMPUTE sq_res=residual**2.
compute constant=1.
```

```
AGGREGATE
/OUTFILE='tempdata.sav'
/BREAK=constant
/rss = SUM(sq_res)
/N=N.
MATCH FILES /FILE=*
/FILE='tempdata.sav'.
EXECUTE.
if missing(rss) rss=lag(rss,1).
if missing(n) n=lag(n,1).
compute g=sq_res/(rss/n).
execute.
* BP&K tests.
* Regression of g on the predictors.
REGRESSION
/STATISTICS R ANOVA
/DEPENDENT g
/METHOD=ENTER !3
/SAVE RESID(resid) .
*Final report.
do if $casenum=1.
print /" BP&K TESTS"
/" ==========".
end if.
* Routine adapted from Gwilym Pryce.
matrix.
compute p=!2.
get g /variables=g.
get resid /variables=resid.
compute sq_res2=resid&**2.
compute n=nrow(g).
compute rss=msum(sq_res2).
compute ii_1=make(n,n,1).
compute i=ident(n).
compute m0=i-((1/n)*ii_1).
compute tss=transpos(g)*m0*g.
compute regss=tss-rss.
print regss
/format="f8.4"
/title="Regression SS".
print rss
/format="f8.4"
/title="Residual SS".
```

```
print tss
/format="f8.4"
/title="Total SS".
compute r_sq=1-(rss/tss).
print r_sq
/format="f8.4"
/title="R-squared".
print n
/format="f4.0"
/title="Sample size (N)".
print p
/format="f4.0"
/title="Number of predictors (P)".
compute bp_test=0.5*regss.
print bp_test
/format="f8.3"
/title="Breusch-Pagan test for Heteroscedasticity"
+ " (CHI-SQUARE df=P)".
compute sig=1-chicdf(bp_test,p).
print sig
/format="f8.4"
/title="Significance level of Chi-square df=P (H0:"
+ "homoscedasticity)".
compute k_test=n*r_sq.
print k_test
/format="f8.3"
/title="Koenker test for Heteroscedasticity"
+ " (CHI-SQUARE df=P)".
compute sig=1-chicdf(k_test,p).
print sig
/format="f8.4"
/title="Significance level of Chi-square df=P (H0:"
+ "homoscedasticity)".
end matrix.
!ENDDEFINE.

* (2) Sample data (replace by your own)*.

INPUT PROGRAM.
- VECTOR x(20).
- LOOP #I = 1 TO 50.
- LOOP #J = 1 TO 20.
```

```
- COMPUTE x(#J) = NORMAL(1).
- END LOOP.
- END CASE.
- END LOOP.
- END FILE.
END INPUT PROGRAM.
execute.

* x1 is the dependent and x2 TO x20 the predictors.

* (3) MACRO CALL (select and run).

BPKTEST x1 19 x2 TO x20.
```

SUMMARY

The thesis describes the continuous need for corporations to renew their business portfolio in order to adapt to the changing conditions of today's business environment (i.e., technological change, new competition and volatile customer demand). The ongoing booming of founding international start-ups suggests that small entrepreneurial teams are an effective means to develop new businesses. Corporations should be able to establish small entrepreneurial teams (corporate ventures) for strategic renewal. However, in these cases corporate management is facing two obstacles. First, corporate ventures often fail for reasons to be more closely investigated. Second, it remains unclear how the partial successes may be improved to large successes. Although the key success factors are not well understood, there is no indication that corporate ventures will be successful without effective management. Since an empirical model for corporate venture management does not exists so far, it is high time to pay attention to the development of such a model.

In order to investigate the intricacies of the current situation, the following problem statement is formulated in Chapter 1. *How can corporate management effectively manage corporate ventures?* Guided by three research questions (RQ1 to RQ 3), a four-stage methodology is applied to answer the problem statement. *First*, the autonomy of corporate ventures is explored. *Second*, the identified autonomy dimensions are operationalized into an autonomy construct. *Third*, the autonomy construct is evaluated and adapted. *Fourth*, the autonomy construct is applied. Following the research methodology, an empirical model for effective corporate venture management is developed, giving an answer to the problem statement.

Chapter 2 reviews related work which characterizes corporate ventures as a means to realize dual structures that enable corporations to development new businesses while improving the

mainstream business at the same time. The chapter presents the two analytical frameworks (resource-based view and organizational design-based view) that are applied in prior studies to investigate the management of corporate ventures. It identifies the dynamic capability-based view as an alternative analytical framework.

Chapter 3 deals with *RQ1: What are the dimensions reflecting the autonomy that corporate management grants to venture managers?* The answer is based on the explorative research of a case study. Following an interpretive approach, the research builds on the perception of corporate managers and venture managers to observe the autonomy that venture managers may enjoy. Literature research is conducted to explore the dimensions reflecting the observed autonomy. The results indicate that the autonomy of venture managers is underpinned through four autonomy dimensions, namely functional autonomy, decision autonomy, strategic autonomy and job autonomy.

Chapter 4 gives a partial answer to *RQ2: How can the autonomy dimensions identified by RQ1 be operationalized in a construct that enables us to measure the autonomy of venture managers?* A theoretical model is developed based on literature research. The model associates the four autonomy dimensions (functional autonomy, decision autonomy, strategic autonomy and job autonomy) with corporate venture success. We operationalize the model by which it provides an initial four-dimensional construct that reflects the autonomy of venture managers.

Chapter 5 present the research results that provides a conclusive answer to *RQ2*. Therefore the initial construct is evaluated and adapted by following a four-step variable reduction procedure. *First*, the appropriateness of the data to apply variable reduction techniques is evaluated. *Second*, component extraction is performed. *Third*, component rotation is conducted. *Fourth*, Cronbach's Alphas are computed. The construct validity is evaluated in the first three steps and the construct reliability is evaluated in the fourth step. Following the statistical procedure, the initial four-

dimensional construct is reduced to a two-dimensional construct with the scales of strategic autonomy and job autonomy retained.

In Chapter 6, the two-dimensional autonomy construct is applied to answer *RQ3: How are the autonomy dimensions related to the success of the corporate ventures?* A questionnaire is distributed in the German IT consulting industry. Having evaluated the research methodology and the appropriateness of the data, the answers of 87 venture managers are analyzed. The results show that strategic autonomy and job autonomy are both positively related with corporate venture success. Both relations are amplified when corporate management enforces at the same time a business policy that prioritizes the achievement of exploitation objectives. The findings reveal a management model which also provide an answer to the PS.

Chapter 7 provides the answers to the three RQs and the PS. The research carried out throughout the thesis to answer the three research questions led to the empirical results reported in Chapter 6. These results suggest an empirical model for effective corporate venture management, highlighting three management principles. First, corporate management should allow venture managers to make *strategic decisions* without their approval. Second, corporate management should grant venture managers with the authority to make *work-mode decisions* without their approval. Third, corporate management should emphasize a business policy that forces venture managers to consider *exploitation priority* in their strategic decisions and work-mode decisions. Following the dynamic capability-based view, it is further discussed how corporate management can realize the three management principles. Finally, the chapter (a) provides the implications of the research results for researchers and practitioners, (b) highlights the limitations of the research and (c) gives recommendations for future research endeavors.

SAMENVATTING

De dissertatie beschrijft de voortdurende noodzaak voor bedrijven om hun bedrijfsportfolio te vernieuwen. Bedrijven dienen zich immers aan te passen aan de veranderende voorwaarden van de huidige bedrijfsomgeving. Het gaat daarbij om technologische veranderingen, nieuwe vormen van competitie en vluchtige gebruikers eisen. De voortgaande, ongehinderde groei van internationale start-ups vormt een aanwijzing dat kleine ondernemende teams een effectief middel zijn om nieuwe omzet-mogelijkheden te bewerkstelligen. De bedrijven moeten evenwel in staat zijn om de kleine ondernemende teams (ook genoemd: *corporate ventures*) aan te sturen ten behoeve van hun strategische vernieuwing. In al deze gevallen ontmoet het bedrijfsmanagement twee obstakels.

Allereerst falen de *corporate ventures* redelijk vaak vanwege redenen die nauwkeuriger onderzocht dienen te worden. Ten tweede, blijft het onduidelijk hoe een potentieel succes kan worden verbeterd tot een goed succes. Hoewel de belangrijkste succesfactoren nog niet volledig geïmplementeerd zijn, is er geen enkele indicatie dat *corporate ventures* succesvol zullen zijn zonder effectief management. Omdat een empirisch model *voor corporate venture management* nog altijd niet bestaat, is het de hoogste tijd dat zulk een model wordt ontwikkeld.

Om de onduidelijkheden rondom de huidige situatie diepgaand te onderzoeken hebben we in Hoofdstuk 1 de volgende probleemstelling (PS) geformuleerd: *Hoe kan* corporate management *de* corporate ventures *effectief aansturen*? Een vier-stappen methodologie is ontwikkeld om deze probleemstelling nader te onderzoeken en te beantwoorden. Er zijn drie onderzoeksvragen (OVs) die het pad naar de beantwoording vorm geven, te weten OV1, OV2 en OV3. Zij komen bij de hoofdstukbespreking aan de beurt. De vier stappen van de onderzoeksmethodologie luiden als volgt: (1) de autonomie van de *corporate ventures* wordt exploratief onderzocht; (2)

de geïdentificeerde autonomie-dimensies worden geoperationaliseerd in een autonomie-construct; (3) het autonomie-construct wordt geanalyseerd en aangepast; (4) het autonomie-construct wordt toegepast. Na het doorlopen van deze vier-stappen methodologie, wordt een empirisch model voor effectief *corporate venture management* ontwikkeld. Dat model geeft een antwoord op de probleemstelling.

Hoofdstuk 2 bespreekt gerelateerd werk dat de *corporate ventures* karakteriseert als een middel om duale structuren te bewerkstelligen. Een duale structuur stelt corporaties in staat om een nieuwe bedrijfsaanpak te realiseren terwijl de oude vertrouwde aanpak op hetzelfde moment wordt verbeterd. Het hoofdstuk beschrijft twee analytische kaders (een kader is een kijk op het bedrijf), te weten, een *resource-based view* en een *organisational design-based view*. Zij zijn ontleend aan eerdere situaties die het management van *corporate ventures* onderzocht. Voorts identificeert het hoofdstuk de *dynamic capability-based view* als een alternatief analytisch kader.

Hoofdstuk 3 behandelt OV1: *Wat zijn de dimensies die de mate van autonomie beschouwen die het* corporate management *toestaat aan de* venture managers*?* Het antwoord is gebaseerd op het exploratieve onderzoek van een *case study*. Er wordt een interpretatieve benadering gevolgd; het onderzoek richt zich op de perceptie van de *corporate managers* en de *venture manager* om zodoende de autonomie-dimensies op te sporen. De percepties van beide groepen worden verdeeld in twee reeksen van interviews. De resultaten geven aan dat de autonomie van de *venture manager* wordt ondersteund door vier autonomie-dimensies, te weten functionele autonomie, beslissings autonomie, strategie-autonomie, en werk-autonomie.

Hoofdstuk 4 geeft een gedeeltelijk antwoord op OV2: *Hoe kunnen de autonomie-dimensies die geïdentificeerd zijn door OV1 worden geoperationaliseerd in een construct dat in staat stelt de autonomie van* venture managers *te meten?* Er wordt een theoretisch model ontworpen op basis

van literatuuronderzoek. Het model verbindt de vier autonomie-dimensies (functionele autonomie, beslissings autonomie, strategie-autonomie en werk-autonomie) met de successen van een *corporate venture*. Wij operationaliseren dit model waardoor het ons een beginnend vier-dimensionaal construct oplevert dat de autonomie van de *venture managers* weerspiegelt.

Hoofdstuk 5 toont de resultaten van ons onderzoek en daarmee geeft het een concluderend antwoord op OV2. Het initiële construct wordt geëvalueerd en aangepast door de vier stappen procedure die het aantal variabelen reduceert. Het verloop is als volgt: (1) de delen worden geëvalueerd op hun geschiktheid om de reductie-technieken toe te passen op de variabelen; (2) we passen de component extractie-techniek toe (PCA, principal component analysis), (3) we passen component-rotatie toe; (4) Cronbach's alphas worden berekend. De validiteit van het construct wordt gemeten in de eerste drie stappen en de betrouwbaarheid van het construct wordt bepaald in de vierde stap. Door onze statistische procedure stap voor stap te volgen wordt het initiële vier-dimensionale construct gereduceerd tot een twee-dimensionaal construct met als overblijvende dimensies: strategie-autonomie en werk-autonomie.

In hoofdstuk 6 wordt het twee-dimensionale autonomie-construct gebruikt om een antwoord te formuleren op OV3: *Hoe zijn de autonomie-dimensies verbonden met het succes van de* corporate ventures*?* Een vragenlijst is gedistribueerd onder de Duitse IT consulting industrie. Na de evaluatie van de onderzoeksmethodologie en van de geschiktheid van de data (beide evaluaties zijn in orde), zijn de antwoorden van 87 *venture managers* geanalyseerd.

De resultaten tonen aan dat zowel de strategie-autonomie als de werk-autonomie positief gerelateerd zijn aan het succes van de *corporate venture*. Beide relaties worden verruimd wanneer het *corporate management* te zelfder tijd het bedrijfsbeleid bekrachtigt dat de voltooiing van de exploitatie-doelstellig prioriteert.

Hoofdstuk 7 geeft het antwoord op de Probleemstelling. Het onderzoek dat leidde tot de beantwoording van de drie OVs heeft geleid tot empirische resultaten die in Hoofdstuk 6 zijn opgenomen. Deze resultaten bevelen een empirisch model aan voor een effectieve *corporate venture management*, en belichten drie management-principes: (1) *corporate management* dient *venture managers* toe te staan om strategische beslissingen te nemen zonder hun goedkeuring; (2) *corporate management* dient *venture managers* de autoriteit te geven om beslissingen over de wijze van werken te nemen zonder hun goedkeuring; (3) *corporate management* dient de nadruk te leggen op een bedrijfsbeleid dat *venture managers* dwingt de exploitatie prioriteiten in ogenschouw te nemen bij hun strategische beslissingen en hun beslissingen over de wijze van werken. Volgens de *dynamic capability-based view*, hebben we verder beschreven hoe het *corporate managemenent* de drie management principes kan realiseren

Tenslotte geeft het hoofdstuk: (1) de implicaties van onze studie voor onderzoekers en praktijk-mensen, (2) de begrenzingen van het onderzoek, en (3) aanbevelingen voor toekomstige onderzoeksinspanningen.

CURRICULUM VITAE

Jérôme Gard was born in Ottweiler, Germany on Mach 21, 1983. He earned a diploma (Dipl.-Ing.) in Automotive Engineering at the University of Applied Sciences Trier in 2006 and received a master's degree with honors (M.Eng.) in mechanical engineering at the University of Applied Sciences Konstanz in 2009.

After his graduation, he started his professional career as a research associate and project officer at the IST Institut für Strategische Innovation und Technologiemanagement in Konstanz (Germany). One year later, he accepted a position as an external PhD candidate at the Faculty of Science at Leiden University, the Netherlands. Currently, he works for IST as a senior project manager and management consultant for corporate entrepreneurship and strategic risk management.

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30. Wouter van Atteveldt (VU) *Semantic Network Analysis: Techniques for Extracting, Representing and Querying Media Content*
31. Loes Braun (UM) *Pro-Active Medical Information Retrieval*
32. Trung H. Bui (UT) *Toward Affective Dialogue Management using Partially Observable Markov Decision Processes*
33. Frank Terpstra (UvA) *Scientific Workflow Design; theoretical and practical issues*
34. Jeroen de Knijf (UU) *Studies in Frequent Tree Mining*
35. Ben Torben Nielsen (UvT) *Dendritic morphologies: function shapes structure*

2009

1. Rasa Jurgelenaite (RUN) *Symmetric Causal Independence Models*
2. Willem Robert van Hage (VU) *Evaluating Ontology-Alignment Techniques*
3. Hans Stol (UvT) *A Framework for Evidence-based Policy Making Using IT*
4. Josephine Nabukenya (RUN) *Improving the Quality of Organisational Policy Making using Collaboration Engineering*
5. Sietse Overbeek (RUN) *Bridging Supply and Demand for Knowledge Intensive Tasks - Based on Knowledge, Cognition, and Quality*
6. Muhammad Subianto (UU) *Understanding Classification*
7. Ronald Poppe (UT) *Discriminative Vision-Based Recovery and Recognition of Human Motion*
8. Volker Nannen (VU) *Evolutionary Agent-Based Policy Analysis in Dynamic Environments*
9. Benjamin Kanagwa (RUN) *Design, Discovery and Construction of Service-oriented Systems*
10. Jan Wielemaker (UvA) *Logic programming for knowledge-intensive interactive applications*
11. Alexander Boer (UvA) *Legal Theory, Sources of Law & the Semantic Web*
12. Peter Massuthe (TU/e), Humboldt-Universitaet zu Berlin) *Operating Guidelines for Services*
13. Steven de Jong (UM) *Fairness in Multi-Agent Systems*
14. Maksym Korotkiy (VU) *From ontology-enabled services to service-enabled ontologies (making ontologies work in e-science with ONTO-SOA)*
15. Rinke Hoekstra (UvA) *Ontology Representation - Design Patterns and Ontologies that Make Sense*
16. Fritz Reul (UvT) *New Architectures in Computer Chess*
17. Laurens van der Maaten (UvT) *Feature Extraction from Visual Data*
18. Fabian Groffen (CWI) *Armada, An Evolving Database System*
19. Valentin Robu (CWI) *Modeling Preferences, Strategic Reasoning and Collaboration in Agent-Mediated Electronic Markets*
20. Bob van der Vecht (UU) *Adjustable Autonomy: Controling Influences on Decision Making*
21. Stijn Vanderlooy (UM) *Ranking and Reliable Classification*
22. Pavel Serdyukov (UT) *Search For Expertise: Going beyond direct evidence*
23. Peter Hofgesang (VU) *Modelling Web Usage in a Changing Environment*
24. Annerieke Heuvelink (VU) *Cognitive Models for Training Simulations*
25. Alex van Ballegooij (CWI) *"RAM: Array Database Management through Relational Mapping"*
26. Fernando Koch (UU) *An Agent-Based Model for the Development of Intelligent Mobile Services*

27. Christian Glahn (OU) *Contextual Support of social Engagement and Reflection on the Web*
28. Sander Evers (UT) *Sensor Data Management with Probabilistic Models*
29. Stanislav Pokraev (UT) *Model-Driven Semantic Integration of Service-Oriented Applications*
30. Marcin Zukowski (CWI) *Balancing vectorized query execution with bandwidth-optimized storage*
31. Sofiya Katrenko (UvA) *A Closer Look at Learning Relations from Text*
32. Rik Farenhorst (VU) and Remco de Boer (VU) *Architectural Knowledge Management: Supporting Architects and Auditors*
33. Khiet Truong (UT) *How Does Real Affect Affect Affect Recognition In Speech?*
34. Inge van de Weerd (UU) *Advancing in Software Product Management: An Incremental Method Engineering Approach*
35. Wouter Koelewijn (UL) *Privacy en Politiegegevens; Over geautomatiseerde normatieve informatie-uitwisseling*
36. Marco Kalz (OUN) *Placement Support for Learners in Learning Networks*
37. Hendrik Drachsler (OUN) *Navigation Support for Learners in Informal Learning Networks*
38. Riina Vuorikari (OU) *Tags and self-organisation: a metadata ecology for learning resources in a multilingual context*
39. Christian Stahl (TU/e), Humboldt-Universitaet zu Berlin) *Service Substitution - A Behavioral Approach Based on Petri Nets*
40. Stephan Raaijmakers (UvT) *Multinomial Language Learning: Investigations into the Geometry of Language*
41. Igor Berezhnyy (UvT) *Digital Analysis of Paintings*
42. Toine Bogers (UvT) *Recommender Systems for Social Bookmarking*
43. Virginia Nunes Leal Franqueira (UT) *Finding Multi-step Attacks in Computer Networks using Heuristic Search and Mobile Ambients*
44. Roberto Santana Tapia (UT) *Assessing Business-IT Alignment in Networked Organizations*
45. Jilles Vreeken (UU) *Making Pattern Mining Useful*
46. Loredana Afanasiev (UvA) *Querying XML: Benchmarks and Recursion*

2010

1. Matthijs van Leeuwen (UU) *Patterns that Matter*
2. Ingo Wassink (UT) *Work flows in Life Science*
3. Joost Geurts (CWI) *A Document Engineering Model and Processing Framework for Multimedia documents*
4. Olga Kulyk (UT) *Do You Know What I Know? Situational Awareness of Co-located Teams in Multidisplay Environments*
5. Claudia Hauff (UT) *Predicting the Effectiveness of Queries and Retrieval Systems*
6. Sander Bakkes (UvT) *Rapid Adaptation of Video Game AI*
7. Wim Fikkert (UT) *Gesture interaction at a Distance*
8. Krzysztof Siewicz (UL) *Towards an Improved Regulatory Framework of Free Software. Protecting user freedoms in a world of software communities and eGovernments*
9. Hugo Kielman (UL) *A Politiele gegevensverwerking en Privacy, Naar een effectieve waarborging*
10. Rebecca Ong (UL) *Mobile Communication and Protection of Children*
11. Adriaan Ter Mors (TUD) *The world according to MARP: Multi-Agent Route Planning*
12. Susan van den Braak (UU) *Sensemaking software for crime analysis*
13. Gianluigi Folino (RUN) *High Performance Data Mining using Bio-inspired techniques*
14. Sander van Splunter (VU) *Automated Web Service Reconfiguration*
15. Lianne Bodenstaff (UT) *Managing Dependency Relations in Inter-Organizational Models*
16. Sicco Verwer (TUD) *Efficient Identification of Timed Automata, theory and practice*
17. Spyros Kotoulas (VU) *Scalable Discovery of Networked Resources: Algorithms, Infrastructure, Applications*
18. Charlotte Gerritsen (VU) *Caught in the Act: Investigating Crime by Agent-Based Simulation*
19. Henriette Cramer (UvA) *People's Responses to Autonomous and Adaptive Systems*

20. Ivo Swartjes (UT) *Whose Story Is It Anyway? How Improv Informs Agency and Authorship of Emergent Narrative*
21. Harold van Heerde (UT) *Privacy-aware data management by means of data degradation*
22. Michiel Hildebrand (CWI) *End-user Support for Access to\\ Heterogeneous Linked Data*
23. Bas Steunebrink (UU) *The Logical Structure of Emotions*
24. Dmytro Tykhonov (TUD) *Designing Generic and Efficient Negotiation Strategies*
25. Zulfiqar Ali Memon (VU) *Modelling Human-Awareness for Ambient Agents: A Human Mindreading Perspective*
26. Ying Zhang (CWI) *XRPC: Efficient Distributed Query Processing on Heterogeneous XQuery Engines*
27. Marten Voulon (UL) *Automatisch contracteren*
28. Arne Koopman (UU) *Characteristic Relational Patterns*
29. Stratos Idreos(CWI) *Database Cracking: Towards Auto-tuning Database Kernels*
30. Marieke van Erp (UvT) *Accessing Natural History - Discoveries in data cleaning, structuring, and retrieval*
31. Victor de Boer (UvA) *Ontology Enrichment from Heterogeneous Sources on the Web*
32. Marcel Hiel (UvT) *An Adaptive Service Oriented Architecture: Automatically solving Interoperability Problems*
33. Robin Aly (UT) *Modeling Representation Uncertainty in Concept-Based Multimedia Retrieval*
34. Teduh Dirgahayu (UT) *Interaction Design in Service Compositions*
35. Dolf Trieschnigg (UT) *Proof of Concept: Concept-based Biomedical Information Retrieval*
36. Jose Janssen (OU) *Paving the Way for Lifelong Learning; Facilitating competence development through a learning path specification*
37. Niels Lohmann (TU/e) *Correctness of services and their composition*
38. Dirk Fahland (TU/e) *From Scenarios to components*
39. Ghazanfar Farooq Siddiqui (VU) *Integrative modeling of emotions in virtual agents*
40. Mark van Assem (VU) *Converting and Integrating Vocabularies for the Semantic Web*
41. Guillaume Chaslot (UM) *Monte-Carlo Tree Search*
42. Sybren de Kinderen (VU) *Needs-driven service bundling in a multi-supplier setting - the computational e3-service approach*
43. Peter van Kranenburg (UU) *A Computational Approach to Content-Based Retrieval of Folk Song Melodies*
44. Pieter Bellekens (TU/e) *An Approach towards Context-sensitive and User-adapted Access to Heterogeneous Data Sources, Illustrated in the Television Domain*
45. Vasilios Andrikopoulos (UvT) *A theory and model for the evolution of software services*
46. Vincent Pijpers (VU) *e3alignment: Exploring Inter-Organizational Business-ICT Alignment*
47. Chen Li (UT) *Mining Process Model Variants: Challenges, Techniques, Examples*
48. Withdrawn
49. Jahn-Takeshi Saito (UM) *Solving difficult game positions*
50. Bouke Huurnink (UvA) *Search in Audiovisual Broadcast Archives*
51. Alia Khairia Amin (CWI) *Understanding and supporting information seeking tasks in multiple sources*
52. Peter-Paul van Maanen (VU) *Adaptive Support for Human-Computer Teams: Exploring the Use of Cognitive Models of Trust and Attention*
53. Edgar Meij (UvA) *Combining Concepts and Language Models for Information Access*

2011

1. Botond Cseke (RUN) *Variational Algorithms for Bayesian Inference in Latent Gaussian Models*
2. Nick Tinnemeier (UU) *Organizing Agent Organizations. Syntax and Operational Semantics of an Organization-Oriented Programming Language*
3. Jan Martijn van der Werf (TU/e) *Compositional Design and Verification of Component-Based Information Systems*

4. Hado van Hasselt (UU) *Insights in Reinforcement Learning; Formal analysis and empirical evaluation of temporal-difference learning algorithms*
5. Base van der Raadt (VU) *Enterprise Architecture Coming of Age - Increasing the Performance of an Emerging Discipline.*
6. Yiwen Wang (TU/e) *Semantically-Enhanced Recommendations in Cultural Heritage*
7. Yujia Cao (UT) *Multimodal Information Presentation for High Load Human Computer Interaction*
8. Nieske Vergunst (UU) *BDI-based Generation of Robust Task-Oriented Dialogues*
9. Tim de Jong (OU) *Contextualised Mobile Media for Learning*
10. Bart Bogaert (UvT) *Cloud Content Contention*
11. Dhaval Vyas (UT) *Designing for Awareness: An Experience-focused HCI Perspective*
12. Carmen Bratosin (TU/e) *Grid Architecture for Distributed Process Mining*
13. Xiaoyu Mao (UvT) *Airport under Control. Multiagent Scheduling for Airport Ground Handling*
14. Milan Lovric (EUR) *Behavioral Finance and Agent-Based Artificial Markets*
15. Marijn Koolen (UvA) *The Meaning of Structure: the Value of Link Evidence for Information Retrieval*
16. Maarten Schadd (UM) *Selective Search in Games of Different Complexity*
17. Jiyin He (UvA) *Exploring Topic Structure: Coherence, Diversity and Relatedness*
18. Mark Ponsen (UM) *Strategic Decision-Making in complex games*
19. Ellen Rusman (OU) *The Mind's Eye on Personal Profiles*
20. Qing Gu (VU) *Guiding service-oriented software engineering - A view-based approach*
21. Linda Terlouw (TUD) *Modularization and Specification of Service-Oriented Systems*
22. Junte Zhang (UvA) *System Evaluation of Archival Description and Access*
23. Wouter Weerkamp (UvA) *Finding People and their Utterances in Social Media*
24. Herwin van Welbergen (UT) *Behavior Generation for Interpersonal Coordination with Virtual Humans On Specifying, Scheduling and Realizing Multimodal Virtual Human Behavior*
25. Syed Waqar ul Qounain Jaffry (VU) *Analysis and Validation of Models for Trust Dynamics*
26. Matthijs Aart Pontier (VU) *Virtual Agents for Human Communication - Emotion Regulation and Involvement-Distance Trade-Offs in Embodied Conversational Agents and Robots*
27. Aniel Bhulai (VU) *Dynamic website optimization through autonomous management of design patterns*
28. Rianne Kaptein(UvA) *Effective Focused Retrieval by Exploiting Query Context and Document Structure*
29. Faisal Kamiran (TU/e) *Discrimination-aware Classification*
30. Egon van den Broek (UT) *Affective Signal Processing (ASP): Unraveling the mystery of emotions*
31. Ludo Waltman (EUR) *Computational and Game-Theoretic Approaches for Modeling Bounded Rationality*
32. Nees-Jan van Eck (EUR) *Methodological Advances in Bibliometric Mapping of Science*
33. Tom van der Weide (UU) *Arguing to Motivate Decisions*
34. Paolo Turrini (UU) *Strategic Reasoning in Interdependence: Logical and Game-theoretical Investigations*
35. Maaike Harbers (UU) *Explaining Agent Behavior in Virtual Training*
36. Erik van der Spek (UU) *Experiments in serious game design: a cognitive approach*
37. Adriana Burlutiu (RUN) *Machine Learning for Pairwise Data, Applications for Preference Learning and Supervised Network Inference*
38. Nyree Lemmens (UM) *Bee-inspired Distributed Optimization*
39. Joost Westra (UU) *Organizing Adaptation using Agents in Serious Games*
40. Viktor Clerc (VU) *Architectural Knowledge Management in Global Software Development*
41. Luan Ibraimi (UT) *Cryptographically Enforced Distributed Data Access Control*

42. Michal Sindlar (UU) *Explaining Behavior through Mental State Attribution*
43. Henk van der Schuur (UU) *Process Improvement through Software Operation Knowledge*
44. Boris Reuderink (UT) *Robust Brain-Computer Interfaces*
45. Herman Stehouwer (UvT) *Statistical Language Models for Alternative Sequence Selection*
46. Beibei Hu (TUD) *Towards Contextualized Information Delivery: A Rule-based Architecture for the Domain of Mobile Police Work*
47. Azizi Bin Ab Aziz(VU) *Exploring Computational Models for Intelligent Support of Persons with Depression*
48. Mark Ter Maat (UT) *Response Selection and Turn-taking for a Sensitive Artificial Listening Agent*
49. Andreea Niculescu (UT) *Conversational interfaces for task-oriented spoken dialogues: design aspects influencing interaction quality*

2012

1. Terry Kakeeto (UvT) *Relationship Marketing for SMEs in Uganda*
2. Muhammad Umair (VU) *Adaptivity, emotion, and Rationality in Human and Ambient Agent Models*
3. Adam Vanya (VU) *Supporting Architecture Evolution by Mining Software Repositories*
4. Jurriaan Souer (UU) *Development of Content Management System-based Web Applications*
5. Marijn Plomp (UU) *Maturing Interorganisational Information Systems*
6. Wolfgang Reinhardt (OU) *Awareness Support for Knowledge Workers in Research Networks*
7. Rianne van Lambalgen (VU) *When the Going Gets Tough: Exploring Agent-based Models of Human Performance under Demanding Conditions*
8. Gerben de Vries (UvA) *Kernel Methods for Vessel Trajectories*
9. Ricardo Neisse (UT) *Trust and Privacy Management Support for Context-Aware Service Platforms*
10. David Smits (TU/e) *Towards a Generic Distributed Adaptive Hypermedia Environment*
11. J.C.B. Rantham Prabhakara (TU/e) Process Mining in the Large: Preprocessing, Discovery, and Diagnostics
12. Kees van der Sluijs (TU/e) *Model Driven Design and Data Integration in Semantic Web Information Systems*
13. Suleman Shahid (UvT) *Fun and Face: Exploring non-verbal expressions of emotion during playful interactions*
14. Evgeny Knutov (TU/e) *Generic Adaptation Framework for Unifying Adaptive Web-based Systems*
15. Natalie van der Wal (VU) *Social Agents. Agent-Based Modelling of Integrated Internal and Social Dynamics of Cognitive and Affective Processes.*
16. Fiemke Both (VU) *Helping people by understanding them - Ambient Agents supporting task execution and depression treatment*
17. Amal Elgammal (UvT) *Towards a Comprehensive Framework for Business Process Compliance*
18. Eltjo Poort (VU) *Improving Solution Architecting Practices*
19. Helen Schonenberg (TU/e) *What's Next? Operational Support for Business Process Execution*
20. Ali Bahramisharif (RUN) *Covert Visual Spatial Attention, a Robust Paradigm for Brain-Computer Interfacing*
21. Roberto Cornacchia (TUD) *Querying Sparse Matrices for Information Retrieval*
22. Thijs Vis (UvT) *Intelligence, politie en veiligheidsdienst: verenigbare grootheden?*
23. Christian Muehl (UT) *Toward Affective Brain-Computer Interfaces: Exploring the Neurophysiology of Affect during Human Media Interaction*
24. Laurens van der Werff (UT) *Evaluation of Noisy Transcripts for Spoken Document Retrieval*
25. Silja Eckartz (UT) *Managing the Business Case Development in Inter-Organizational IT Projects: A Methodology and its Application*
26. Emile de Maat(UvA) *Making Sense of Legal Text*
27. Hayrettin Gürkök (UT) *Mind the Sheep! User Experience Evaluation & Brain-Computer Interface Games*

28. Nancy Pascall (UvT) *Engendering Technology Empowering Women*
29. Almer Tigelaar (UT)*Peer-to-Peer Information Retrieval*
30. Alina Pommeranz (TUD)*Designing Human-Centered Systems for Reflective Decision Making*
31. Emily Bagarukayo (RUN) *A Learning by Construction Approach for Higher Order Cognitive Skills Improvement, Building Capacity and Infrastructure*
32. Wietske Visser (TUD)*Qualitative multi-criteria preference representation and reasoning*
33. Rory Sie (OU) *Coalitions in Cooperation Networks (COCOON)*
34. Pavol Jancura (RUN)*Evolutionary analysis in PPI networks and applications*
35. Evert Haasdijk (VU)*Never Too Old To Learn - On-line Evolution of Controllers in Swarm- and Modular Robotics*
36. Denis Ssebugwawo (RUN)*Analysis and Evaluation of Collaborative Modeling Processes*
37. Agnes Nakakawa (RUN)*A Collaboration Process for Enterprise Architecture Creation*
38. SelmarSmit (VU)*Parameter Tuning and Scientific Testing in Evolutionary Algorithms*
39. Hassan Fatemi (UT) *Risk-aware design of value and coordination networks*
40. Agus Gunawan (UvT) *Information Access for SMEs in Indonesia*
41. Sebastian Kelle (OU) Game Design Patterns for Learning
42. Dominique Verpoorten (OU) *Reflection Amplifiers in self-regulated Learning*
43. Withdrawn
44. Anna Tordai (VU) *On Combining Alignment Techniques*
45. Benedikt Kratz (UvT) *A Model and Language for Business-aware Transactions*
46. Simon Carter (UVA) *Exploration and Exploitation of Multilingual Data for Statistical Machine Translation*
47. Manos Tsagkias (UVA) *Mining Social Media: Tracking Content and Predicting Behavior*
48. Jorn Bakker (TUE) *Handling Abrupt Changesin Evolving Time-series Data*
49. Michael Kaisers (UM) *Learning against Learning - Evolutionary dynamics of reinforcement learning algorithms in strategic interactions*
50. Steven van Kervel (TUD) *Ontologogy driven Enterprise Information Systems Engineering*
51. Jeroen de Jong (TUD) *Heuristics in Dynamic Scheduling; a practical framework with a case study in elevator dispatching*

2013

1. Viorel Milea (EUR) *News Analytics for Financial Decision Support*
2. Erietta Liarou (CWI) *MonetDB/DataCell: Leveraging the Column-store Database Technology for Efficient and Scalable Stream Processing*
3. Szymon Klarman (VU) *Reasoning with Contexts in Description Logics*
4. ChetanYadati (TUD) *Coordinating autonomous planning and scheduling*
5. Dulce Pumareja (UT) *Groupware Requirements Evolutions Patterns*
6. Romulo Goncalves (CWI) *The Data Cyclotron: Juggling Data and Queries for a Data Warehouse Audience*
7. Giel van Lankveld (UT) *Quantifying Individual Player Differences*
8. Robbert-Jan Merk (VU) *Making enemies: cognitive modeling for opponent agents in fighter pilot simulators*
9. Fabio Gori (RUN) *Metagenomic Data Analysis: Computational Methods and Applications*
10. Jeewanie Jayasinghe Arachchige (UvT) *A Unified Modeling Framework for Service Design*
11. Evangelos Pournaras (TUD) *Multi-level Reconfigurable Self-organization in Overlay Services*
12. Marian Razavian (VU) *Knowledge-driven Migration to Services*
13. Mohammad Safiri (UT) *Service Tailoring: User-centric creation of integrated IT-based homecare services to support independent living of elderly*
14. Jafar Tanha (UVA) *Ensemble Approaches to Semi-Supervised Learning Learning*
15. Daniel Hennes (UM) *Multiagent Learning - Dynamic Games and Applications*

16. Eric Kok (UU) *Exploring the practical benefits of argumentation in multi-agent deliberation*
17. Koen Kok (VU) *The PowerMatcher: Smart Coordination for the Smart Electricity Grid*
18. JeroenJanssens (UvT) *Outlier Selection and One-Class Classification*
19. Renze Steenhuizen (TUD) *Coordinated Multi-Agent Planning andScheduling*
20. Katja Hofmann (UvA) *Fast and Reliable Online Learning to Rank for Information Retrieval*
21. Sander Wubben (UvT) *Text-to-text generation by monolingual machine translation*
22. Tom Claassen (RUN) *Causal Discovery and Logic*
23. Patricio de Alencar Silva (UvT) *Value Activity Monitoring*
24. Haitham Bou Ammar (UM) *Automated Transfer in Reinforcement Learning*
25. Agnieszka Anna Latoszek-Berendsen (UM) *Intention-based Decision Support. A new way of representing and implementing clinical guidelines in a Decision Support System.*
26. AlirezaZarghami (UT) *Architectural Support for Dynamic Homecare Service Provisioning.*
27. Mohammad Huq (UT) *Inference-based Framework Managing Data Provenance*
28. Frans van der Sluis (UT) *When Complexity becomes Interesting: An Inquiry into the Information eXperience*
29. Iwan de Kok (UT)*Listening Heads*
30. Joyce Nakatumba (TUE) *Resource-Aware Business Process Management: Analysis and Support*
31. DinhKhoa Nguyen (UvT) *Blueprint Model and Language for Engineering Cloud Applications*
32. Kamakshi Rajagopal (OUN) *Networking For Learning; The role of Networking in a Lifelong Learner's Professional Development*
33. Qi Gao (TUD) *User Modeling and Personalization in the Microblogging Sphere*
34. KienTjin-Kam-Jet (UT) *Distributed Deep Web Search*
35. Abdallah El Ali (UvA) *Minimal Mobile Human Computer*
36. Than Lam Hoang (TUe) *Pattern Mining in Data Streams*
37. Dirk Börner (OUN) *Ambient Learning Displays*
38. Eelco den Heijer (VU) *Autonomous Evolutionary Art*
39. Joop de Jong (TUD) *A Method for Enterprise Ontology based Design of Enterprise Information Systems*
40. Pim Nijssen (UM) *Monte-Carlo Tree Search for Multi-Player Games*
41. JochemLiem (UVA) *Supporting the Conceptual Modelling of Dynamic Systems: A Knowledge Engineering Perspective on Qualitative Reasoning*
42. Léon Planken (TUD) *Algorithms for Simple Temporal Reasoning*
43. Marc Bron (UVA) *Exploration and Contextualization through Interaction and Concepts*

2014

1. Nicola Barile (UU) *Studies in Learning Monotone Models from Data*
2. Fiona Tuliyano (RUN) *Combining System Dynamics with a Domain Modeling Method*
3. Sergio Raul Duarte Torres (UT) *Information Retrieval for Children: Search Behavior and Solutions*
4. Hanna Jochmann-Mannak (UT) *Websites for children: search strategies and interface design - Three studies on children's search performance and evaluation*
5. Jurriaan van Reijsen (UU) *Knowledge Perspectives on Advancing Dynamic Capability*
6. Damian Tamburri (VU) *Supporting Networked Software Development*
7. Arya Adriansyah (TUE) *Aligning Observed and Modeled Behavior*
8. Samur Araujo (TUD) *Data Integration over Distributed and Heterogeneous Data Endpoints*
9. Philip Jackson (UvT) *Toward Human-Level Artificial Intelligence: Representation and Computation of Meaning in Natural Language*
10. Ivan Salvador Razo Zapata (VU) *Service Value Networks*
11. Janneke van der Zwaan (TUD) *An Empathic Virtual Buddy for Social Support*

12. Willem van Willigen (VU) *Look Ma, No Hands: Aspects of Autonomous Vehicle Control*
13. Arlette van Wissen (VU) *Agent-Based Support for Behavior Change: Models and Applications in Health and Safety Domains*
14. Yangyang Shi (TUD) *Language Models With Meta-information*
15. Natalya Mogles (VU) *Agent-Based Analysis and Support of Human Functioning in Complex Socio-Technical Systems: Applications in Safety and Healthcare*
16. Krystyna Milian (VU) *Supporting Trial Recruitment and Design by Automatically Interpreting Eligibility Criteria*
17. Kathrin Dentler (VU) *Computing Healthcare Quality Indicators Automatically: Secondary Use of Patient Data and Semantic Interoperability*
18. Mattijs Ghijsen (VU) *Methods and Models for the Design and Study of Dynamic Agent Organizations*
19. Vincius Ramos (TUE) *Adaptive Hypermedia Courses: Qualitative and Quantitative Evaluation and Tool Support*
20. Mena Habib (UT) *Named Entity Extraction and Disambiguation for Informal Text: The Missing Link*
21. Kassidy Clark (TUD) *Negotiation and Monitoring in Open Environments*
22. Marieke Peeters (UT) *Personalized Educational Games - Developing Agent-Supported Scenario-based Training*
23. Eleftherios Sidirourgos (UvA/CWI) *Space Efficient Indexes for the Big Data Era*
24. Davide Ceolin (VU) *Trusting Semi-structured Web Data*
25. Martijn Lappenschaar (RUN) *New Network Models for the Analysis of Disease Interaction*
26. Tim Baarslag (TUD) *What to Bid and When to Stop*
27. Rui Jorge Almeida (EUR) *Conditional Density Models Integrating Fuzzy and Probabilistic Representations of Uncertainty*
28. Anna Chmielowiec (VU) *Decentralized k-Clique Matching*
29. JaapKabbedijk (UU) *Variability in Multi-Tenant Enterprise Software*
30. Peter de Kock (UvT) *Anticipating Criminal Behaviour*
31. Leo van Moergestel (UU)*Agent Technology in Agile Multiparallel Manufacturing and Product Support*
32. Naser Ayat (UvA) *On Entity Resolution in Probabilistic Data*
33. Tesfa TegegneAsfaw (RUN) *Service Discovery in eHealth*
34. Christina Manteli (VU) *The Effect of Governance in Global Software Development: AnalyzingTransactive Memory Systems*
35. Joost van Oijen (UU) *Cognitive Agents in Virtual Worlds: A Middleware Design Approach*
36. Joos Buijs (TUE) *Flexible Evolutionary Algorithms for Mining Structured Process Models*
37. Maral Dadvar (UT) *Experts and Machines United Against Cyberbullying*
38. Danny Plass-Oude Bos (UT) *Making Brain-computer Interfaces Better: Improving Usability Through Post-processing*
39. Jasmina Marić (UvT) *Web Communities, Immigration and Social Capital*
40. Walter Omona (RUN) *A Framework for Knowledge Management Using ICT in Higher Education*
41. Frederic Hogenboom (EUR) *Automated Detection of Financial Events in News Text*
42. Carsten Eijckhof (CWI/TUD) *Contextual Multidimensional Relevance Models*
43. Kevin Vlaanderen (UU) *Supporting Process Improvement using Method Increments*
44. Paulien Meesters (UvT) *Intelligent Blauw. Met als ondertitel: Intelligence-gestuurde politiezorg in gebiedsgebonden eenheden*
45. Birgit Schmitz (OUN) *Mobile Games for Learning: A Pattern-Based Approach*
46. Ke Tao (TUD) *Social Web Data Analytics: Relevance, Redundancy, Diversity*
47. Shangsong Liang (UvA) *Fusion and Diversification in Information Retrieval*

2015

1. Niels Netten (UvA) *Machine Learning for Relevance of Information in Crisis Response*
2. Faiza Bukhsh (UvT) *Smart auditing: Innovative Compliance Checking in Customs Controls*
3. Twan van Laarhoven (RUN) *Machine learning for network data*

4. Howard Spoelstra (OUN) *Collaborations in Open Learning Environments*
5. Christoph Bösch (UT) *Cryptographically Enforced Search Pattern Hiding*
6. Farideh Heidari (TUD) *Business Process Quality Computation – Computing Non-Functional Requirements to Improve Business Processes*
7. Maria-Hendrike Peetz (UvA) *Time-Aware Online Reputation Analysis*
8. Jie Jiang (TUD) *Organizational Compliance: An agent-based model for designing and evaluating organizational interactions*
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