Advanced Corporate Innovation Systems

Comparing Requirements for New Product Development and Business Model Innovation

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For my dad,

who would have been proud

to see the result of my work.

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AI	Artificial Intelligence
B2B	Business to business
BM	Business Model
BMI	Business Model Innovation
CA	Cronbach's Alpha
CI	Corporate Incubator
CIS	Corporate Innovation System
CLT	Central Limit Theorem
EFA	Exploratory Factor Analysis
IoT	Internet of Things
IP	Intellectual Property
KMO	Kaiser-Meyer-Olkin
KPI	Key Performance Indicator
MVA	Market Value Added
MVP	Minimal Viable Product
NDA	Non-Disclosure Agreement
NPD	New Product Development
OECD	Organization for Economic Cooperation and Development
OEM	Original Equipment Manufacturer
R&D	Research & Development
ROI	Return on Investment
SLR	Systematic Literature Review
VC	Venture Capital

1 Introduction

The introduction to this dissertation pursues several goals. The first aim is to prepare the reader for the following study by elaborating the researcher's motivation for this work. Next, the problem statement and derived research questions, which provide the basis for this study, are explained. Finally, the selected research strategy is outlined and followed by a short introduction to the structure of the following chapters.

1.1 Research Motivation

"The world is changing very fast. Big will not beat small anymore. It will be the fast beating the slow." (Rupert Murdoch, Chairman and CEO, News Corporation)

Current headlines consistently report on industries being turned upside down by digitalization, increasing automation, and new business models (BM), and the automotive industry is one example of an industry that is facing these challenges at a rapid pace (Gao et al., 2016; Skroupa, 2017; Paus et al., 2019). Technology-intensive firms in particular need to be concerned about accelerating innovation-lifecycles and emerging megatrends (Yoo et al., 2010; Lindgardt et al., 2009). Besides a constant adaptation of their products, processes, and services, firms nowadays also need to explore entirely new business models in order to survive in the long-run (Chesbrough, 2007; Gassmann, 2014; IBM Institute for Business Value, 2014). In connection with this, De Mey (2016) claimed that in recent years, the scope of firms' innovation capabilities has been expanded, as "the traditional product focus is making space for innovation from other parts of the business model". Furthermore, such a development also seems to require different skills of employees, such as experience in Design Thinking or the Lean Startup approach. Thus, "long-term strategy and business development are slowly being replaced by intrapreneurial innovation" (De Mey, 2016).

According to recent studies (e.g. Spieth et al., 2014), successful management of business model innovation (BMI) represents a fundamental competitive advantage for corporate strategy – not only in the short-term, but also for decades to come. In line with this, a vast number of authors highlight the importance of BMI for both research and practice (e.g. Casadeus-Masanell and Zhu, 2011; Björkdahl and Holmén, 2013).

However, several researchers (Teece, 2010; Zott et al., 2011) characterize the existing conceptual frameworks of BMI as fuzzy and inconsistent.

Besides the significant importance of BMI, it is recognized that this type of innovation is essentially driven by an entire organization and not only by single units of a firm (Fuglsang and Sundbo, 2005; Amit and Zott, 2001). Therefore, it is vital for established corporations to understand and develop a suitable setting for a systematic adaptation of their innovation endeavors and business models (Simsit et al., 2014; Bkörkdahl and Holmén, 2013). Surrounded by a volatile environment, as described above, firms are facing a tremendous increase in the complexity of their innovation activities, which need to be tackled carefully (Kirchgeorg et al., 2010).

In order to master a strategic shift in existing business models, structured frameworks depict elements and relationships that support managers during a debate concerning the right course of action for business sustainability (Adner, 2006). Still, many corporations are struggling with such an endeavor, which unambiguously highlights the demand for further research in this field (Berman, 2012; Gimpel and Röglinger, 2015; Lenet, 2017). However, the common understanding of existing innovation frameworks relies on approaches that either emphasize a single dimension (push and pull approaches) or a very restricted number of dimensions (the coupled approach) (Berkhout et al., 2010; Caetano and Amaral, 2011; Kroon et al., 2008; Tödtling and Trippl, 2005), which does not address a suitable approach for managing an increase in complexity. Therefore, several researchers suggest considering the innovation system perspective (e.g. Budde et al, 2012; Ortt and Smits, 2006) due to its "dynamic approach and holistic view of innovation" (Van Lancker et al., 2016, p.41). According to Lundvall (2008), firms play the most important role within an innovation system, which is why it seems surprising that very little studies so far analyzed the micro-level, i.e. the corporate innovation system (CIS) (Grandstand, 2000).

This dissertation contributes to closing existing research gaps in multiple ways. First, this research has the aim to supplement the limited amount of studies on CIS, which needs to be explored more deeply. Second, this study targets a more precise differentiation of BMI compared to traditional types of innovation, as requested by several scholars (Bucherer et al., 2012; Bajeva et al., 2004). Finally, to the researcher's

knowledge, no study has ever combined the two mentioned fields of study, even though their relationship becomes more and more apparent.

1.2 Problem Statement and Research Questions

According to the aforementioned research gaps and the significant need of practitioners to tackle the increasing complexity of their firms' innovation activities, the following problem statement outlines the overarching focus of this study:

> *The purpose of this study is to analyze the corporate innovation system of multinational corporations in the mobility sector. Thereby, the focus is on how a firm successfully organizes its corporate innovation system in order to respond to digital challenges and paradigm shifts in the market.*

Thereby, the researcher strongly focused on a practice-related approach, which is reflected in the comprehensive empirical part of this study. In order to address the most relevant aspects of the described problem statement, it has been divided into more manageable research units that address the following two research questions:

1) *How can a firm in the mobility sector successfully design and implement a corporate innovation system that leverages its innovation activities towards new business models?*
2) *What are specific requirements for business model innovation versus new product development in the context of corporate innovation systems in the mobility sector?*

The following section explains how the researcher tackled the above presented research questions and which methodological structure supported the mentioned research strategy of this dissertation.

1.3 Research Strategy and Methodology

The overall research strategy of this dissertation refers to a mixed methods approach, which consists of a sequence of qualitative and then quantitative studies (Figure 1).

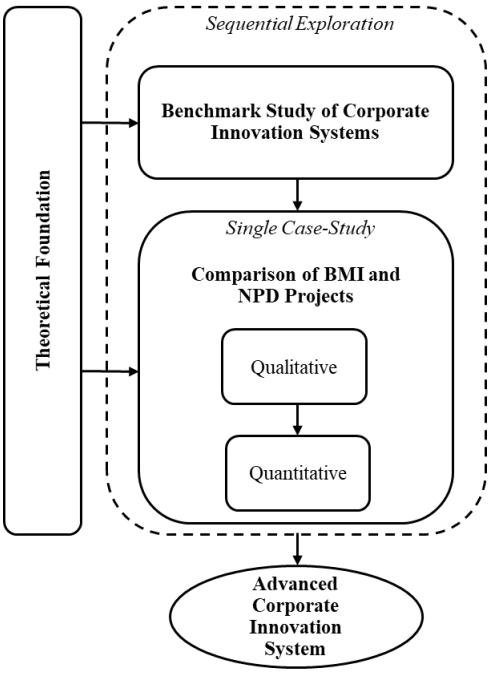

Figure 1: Research strategy of this study

In general, mixed methods research depicts "the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study" (Mayoh and Onwuegbuzie, 2013). According to several authors, this procedure has increasingly gained popularity and was applied by a vast number of studies during the past decade (e.g. Kuckartz, 2014; Teddlie and Tashakkori, 2003; Creswell and Tashakkori, 2007, Schreier and Odag, 2010). In connection with this, the fundamental principle of mixed research instructs researchers to "collect multiple data points using different strategies, approaches, and methods" with the aim of creating "complementary strengths and non-overlapping weaknesses" (Johnson and Turner, 2003; also see Brewer and Hunter, 1989). Accordingly, an effective use of a mixed methods approach may result in superior outcomes compared to single-method studies (Mayoh and Onwuegbuzie, 2013). Besides the benefits of combining mixed methods for research studies, Creswell and Plano Clark (2011) highlight the challenge of integrating different databases. However, they suggest three suitable approaches in order to tackle this challenge: merging data, connecting data,

and embedding data (Creswell and Plano Clark, 2011). The mixed methods approach usually applies to studies with research problems that among others refer to contextualizing information, taking the macro-perspective of a system, developing a complementary picture, or examining a process along with outcomes (Plano Clark, 2010). In case of this dissertation, a complex problem statement including two ambitious research questions provided sufficient rationale for adopting the selected mixed methods approach.

Prior to the empirical part of this study, a systematic literature review (SLR) had the goal of addressing the problem statement by identifying, critically evaluating and synthesizing existing findings of relevant related studies (Cronin, et al, 2008; Baumeister and Leary, 1997; Bem, 1995). As chosen for this work, a sequential design, consisting of two qualitative sections followed by a quantitative section, is recommended if the researcher aims to frame a survey instrument, an intervention, or a program based on qualitative findings (Creswell and Plano Clark, 2011; Morse and Niehaus, 2009). In line with suggested sub-types of mixed methods research by Johnson et al. (2007), this dissertation is characterized by a "qualitative dominant" mixed methods approach, whereby the quantitative research aims for completing the interpretation of qualitative results (Creswell et al., 2008). Thereby, the iterative triangulation of data from different sources served as a means of convergent validation (Campbell and Fiske, 1959) and the development of theory(Glaser and Strauss, 1967).

Resulting from the presented research strategy of this dissertation, the following section provides further details regarding the content-related structure including an overview of each chapter.

1.4 Research Structure

In order to investigate the problem statement of this study using the mixed methods research approach, the following analysis has been categorized in six distinct chapters (Figure 2). Following an introduction to this dissertation, the second chapter includes an overview of state-of-the-art literature in the field of innovation management, competitive advantage and existing types of innovation. Furthermore, a systematic literature review has been conducted in the field of corporate innovation systems, which represents an essential basis for the empirical analysis in subsequent chapters. Thereby,

the large variety of different publication mediums revealed a wide dispersion of thought on the topic, which for instance, is also related to literature on open innovation or organizational learning.

Because the literature review revealed a very limited number of studies on the presented problem statement, the third chapter represents a first attempt to take a qualitative approach towards exploring corporate innovation systems of worldwide firms in the mobility sector. Therefore, seven CIS dimensions served as a basis for identifying enablers and requirements for advanced corporate innovation systems including the right setting for business model innovation activities. Hereby, the procedure was organized twofold: First, an analysis of the current mobility landscape provided insights into relevant paradigm shifts and described environmental premises for the micro-level perspective of firms' innovation systems. Second, the analysis of n=29 qualitative interviews included practical lessons learned in the mentioned research context and lead to precise recommendations for practice and further studies.

Following the initial qualitative research, the fourth chapter includes a single case study analysis, whereby several embedded sub-cases (n=9) have been analyzed. With the aim to dig deeper into the presented problem statement on an innovation project level, demands and requirements for successful BMI and NPD projects have been identified on a qualitative basis. Resulting from this, a framework for managing BMI and new product development (NPD) is presented by considering literature-based dimensions, which align with afore-mentioned CIS dimensions on another level of analysis. Including a qualitative assessment of the differentiation level of both innovation types, the qualitative case study as well as the benchmark study represent a substantial basis for the final part of the empirical analysis.

With respect to the selected mixed methods approach, the fifth chapter builds upon the two qualitative studies, while aiming for an operationalization of detected results. An online quantitative survey was conducted to compare the requirements of successful BMI and NPD projects. In total, n=107 employees of a traditional automotive firm participated in the study. By testing whether the relationship of pre-defined constructs and the project success change while considering the project type, a moderator analysis revealed a trend for the interaction of several constructs. Accordingly, the study disclosed significant differences in the requirements of BMI and NPD projects.

Finally, the study addresses current research gaps by analyzing the corporate innovation system of multinational corporations in the mobility sector, whereby specific requirements for different types of innovation, i.e. BMI and NPD, have been detected. Besides highlighting distinctive characteristics of BMI within an organizational setting, the comparison of BMI and NPD projects revealed that both innovation types mainly differ with respect to external partnerships, organizational integration, as well as market and customer focus. Results suggest that practicioners should closely consider the outlined differences and specific requirements for advancing a firm's innovation system in times of shifting markets.

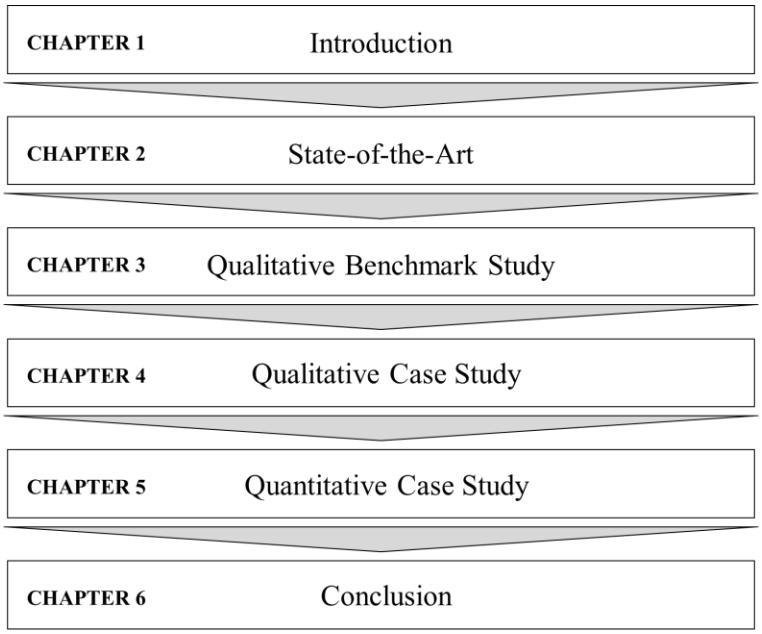

Figure 2: Research structure of this study

As illustrated above, the following chapter will provide an overview about state-of-the-art literature relevant to the dissertation's problem statement including a systematic literature review in the field of corporate innovation systems.

2 State-of-the-Art

The following chapter has the aim to provide a broader understanding of the underlying theoretical framework of this study. Therefore, an initial definition of the innovation context is followed by a systematic literature review in the field of corporate innovation systems. Resulting from this, the researcher detected related fields of study as well as gaps in literature that have been addressed throughout the subsequent chapters of this dissertation.

2.1 Gaining Competitive Advantage Through Innovation

Nowadays, innovation is a popular and widely used buzzword. While managers, politicians and researchers constantly refer to innovation throughout various fields of application, they might not always have the same understanding when it comes to the actual term "innovation" (e.g.Vahs and Brem, 2013; Gerpott, 2005; Lenet, 2017). Even though scholars have defined "innovation" in a variety of different ways, Hofbauer and Wilhelm (2015) detected that they all seem to be consistent in referring to something "new". According to Disselkamp (2012), the term originates from the Latin word "innovatio", which means "to renew" or "to devote oneself to something new". Resulting from this definition, innovation does not necessarily have to be limited to something completely new, but can also represent a renewal of something that already existed.

At the beginning of the 20th century, Joseph Alois Schumpeter was considered the first author to define innovation by acknowledging that novel combinations of resources lead to the creation of innovations (Schumpeter, 1934). More generally speaking, innovations represent the implementation of new ideas into marketable solutions (Berner, 2004). For example new products, new processes, new forms of contracts, new distribution channels or new advertising statements pick up the concept of innovation (Disselkamp, 2012). Another aspect of innovation incorporates "an iterative process initiated by the perception of a new market and/or new service opportunity for a technology-based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention" (OECD, 1991). Per se, innovation is recognized to "underpin the […] dynamism of all economies" (OECD,

2015, p. 3) and, therefore, is an especially important driver for future growth (Braconier et al., 2014). With respect to available literature on innovation, its basic criteria incorporate both "novelty" and "differentiation" (e.g. Hofbauer et al., 2009; Vahs and Brem, 2013). Considering the suggested approaches for innovation, Figure 3 depicts a general overview of the concept.

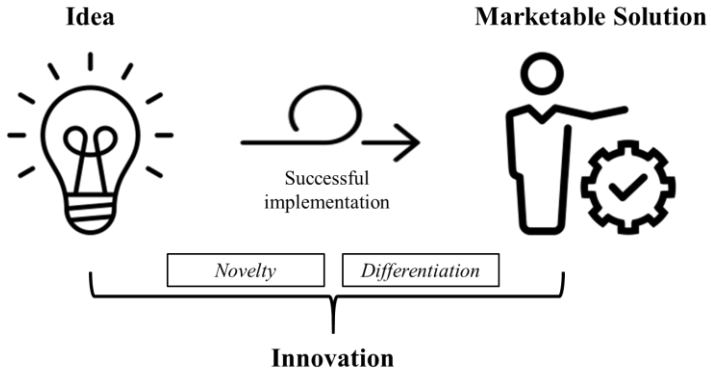

Figure 3: The concept of innovation

In this context, it is important to highlight that innovative ideas certainly need to result in an advantage for a specific user group, such as customers, employees or shareholders of a firm (e.g. Bergmann, 2000; Oestreicher, 2009). Accordingly, Drucker (1986) defined innovations as the "changes in value and satisfaction that the customer received from resources" (p. 62). Following several authors, innovation and new ideas may emerge based on various factors within and outside an organization (Chen et al., 2006; Chong and Gan, 2011). Internal factors often rely on the transfer of knowledge among employees across different departments (Argote and Ingram, 2000; Distanont et al. 2012). External factors are typically believed to give rise to more innovations compared to factors originating internally (Hillebrand and Biemans, 2004; Littler et al., 1995). Furthermore, an environment which successfully fosters innovation likely contains five key features: a highly skilled and flexible workforce, a business environment that facilitates investments in innovation and allows for experimentation, a profound system for knowledge management, policies that encourage entrepreneurial activities, and a focus on policy governance and implementation (OECD, 2015; Pece et al., 2015).

Tushman and Nadler (1986) explain that "organizations can gain competitive advantage only by managing effectively for today while simultaneously creating innovation for tomorrow" and furthermore that "there is perhaps no more pressing managerial problem than the sustained management of innovation" (p.74). In line with this, Virameteekul

(2011) added that innovation has the potential to create sustainable growth, which leads to competitive advantages across internal and external markets. In order to generate long-term profits and thereby ensure the survival of a firm, a manufacturer or service provider needs to be either cost leader or successfully differentiate itself (Porter, 1985). Accordingly, both strategies require innovation. Only the advancement of procedures, products and services enables a company to make cheaper offerings than the competition or to offer greater benefits through new services and features to its customers (Disselkamp, 2012).

Already in 1957, the American Nobel Prize winner Robert Solow recognized that around 80% of economic growth was generated through innovation (Solow, 1957). Following a study by Mercer Management Consulting, the world's leading companies generate on average 50% of their sales by selling products and services developed over the past five years, while other sources even publish that new products account for more than 75% of firms' total sales (Kautzsch et al., 2004). Similar conclusions were drawn by a large-scale study of McKinsey, whereby 3,000 large corporations have been analyzed worldwide (Eglau et al., 2000). Although exact percentages seem debatable, the overall message is clear: Innovations are generally considered to safeguard the competitiveness of a firm. In connection with this, it is often assumed that high investments in R&D are related to increased innovation (Viki, 2016). However, this might not necessarily the case in practice. Supporting this statement, Figure 4 depicts a comparison between the "Top 10 Innovators" versus the "Top 10 R&D Spenders" from 2018.

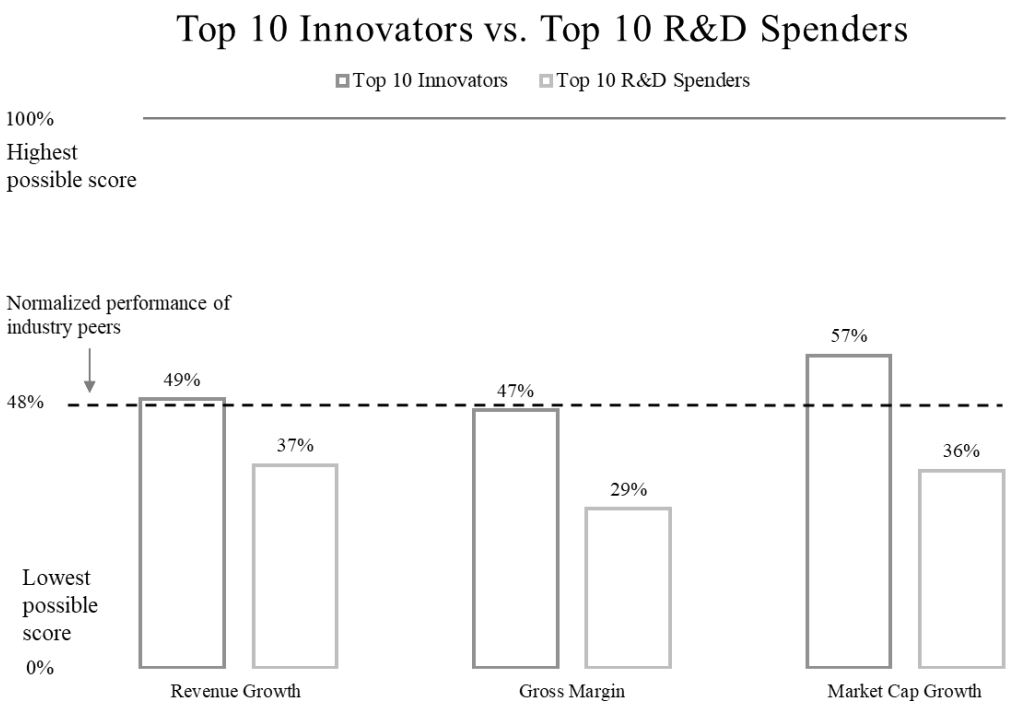

Figure 4: Top 10 innovators vs. top 10 R&D spenders [1]

As illustrated above, the most innovative companies clearly outperformed the firms with the highest R&D spending regarding revenue growth, gross margin, and market capitalization growth. Furthermore, the top R&D spenders were not able to catch up with their industry peers. According to Jaruzelski et al. (2018), automotive and healthcare firms still dominate the list of top R&D spenders.

In connection with this, Lengnick-Hall (1992) claimed that "innovation, technology advances, and competitive advantage are connected by complex and multidimensional relationships" (p. 399). Thus, besides the development of new and better products and services, the business model of a company can be another important driver of firm performance (Dunford et al., 2010). Resulting from a literature review on business model innovation conducted by Foss and Saebi (2017), researchers argue that novel value propositions or constellation combinations targeted at particular segments of customers might result in a higher willingness to pay (e.g. Yunus et al., 2010). Furthermore, organizational optimizations may also contribute to monetary savings and allow for more "strategic flexibility" (Hitt et al., 1998, p. 22). By applying appropriate revenue models, firms can potentially acquire a sizeable share of the total created value.

[1] Based on data from Capital IQ, Thomson Reuter Eikon, Strategy & analysis (2018).

Thereby, a company obtains the ability to create more value than competing firms, which ultimately results in a competitive advantage (McGrath et al., 1996; Peteraf and Barney, 2003). Even though successful innovations of a business model are regarded as blueprints to be replicated (Doz and Kosonen, 2010; Winter and Szulanski, 2001), their broad complexity and dependencies still ensure a competitive advantage for the firm conducting the business model innovation from a resource-based perspective (Barney, 1991; Grant, 1991). In line with this, Berglund and Sandström (2013) highlight that firms increasingly require external resources and capabilities for advancing their innovation activities, which leads them to adopting a network or open system perspective. In this context, Porter and Rivkin (1998) added that business models with tightly coupled elements are more likely to succeed in the long-run, as the casual ambiguity level is higher compared to business models consisting of more loosely coupled elements.

Nevertheless, competitive advantage resulting from an innovative business model incorporates numerous challenges, such as uncertain performance implications of business changes caused by inherently complex element interactions (Rivkin, 2000). Consequently, a present-day advantageous business model innovation might still be rendered obsolete as soon as competitors invent even more successful business models (Covin and Miles, 1999). According to Hall (1993), innovative intangible resources, such as personal networks or a forward-thinking innovative corporate culture (Barney, 1986), incorporate the capability of providing sustainable competitive advantage. Innovating a firm's strategy highlights another angle to outperform competition (Goksoy et al., 2013). Therefore, companies have to "simultaneously exploit their current competitive advantages while exploring for future opportunities" (Ireland and Webb, 2007, p. 49). This aspect will be further elaborated in the following chapter 2.2. In summary, state-of-the-art literature on innovation and competitive advantage reveals that sustainable innovation management is required to preserve the competitive advantage of a firm by staying relevant in the market as a successful innovator (Mitchell and Coles, 2003; Hana, 2013).

2.2 Managing Organizational Ambidexterity

According to Sundbo (1995), the strategic perspective represents one of the three fundamental positions in innovation theory. Based on a recent trend in various industries ranging from construction to consumer electronics, firms started to initiate a strategic shift from manufacturer to service provider (Neely, 2007; Roy et al., 2009; Kastalli and Van Looy, 2013). Following Stampfl (2016), such a strategic endeavor represents one of the main triggers for the development of new business models. However, Bejeva et al. (2004) revealed that only 21% of analyzed firms were able to accomplish considerable success with their service-oriented strategy. Aside from unexpected hurdles, the main reason for the companies' poor performance within a new business area is explained by the awareness that a different organizational system is required for reaching success with intangible services compared to tangible products. Accordingly, a service-oriented strategy needs to be more project-based and people-driven than product-related approaches. In addition to an adapted business model, new capabilities are considered essential success factors for such a strategic shift (Oliva and Kallenberg, 2003).

In connection with this, the exploration of new opportunities may help companies to overcome innovation impediments (Keupp and Gassmann, 2009), while serving the target of strategic growth in consideration of employees' performance targets (Chesbrough, 2006; Chesbrough and Crowther, 2006). Thereby, senior level executives of many established firms refer to innovative business models as a key strategic challenge (Ghaziani and Ventresca, 2005; Pohle and Chapman, 2006; Giesen et al., 2007; Zott et al., 2011). Aspara et al. (2010) point out that an increased focus on business model innovation represents a (second-order) strategic choice for companies regarding the exploration of existing resources versus the exploration of new resources (also see Tollin, 2008). The strategic potential of a new business model concerns the identification of novel sources of value creation (Zott et al., 2011). With respect to the resource-based theory (e.g. Barney, 1991), several authors emphasize that a firm's strategy should include balancing the exploitation of existing internal resources and the deployment of external resources to master sustainable growth (e.g. Eisenhardt and Schoonhoven, 1996). Therefore, a rational strategy typically involves acquiring a scarce resource to profit from market asymmetries, which requires opening up

innovation processes to incorporate essential resources that are not available internally (Ritter and Gemünden, 2004; Wu, 2007). Such critical resources, for instance, include specific skills and financial resources, as well as legitimacy and market power (Hagedoorn, 1993; Wiewiel and Hunter, 1985). Kukalis (1989) emphasized that companies operating in a complex environment maximize performance by adopting flexible planning systems, which allow them to adjust strategic objectives quickly in order to benefit from opportunities, while keeping up with environmental changes (Stevenson and Jarrillo-Mossi, 1986). However, Di Minin and Bianchi (2011) claimed that many R&D Centers struggle when it comes to applying the open innovation approach due to the risk of deviating from their core competencies. Thereby, the challenge includes exploiting currently relevant technologies while at the same time exploring future developments, which needs to be aligned with strategic R&D projects that ensure the firm's long-term technological capabilities.

In general, ambidexterity is associated with the perspective of dynamic capabilities and describes "the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" (Teece et al., 1997, p. 516) or "the capacity of an organization to purposefully create, extend, or modify its resource base" (Helfat et al., 2007, p.1). According to several authors, organizational ambidexterity represents a vital factor for firms' long-term survival (e.g. Spieth et al., 2014; Nosella et al., 2012). Following Tushman and O'Reilly (1996), it defines "the ability to simultaneously pursue both incremental and discontinuous innovation… from hosting multiple contradictory structures, processes, and cultures within the same firm" (p.24). In this context, both authors referred to three different approaches, i.e. sequential, structural, and contextual ambidexterity (O'Reilly and Tushman, 2013). Sequential ambidexterity explains the theory of punctual equilibrium change, which describes the realignment of firms' structures and processes by a sequential process in order to adapt to environmental shifts (Tushman and Romanelly, 1985). Structural ambidexterity "entails not only separate structural units for exploration and exploitation but also different competencies, systems, incentives, processes, and cultures – each internally aligned" (O'Reilly and Tushman, 2008, p.102). Depending on a strong leadership commitment, these separate units combine a common strategic objective, as well as an overarching value system and shared resources (O'Reilly and Tushman, 2004; Smith et al., 2010; Jansen et al., 2009; Lai and Weng, 2010). Contextual ambidexterity resolves

the combination of exploitation and exploration on the individual level (Gibson and Birkinshaw, 2004), which requires "a supportive organizational context that encourages individuals to make their own judgements as to how to best divide their time between the conflicting demands for alignment and adaptability" (p. 211). A prominent example of contextual ambidexterity refers to Toyota's production system, where workers are expected to perform routinized tasks and continuously change their jobs for increased efficiency at the same time (Adler, Goldoftas and Levine, 1999). Overall, while recommending a structural separation between exploitation and radical exploration for achieving ambidexterity, this measure does not represent a sufficient condition (Kauppila, 2010). Furthermore, another crucial requirement refers to features of an organization that provide individuals with the freedom to divide their time between exploitative and exploratory activities (Gibson and Birkinshaw, 2004). Thus, contextual ambidexterity is accomplished by "building a set of processes or systems that enable and encourage individuals to make their own judgements about how to divide their time between conflicting demands for alignment and adaptability" (Gibson and Birkinshaw, 2004, p. 201).

Several authors recognized the connection between organizational ambidexterity and corporate entrepreneurship (e.g. Burgers and Jansen, 2008; Volery et al., 2013). Based on existing research, corporate entrepreneurship incorporates innovation, venturing activities, and strategic renewal of a firm (Guth and Ginsberg, 1990; Simsek et al., 2007; Yin and Lau, 2008; Zahra, 1993). By providing increased autonomy to entrepreneurial organizational units, a firm may increase its flexibility to react to changing demands and at the same time adopt new working methods that support its explorative activities (Gilbert, 2006; Westerman et al., 2006).

In order to obtain a more precise understanding of existing innovation types in this context and the focus of this dissertation, the following sections will outline existing research on innovation typology, as well as the two types which will be analyzed in subsequent chapters.

2.3 Innovation Typology

According to Hauschildt et al. (2016), a vast amount of research proposes multiple approaches to classify different types of innovation. Thus, the terms "innovativeness" and "innovation" are characterized by a certain ambiguity (Garcia and Calantone, 2002). In his fundamental study on economic development, Schumpeter (1934) determined five types of innovation: new products, new methods of production, new sources of supply, exploitation of new markets, and new ways to organize a business. So far, numerous studies have focused on Schumpeter's (1934) first two types of innovation, i.e. new products and new production methods (e.g. Banbury and Mitchell, 1995; Schroeder, 1990; Leiblein and Madsen, 2009; Roberts, 1999; Adner and Kapoor, 2010; Leiponen and Helfat, 2010). In line with this, Utterback and Abernathy (1975) defined a subset of innovation distinctions, i.e. product and process innovations, which rely on the Schumpeterian propositions. While admitting "fuzzy boundaries", Francis and Bessant (2005) refer to a typology of innovation that targets products, processes, the firm's positioning, and the dominant paradigm of the company. However, Amit and Zott (2001) argue that the existing Schumpeterian typology of innovation is not capable of explaining the rise of new firms, such as eBay, for example, in the digital field.

Further approaches of categorizing product innovations target the degree of novelty compared to an established product as a distinctive feature (Johannessen et al., 2001). Resulting from this, several researchers refer to a differentiation between incremental and radical innovations (Ettlie et al., 1984; Dewar and Dutton, 1986). Pellisier (2008) described incremental innovations as products that have been adapted by improving already existing components, while radical innovations refer to a completely new design of products by combining a new set of components in a novel way. Furthermore, incremental innovations are associated with Cooper's stage-gate model (1986) and a sequential innovation process (Schroeder et al., 1986), even though innovations rarely follow a strictly linear approach in general (Bucherer et al., 2012). On the other hand, radical innovations incorporate additional iterations including constant customer feedback, referred to as "probe and learn" (Lynn, Morone and Paulson, 1996) or "market experiments" (Slater and Narver, 1998). According to Zahn (1995), technological change mainly explains the underlying reason for the emergence of this innovation typology. Moreover, Balachandra and Friar (1997) developed a contingency

framework for NPD projects, which incorporates three dimensions: innovation (incremental vs. radical), market (new vs. existing) and technology (low vs. high). A fourth dimension refers to the nature of the industry.

Furthermore, innovations at the organizational level have been discussed by several researchers (Souder and Chakrabarti, 1984; Womack et al., 1990; Crossan and Apaydin, 2010). In line with this, Armbruster et al. (2008) distinguish four different types of innovation: technical product innovations, non-technical service innovations, technical process innovations, and non-technical process innovations representing organizational innovations. Based on the groundbreaking study of Christensen (1997) on disruptive innovation, Satell (2017) created a holistic innovation typology by combining breakthrough innovation, sustaining innovation, and basic research. Another approach refers to the concept of cultural innovations, which relate to enhancements in the social sphere, both for individuals themselves and their relationship with others (e.g. Drucker, 1986). More recently, the service science perspective on the innovation of business models emerged as another relevant field (Maglio and Spohrer, 2013; Snyder et al., 2016).

In practice, companies often adapt suggested innovation typologies to their individual requirements and business environment. For instance, the multinational consumer goods corporation Procter & Gamble defined four different types of innovation: preserving innovations, marketing innovations, expanding innovations, and disruptive innovations (Brown and Anthony, 2011).

Apart from that, academic literature provides even more innovation typologies, which originate in various perspectives and research backgrounds (e.g. Lehner, 2004; Gunday et al., 2011; Kotsemir et al., 2013; Tavassoli and Karlsson, 2015; Stampfl, 2016; Rajapathirana and Hui, 2017; Rantala et al., 2018). At this point, Garcia and Calantone (2002) advise to question the difference between suggested classifications of innovations, as for example terms such as “radical, really-new, incremental, and discontinuous are used ubiquitously to identify innovations” (p. 110). Moreover, successfully applying innovation approaches is considered highly situational, which consequently demands a thorough understanding of innovation types for further analyses (Albers et al., 2016).

Following the addressed spectrum of innovation types, this dissertation was not intended to solve the issue of ambiguity, which is why the presented analysis focused on two specific innovation types, i.e. NPD and BMI. The researcher made this choice based on several reasons. Mainly, because NPD represents a well-established approach for innovation, while BMI describes a new challenge for firms, which indicates a promising tension to explore. At the same time, BMI clearly gained popularity over the last decade, which is reflected by the increasing number of yearly publications (see Figure 5). Besides a positive interplay between the two innovation types (Amit and Zott, 2010), they are both considered to be relevant for companies in the mobility sector, which depicted a reasonable basis for an empirical analysis.

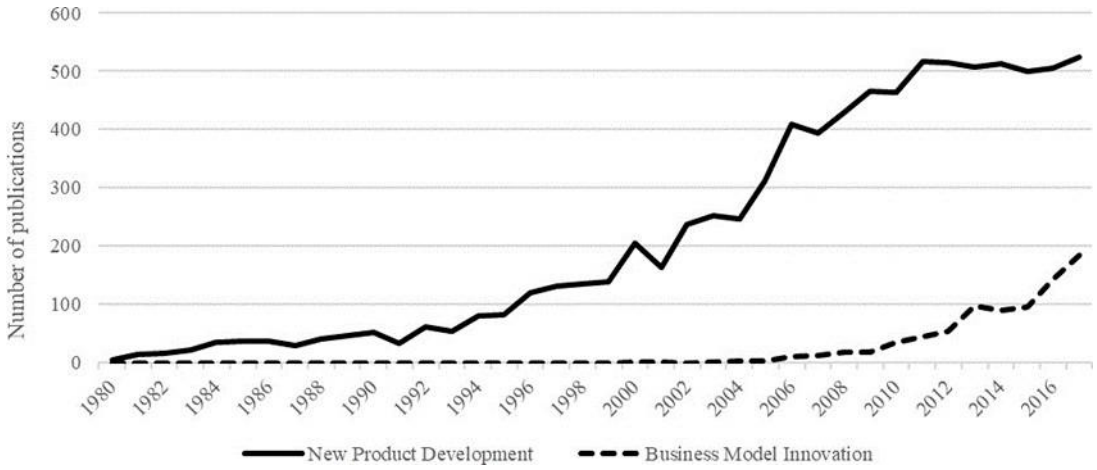

Figure 5: Yearly peer-reviewed publications on NPD and BMI since 1980[2]

In order to purposefully answer the presented research questions, a precise distinction between the two types of innovation was required, which will be outlined in the following sub-chapters.

[2] The number of yearly publications was extracted from Scopus, which represents the largest database for peer-reviewed literature (https://www.elsevier.com/solutions/scopus). The researcher searched for "new product development" and "business model innovation" within abstract, title and keywords since the year 1980.

2.3.1 New Product Development

According to Armbruster et al. (2008), the present scientific debate predominantly links the term "innovation" to research and development (R&D), which refers to the creation of new products. In this context, many existing studies claim that innovative products emerge from increased R&D activities, which ultimately enhance firms' competitive advantage and market shares (e.g. Freeman and Soete, 1997). Thus, new product development is considered crucial for firms' sustainable success and growth (Baumol, 2002; Schumpeter, 1939).

Many approaches regarding NPD refer to the widely recognized work by Booz, Allen and Hamilton (1982), who suggested a sequential NPD process including the following seven stages: new product strategy, idea generation, screening and evaluation, business analysis, development, testing, and commercialization. Furthermore, Robert G. Cooper made a considerable impact in the research field of NPD, as he proposed the widely applied Stage-Gate Model that represents an essential tool for the management of NPD processes (e.g. Cooper, 1990; Cooper and Kleinschmidt, 1995; Cooper, 2011). According to Baker et al. (1967), product innovations can be differentiated including technology-push (inside-out) and market-pull (outside-in) innovations. In connection with this, technology-push innovations rely on the usage of new technologies and largely arise from R&D, while market-pull innovations rely on previously un-identified needs determined by the sales and marketing departments (O'Connor and Rice, 2001).

In the past, numerous authors have focused on analyzing NPD and its determinants of success (e.g. Schroeder, 1990; Banbury and Mitchell, 1995; Katila and Chen, 2008; Leiblein and Madsen, 2009; Leiponen and Helfat, 2010). Nevertheless, Barczak et al. (2009) claimed the majority of initiated NPD projects fail in practice. Building upon his own prior findings and large-sample reviews by other scholars (e.g. Montoya-Weiss and Calantone, 1994; Mishra et al., 1996; Song and Parry, 1996), Cooper (2013) identified success drivers for managing NPD projects, such as a strong customer focus, investments in pre-development work, and leveraging core competencies. Furthermore, the proposed framework by Balachandra and Friar (1997) built upon 72 success factors from earlier studies, whereby the requirements for NPD have been depicted along the dimensions of environment, market, organization, and technology. According to Henard and Szymanski (2001), product innovations are positively affected by the

product itself, its strategy-fit, applied processes, and the marketplace. Evanschitzky et al. (2012) conducted a similar analysis, which also incorporated an organizational dimension. Besides identifying critical success factors for evolutional product innovations, the same has been obtained for radical technological innovations (Wohlfeil and Terzidis, 2015). Following Womack et al. (1990), the involvement of suppliers is also considered as a decisive factor for thriving NPD. In addition, company-internal collaboration, for example, between manufacturing and product design, was found to be essential as well (Mukhopadhyay and Gupta, 1998). Derived from an analysis of best practices regarding the NPD process, concurrent engineering was highlighted as another important aspect (Womack et al., 1990). Referring to the Stage-Gate Model, integrating fixed points for evaluation and decision-making in the development process are also required for successful NPD (Cooper, 1994). Thereby, a solid leadership is considered decisive (Clark and Fujimoto, 1991; Brown and Eisenhardt, 1995). In line with the technical complexity of NPD (Moore, 2008), modularization in product design represents another characteristic of product innovation (Schonberger, 1986; Wheelwright and Clark, 1992).

Although several authors emphasized the importance of first-mover advantage (Lieberman and Montgomery, 1988) and speed to market (Cordero, 1991), experience shows that both represent a considerable challenge to firms' NPD activities (Wheelwright and Clark, 1992). Therefore, the usage of suitable development tools, i.e. software solutions, represents one option for supporting the success of these innovation projects (Cordero, 1991; Brown and Eisenhardt, 1995). Altogether, the depicted differentiation of NPD served for providing a clear understanding of this innovation type for the following chapters. For this dissertation, the researcher defined NPD as innovations that focus on the creation of new products or services.

2.3.2 Business Model Innovation

Schumpeter's last type of innovation is nowadays often referred to as business model innovation (Casadesus-Masanell and Zhu, 2013). Several sources significantly differentiate BMI from other types of innovation (e.g. Amit and Zott, 2010; Comes and Berniker, 2008). While product or process innovations can often be copied rather easily, BMIs represent real game changers for firms (Kim and Mauborgne, 1999). Bucherer et al. (2012) add that BMIs are hard to replicate due to several reasons: Their complexity

and simultaneous adaptation of several elements require considerable time and effort, and they need to go hand in hand with the firm's long-term strategy, core competencies, and corporate culture. Nevertheless, a firm's products and services have a strong impact on the value proposition of a BMI, whereby established processes influence its operational model (Bucherer et al., 2012). As a result, BMIs often underlie other types of innovation, such as NPD. Furthermore, Amit and Zott (2010) emphasize that technological innovations (e.g. the internet) often facilitate BMI, as they are deployed in an innovative way.

In line with this, Bucherer et al. (2012) define BMI as "a process that deliberately changes the core elements of a firm and its business logic". In addition, Casadesus-Masanell and Zhu (2013) describe this type of innovation as "the search for new logics of the firm, new ways to create and capture value for its stakeholders, and (…) finding new ways to generate revenues and define value propositions for customers, suppliers, and partners" (also see Magretta, 2002; Berglund and Sandström, 2013; Baden-Fuller and Mangematin, 2013; Gambardella and McGahan, 2010). AlDebei and Avison (2010) suggest four business model dimensions: value proposition, value finance, value architecture, and value network. The value proposition refers to value elements of a BM, such as products or services, whereas the value finance depicts the revenue structure and pricing models (Osterwalder et al., 2005). Moreover, the value architecture describes a firm's structural design, while the value network represents the interaction with other organizations (e.g. Shafer et al., 2005). Accordingly, in order to create a new BMI, at least two of the four BM elements should be changed, which automatically has an impact on the remaining components of a BM (see for example Gassmann et al., 2013).

Similar to NPD, BMI may also incorporate different forms (IBM, 2006): industry model innovation (innovating the industry value chain by moving to new industries), revenue model innovation (innovating the revenue model through offering re-configuration and pricing models) or enterprise model innovation (innovating the role the company plays in the value chain by configuring networks, suppliers, customers, including capabilities/asset configuration). In connection with this, BMI enables companies to obtain a competitive advantage in established industries but at the same time for launching novel products (Björkdahl, 2009). However, following Chesbrough and Rosenbloom (2002), firms often struggle when it comes to innovating their business

models. Besides presented definitions of BMI, this field of research has not been formalized much yet, although it has gained "an increasing amount of attention in management research and among practitioners" (Foss and Saebi, 2017, p. 200).

One of the most applied tools for BMI refers to the Business Model Canvas by Osterwalder and Pigneur (2010), which serves as a strategic blueprint while providing nine basic building blocks of a business model. Furthermore, Francis and Bessant (2005) proposed a holistic innovation management approach that describes BMI as "innovation in outer-directed paradigms" (p. 13). In order to incorporate structural implications and challenges associated with BMI, the integrative framework by Frankenberger et al. (2013) consists of the following four phases: initiation, ideation, integration, and implementation. Resulting from the "overwhelming demand for a new business model innovation methodology" (p.7), Gassmann et al. (2013) applied re-combination of assets to create BMI, while considering various success factors, e.g. open-minded team members or a suitable company-fit. The Business Model Framework by Chesbrough (2007) provides an approach for further advancing a firm's business model, which can be achieved for example by launching company-internal BM experiments. Approaching BMI more quantitatively, Casadeus-Masanell and Zhu (2013) developed a formal framework of BMI based on game theory, whereby they suggested that more innovative business models are likely to be more successful, as they incorporate higher barriers for competitors to take advantage of the initial idea. Kaplan (2012) added that the success of BMI may be enhanced by sufficient IT support, management attention, adapted controlling measures, and the willingness to take risks. Moreover, multi-functional teams are considered essential regarding the qualification of innovating employees (Wheelwright and Clark, 1992; Dimancescu, 1992). Altogether, several authors highlighted that business models have to be seen as dynamic systems (Morris et al., 2005), which makes this type of innovation a complex endeavor. For the purpose of this study, BMI was defined as innovations that focus on the introduction of a new business model to a firm by reconfiguring its core elements. In order to tackle the complexity and novelty of the BMI approach in a systematic way, the researcher decided to proceed by including the innovation system perspective enhance the analysis. Thus, the following section will outline the state-of-the-art on micro-level innovation systems, i.e. corporate innovation systems, through a systematic literature review.

2.4 The Corporate Innovation System – A Systematic Literature Review

Even though the innovation system approach dates back to its introduction by Lundvall in 1985, little attention has been devoted to the perspective of corporate innovation systems. Currents paradigm shifts caused by disruptive innovations force incumbents to master a strategic shift in their business models, which increases the complexity of their innovation activities (Berman, 2012; Gimpel and Röglinger, 2015). According to Garud et al. (2011), organizations often struggle when dealing with such complexities, which can be relational or temporal in nature, as they were originally designed to suppress them.

This development generates the need to study what requirements should be considered with respect to a corporate innovation system in order to support and maintain an organization's innovative strength and to increase it to a sustainable level. The following systematic literature review[3] of corporate innovation systems aims to provide a basis for this endeavor by identifying existing research orientations, as well as gaps for future research to address. Furthermore, findings highlight fundamental approaches and theories that should be taken into consideration for studying the framework of firms' innovation activities in the subsequent chapters of this dissertation. Accordingly, findings will also be highly relevant for organizations that strive to pursue a holistic approach to innovation management. The following sections elaborate the methodological approach, findings as well as an overview on corporate innovation systems by the conducted SLR.

2.4.1 Methodological Approach

In order to analyze the aforementioned problem statement, a SLR review has been conducted. This methodological approach addresses the need to enrich traditional narrative literature reviews that has been widely criticized in the field of management. In this context, narrative literature reviews are characterized by a lack of relevance based on the application of individual, mainly subjective and biased methodology by several authors (Fink, 1998; Hart, 1998). According to Transfield et al. (2003), the approach of a SLR has its origin in the medical sciences and utilizes a stringent,

[3] Chapter 2.4 contains extracted material from the author's publication: Hirte, R. and Roth, P. (2018), Advanced Innovation Management – Best Practice of German and American Corporations in the Mobility Sector, Journal of Strategic Innovation and Sustainability (JSIS), Vol. 13 No. 5, pp. 111-126.

replicable, and transparent scientific research process (Cook et al., 1997). Furthermore, it is critical to distinguish a SLR from a meta-analysis, which in contrast applies statistical and econometric parameters in order to analyze data (Transfield et al., 2003). Becheikh et al. (2006) highlighted the main benefits of a SLR: identification of key scientific contributions to a field or research question, limitation of bias or systematic errors, reduction of chance effects, enhancement of legitimacy and more reliable results.

Definition of Search Strategy

According to Kitchenham (2007) and Alderson et al. (2004), an adequate methodological approach incorporates six successive steps: 1. Definition of a review protocol, 2. Definition of a search strategy, 3. Documentation of the search strategy, 4. Explication of inclusion and exclusion criteria, 5. Specification of information to be obtained including quality criteria, and 6. Quantitative meta-analysis of the detected findings. Furthermore, Tahir, Rasool and Gencel (2016) proposed a search strategy that implies certain guidelines for the above mentioned steps. For instance, they suggested to review studies based on title, abstract and conclusion, which reduces the number of literature throughout the research process. In addition, Boolean operators ('AND' and 'OR'), as well as the wildcard character ('*') should be used to formulate the search string. Snowball tracking is also considered as a way to identify further studies by scanning the reference lists of primary search results (Tahir, Rasool and Gencel, 2016).

Database and Study Selection

For the presented review, the search scope covers journal articles, conference papers, books/book chapters, manuscripts, and dissertations. Utilized search engines include: BASE, CiteSeer, Google Scholar, Emerald Insight, JSTOR, IEEE Xplore, as well as Science Direct. By using the Boolean operator 'OR', the following search terms have been applied and combined: corporate innovation system, organizational innovation system, open innovation system, corporate innovation ecosystem, and corporate innovation framework. Synonyms were tested and search terms adapted accordingly throughout the search process. Furthermore, search iterations and snowball tracking have been conducted based on primary sources. Inclusion criteria considered elements of a CIS, such as processes, structures, stakeholders, activities and strategy. Titles that covered the scope of innovation management in general, without any system-related

context, have been excluded due to insufficient focus. As the term ‘corporate innovation system’ was introduced in the year 2000, older publications have also been excluded.

Search Results

Resulting from an iterative search process for identifying relevant primary studies (see Figure 6), the SLR revealed the following search results: 46 journal articles, 4 conference papers, 5 books/book chapters, 7 manuscripts/working papers, 3 dissertations.

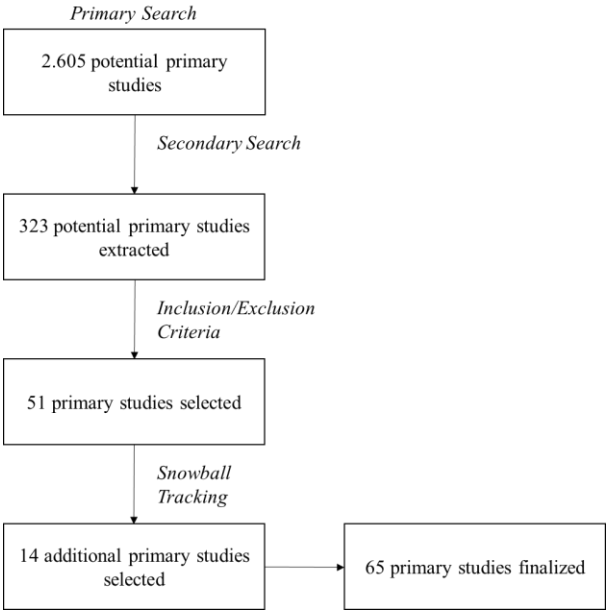

Figure 6: Process of primary study selection

As depicted above, 65 primary studies have been detected in the context of corporate innovation systems, which served as a basis for the researcher’s further analysis. With respect of their year of publication, most identified sources were published in the years 2010, 2011, 2013 and 2014 (see Figure 7).

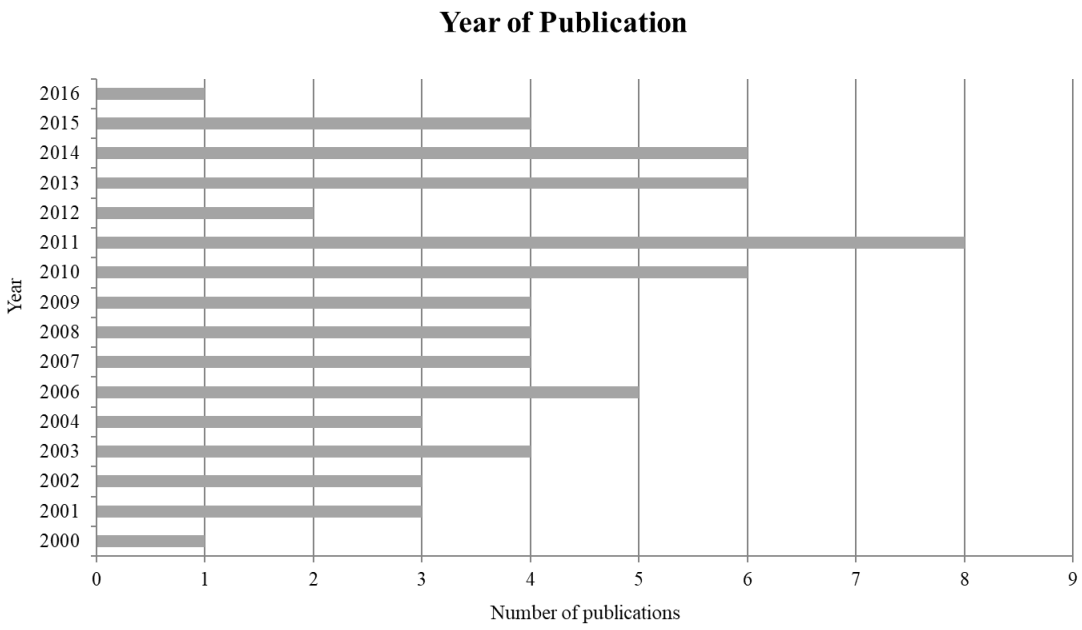

Figure 7: Distribution of primary studies with respect to year of publication

In total, contributions of 31 journals have been considered for this review, which indicates a wide dispersion of the topic. Among others, the most relevant sources included: Research Policy, R&D Management, International Journal of Technology Management, and Technovation (see Table 1).

Journal name	*Publication count*
Creativity and Innovation Management	1
Entrepreneurship Theory and Practice	1
European Journal of Business and Management	1
European Journal of Innovation Management	2
Harvard Business Review	1
Industrial Management and Data Systems	1
Industry and Higher Education	1
Industry and Innovation	1
Innovation and Management Review	1
International Journal of Business and Management	1
International Journal of Entrepreneurship and Innovation Management	1
International Journal of Management Reviews	1
International Journal of Product Development	1
International Journal of Technology Intelligence and Planning	1
Journal of Business Venturing	2
International Journal of Technology Management	3
Journal of Change Management	1
Journal of Interactive Marketing	1
Journal of Management	1
Journal of Technology Transfer	2
Journal of Academic Marketing Science	1
Long Range Planning	1
MIT Sloan Management Review	1
Organizational Studies	1
Procedia Computer Science	1
Procedia Social Behavior and Sciences	1
R&D Management	4
Research Policy	6
Strategic Management Journal	1
Technovation	3
The Academy of Management Annals	1

Table 1: Overview of primary studies‘ journal publications

The following sections will present the results derived from the conducted SLR including related research fields, a critical assessment of the innovation system perspective, and research gaps for further exploration.

2.4.2 Overview on Corporate Innovation Systems

The detected findings of the conducted SLR are presented in separate passages, as this approach makes it easier for the reader to comprehend the course of the analysis. First, an examination of existing definitions of CIS leads to the derivation of a working definition of such a system. Some insights into the historical context and studied types of innovation systems are also presented in this section. Furthermore, an introduction of relevant characteristics and sub-systems of CIS, as well as related fields of study are highlighted in the next section. Finally, a critical assessment of the system perspective aims to provide a basis for any future efforts in this field of study.

Definitions and Historical Context

To date, few authors have explicitly defined the term ‘corporate innovation system’, as prior research on innovation systems were mainly oriented towards national, regional or sectoral types of innovation systems (Carlsson et al., 2002; Freeman, 1995; Asheim et al., 2011; Faber and Hoppe, 2013; Malerba, 2002). However, Tschirky and Koruna (1998) early on referred to corporations as socio-technical systems. In this context, Van Lancker et al. (2016) suggest a general definition of innovation systems, which is based on findings from several authors. Accordingly, an innovation system includes “a complex of diverse innovation actors that work in collaboration on the generation, development and utilization of innovation, shaped by a number of institutions” (Bergek et al., 2008; Carlsson et al., 2002; Coenen and Diaz Lopez, 2010; Guan and Chen, 2012).

Granstrand (2000) is considered the first author who introduced the field of corporate innovation systems to the innovation literature. He defines this type of innovation system as “the set of actors, activities, resources and institutions and the causal interrelations that are in some sense important for the innovative performance of a corporation” (Granstrand, 2000). Sigurdson and Chen (2001) describe a CIS as “a corporate’s organization (or a network of corporations), and rules and strategies governing the invention, development, and adoption of new technologies”. Hauschildt

and Salomo (2011) highlighted that CIS need to be open and encourage creativity, spontaneity and self-organization in order to provide a framework for successful innovation processes. In connection with this, Lundvall (2008) argued that firms play the most crucial role in the innovation system perspective, as they innovate together with other organizations.

As the concept of CIS still remains ambiguous, the working definition used for this study describes this type of innovation system as a complex organizational framework that includes the required processes, resources, structures and institutions for successfully conducting a firm's innovation activities.

The approach of CIS is based on the Neo-Schumpeterian tradition, as it has its own unique constituents, function, and activities (Lee, 2010). The following system concepts reveal the historical embedment of CIS and thereby represent their fundamental basis: input/output analysis (Leontief, 1941), development blocks (Dahmén, 1950), innovation system (Lundvall, 1985), national innovation system (Freeman, 1987), Porter's diamond (Porter, 1990), technological innovation systems (Carlsson and Stankiewicz, 1991), local industrial systems (Saxenian, 1994), sectoral innovation systems (Breschi and Malerba, 1997), regional innovation systems (Cooke, 1997), corporate innovation system (Granstrand, 2000), social system of innovation and production (Amable, 2003), organizational innovation system (Wagner-Luptacik et al., 2006).

This SLR revealed that the concept of CIS is closely associated with the approaches of organizational innovation and corporate innovation management (e.g. Lee, 2010; Christensen and Raynor, 2003; Hauschildt and Salomo, 2011; Bagno and Cheng, 2007). Thus, many studies do not clearly make a conceptual distinction between these terms. In their study, Fuglsang and Sundbo (2005) differentiate three different modes of innovation systems, which support the integration of innovation within firms and help to motivate involved actors: first, the value-based entrepreneurial mode explains that innovation is related to individual's actions and their motivation to innovate (Kanter, 1983; Drucker, 1999). In this case, innovation is driven by the individual entrepreneur and psychological factors. Second, the technology-based functional mode refers to technological trajectories, which determine change and innovation within organizations (Dosi et al., 1988). In this context, innovation is driven by institutional routines of the

respective organization. And third, the strategic-reflexive mode states that strategy and reflexivity determine change of innovation systems. Thus, innovation is driven by whole organizations and can be described as the result of interaction processes and common values within the organization.

Related Research Fields

Prior studies highlight several research orientations in the context of corporate innovation systems. To begin, many authors refer to the resource-based theory when they analyze intra-firm innovation (e.g. Xu et al., 2007; Covin and Miles, 1999; Floyd and Wooldridge, 1999). According to Grant (1991), a firm's strategy for the obtainment of sustainable competitive advantage needs to be targeted on filling its current resource gaps through innovative capacity. Hackett and Dilts (2004) describe the resource-based view as "a strategic view of the firm's ability to extract rents from bundles of innovations". Thus, to innovate, a firm requires the ability to flexibly shift its existing resources from one deployment to another with the aim to assemble them into novel combinations (Amit and Schoemaker, 1993; Freeman and Engel, 2007). According to Ireland and Webb (2007), a balance between exploiting a firm's existing proven resource combinations and exploring new ones, is decisive for long-term success. Furthermore, several authors highlight that there needs to be a balance between control and flexibility in any organizational system (Koen et al., 2010; Markides, 2000; De Wit and Meyer, 2004; Sniukas, 2010). These findings refer to the approach of ambidexterity (see chapter 2.2), which has been linked to superior long-term performance of firms by pursuing both evolutionary and revolutionary change at the same time (Raisch and Birkinshaw, 2008; Mortara and Minshall, 2011; Hannan and Freeman, 1984; Levy and Merry, 1986).

The following sections present the particular research clusters that have a significant relevance in the context of corporate innovation systems. The first cluster refers to the structural characteristics and sub-systems of this type of innovation system. Based on the definition of Granstrand (2000), a CIS is composed of activities, actors, resources, and institutions. Other authors support these findings by elaborating further relevant elements that are essential for corporate innovation activities. Sigurdson and Cheng (2001) for example allocate the following characteristics to CIS: organizational ability and strategy, research and development structure, arrangements of advanced learning,

association with the public sector, human resource management, competitive strategy, access to newly developed knowledge and technology, management of intellectual property (IP) right, networking ability and strategy, including financing strategy. In addition, four important structural components are suggested by several studies: diverse actors, an innovation network, innovation processes, and institutions (van Lancker et al., 2016; Westergren and Westergren and Holmström, 2012; Chesbrough, 2012). Bagno and Cheng (2007) propose the following dimensions of so-called "intra-organizational innovation systems": strategic adequacy, interpretation of external environment, conception of internal organizational structure, integration of external structure, systematization of organizational basic processes, consideration of human factors and relationships. According to Coriat and Weinstein (2002), it is essential to take into account the internal organization of a firm in connection with its innovation activities. This includes, for instance, the organizational design, modes of coordination between groups, modes of coordination between sub-units, incentive mechanisms and labor management. Several authors highlight the innovation process as the key component of CIS, as it has an impact on many other mentioned elements (e.g. Lee, 2010; Edquist, 2005). Furthermore, the relevance of strategic innovation management is highlighted in particular by several authors in this context (e.g. Afuah, 2009; O'Reilly and Tushman, 2013).

According to Granstrand (2000), the most relevant sub-systems of a CIS include the following: actors system, research & development system, production system, marketing system, outsourcing system, system of technologies, and institutional systems. Fuglsang and Sundbo (2005) support these findings by suggesting the production system or the profit-maximizing system as essential sub-systems to consider. In this context, they highlight the dialectic relation between each system and the actors within and outside the system. In accordance with the institutional theory of Edquist and Johnson (1997), Coriat and Weinstein (2002) mention institutional sub-systems, such as rules, standards or modes of inter-firm relationships to take into account in this context. In addition to that, Ireland et al. (2009) mention the importance of reward systems for corporate innovation management.

Another research stream highlights the interface between a CIS and the innovation ecosystem. This aspect is based on the open systems theory by Christensen (1997), which states that organizations are influenced by their environment. In this context,

organizations tend to serve those actors, which provide them with resources. Several authors acknowledge that external relationships represent a critical success factor in the introduction of innovations (Gellynck and Vermeire, 2009; Gronum et al., 2012; Ozman, 2009). Hereby, existing partners are classified into two different groups: 1. business partners include for example clients, suppliers, other firms or competitors; 2. science partners refer to universities, public research institutions, non-profit organizations or consulting firms (Madeira Silva and Correia Leitao, 2009). In connection with this, Ortt and Smits (2006) distinguish between three levels: macro level, meso level, micro level (also see van der Steen, 1999). The micro level refers to an organization (or a network of organizations), the meso level describes an industry and the macro level characterizes a country. All three levels and their specific institutions, rules and procedures influence firms' innovation processes in a direct or indirect manner. Another important factor at all three levels refers to trends that certainly determine the impact of each level. In this context, several trend radars suggest different trend clusters, such as the following: health and individual, technology and innovation, economy and businesses, environment and resources, as well as policy and law (Durst et al., 2011). Furthermore, other authors focus on the impact of the environmental context and the competitive environment on firms' innovation activities (e.g. Birkinshaw et al., 2008; Ganter and Hecker, 2013; Buchanan et al., 2005; Sniukas, 2010). In connection with this, the topic of open innovation is highly relevant for CIS and more radical types of innovations in particular (Baka, 2014; Bigliardi et al., 2012; Budde et al., 2012; Enkel et al., 2009). Chesbrough and Bogers (2014) define open innovation as "a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model". In connection with this, Servatius and Piller (2014) explain that a firm's R&D department, as well as its ability to collaborate with external partners, is decisive for the success of corporate innovation activities. In total, a large number of researchers analyzed the research stream of open innovation and separate literature reviews exist (e.g. Hossain et al., 2014).

A further research orientation addresses the connection between CIS and organizational learning and knowledge management (e.g. Lee, 2010; Pellissier, 2008). This approach is connected to corporate renewal and the internal infrastructure of organizations (Apilo, 2010; Steiber and Alänge, 2015; Coriat and Weinstein, 2002; Stampfl, 2016).

In their studies, Dess et al. (2003) and Baden-Fuller and Stopford (1994) highlight the importance of constant adaptation and low cost experimentation, as well as knowledge diffusion that all have a positive impact on individual and organizational learning. In their case study about Google's CIS, Steiber and Alänge (2013) refer to the requirement of a sub-system that encourages learning from successes and failures of existing innovation projects. This hygiene factor was also addressed by Apilo (2010), who describes the following four perspectives in the field of corporate renewal: innovation, organizational change, organizational learning and strategy. In connection with a firm's innovation process, Coriat and Weinstein (2002) highlight the struggle of organizational learning and building the right capabilities to innovate within firms, which they describe as conditions of a "cognitive coordination". Stampfl (2016) also stresses the strong relation between organizational learning and innovation. However, he points out that prior studies have mainly provided findings with respect to product innovation (Forrester, 2000) and process innovation (Jang et al., 2002) and did not specifically target radical types of innovations.

In connection with this, it has been proposed that innovative outcomes will change with changes in firm's R&D structure, where particular types of knowledge seem to be better managed through interaction of internal research units (Birkinshaw et al., 2002; Argyres and Silverman, 2004). Regarding the relationship between internal organizational structure and innovative outcomes, the study of Argyres and Silverman (2004) explored the effect of centralization versus decentralization of a company's R&D structure on its innovativeness. Whereas centralized research seems to support broader, non-specific challenges and radical innovation, decentralized research enables resolving business-unit specific challenges and incremental innovation. Furthermore, their study reveals that hybrid structures do not consistently lead to innovation that supports both centralized and decentralized approaches.

In this context, several studies (e.g. Jeong et al., 2008; Rothwell, 1975) highlight that sustainable corporate innovativeness requires an organization-wide entrepreneurial spirit that is essential in order to cope with and benefit from rapidly changing marketplace conditions. Further authors (Kuratko et al., 2005; Hornsby et al., 2002 and Villiers-Scheepers, 2011) recommend establishing a sustainable environment for intrapreneurship, which is based on certain organizational structures and managerial tools. These refer to the following examples: managerial support for generating and

developing new business ideas, allocation of free time, convenient organizational structures with respect to the level of decentralization and decision-making autonomy, appropriate incentives and reward-systems, as well as tolerance for trial-and-error or failures within the creative process.

Derived from the mentioned related research fields and existing approaches revealed by this SLR, relevant dimensions of a CIS have been considered for suggesting a CIS model for further analysis (see chapter 3.3.2).

Critical Assessment of the Innovation System Perspective

In order to provide a basis for future studies on CIS, a critical assessment of the innovation system perspective is considered essential. The following section contain several arguments that either support or oppose the approach of innovation systems, which were further explained using the SLR.

First, several authors addressed the dynamic approach and multi-dimensional aspects of innovation, which require a holistic, comprehensive view on the topic (Budde et al., 2012; Tödtling and Trippl, 2005; West and Bogers, 2013; Van Lancker et al., 2016). Furthermore, Alänge (2013) points out that currently many studies provide valuable insights in this context, which are scattered in different studies and diverse innovation research fields. Existing findings need to be compiled in order to make them applicable for further research and practice in the field of innovation management. Berkhout et al. (2010) support this statement by proposing that micro-level innovation managers require hands-on models for innovation development that are not provided sufficiently by prior studies. Lee (2010) describes the innovation system approach as an influential theoretical framework that provides a consistent basis for generating hypotheses about relations among specific variables. Furthermore, Lundvall (2008) highlights that innovation systems help to organize and focus the analysis of innovation projects, to foresee what is going to happen, to explain what has happened and to give a basis for rational action. Servatius and Piller (2014) also support the system perspective of innovation, as it implies the relationship between structures, processes, and people. They refer to the combination of “hard” and “soft” factors, which is highly relevant for the momentum of such systems. Spielmann (2005) addresses the ability of innovation system studies to open the “black box” of innovation and to analyze processes that are typically overlooked in their linear approach to R&D. According to Ortt and Smits

(2006), a system perspective for innovation is recommended for several reasons. First, the successful market introduction of an innovation requires the adoption of new organizational practices, such as marketing or manufacturing, as well as adapted arrangements of internal infrastructures. Second, most organizations rely on an alliance or network with other actors of the innovation ecosystem when they innovate. And third, enablers for successful corporate innovation are represented by institutions, qualified people, as well as an appropriate infrastructure including high-level knowledge (Ortt and Smits, 2006).

In contrast to the arguments supporting the innovation system approach, there also exist several constraints that need to be considered within a critical assessment. Foray (2000) for instance assigns too little operational value as well as a lack of substance to the innovation system perspective. Lundvall (2008) also highlights that the innovation system defines a concept rather than a general theory, as it does not specify any general laws of cause and effect. Edquist (2005) supports this statement by demanding a more rigorous, systematic and theory-like concept of innovation systems. Furthermore, Carlsson et al. (2002) point out that the dynamic nature of innovation systems might lead to considerable empirical challenges throughout the research process. In addition, it is recommended to avoid thinking in terms of mechanical models of causality in connection with innovation systems and to develop theory as well as analytical techniques (Lundvall, 2008).

In order to sum up the present debate concerning the relevance of the innovation system perspective for research and practice, a larger number of benefits indicate that the approach is appropriate for future analyses. In particular, the aforementioned increasing complexity of firms' innovation activities due to ongoing paradigm shifts in various industries, justify a holistic view on the topic of corporate innovation management. However, critical remarks of any innovation system study should be considered.

2.4.3 Discussion

Handling the increasing complexity of a firm's innovation activities still remains a challenge. This SLR contributes to solving this issue by providing a fundamental basis for future studies in this context. In the presented SLR, 65 primary studies have been identified and resulting from their findings, five major research streams have been

detected that all have a high relevance to CIS. In order to advance the limited number of studies that focus on CIS in particular, it is suggested to further analyze their complexity and the interaction of different factors in a systemic organizational context. In connection with this, a more detailed analysis of the relation between corporate sub-systems can reveal valuable findings. In addition, as firms are increasingly facing the challenge of re-thinking and transforming their business models due to changing market conditions, a study of the requirements of CIS that support such a successful transformation is essential. According to Stampfl (2016), several companies perform a strategic shift from manufacturer to service provider. In this context, the study of Baveja et al. (2004) reveals that being successful in services requires a different organizational innovation system than for tangible products. Furthermore, this SLR did not detect any studies that connect the corporate innovation system approach with business model innovations and their specific requirements. As many companies are currently facing the challenges of digital transformation and paradigm shifts within their industries, it is recommended to provide more holistic view on the impact of this development on firm's innovation system. Although several studies examined CIS within different regions, it is suggested to supplement empirical data by taking a closer look at issues, such as the cultural impact and the interaction with the regional innovation ecosystem, both affecting innovation outcomes of firms. Furthermore, a cross-industry study on CIS has the potential to reveal valuable findings for research and practice. Due to the increasing variety of firms' innovation activities, the performance of managers will increasingly depend on their capability to manage a complex innovation system. This aspect has also been supported by prior studies (Jaruzelski et al., 2014; Koetzinger and Alon, 2013; Wagner et al., 2013), who identify this capability as an important factor with regard to a corporation's financial future. Thus, it is recommended that the corporate capability of an institutionalized innovation management is supported by managers of firms in transition. Following the presented SLR, the subsequent chapters will expand on the empirical approach of this study, which has been chosen in order to address the mentioned problem statement using qualitative and quantitative data.

3 Benchmark Study of CIS in the Mobility Sector

In connection with the presented research strategy of this dissertation, the following chapter aims to gain a better understanding of corporate innovation systems, which is to date rather limited from an academic and practical point of view.[4] While considering existing theoretical approaches, a qualitative benchmark study of CIS in the mobility sector has been conducted to learn more about current paradigm shifts in the market and their consequences for firms' required innovation frameworks for developing new business models. In this context, precise challenges and requirements for business model innovations (BMI) were detected based on best practice, which provide a foundation for subsequent chapters of this work. The subsequent section starts with describing the methodological approach of this research.

3.1 Methodological Approach

3.1.1 Research Design

Qualitative research is considered particularly suitable in case of underexplored research areas (Yin, 2011) and helps to "capture contextual richness" (p. 3). This usually applies, if the researcher attempts to answer research questions including 'how' and 'why' (Yin, 2011). Furthermore, qualitative research is characterized by "induction, discovery, exploration, theory/hypothesis generation, the researcher as the primary 'instrument' of data collection, and qualitative analysis" (Mayoh and Onwuegbuzie, 2013).

Based on (Gläser and Laudel, 2010), this study relies on the empirical analysis of qualitative semi-structured expert interviews (n=29). Eisenhard and Graebner (2007) support this approach, as interviews allow to gather "rich and empirical data" (p. 28) in an efficient manner. Furthermore, experts represent suitable interview partners, who are considered as a source of specialist knowledge regarding the circumstances to be investigated (Gläser and Laudel, 2010).

[4] Chapter 3 contains extracted material from the author's publication: Hirte, R. and Roth, P. (2018), "Advanced Innovation Management – Best Practice of German and American Corporations in the Mobility Sector", *Journal of Strategic Innovation and Sustainability (JSIS)*, Vol. 13 No. 5, pp. 111-126.

Thus, the following research question, which was derived from the overall problem statement of this study, has been explored (see chapter 1.2):

> *How can a firm in the mobility sector successfully design and implement a corporate innovation system that leverages its innovation activities towards new business models?*

The first step of this dissertation's qualitative research aims to narrow down the essential demands and requirements of a CIS that successfully incorporates a broad range of innovation activities, specifically including BMI. The following sections provide deeper insights into the methodology of this study as well as the results.

3.1.2 Data Collection

During a period between March 2017 and May 2018, qualitative data has been collected from 29 semi-structured expert interviews in 21 multinational corporations in the mobility sector. In total, eight corporations have been included each in Germany and the USA, five corporations in China, and three corporations in Japan. For some corporations, experts have been interviewed from more than one region, as it seemed interesting to consider regional differences within one firm. Internationally distributed organizations and interview partners were selected to ensure a broad perspective of applied innovation approaches and best practices within different worldwide regions and diverse cultural backgrounds. Besides the conducted semi-structured interviews, additional data was considered for triangulation following Yin (2003), which included for example web-based research, press releases, and observations from site visits.

The duration of each expert interview was 59 minutes on average. All experts and firms remain anonymous for this study. Typically, an average transcript contained 11.5 pages, with a total of 212,261 words transcribed on 332 pages for this analysis[5]. Furthermore, the interviews were conducted in German or English language – mostly in person, otherwise via phone or Skype. The researcher always offered her preference for visiting the interview partners within their work environment in order to obtain an impression of the corporation's general atmosphere and at the same time to make the interview partner feel as comfortable as possible. Two interviews were conducted with two

[5] Transcripts are kept at the Institute of Entrepreneurship, Technology Management and Innovation (EnTechnon). Access to an anonymized version of the transcripts requires the permission of the author.

experts at the same time, as they preferred to reply to the questions in tandem. Altogether, the experts referred to concrete issues and solution approaches derived from their day-to-day experience within their field of operation.

A preliminary interview guideline was prepared (Yin, 2011) and contained seven main sections (see Appendix A). Following a short introduction of the researcher and the interviewed expert regarding his/her function and the organization he/she works in, the second passage referred to the organization's role within the mobility sector. Strengths and weaknesses of the current business model were explored, as well as further insights into the development of the sector. Afterwards, the third section focused on the organizational structure of the firm, including its general innovation framework as well hierarchical patterns. Fourth, strategic issues were discussed, including the type of innovation focused on, as well as management commitment. The next section referred to the innovation process, which included the path from an idea to the innovation outcome. The interaction with the external innovation ecosystem was also addressed, which referred to open innovation approaches and partner selection of the firm. Subsequently, hygiene factors and the organization's incentive scheme were discussed with the experts. Furthermore, the organizational culture and the people involved in the firm's innovation activities were considered in the interview guideline. Last but not least, the required resources were incorporated within the final section of the interview guideline. It is essential to mention, that the researcher had the goal of extracting and identifying specific requirements for BMIs, which applied for each of the mentioned interview sections. However, some experts struggled with differentiating between 'innovation in general' and 'BMI', although they had many years of professional experience in innovation management. Therefore, the researcher had to dig deeper into their answers in order to identify the specific requirements and challenges.

Even though guiding questions were prepared in advance, based on existing literature and the defined CIS dimensions (see 3.3.2) as well as prior experience, the interview guideline was adapted and improved continuously throughout the data collection phase. The researcher avoided to provide the interview guideline to the experts in advance in order to prevent biased answers. However, some experts requested the interview guideline as a prerequisite for their participation in the study. Furthermore, the interviews followed a conversational mode, which allowed the experts to highlight certain topics that were most relevant from their point of view.

After each interview, the recorded audio files were transcribed carefully in a Word document. With the exception of four interviews, all experts agreed to audio recording during the interview. For the remaining interviews, notes were taken during the interview to sum up the main content of the conversation. With the aim of preserving as much information as possible, these meeting notes were elaborated in more detail right after the interview and put into context with the pre-defined questions of the interview guideline. One Chinese interview was conducted with the aid of a translator, who was familiar with innovation management and the topic of this dissertation.

The selection of suitable interview partners has been conducted via recommendations and introductions through the researcher's personal and professional network, conferences, LinkedIn, or phone acquisitions. Thereby, differences regarding the mentioned worldwide regions could have been detected with respect to openness of sharing information and the willingness to exchange on the research topic. For instance, German corporations were all perceived as very open to share information without requesting a Non-Disclosure Agreement (NDA) and at the same time expressed a high interest in lessons learned from other firms in the sector. In contrast, many American corporations requested a NDA and had to be convinced of their participation in the study in advance. Also, American experts were perceived more hesitant when it came to sharing explicit examples from their daily business and additionally requested a preliminary set of questions for the interview, which has both not been the case for German experts. In China, most experts were approached via a Chinese intermediate contact person, which might have contributed to the fact that no NDAs were requested and all interviewed experts were perceived as very open to sharing their lessons learned and expertise in the analyzed field. Due to the existing language barrier, interviews had to be arranged very carefully, as not all managers spoke English. In contrast, Japanese experts were very hard to identify, as they did not necessarily use platforms such as LinkedIn and were rather hesitant to having a conversation in English. It was also a struggle to establish a professional network outside the own corporation in Japan. However, during the expert interview, Japanese managers were perceived very curious about the research and no NDAs were required.

3.1.3 Sampling

The included corporations (n=21) all operated in the mobility sector, which refers to "the market that includes public and private passenger transport as well as the transportation of goods" (McKinsey & Company, 2012). Accordingly, besides mainly (automotive) OEMs and their tier-2/tier-2 suppliers, this sector also incorporates "new entrants in the mobility space" (D'Incà and Mentz, 2016) that refer to digital players, startups and other related firms that are currently claiming their role within the mobility ecosystem. Thus, in particular, the following industries have been included in the sample: automotive, aerospace, traffic and transport, personal logistics, internet service providers, smartphones and computer, and microelectronics. However, in order to specify the target sample, firms had to contain a minimum of 500 employees[6] as a selection criterion for this study.

Experts (n=31) were selected based on their current position, which either had to have a direct relation to BMI or at least a project-related link to (BM) innovation. Accordingly, involved departments include for example: New Business Models, Mobility Strategy, Digital Ecosystem, or Research & Innovation. Furthermore, interviewed experts were required to obtain at least a lower management position up to director or vice president within their respective corporation. However, most experts represented managers (21%) or senior managers (21%). Regarding their geographical dispersion, 34% of all interviewed experts were located in the USA, 31% in Germany, 17% in China, and 17% in Japan. In total, 31 experts participated in the study, of which eight were female (26%) and 23 were male (74%). Due to their broad spectrum of positions and departments, each expert's experience in the field of BMI has been evaluated by the aid of a Likert scale (high (+++) / medium (++) / low (+) in a qualitative manner. More than half of all interviewed experts were rated with a high BMI experience (52%). A complete overview of the entire sample can be found in the attachment (see Appendix B).

[6] This selection criterion was based on a classification by the Federal Labor Office that defined firm size clusters for estimating the amount of employees paying social insurance. Thus, the cluster with the largest firm size included a number of >500 employees, which was linked to § 281 SGB III, § 28a SGB IV. The largest firm size cluster was selected due to an expected easier access to innovation managers via events, personal networks or social media.

3.1.4 Data Analysis

With the aim of conducting a deep analysis of the collected qualitative data, all transcripts and meeting notes were uploaded to MAXQDA 12 in the first step. Secondly, the material was analyzed according to suggested research approaches by Mayring (2000) and Yin (2011), which is illustrated in Figure 8. Thereby, the study strived for analytic generalization through searching for patterns of evidence across units (Yin, 2011).

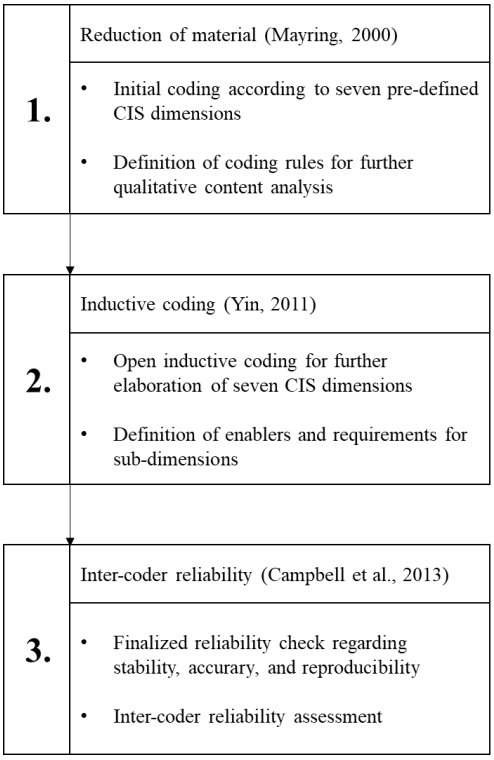

Figure 8: Process of qualitative content analysis

The first round of coding had the aim of reducing the qualitative material to more manageable units. This step was based on Mayring's (2000) process model of qualitative content analysis, which suggests a preliminary definition of units of analysis. In this context, the qualitative analysis was conducted by the aid of a category system, which was obtained by the following steps: summary, explanation, and structuring. Hereby, the category system was determined by following the seven CIS dimensions derived from the systematic literature review (see chapter 3.2.2). Furthermore, it is essential to define coding rules to repeatedly review the coded material (Mayring, 2000), as illustrated by an example in Table 2.

Dimension	Code	Coding Rule
Resources	Internal stakeholders	*Inclusion* if there is a direct reference to resources in the context of BMI/radical innovation. *Exclusion* if resources are mentioned in the context of traditional product, process or service innovation.

Table 2: Example of coding rules

The second round of coding refers to open inductive coding suggested by Yin (2011). This had the aim to further elaborate the seven pre-defined CIS dimensions, as well to define enablers and requirements for each sub-dimension. Yin (2011) proposes the three following steps for analyzing a qualitative database, which also aligns with the first round of coding according to Mayring (2000): Disassembling data through and initial coding and reassembling it by making sense of these codes, interpreting qualitative data, and drawing theoretical conclusions from the obtained findings. In total, as the data collection was conducted within three different regions one after another (Germany, USA, and Asia), the respective qualitative material was analyzed right after each data collection phase, which led to several iterations of the overall coding scheme. Table 3 illustrates an example of the applied coding scheme for the dimension 'Resources' (the complete coding scheme can be found in Appendix C).

Code	Sub-code	Anchoring Example	Coding Rule
Internal stakeholders	Flexible resource allocation	*"So maybe they need help one time from the infotainment team, another time they may need help from the trunk team, another time they may need help from software architecture. So it always depends on where they need that help, we can pull resources to help." (IP13)*	Inclusion due to direct reference to resources and internal stakeholders involved in BMI project.

Table 3: Coding example

Last but not least, the final step of the conducted qualitative content analysis referred to inter-coder reliability. According to Campbell et al. (2013), the reliability of coding in case of in-depth semi-structured interviews can be characterized by three different types: stability, accuracy, and reproducibility. Furthermore, they highlight that researchers require "sufficient background knowledge in the subject matter of the interviews" (p.297) for coding the material (Campbell et al., 2013). This prerequisite was given in case of this study, as the researcher has dealt with (BM) innovation management for several years in advance within a practical and academic context. In order to ensure a high quality of the data analysis, several authors suggest the concepts

of inter-coder reliability and inter-coder agreement (e.g. Popping, 2010; Garrison et al., 2006). Inter-coder reliability refers to the requirement that "two or more equally capable coders operating in isolation from each other select the same code for the same unit of text" (Krippendorff, 2004, p. 217; Popping, 2010; p. 1069). On the contrary, inter-coder agreement demands that "two or more coders are able to reconcile through discussion whatever coding discrepancies they may have for the same unit of text" (Garrison et al., 2006; Morrissey, 1974, pp. 215). As the limited resources for this research did not allow for two dedicated coders for the analysis of the material, inter-coder reliability has been assessed for a smaller sample. Concerning the size of this sample, existing studies suggest, for instance, utilizing "10 percent" of the material (Hodson, 1999, p. 29), or "5 to 10 pages" of the total transcripts (Miles and Huberman, 1984, p. 63). For this study, 34 pages (approximately 10% of the total material) were coded by a second researcher, who had a lot of experience in social sciences and innovation management as well. Resulting from this, an inter-coder reliability of 68.66% percent has been detected, which is considered a reasonable amount for validity in comparison to other studies (e.g. Campbell et al., 2013; Garrison et al., 2006). In general, it is recommended to limit the complexity of a coding scheme, as simpler coding schemes are considered more reliable than complex ones (Campbell et al., 2013; Garrison et al., 2006).

The following section will provide a detailed overview of the obtained results from the conducted qualitative content analysis. First, insights into the current development of the mobility sector will be outlined, while the second part will elaborate on BMI requirements along the dimensions of a CIS. Afterwards, a discussion of the presented results will close the chapter.

3.2 Results

The following results of the qualitative analysis have been divided into two segments. First, the qualitative expert interviews served as a comprehensive overview of the current development and trends in the mobility sector. This description of the current mobility landscape represented a significant foundation for evaluating the innovation system of corporations that operate in this field. Second, the presented qualitative findings outline detailed requirements and success factors for responding to mentioned paradigm shifts, which are oriented towards the seven dimensions of a CIS: innovation process, organizational structure, resources, hygiene factors and rewards, people and

culture, strategy, and external interaction. Thereby, a particular focus was set on the requirements for BMIs, which to date seem rather underexplored from a holistic perspective (e.g. Van Lancker et al., 2016).

3.2.1 Current Development of the Mobility Landscape

This study purposely does not solely focus on the automotive sector, which is "relating to or concerned with motor vehicles" (Oxford Dictionary, 2018), but instead expands its view to the entire mobility landscape. According to Serbinski (2016), mobility defines "technologies and services that enable people and goods to move around more freely". This definition also goes beyond the term 'automotive' and rather incorporates current trends, such as urbanization, sharing economy, on demand, and mobile technology (Serbinski, 2016).

With the aim of gaining a deeper understanding of the sample firms' business environment, interviewed experts were asked to elaborate on the current development of the mobility sector from their perspective, as well as the role of their firm within this field. In total, the experts referred to 11 trends that predominantly affect the transformation of the mobility sector. Thereof, two major trends have been detected, which seemed to influence the development of the market the strongest: Mobility Services, and Digitalization. Additional trends mentioned include the following: Autonomous Driving, Electric Mobility, Connectivity, Artificial Intelligence (AI), Work 4.0, Internet of Things (IoT), Micro Mobility, Industry 4.0, and Smart Home.

In order to facilitate the increasing complexity of players in the mobility sector, the following illustration (Figure 9) depicts four major players that have been derived from the qualitative data material and are all represented by the sample of this study: Traditional Players, New Mobility Players, Adjacent Players, and Digital Players (also see IP20_CN_NP).[7] First, Traditional Players strive for the transformation of their current business model, which usually has a hardware focus, by the aid of new technologies. Representatives of this player type are for instance OEMs in the automotive sector. Second, New Mobility Players make use of new and usually

[7] In order to adhere to the given scope of this work, references to the respective interview partner are displayed by using an acronym. Thereby 'IP' refers to the interview partner, 'GER' represents Germany, 'SV' Silicon Valley, 'CN' China, and 'JPN' Asia. Furthermore, the proposed types of players in the mobility sector (3.2.1) were considered by using the following associations: 'TP' for Traditional Player, 'AP' for Adjacent Player, 'NP' for New Player, and 'DP' for Digital Player.

disruptive technologies to increase the overall efficiency within the mobility sector from scratch. This means that they typically do not need to transform their business model, as they represent rather young firms that, for example, offer an app-based transportation service. Third, Adjacent Players are expanding into the mobility sector in order to add key value to their existing business model. These are firms that expand their original role of a supplier to the role of a hardware manufacturer, i.e. OEM, in certain business areas. Fourth, Digital Players are also entering the mobility sector and are motivated by their data at hand. Mostly, this endeavor is driven by disruptive technologies, such as AI, which is applied in case of autonomous driving. Altogether, it is essential to note that the four mentioned types are not exclusive, as certain corporations might represent several types simultaneously depending on their business model (transformation) stage.

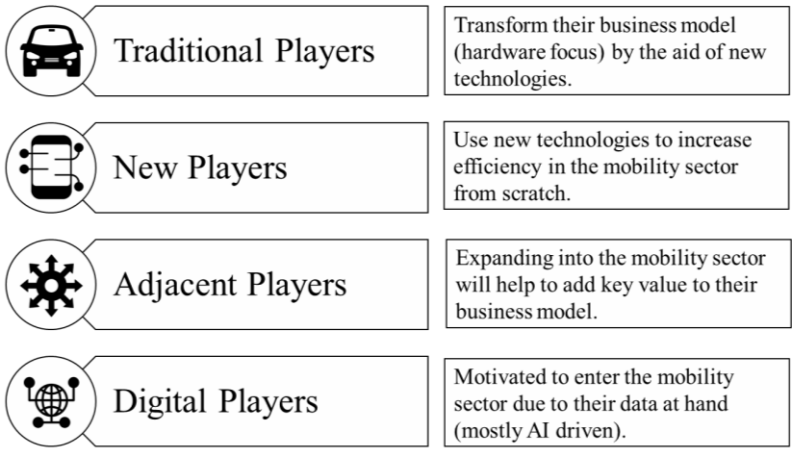

Figure 9: Major players in the mobility sector

Overall, the interviewed experts agreed on firms' current need to adapt their traditional business models due to changing market dynamics. Experts from Traditional Players highlighted this challenge: "We now have announced a company-wide strategy that has the focus to understand the changing needs of our society. Cars are not only used as a status symbol or possession anymore" (IP1_GER_TP). Furthermore, "the market is completely reassembling itself. And of course it's not selective anymore, as we collaborate with our customers. In one area we act as competitors, in another area they represent our customers" (IP6_GER_AP).

In this context, the exploration of new revenue streams, as for instance autonomous driving, have been mentioned: "The next big thing is not the car, it's autonomous driving" (IP13_SV_NP).

Furthermore, several experts emphasized the relevance of changing strategic scope among market players: "All the companies I worked for, it became almost like a random walk through Silicon Valley, but now they are actually coming together. Because now automotive is so much broader" (IP14_SV_TP). In addition, "it's more the trend that companies are diversifying their portfolio in different industries" (IP20_CN_NP).

Another aspect of the mobility sector's assessment incorporated an analysis of strengths and weaknesses of firms' current business models (see Figure 10). In connection with this, interviewed experts highlighted for instance their competence as a volume manufacturer, a well-established brand, an existing infrastructure and ecosystem, as well as available resources as beneficial traits of their current business model. Traditional or Adjacent Players mainly named these aspects, while a New Mobility Player for example referred to a "two-sided market base" (IP23_CN_AP) as a powerful aspect.

On the opposite, mentioned weaknesses for example incorporated a lack in experience when it comes to business model changes and a more holistic view of firms' value proposition in the mobility sector. Traditional Players emphasized their limited speed and agility, while New Mobility Players questioned their sometimes "very chaotic" approach. Furthermore, Adjacent Players that operated in their business online, struggled in dealing with the "real" economy, which operates offline. In addition, another expert from a Digital Player referred to the challenge of finding "hardware and software co-optimized solutions" (IP29_CN_DP).

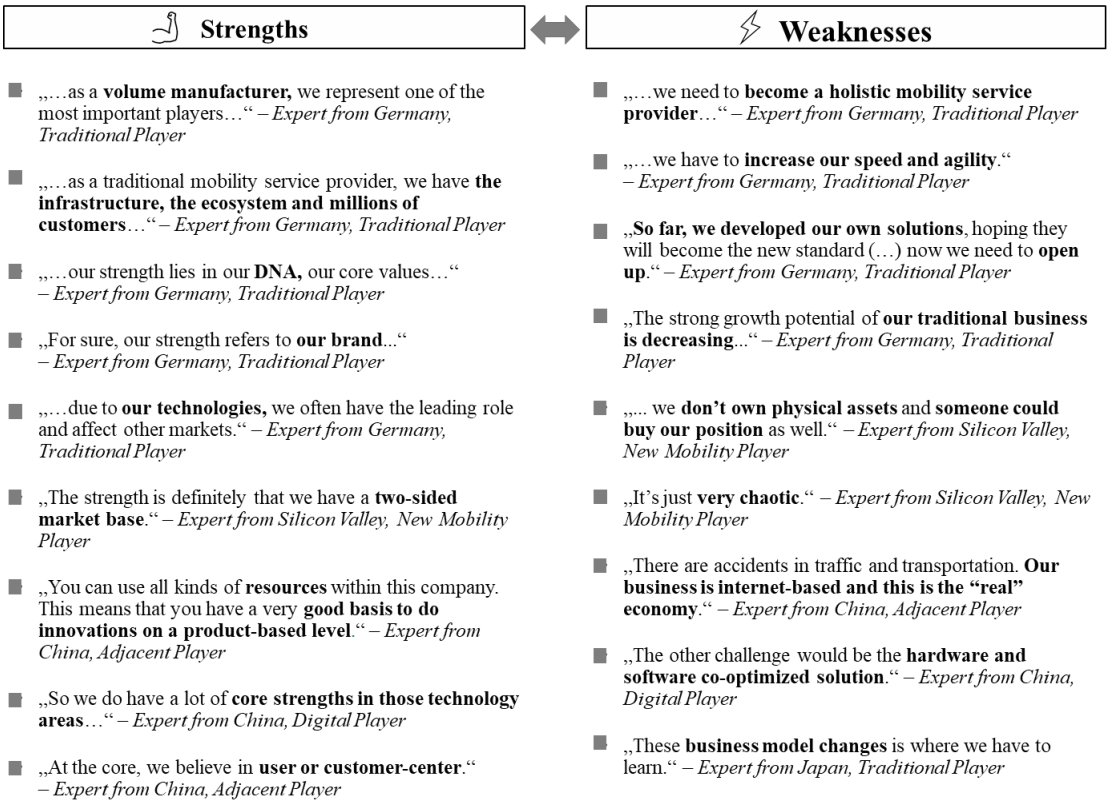

Figure 10: Strengths and weaknesses of current business models

Overall, the initial analysis of the mobility landscape revealed that there seemed to be a tremendous transformation in the entire sector, which made this field a suitable environment for analyzing the proposed research questions. In the following sub-chapters, requirements and success factors for dealing with the mentioned challenges and paradigm shifts were outlined by considering the seven dimensions of a CIS.

3.2.2 Identification of CIS Dimensions

Based on the conducted SLR in chapter 2.4, which introduced the research field of CIS comprehensively, the following section relies on the identified related fields of research in order to determine suitable dimensions of an advanced corporate innovation system for further analysis. Accordingly, the researcher decided to include this part of the SLR results at this point, as it supports the reader's understanding of the subsequent qualitative analysis of this chapter.

Besides a limited number of conducted studies on CIS, the SLR revealed that existing literature on innovation management provides a number of frameworks and approaches on innovation best practice (e.g. Hauschildt and Salomo, 2011; Christensen and Raynor,

2003). Nevertheless, as elaborated in chapter 3.2.1., corporations in the mobility sector are currently facing rapid environmental changes due to digitalization and disruptive business models by new players. In this context, little attention has been devoted to the challenge of successfully transforming a firm's established innovation structures and activities in a holistic and systematic manner. Therefore, suitable dimensions have been identified for analyzing an advanced CIS by fusing best practices in the mobility sector.

Based on Granstrand's (2000) endeavor of defining the initial CIS (see chapter 2), the following five dimensions were proposed: activities, actors, resources, institutions, and causal interrelations. These dimensions refer to different essential sub-systems of the overall framework, such as the actor system. In addition, the 'Star Model' represents another framework, which incorporates recommendations to managers for influencing employee behavior by organizational design choices (Kates and Galbraith, 2007). As a result, recommended policies were based on the following dimensions: strategy, structure, processes, rewards and people. The strategy dimension refers to the firm's goals, objectives, values, and mission, while the structure dimension describes the separation of labor, as well as the use of power and authority within the organization. Furthermore, the process dimension includes the flow of information, as well as tools for integrating information technologies. In general, processes describe the routines by which a firm progresses in its innovation endeavors. The definition of the rewards dimension alludes to reconciling the goals of the organization with its employees' goals. Human resource policies, including recruiting and job profiles, job rotation, training, and development of staff form the people dimension.

According to Sigurdson and Cheng (2001), a CIS requires the following characteristics: organizational ability and strategy, research and development structure, arrangements of advanced learning, association with the public sector, human resource management, a competitive strategy, access to newly developed knowledge and technology, management of intellectual property right, networking ability and strategy, as well as a financing strategy.

Based on the study of Bagno and Cheng (2007), 'intra-organizational innovation systems' are composed of the following six dimensions: strategic adequacy, interpretation of external environment, conception of internal organizational structure,

integration of external structure, systematization of organizational basic processes, consideration of human factors and relationships.

With respect to incorporating the field of corporate entrepreneurship, Ireland et al. (2009) proposed an organizational architecture that includes the following four dimensions: structure, culture, reward systems, and resource set. A firm's structure relates to the setup of communication, workflow relationships, and authority. In connection with culture, the authors for instance describe employees' emotional commitment to the organization. Mentioned reward systems may influence employees' risk taking behavior during their tasks. Last but not least, resources or capabilities increase the potential of exploiting entrepreneurial opportunities within the firm.

Another innovation management framework has been suggested by McKinney (2012), who referred to the four four dimensions: strategy, systems, culture, and ecosystem. According to the author, the strategy dimension includes for example innovation governance, success metrics or the impact of intellectual property (IP). The system dimension addresses for instance innovation processes as well as the management of ideas and information. Relating to the culture dimension, the following sub-dimensions were proposed: employee involvement, education, and training. Finally, the ecosystem dimension describes among others the collaboration with external partners, IP management, and technology scanning.

In this context, several existing studies can be summarized, as they suggested the four same essential structural components of a corporate innovation framework: diverse actors, innovation network, innovation process, and institutions (Van Lancker et al., 2016; Westergren and Holmström, 2012; Chesbrough, 2012). A number of authors highlighting the innovation process as a key factor within a CIS, as it impacts many of the proposed dimensions significantly (e.g. Lee, 2010; Edquist, 2005). In connection with this, four dimensions were connected to innovation processes in the basic literature on innovation management: organizational members, organizational culture, organizational structure, and organizational environment (Britzer, 1990; Thom, 1980; Witte, 1988).

In order to sum up the presented studies on existing CIS approaches, Table 4 depicts seven dimensions that serve as a basis for the following empirical analysis: innovation process, organizational structure, resources, hygiene factors and rewards, people and

culture, strategy and external interaction. By synthesizing existing innovation models, previously scattered perspectives have been merged systematically and represent a foundation for the following empirical analysis. However, as existing dimensions still represent a rather abstract model, this study aims to substantiate the framework by conducting the following empirical analysis.

Dimension	Existing studies (exemplary)
Innovation Process	Van Lancker et al., 2016; Lee, 2010; Edquist, 2005; Granstrand, 2000; Kates and Galbraith, 2007; Westergren and Holmström, 2012; Chesbrough, 2012; McKinney, 2012
Organizational Structure	Kates and Galbraith, 2007; Ireland et al., 2009; Sigurdson and Cheng, 2001; Britzer, 1990; Thom, 1980; Witte, 1988
Resources	Granstrand, 2001; Ireland et al., 2009; Sigurdson and Cheng, 2001
Hygiene Factors and Rewards	Kates and Galbraith, 2007; Ireland et al., 2009; Sigurdson and Cheng, 2001
People and Culture	Van Lancker et al., 2016; Granstrand, 2000; Kates and Galbraith, 2007; Ireland et al., 2009; Sigurdson and Cheng, 2001; McKinney, 2012; Thom, 1980; Witte 1988
Strategy	Kates and Galbraith, 2007; Sigurdson and Cheng, 2001; McKinney, 2012
External Interaction	Van Lancker et al., 2016; Westergren and Holmström, 2012; Chesbrough, 2012; Thom, 1980; Witte, 1988

Table 4: Identified CIS dimensions

The following graphical illustration has the aim to facilitate the reader's memory of the seven CIS dimensions throughout the subsequent chapters of this study (Figure 11). As presented below, the seven dimensions are depicted in a systematic order, which represents a firm's CIS.

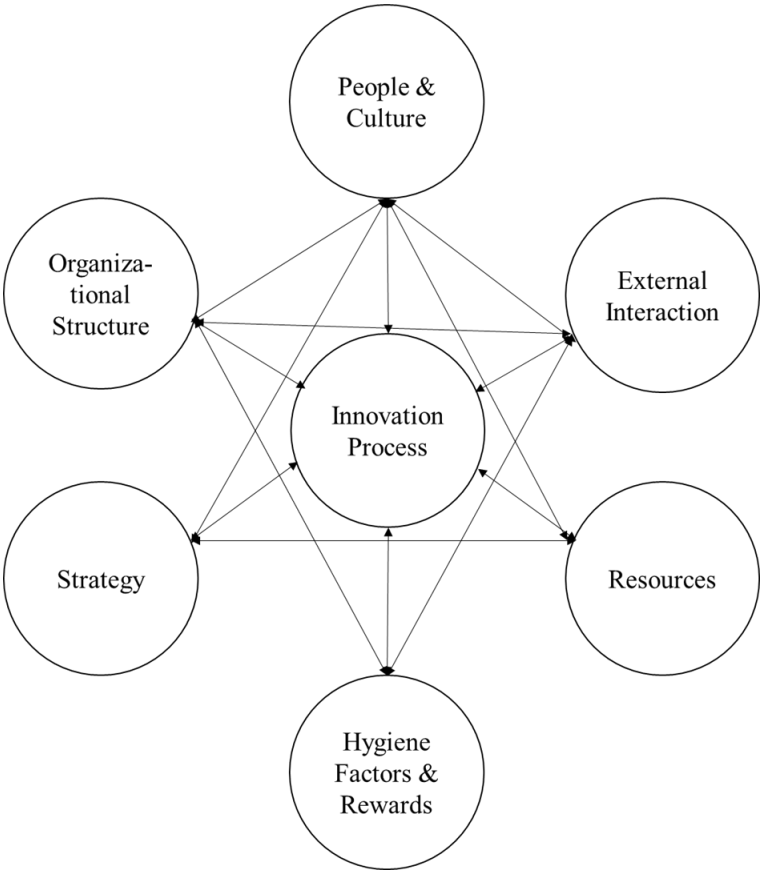

Figure 11: CIS model

Resulting from the conducted SLR, the CIS model incorporates all relevant components of a CIS and the order of each dimension was determined top down by the researcher according to the obtained number of codings (see chapter 3.2.3.) and existing literature. For instance, the 'Innovation Process' revealed the highest number of codings (679) in the qualitative analysis and was also considered as the core element of a CIS by existing studies (e.g. Edquist, 2005). Therefore, the dimension was placed in the center of the CIS model. The 'People and Culture' dimension was ranked second on the basis of obtained codings (568) and also represents a crucial factor in CIS literature (e.g. Bergek et al., 2008; Carlsson et al., 2002), which justified its position at the top of the CIS model. The following section further explains the relevance of defined CIS dimensions according to qualitative findings including their requirements for successful BMI.

3.2.3 Requirements for an Advanced CIS

With the goal of increasing the understanding of identified CIS dimensions and detecting enablers for successfully designing and implementing a corporate innovation system that supports BMI, the following sections provide qualitative insights into the conducted benchmark study of CIS in the mobility sector. Thus, the focus has been on including different innovation types, i.e. BMI, in addition to more traditional approaches to corporate innovation management. In this context, the seven dimensions have been enhanced by 31 sub-dimensions and 150 enablers in total, which were extracted by inductive coding. A detailed description of each dimension will be outlined in the following sections, starting with the 'Innovation Process'.

Innovation Process

As suggested by existing literature (e.g. Edquist, 2005), the qualitative data revealed the importance of the innovation process within the CIS of a firm, which is indicated by 679 codings. Furthermore, five sub-dimensions were identified throughout the analysis: idea generation, validation, development, implementation/go-to-market, methods and tools.

With respect to the initial phase of the innovation process, many Traditional Players supported their idea generation by company-wide innovation challenges, especially to foster corporate entrepreneurship. This challenge-based innovation process was oftentimes conducted by the aid of an internal IT platform "in the sense of challenges that we announce at the central level, but also within the departments themselves" (IP6_GER_TP). Because such a platform requires a dedicated team and significant effort to screen submitted ideas, firms included an evaluation function through their employees, who were able to vote for their favorite idea (e.g. IP12_SV_AP). At the same time, this measure represented a tool for creating a community that fostered cultural change within traditional companies: "You need to build up a community in order to identify those crazy people within the firm (…)" (IP12_SV_AP). Furthermore, a combination of internal as well as external sources was considered important. IP14_SV_TP described for instance that startups in Silicon Valley – "they give you ideas, they give you at least a sense of direction or they give you signals". Another relevant aspect during the idea generation phase referred to an early involvement of the respective target line function, which was supported by IP14_SV_TP: "We are very

driven by a particular goal, we have a revenue model in mind, we have a profit model in mind".

During an initial management evaluation of new ideas, which was essential for all types of innovations and conducted within all types of analyzed firms, IP22_CN_TP from an established digital firm in China recommended the following approach: "Probably you need a pre-evaluation stage where people can make a small investment […] People can apply to the fund for a very small prototype and do the innovation. So you not just evaluate the idea but you evaluate what people have achieved. Probably, this can lower the risk and lower the difficulty for the management to make a decision". A 'New Player' from Silicon Valley described a rather pragmatic approach: "If you can explain it on three pages within six minutes and it makes sense, then you'll get the budget" (IP13_SV_NP). All experts highlighted the need to focus on the customer: "In the beginning is always the customer journey" (e.g. IP8_GER_TP). Apart from that, the interviewed experts addressed the importance of a functional prototype, which served for the evaluation of early-stage innovations in general: "The alpha phase is a first phase at the end of which we want to have a demonstrator of convincing scale (IP16_SV_TP). IP15_SV_DP added: "In the second section we start building first prototypes (…) This is where the best 10% of all the ideas receive resources to proceed". Referring to digital services, "you have to think differently. But technically, there is also the idea to say 'Yes, a proof-of-concept is conducted', where you have built a first prototype, a first software-status with which you can test how it might work – rudimentary" (IP28_JPN_TP). In addition, this initial phase of the innovation process was characterized by a bottom-up approach, which required a high degree of voluntariness (IP22_CN_DP) and usually "it's a very small team. So who is leading is not important. Maybe a low-level guy" (IP23_CN_AP).

According to the considered sample, most companies applied the typical stage-gate innovation process, regardless of what type of innovation they developed. However, "the number of stages depends on the innovation project" (IP11_SV_NP). For digital business models and more radical types of innovations, each gate was suggested to be "more focused in terms of investments – what do you have to invest in which innovation and what's the return" (expert 6). IP12_SV_AP added that for such innovation types, "these stages represent a different form, as you're typically undergoing an internal assessment and the validation is conducted through those presentations and the final

decision". Overall, many experts from Traditional Players struggled to define their business model innovation process, as firms were still experimenting with this type of innovation (e.g. IP1_GER_TP). In contrast, New Players and Digital Players seemed to avoid thinking in terms of processes at all: "Processes slow you down […] I always say, Silicon Valley is like a youth science competition. We take what we have, see what's the outcome and then we make it to the first level to see whether we can make it to the second" (IP13_SV_NP). Resulting from this, a project-specific innovation process was required for the development phase of different innovation types. With respect to the mentioned ideation challenges, the best ideas or projects were usually further executed within internal incubation units or accelerator programs, which will be further explained in the following section. However, IP6_GER_AP pointed out that in order to avoid thinking in silos, "it's all integrated with each other. We just had the case where one campaign was launched by the commercial department, the challenge was open to employees of the [other] department, and the winning idea is executed at the [corporate incubator (CI)], which is operated by the engineering department". Thus, high degrees of freedom as well as a decent tolerance of failures were considered critical (e.g. IP2_GER_TP; IP13_SV_NP). Furthermore, a focus on speed and quick execution was emphasized by all experts, especially in the field of software-related innovations: "Especially when it comes to software services, we cannot wait 18 months for a new product to come" (IP6_GER_AP).

Especially in case of BMIs, the transfer to a line function or founding a separate entity was still associated with a lot of uncertainty for most interviewed experts: "This model we're still defining" (IP16_SV_TP). Nevertheless, in case of an integration of the innovation into the existing corporation, an early involvement of required internal stakeholders seemed essential. Throughout the innovation process, several experts mentioned the importance of advanced innovation tools and methods, such as "Design Thinking" (IP1_GER_TP). In addition, partnerships with universities and research institutions were mentioned to encourage the application of up-to-date approaches: "We have a strong partnership with the D-School at Stanford" (IP17_SV_TP).

Resulting from the presented findings regarding the 'Innovation Process' dimension, the following proposition emerged.

Proposition CIS_IP: Early management approval, investment-based and project-specific quality gates as well as management support for exploration are required within a corporate innovation system that supports the development of new business models.

Organizational Structure

According to the conducted qualitative content analysis and in line with existing literature (e.g. Kates and Galbraith, 2007), 'Organizational Structure' represented a critical aspect within a CIS. Thus, 451 codings have been associated with this dimension, including five sub-dimensions that resulted from inductive coding: legal/organizational embedding, venture capital (VC) arm, corporate incubator [8], accelerator, innovation hubs/labs.

In connection with supporting the (BM) innovation process, many interviewed experts from Traditional Players addressed an organizational embedding by the aid of separate legal entities. This either referred to spinning-out mature innovation projects: "Afterwards, when the projects are mature and sustainable, they graduate and become own separate legal entities." (IP15_SV_DP), or to the environment in which the innovation is being developed from the beginning: "We came to the conclusion that the advantages of a small independent legal entity exceed. You need to be attractive for different personnel, you need higher flexibility and different reporting structures. That's why we chose this path for our corporate incubators" (IP8_GER_TP). However, for such separate innovation units, an independent funding model was considered crucial (IP20_CN_NP). Furthermore, several experts highlighted a required link to their firms' strategic departments when it comes to the organizational embedding of BMI activities: "We have a corporate strategy department, which includes a corporate business model department" (IP6_GER_AP). IP4_GER_TP supports the bundling of innovation

[8] In addition to the presented benchmark study on CIS in the mobility sector, the researcher conducted further analyses on corporate incubation in particular, which were published in a journal article (TIM Journal) and presented at several reputable innovation conferences worldwide (R&D Management Conference, ISPIM, ICE, PICMET). Due to the limited scope of this work, these findings have not been included in the main part of this dissertation. However, interested readers are invited to examine the list of publications from Appendix D.

activities by adding: “New digital topics and disruptive business models are driven in close connection with our central strategy and central research departments” (IP4_GER_TP). In line with this, a close connection to the board of management was considered decisive for (BM) innovation activities and experts for instance referred to their “Chief Digital Officer” (IP9_GER_TP) or their “Chief Technology Officer” (IP16_SV_TP) as important stakeholders. Altogether, an autonomous setup was crucial for any innovation activities in order to allow for more freedom to explore new topics (IP12_SV_AP) or to “not disturb the traditional business” (IP24_JPN_TP).

With respect to the development of new business models and more radical types of innovation, many analyzed companies set-up dedicated entities, such as corporate incubators, accelerators or venture capital units. In this context, several interviewed experts revealed that their VC activities oftentimes focused on series-A ventures that “are developing technologies that we feel are going to be beneficial to (…) our core” (IP17_SV_TP). Besides a focus on external ventures, the admission of internal spin-offs was highlighted in order “to make the company dynamic” (IP19_SV_TP). This aspect was supported by IP17_SV_TP, who described his firm’s VC arm as “a mix between a corporate venture fund and a regular venture fond”. In sum, VC entities acted as an instrument for strategic partnerships for instance to expand to new markets (IP21_CN_AP) or to invest in firms that offer technologies with a high relevance for current or future business endeavors (IP16_SV_TP).

According to the interviewed experts, a corporate incubator represented an approach to enhance corporate entrepreneurship and company building (e.g. IP2_GER_TP, IP29_CN_DP, IP15_SV_DP). The utilization of agile methods played an important role: “Incubation is really important, how do you use agile methodologies, how can you be lean and prototype and test ideas and start to grow those. And then a real go-to-market launch unit that takes those incubated concepts and gives the right business structure and the right back-office support to bring those to market.” (IP17_SV_TP). In this context, approaches concerning the responsibility of such an entity differed among the analyzed firms, as IP3_GER_TP described for instance: “Each division has an incubator where they play a lot with business model innovations and not with technological innovations, which is rather located in the division of Corporate Technology”. Two experts highlighted a stringent incubation process as a critical

success factor for corporate incubation (IP7_GER_TP, IP8_GER_TP). However, the concept of a corporate incubator will be outlined more in-depth in chapter 6.

Accelerator programs typically represented an instrument for open innovation, as firms "try to attract external startups" (IP9_GER_TP) through various "Call for Startups" (IP9_GER_TP) per year, which usually related to a specific field of interest. Such programs were often established in cooperation with external partners, as addressed by IP2_GER_TP: "For the topic of new digital business models, we are docked to the […] Accelerator". This program had the benefit of advising the participating startups over a period of several months from a corporate-internal as well as an external perspective (IP2_GER_TP). After the acceleration phase, several exit options were suggested: "Either, for example in the B2B area, we assign these firms within the scope of service or cooperation agreements or we further support the topic through an investment" (IP2_GER_TP). One corporation stood out by attaching their accelerator tenants to their core business in a mutually beneficial way, i.e. by providing their software and cloud services for free during the program, which encouraged the startups to maintain the usage of their technology afterwards as well (IP22_CN_DP).

In addition to these initiatives, most corporations experienced an increasing diversification of their innovation activities across the firms' divisions (e.g. IP8_GER_TP, IP20_CN_NP, IP9_GER_TP). In line with this, IP1_GER_TP emphasized that it was essential to establish a balance between "fixed structures that are managed top-down and at the same time you need enough freedom also for small business units to deal with these new types of innovation at their own pace". For dedicated innovation hubs, adequate resource allocation (IP1_GER_TP), a leadership with a corporate background (IP16_SV_TP), a long-term disruptive focus (IP27_JPN_TP), as well as physical separation in proximity to the parent company (IP12_SV_AP) were named as essential success factors. However, in contrast to established firms, many younger players especially from Silicon Valley, shared that they "don't have particular departments for innovation" (IP13_SV_NP) and "no special focus on business model innovations" (IP18_SV_NP). Departmental thinking seemed counterproductive to them, as they believed "we are all innovators. I don't think it makes sense to have a separate innovation team" (IP15_SV_DP). Altogether, both approaches were aligning, as established firms were broadening their innovation activities to enable company-wide innovation endeavors similar to younger firms from

Silicon Valley. Nevertheless, IP7_GER_TP pointed out that it might represent a challenge to monitor such a vast innovation spectrum with increasing complexity across all divisions: “I would say, we know half of them, a quarter might be relevant for us and the other half is hopefully not as relevant for us” (IP7_GER_TP).

Following the described results of the qualitative content analysis for the ‘Organizational Structure’ dimension, the second proposition emerged:

Proposition CIS_OS: An autonomous setup with policies independent from corporate reporting structures is required for a corporate innovation system that supports the development of new business models.

Resources

Resulting from the qualitative content analysis, 346 codings have been associated with corporations’ required resources for business model innovations. Thereby, the following six sub-dimensions were identified: internal stakeholders, financial resources, knowledge, physical space, technology, and data.

In line with the resource-based theory (Barney, 1991), several interviewed experts revealed that BMIs require a particular resource-set other than traditional R&D-based innovations, which was supported by IP8_GER_TP: “I believe what’s being underestimated is that when you build up a new business model, you are building up a completely new business. And at least during the ramp-up phase, you have a higher demand for resources, especially in terms of people who implement this new business model. (…) So business model innovations are very resource intensive.” Furthermore, “when you look at business model innovations, you need another type of innovation managers, who are able to deal with a broader spectrum of topics and thinks more like an entrepreneur” (IP7_GER_TP). With respect to internal stakeholders, an increased need for cross-departmental and cross-functional collaboration was addressed for instance by IP2_GER_TP: “We moved away from the classical logic of standalone business units, which would not work for us”. In this context, two important approaches were named: ‘Social Collaboration’, which enables worldwide networking across hierarchies, as well as ‘Radical Collaboration’, which fosters a maximum of transparency among divisions (IP6_GER_AP). However, “finding the right people within the organization is the tricky part” (IP16_SV_TP), which requires support in

identifying suitable internal stakeholders. Thus, IP29_CN_DP recommended "to stand high so that people can see what you are doing and know what you can deliver". Another critical aspect referred to a flexible allocation of internal capabilities: "It's easier to think in terms of the capabilities that we have and push those rather than assigning a particular person to that" (IP14_SV_TP).

Besides human resources, financial resource allocation has been identified as a critical requirements for successful BMI, as stressed by IP15_SV_DP: "In general, there are no borders at […] except for money. So everybody can have ideas and share them, however the potential has to be high enough to get the right amount of funding". According to IP6_GER_AP, upfront investments are particularly relevant for software-related innovations: "For software business, sometimes several millions of upfront investment are just needed. And up to now, the old business always financed the new ones ad hoc. This is where we need to change our way of thinking". Supporting this aspect, IP14_SV_TP claimed: "With software you can get something done in 12 weeks. So again, it comes back to that original flexibility, where you need to fund things quickly". In order to provide sufficient financial resources for high-potential innovation projects, the interviewed experts' recommendations were twofold. First, several firms implemented special innovation funds that were dedicated to supporting new business endeavors or prototyping selected ideas (IP4_GER_TP, IP22_CN_DP). Second, business units were required to hold back a flexible proportion of their budget for innovative ideas and new business models so that they could learnhow to react quickly to changing market dynamics and operate within an entrepreneurial approach (IP8_GER_TP). Nevertheless, the allocation of financial resources still required a top-down approach (IP15_SV_DP, IP26_JPN_TP). In line with this, IP15_SV_DP shared: "There is one equation… potential divided by investment. The higher the potential or a new business, the higher the investment in resources. You have to play with that balance".

Furthermore, IP3_GER_TP emphasized that "you need knowledge transfer, you need crowd-sourcing and decentralized networks for this type of innovation." Therefore, an increased diversity of knowledge and capabilities was addressed by IP15_SV_DP: "We also have a lot of diversity and people always switch between projects. (…) We have people from different backgrounds, different cultures, different expertise and gender. That's very important, because they all have so much to tell and so much experience

within different fields and different perspectives." In order to enable such a transformation, IP29_CN_DP explained that "we have more than 3000 research and development employees (…) and they get some mini MBA coaching so that they focus more on the business transfer". However, solely internal knowledge was not sufficient, as IP19_SV_TP mentioned: "That's the reason why we have 'Partnerships and Ecosystems', because based on the know-how you can't just do it by yourself anymore. (…) At the end of the day, it's not about super investments in startups, it's about finding the right intelligence for your path". Overall, IP7_GER_TP recommended a system perspective for being able to handle the increasing diversity and complexity of knowledge within a corporation.

Another required resource that was mentioned by the interviewed experts referred to physical workspaces, which needed to be "more open and more collaborative" (IP17_SV_TP). Especially in Silicon Valley, cubical offices and departmental structures were avoided with the aim to support cross-departmental and cross-functional collaboration within the firm (IP13_SV_NP). Traditional Players devoted a lot of attention to creating a non-hierarchical and creative work environment as well (IP6_GER_AP).

In addition, several experts agreed on the need of combining technological capabilities with business model innovations: "So certain things that come out of a business model innovation cannot be realized unless you have a certain technology. And certain technologies enable business model innovation" (IP14_SV_TP). With respect to external resources, a statement from IP6_GER_AP also highlighted the relevance of technology: "The most successful startups emerge from technical innovations and often represent university spin-offs – worldwide. That's a strong learning that I gained during the past five years or so". Resulting from this, it seems crucial to address the advanced technological range by enabling close collaboration between both entities and by strengthening internal technology-driven competencies. Apart from technology, data also played a significant role for BMIs, as they provide additional value (IP9_GER_TP) and opportunities to access to new markets (IP29_CN_DP).

Subsequent to the presented findings relating to the CIS dimension 'Resources', the following proposition emerged:

Proposition CIS_R: A high resource capacity with stakeholders of various backgrounds as well as flexible financial resources are required for a corporate innovation system that supports the development of new business models.

Hygiene Factors & Rewards

In accordance with the two-factor theory of Herzberg (1959) as well as statements of many interviewed experts, who claimed that people represented the most important resource for BMIs, hygiene factors and rewards were associated with 165 codings of the analyzed material. In connection with this, three sub-dimensions were detected: monetary rewards, intrinsic rewards, and HR policies.

From the expert interviews, the following approaches to rewarding employees emerged: extrinsic and intrinsic rewards. With respect to extrinsic rewards, a flexible remuneration was believed to motivate talents in the software field in particular, as they were considered essential to digital business model innovations: "These people are not typically the ones who follow a career path in the automotive industry. And there you need a higher flexibility. In Germany we are very restricted, which is okay, but within this disruptive market with new IT talents you need a more flexible approach to remuneration" (IP8_GER_TP). In line with this, career opportunities were also named as a crucial driver for promoting employees' entrepreneurial activities (IP21_CN_AP). Firms in Silicon Valley oftentimes connected rewards and incentives to financial returns of shareholding: "In general, our goal is to actively participate in the equity market. (…) That's your engine. You have a much higher identification with your company, when you receive shares, as you want the company to grow" (IP13_SV_NP). Furthermore, increasing motivation by an individual bonus linked to one's personal development was described by IP16_SV_TP: "We also have KPIs to measure our performance, but now part of our performance evaluation is whether or not we achieve our personal goals and this is linked to our bonuses. (…) It's going to be on your job and then there is also a part on things that you want to work on for yourself, which you define with your manager. For example this quarter I want to learn German or I want to train for running a marathon". Experts from traditional players in Germany were

rather hesitant with respect to monetary incentives. However, IP9_GER_TP shared that the providing financial resources for prototyping was considered a very effective tool to foster corporate entrepreneurship.

In total, most experts shared the opinion that extrinsic incentives should always be combined with intrinsic incentives for employees to foster innovation. Thus, IP5_GER_TP explained: "I'm not a friend of financial incentives, as this can only be a short-term motivation in my opinion". Therefore, IP6_GER_AP addressed a stronger focus on team or company goals, instead of individual goals, as a basis for transforming an organization towards more BMI activities. Another essential aspect referred to the importance of appealing and more flexible working conditions in the context of corporate entrepreneurship (e.g. IP5_GER_TP, IP13_SV_NP, IP10_SV_TP). Being able to work on "cool topics" (IP5_GER_TP) and to present their ideas "to a large number of peers or to top managers, which has been impossible in the past" (IP12_SV_AP), represented some relevant examples of intrinsic employee motivation. Furthermore, firms needed to "create an environment where you feel safe enough to have ideas and develop innovations without having someone saying *"That's garbage"* – this is essential" (IP13_SV_NP). Along with these requirements, supportive leadership was highlighted by several experts as a key factor, which increases the success rate of business model innovations. (IP7_GER_TP, IP6_GER_AP). If such leaders recognized their function as role models, they had the potential to highly encourage their employees (IP22_CN_DP). Furthermore, several interviewed experts mentioned the term 'holocracy', which incorporated providing a "reasonable amount of freedom" (IP27_JPN_TP) to employees to "work on topics independently where they see added value for the business" (IP6_GER_AP). Apart from that, a broad communication of success stories (IP14_SV_TP), as well as creating internal innovation awards to outstanding corporate entrepreneurs (IP6_GER_AP, IP17_SV_TP) were emphasized for increasing intrinsic motivation.

In order to provide the suitable environment for people to engage in BM innovations, several measures relating to HR policies were proposed. In general, a higher degree of flexibility seemed to be required with respect to career opportunities that are moving away from traditional career paths within the same company (IP6_GER_AP) and working conditions, such as home office or adjustable working hours (IP13_SV_NP). Moreover, an early definition of working models was needed for those employees who

were involved in the mentioned innovation challenges and incubation programs and therefore had to balance their line function with the promotion of disruptive projects. In this context, various interviewed experts shared their experience with the concepts of temporary release and reassignment: “We collaborate closely with HR, especially for getting people out of their line function. (…) You can do a sabbatical when you’re pregnant, so we do have the required HR processes at hand that release people from their departments temporarily. So I ask myself: Why can’t we use these processes to release people for innovation projects?” (IP9_GER_TP). However, there was no consensus regarding the amount of time that should be dedicated to special BMI activities, ranging from “we believe that you have to do it 100% or not at all” (IP2_GER_TP) to “we reduce their daily workload to 60% and the remaining 40% are available to work on their ideas” (IP4_GER_TP).

Following the presented findings for ‘Hygiene Factors & Rewards’, the depicted proposition emerged:

Proposition CIS_HR: A strong focus on intrinsic motivation and flexible working conditions are required for a corporate innovation system that supports the development of new business models.

People & Culture

As addressed by existing literature and the analyzed qualitative material, ‘People and Culture’ represents a highly relevant dimension of a CIS, which was supported by a number of 568 codings. Throughout the analysis, the following five sub-dimensions emerged: organizational culture, actors/roles, qualification, involvement of employees, and communication.

With respect to a firm’s required organizational culture for an advanced CIS, interviewed experts recommended to re-active their employees’ entrepreneurial spirit by referring to the original innovation DNA of their organization: “We are an engineering company that was founded by an engineer who innovated something (…) accordingly, you always have to find a way to re-invent yourself by working at the pulse of time” (IP3_GER_TP). This aspect was also emphasized by IP8_GER_TP: “When you work for a pioneer, it would be nice if you’re creative yourself and I think this DNA is something you can easily explain to your employees”. Furthermore, easy

and direct access to the firm's leadership is considered critical for pushing the development of new business ideas within the company: "These traditional hierarchies where you have to move your way up to present something (…) – here we don't have that. You just walk over and talk to [the manager]" (IP13_SV_NP). In general, a change in peoples' mindset towards more entrepreneurial thinking seemed very important, as interviewed experts noticed "a huge gap between the Silicon Valley mindset and the mindset of traditional OEMs" (IP11_SV_NP). This 'Silicon Valley mindset' was explained by IP13_SV_NP: „The only boundaries are physical boundaries, also for large companies. If it's not possible physically, then they will accept it. If someone just says, *'It's not possible.' – 'Why?' – 'Because I've never done it before'*, these are no valid criteria". One instrument for supporting such a desired mindset referred to the aforementioned idea challenges that "have the focus to change our culture instead of bringing up great ideas. And that change will automatically lead to new business models" (IP19_SV_TP). In this context, IP9_GER_TP highlighted the need to encourage employees to include a business perspective, particularly in an engineering driven environment – "that they consider things like desirability and viability from the beginning and not just think about feasibility". In addition, IP6_GER_AP demanded "a lust for top performance" not only from employees but also from their managers, whereby they needed to accept failures (IP2_GER_TP, IP21_CN_AP). Furthermore, IP6_GER_AP elaborated that that 'Shared Leadership' or 'Servant Leadership' represented approaches that described the opposite of "command and control", which at the same time incorporated "more discipline, more communication within the teams" and the suitable environment. In case of firms with a more traditional mindset, several experts proposed a target group-specific cultural transformation from bottom-up, where you need to "explain the goal and why these changes are necessary (…) and what every single one of them can contribute" (IP1_GER_TP). IP19_SV_TP added: "We do it step by step. We do it with our speed, so people won't get hurt". In order to convince critics, IP4_GER_TP suggested to "take the criticism seriously and just try the new approaches together with them 'live and in color'". Thereby, a focus on motivated employees was highly recommended, as for instance described by IP22_CN_DP: "The critical thing is your self-motivation, how much you want [to develop] your innovative idea, how much you want to change the world (…) If people want to make it happen, they will find a way and the resources. And even if you have all the processes and structures to stop them from finding support, they will find a way." IP4_GER_TP supported this view by

adding: “The intrapreneurship bootcamp is a way to enable motivated employees to work on new topics (…) because we need exactly those people, who just want to work on a problem, solve the problem and create a value added for the company, regardless of their title and hierarchy”.

Apart from that, the analysis also revealed the need for specific roles for developing BMIs within a firm. When asked about the relevant roles for BMI within a company, the interviewed experts named the following: “idea scouts” (IP6_GER_AP, IP7_GER_TP, IP15_SV_DP), “mentors” (IP29_JPN_DP), “energizers” (IP6_GER_AP, IP10_SV_TP, IP17_SV_TP), “innovation managers” (IP5_GER_TP, IP6_GER_AP, IP9_GER_TP, IP10_SV_TP), “sponsors” (IP3_GER_TP, IP9_GER_TP, IP26_CN_TP), “experts” (IP15_SV_DP, IP26_JPN_TP), “a board member responsible for innovation” (P3_GER_TP, IP18_SV_NP, IP19_SV_TP, IP23_CN_AP), and “intrapreneurs” (IP7_GER_TP, IP22_CN_DP). Furthermore, interviewed experts deemed it crucial to provide an adequate training to employees who are developing business model innovations. For example, project-based training (IP2_GER_TP, IP5_GER_TP) in fields such as “user experience, big data, etc.” (IP1_GER_TP) was requested. IP9_GER_TP described that his firm offered a specific training concept including a toolset for business model innovations to its employees, which included for example “business thinking, system thinking, design thinking, and innovation leadership” and was enhanced by a catalyst network in order to spread the learnings across the entire company. Besides general expertise, the need for a wide range of capabilities was addressed (e.g. IP15_SV_DP) and software-related skills that could not be obtained through standardized workshops were considered decisive in times of digital transformation of business models: “In software, there are these superstars, who are coming up with these new crazy ideas that demand two or three, maybe four times average salaries, but they produce more than ten times than average. So you need to be willing to pay them that much“ (IP14_SV_TP).

Another expert proposed that “it’s healthy to give all employees an opportunity to participate” (IP17_SV_TP) in a firm’s innovation endeavors. Most interviewed experts from all regions supported this point of view and IP10_SV_TP pointed out: “New products no longer have to be developed by engineers; every employee no matter what background can be involved or even lead the development”. With respect to digital transformation, IP22_CN_DP highlighted: “It’s an internal marketing thing. (…) You

need the organization to have some alignment, a shared vision. You cannot say 'I work for the core business, so I'm not an entrepreneur, I'm not an innovator.' And other people 'Oh they are innovators'. (…) they share different types of work" (IP22_CN_DP). In line with this, the personal ownership of idea generators (e.g. IP12_SV_AP) and the possibility for them to temporarily support disruptive projects (e.g. IP3_GER_TP, IP4_GER_TP) were described as decisive factors.

Finally, non-hierarchical and direct communication was considered critical for transforming a firm's BM (e.g. IP26_JPN_TP), which "requires a certain social competence of managers" (IP1_GER_TP). By company-wide education and storytelling through role models, success stories were shared to inspire others (IP3_GER_TP) and to involve all required stakeholders (e.g. IP7_GER_TP).

After the elaboration of conducted findings regarding 'People & Culture', the following proposition emerged:

Proposition CIS_PC: A risk-tolerant organizational culture enabled by strong leadership support and a diverse skill-set are required for a corporate innovation system that supports the development of new business models.

Strategy

The 'Strategy' dimension was referred to extensively throughout the collected qualitative material, which is depicted on the basis of 355 codings. Resulting from the conducted qualitative content analysis, extracted sub-dimensions included strategic objectives, performance measurement/reporting structure, IP and patent management, as well as leadership.

With respect to defining strategic objectives for a sustainable and dynamic business model, a combination of hardware and software-based services represented the target of many analyzed firms: "Not just hardware, but also offering services to the customer 'How can I get from A to B the fastest with different modes of transportation'" (IP8_GER_TP). This aspect was also addressed by IP23_CN_AP: "We have the high frequency business. So we have the traffic, we have the user. We can guide them to the low frequency business. (…) That's the logic of our whole business model. Those businesses… if you ran them independently, it's very difficult to make money and to

attract enough users" (IP23_CN_DP). Thereby, a stringent focus on selected strategic issues while remaining prepared for unexpected shifts was considered crucial according to IP8_GER_TP: "With respect to a successful transformation, I think it's essential to focus on major topics. And in this context you certainly have to count on 10-15 topics that need to be pursued rigorously. You need to focus on these 15 topics and employ your resources accordingly. Still, you need to remain flexible, as 5 of these topics might be a failure and another 5 topics have not been on your radar". This challenge was furthermore intensified by an increasing complexity of relevant strategic issues (IP7_GER_TP). The strategic dimension of analyzed corporations often incorporated company-wide initiatives with the objective to transform the current business: "We now have this companywide strategy 2025 that strongly seeks to understand changes in society that have an impact on our business model" (IP1_GER_TP). Another expert shared: "What's new now is that we are developing a holistic strategy that enables digitalization and innovations not only from our business units but companywide" (IP2_GER_TP). In accordance with all interviewed experts, BMIs and all innovations in general had to have a link to the existing core business: "All innovation projects must be fundamentally important for the core business of the company. […] We don't have the time or the energy to focus on topics that don't improve our core business" (IP11_SV_NP). Compared to established firms, new entrants in the field or younger firms first need to focus on establishing their BM instead of transforming it. However, detected examples of BMIs in established firms revealed that their strategic focus also lies within the range or close to their current core business. This might be based on the hurdle of convincing sponsors of investing in more radical innovation projects within the corporation.

In addition, a framework for BMI also requires adaptation of existing reporting structures, which was explained for instance by IP22_CN_DP: "If you just start into a very new business or sector, that means you cannot rely on any previous knowledge (…) there are no benchmarks, no KPIs." IP7_GER_TP supported this point of view by sharing: "Above all, we need a different attitude or a different value system and different KPIs for managers. If I get evaluated based on my contribution to [the next car model], I make other decisions compared to an evaluation based on the number of active users I attract to a platform within a couple of years. Then I make other investments" (IP7_GER_TP). However, IP25_JPN_TP stressed that a certain reporting

structure reflected the attention that the management devoted to the respective innovation in front of internal stakeholders. Instead of focusing on traditional KPIs, such as the return of investment (ROI), the market potential of a BMI seemed to represent a more suitable example for performance measurement (IP3_GER_TP, IP15_SV_DP). In connection with this, several experts (e.g. IP9_GER_TP) recommended relying on qualitative performance indicators, which was explained by IP23_CN_AP: "It's more just a feeling; they have a lot of experience". Thereby, "you should evaluate how much risk you can afford" (IP22_CN_DP).

In connection with IP and patent management, increasing complexity was associated with the field of software-related business model innovations: "Especially in the field of IT those are no easy topics – who is the master of data" (IP6_GER_AP). In addition, IP19_SV_TP pointed out regional requirements: "The issue with software innovations and most of them are very digital – when you talk about business models, you cannot patent anything anymore. This means, the probability of copying is extremely high… Software patents only exist in the USA, not in Europe". Another essential aspect referred to partner-specific NDA processes, as elaborated by IP14_SV_TP: "We have the legal part, which is the NDA, but then honestly to a larger extent it's very personal again, because they are startups, you end up talking person to person rather than from corporation to corporation."

Apart from that, all interviewed experts highlighted the required commitment of firms' executives to "truly innovate and to truly be this disruptive" (IP17_SV_TP). Thereby, the empowerment and protection of the C-level (IP6_GER_AP, IP20_CN_NP), as well as their function of challenging proposed BMI projects (IP12_SV_AP, IP13_SV_NP) were mentioned as essential success factors. After all, the decision-making of a firm's strategic scope and business model transformation belongs to the top management: "New services should not be introduced to the market without the board knowing about it" (IP5_GER_TP). At the same time, the leaders had to take responsibility for initiating a successful transformation, which was addressed by IP8_GER_TP: "It's the responsibility of an executive, to remind employees permanently of lifelong learning (…) and to exemplify and demonstrate the fun of change. And I believe there is certainly still a need for action."

Following the presented findings, the subsequent proposition emerged for the 'Strategy' dimension:

Proposition CIS_S: An adapted performance measurement based on qualitative factors as well as a company-wide commitment to innovation grounded in the strategic portfolio process are required for a corporate innovation system that supports the development of new business models.

External Interaction

In accordance with the open systems theory (Christensen, 1997), the interviewed experts highlighted the importance of a close interaction with the external innovation ecosystem, which was indicated by 392 codings for this CIS dimension. Thereby, the following sub-dimensions emerged: partners, partner selection, type of collaboration.

With respect to required external partners for BMI, various stakeholders have been mentioned: university cooperations (e.g. IP1_GER_TP, IP17_SV_TP, IP25_JPN_TP), accelerator platforms (e.g. IP2_GER_TP, IP8_GER_TP), venture capitalists (e.g. IP2_GER_TP), startups (e.g. IP15_SV_DP, IP21_CN_AP, IP29_CN_DP, IP7_GER_TP), political institutions (e.g. IP5_GER_TP, IP23_CN_AP), customers (e.g. IP5_GER_TP, IP6_GER_AP), technology partners (e.g. IP5_GER_TP, IP7_GER_TP), consulting firms (e.g. IP12_SV_AP), (marketing) agencies (e.g. IP12_SV_AP), consortia (e.g. IP17_SV_TP), OEMs (e.g. IP8_GER_TP, IP11_SV_NP, IP19_SV_TP), and medium-sized firms (e.g. IP12_SV_AP, IP16_SV_TP, IP28_JPN_TP). In connection with the selection of suitable partners, firms located in Silicon Valley seemed to prefer established corporate partners for their innovation projects: "We don't need technology in most cases. Also startups have limited resources, that's why we usually work with large international companies. The advantage is that they have a lot of resources, they already have a big network, they know the industry and they have deep knowledge about their products" (IP 15_SV_DP). The expert added that the criteria for external partnerships were the following: "It has to be a solid company, international, and the culture has to be compatible with ours" (IP15_SV_DP). Without referring to a specific company size or type, IP13_SV_NP highlighted a compatible mindset, as well. However, IP18_SV_NP elaborated on challenges that often emerged with such collaboration models: "It is often hard to collaborate with external partners,

as they struggle with meeting our tight internal deadlines. Therefore, we prefer to do as much as we can internally". In contrast, 'Traditional Players' often named startups as important partners for the development of digital business models: "Partnerships with startups in innovation ecosystems, like Silicon Valley, Shanghai, Tel Aviv, or Munich, that have technologies that we need" (IP3_GER_TP). Another expert revealed: "We look at the startup scene, as they provide us with good ideas. To some extent they also have skills that we are not able to build up within a short period of time" (IP2_GER_TP). However, the expert added that "I find it just as interesting to look at other established corporations, as startups have great ideas but still need to prove that they are able to survive in the long-run" (IP2_GER_TP). For BMIs in particular, the interviewed experts pointed out the need for a diversified scope of external partners, which was addressed by IP8_GER_TP: "In case of business models, you need to enter totally different cooperation.(…) This refers to the issue of cooperation capability or the willingness to cooperate with various players and eventually various industries." This point of view was supported by IP 12_SV_AP, who claimed that "if you have a traditional project, you just have less partners on board and I guess if you have a very progressive innovation project, you typically get more partners on board – or we would have more partners on board in order to increase our speed." IP15_SV_DP also shared unique requirements for BMI: "Nothing is standardized, there are always new collaborations for each project and there has to be a win-win-for both sides."

Altogether, the interviewed experts recommended the definition of more flexible and partner-specific collaboration models for BMI activities. In this context, IP20_CN_NP depicted the following scenario: "I brought up an idea that can solve the problem. (…) But I think that [the corporation] doesn't want this, because it's not the traditional way they would work with. It's a team of 3-4 founders from different industries. (…) And they have worked on something similar before that [the corporation] wants to do, but they are not a startup in A-round funding with a prototype." In addition, IP14_SV_TP stressed the need for an adapted terminology for certain partners: "It drives me crazy when my colleagues back in [headquarter] use the word supplier with startups. Because a supplier to me is someone who has been working with you for the last 10, 20, maybe 30 years (…) It represents a very well established relationship in the traditional business model. Startups are scruffy little things that have the idea that we need to help them grow and bring them into the supply chain. (…) From a startup what you can get are

radical ideas that can really transform your business. When a traditional supplier brings something to us, it's three years later to the original idea and all the other OEMs have seen it already." Resulting from this, dedicated interfaces and transparent objectives are necessary, especially for collaboration with startups. In connection with this, existing regulations for IP management and compliance were required to allow for a more flexible and open interaction with the external ecosystem (e.g. IP6_GER_AP). IP9_GER_TP explained: "People are often scared. We may not open up to the outside because of IP – this often represents a roadblock".

Furthermore, the interviewed experts described the nature of collaboration as different for BMI. Oftentimes, collaborations were preferred compared to acquisitions (IP15_SV_DP), especially in case of startups. IP8_GER_TP emphasized this aspect by stating: "Our learning is that you don't have to buy a firm in a first phase. It's actually about figuring out how it works with smaller startups." However, besides strategic partnerships, acquisitions had the potential of speeding up the BMI process significantly (e.g. IP19_SV_TP, IP23_CN_AP, IP11_SV_NP). Larger corporate partners typically served for jointly defining industry standards in form of consortia (IP3_GER_TP, IP17_SV_TP). Due to the aforementioned resource-intensive nature of BMI, several experts referred to collaboration with external partners for supplementing the lack of resources (e.g. IP5_GER_TP, IP12_SV_AP). Especially the early prototyping stage was characterized by a strong demand for external partnerships, where quick and easy access was decisive (e.g. IP28_JPN_TP, IP29_CN_DP). The Silicon Valley region was expressly associated with a high concentration of collaboration. However, IP12_SV_AP highlighted that initial meetings or conversations at networking events immediately had one clear goal: "'Can you offer value added to my business now or not?' (…) It has to be clear that this will lead to money quickly". In contrast, experts from Traditional Players emphasized the increasing importance of 'Social Collaboration', which described an "altruistic way of thinking", and getting involved in the bigger picture without knowing the benefit right away (IP6_GER_AP). Furthermore, IP17_SV_TP shared that collaboration among satellite offices from established firms generated more opportunities than their parent companies' usual cooperation activities and sometimes even led to projects that would otherwise never have been initiated between both firms.

After the described findings for the ‘External Interaction’ dimension, the following proposition emerged:

Proposition CIS_EI: Flexible collaboration models and project-specific external partners are required for a corporate innovation system that supports the development of new business models.

Resulting from the presented qualitative findings, the following section has the aim to further discuss the mentioned issues including implications for research and practice.

33 Discussion

Considering the lack of research in the field of CIS and the emerging need of firms to transform their business models due to paradigm shifts in various markets, the purpose of this benchmark study was to explore the required CIS for the development of new business models and advanced innovation management approaches. Therefore, precise requirements for BMI and the necessary corporate environment for advanced innovation activities were detected based on practical lessons learned from diverse (BM) innovation experts across the world. In order to address this complex problem statement, seven CIS dimensions have been defined based on underlying theoretical models, such as the initial endeavor of defining a CIS by Granstrand (2000) or existing studies in the field of corporate entrepreneurship (e.g. Ireland et al., 2009). The dimensions include the following: Innovation Process, Resources, Organizational Structure, Hygiene Factors and Rewards, People and Culture, Strategy, and External Interaction. With the aid of n=29 expert interviews that were conducted with senior innovation managers of worldwide leading innovative firms in the mobility sector, current challenges and trends in this field have been revealed, and were followed by a closer examination of requirements for BMI along the pre-defined CIS dimensions. Resulting from this analysis, detected findings enable innovation managers to rethink and adapt their firm’s present innovation system from a holistic point of view. Furthermore, the initial research question was answered comprehensively and presented results include relevant propositions that provide a basis for further research to build upon. For instance, future research might utilize the suggested CIS framework in order to analyze further industries or particular regions. Moreover, while the presented propositions provide a holistic point of view on requirements for BMI within

a corporate setting, additional studies might focus on an operative level of analysis by examining the dimensions for innovation projects or from the perspective of certain roles within the CIS.

The selected research approach seemed suitable for analyzing the mentioned research question. As both research fields, i.e. studies on CIS and BMI, were considerably under-explored, the demand for a combination of both artefacts was evident and highly relevant. In order to get a first understanding about the research context, this qualitative study followed the suggested exploratory approach of Yin (2011) as well as Gläser and Laudel (2010), who recommended relying on experts within the analyzed field. Throughout the analysis, the researcher carefully followed the process of qualitative content analysis by Mayring (2000) and Yin (2011). Thereby, a focus on the validity and reliability of the coded material was given by triangulation (Yin, 2003, Patton, 1999), which was applied twofold. First, the qualitative research included multiple sources by a large number of expert interviews from a variety of firms and worldwide regions. Second, besides the collected qualitative data, web-based research, press releases, and observations from site visits and the researcher's working environment were taken into consideration. In addition, inter-coder reliability was ensured by providing a recommended amount of qualitative material to a second researcher, who coded the data with a significant degree of correspondence (e.g. Popping, 2010). Furthermore, the conducted benchmark study represented an initial step of the overall research strategy of this work, which provided a solid foundation for the following chapters. Throughout the analysis, which was intentionally conducted within different regions across the world, a broad perspective on the research problem was attained. Additionally, important lessons learned with respect to data collection in various regions were shared by the researcher and serves as support for future studies.

The theoretical contributions of this qualitative research include adding to CIS and BMI literature by revealing that an advanced corporate innovation system seems to require certain characteristics for conducting innovation in the field of new business models, which were analyzed along the suggested seven dimensions of a CIS. These dimensions were obtained by a SLR, which condensed several related fields of research, such as corporate entrepreneurship (Ireland et al., 2009), organizational innovation (Teece, 2010), strategic innovation management (Tidd, 2001), and knowledge management, i.e. the learning organization, which was for instance studied by Lundvall (2008).

Second, the database of this benchmark study is clearly unique, as most other studies in the field of CIS focused on a single region within their sample, such as Europe (e.g. Lundvall, 2008). The fundamental study of Granstrand (2000) analyzed a sample consisting of three regions, i.e. Japan, Sweden and USA, which inspired the researcher to focus in several regions as well. However, his research on CIS did not refer to BMI at all, whereby the presented benchmark study proposed a new perspective on innovation systems. Overall, regional differences were mostly identified on a cultural basis (Steiber and Alänge, 2013), as applied innovation practices were broadly aligned. Silicon Valley-based firms were characterized by a high risk-tolerance and the willingness to fail, which complies with existing research (e.g. Mundambi and Swift, 2012). In contrast, Japanese corporations rather expressed an opposing cultural imprint (Yamakawa, 2011).

Furthermore and most importantly, this study presented essential requirements for BMI within the context of CIS. Supported by other authors (e.g. Van Lancker et al., 2016; Edquist, 2005), the innovation process seemed to depict a central component of a CIS, as it affects involved individuals or groups of stakeholders while conducting the innovation (Freeman, 1984). A flexible and dynamic characteristic of the innovation process (Chesbrough, 2012) was stressed for BMI throughout the analysis. Along proposed sub-phases of the innovation process (e.g. Van Lancker et al., 2016), early management approval and support for exploration seemed crucial, which was also highlighted by existing studies on BMI (e.g. Ireland et al., 2009). In addition, investment-based quality gates were recommended for BMI in particular, which to the researcher's knowledge has not been addressed in detail by existing studies. Secondly, in line with existing research on organizational ambidexterity (Parmigiani and Rivera-Santos, 2011; Chesbrough, 2010), an autonomous setup within a CIS was emphasized for BMI. Thereby, a certain degree of freedom independent from rigid reporting structures seemed essential, which has also been addressed by studies on BMI (Stampfl, 2016). In connection with the resource-based theory (Barney, 1991), high resource intensity, especially during an early phase of the innovation process, was associated with BMI (e.g. Van Lancker et al., 2016). In addition, Ireland et al. (2009) supported the obtained findings by agreeing on a required flexibility of resource provision and a link to technological capabilities in the context of a BMI-related resource set. Coriat and Weinstein (2002) also highlighted the importance of 'cognitive coordination',

which referred to managers' ability to build up a firm's capabilities to innovate by handling information and knowledge properly. With respect to the motivation of employees, existing studies confirmed the importance of intrinsic incentives in the field of innovation management (e.g. Steiber and Alänge, 2013). However, Villiers-Scheepers (2011) came to the conclusion that corporate entrepreneurship required intrinsic and extrinsic rewards simultaneously, which appeared to be validated by findings from Silicon Valley-based firms in particular. Moreover, flexible working conditions and HR policies seemed to be essential requirements for BMI, and were also proposed in the two-factor theory by Herzberg (1959). A risk-tolerant organizational culture seemed highly important for BMI, which was positively related to entrepreneurship in existing studies (e.g. Barringer and Bluedorn, 1999). Strong leadership support (Hornsby et al., 2002) as well as a diverse skill-set of internal stakeholders (Lazzarotti et al., 2013) were also identified as relevant requirements for BMI. Regarding performance measurement of BMI activities, a typical corporate reporting structure might not be applicable, which was supported by existing research of Dess et al. (2003), who suggested more sophisticated measures, such as market value added (MVA), in connection with corporate entrepreneurship. The qualitative benchmark study revealed that qualitative reporting might be more suitable in case of BMI, which should be enhanced by a company-wide commitment for innovation. In line with the open systems theory (Christensen, 1997), an active collaboration with external stakeholders was emphasized by the interviewed experts for the case of BMI. Therefore, more flexible collaboration models and project-specific external partners seem necessary, which was supported by several authors who claimed that a dynamic and layered strategy for obtaining a heterogeneous network enabled the development of radical innovations (Bahemia and Squire, 2010; Berkhout et al., 2010.

The practical implications of this benchmark study include essential and holistic guidelines for innovation managers, who are facing the inherent complexity of corporate innovation activities in practice (IBM, 2008). In line with the conducted qualitative analysis, several 'white spots' have been identified by most interviewed experts as areas for improvement. First, a network or community of internal innovation activities seemed to be crucial for exhausting the potential for a better strategic alignment and the optimal exchange of resources for innovation within a firm. This aspect has also been addressed by several existing studies (e.g. Chesbrough, 2003;

Gallagher et al., 2012; Pellisier, 2008). Second, an internal platform for knowledge and capability exchange was considered important, which allowed for the identification of internal capabilities and knowledge spillovers (Bogers, 2011; Bohemia and Squire, 2010). Furthermore, flexible and dynamic collaboration models were highly recommended in order to speed up the execution of radical innovation projects and to broaden the solution scope of existing pain points, which other authors also referred to (Stampfl, 2016; Illi, 2010). Finally, the implementation or go-to-market execution of BMI projects seemed to be rather fuzzy to date, while a stringent integration into the overall innovation process was required. Several existing studies alluded to this issue by referring to possible spin-offs of innovation projects (Steiber and Alänge, 2013; Chesbrough, 2007).

In connection with this benchmark study, several limitations need to be addressed, and represent substantial opportunities for future research. While the proposed CIS dimensions were designed to be mutually exclusive and collectively exhaustive, this does not necessarily imply their different weighting and a homogenous richness. For example, the dimension ‘Innovation Process’ included many more sub-dimensions and requirements than for example the dimension ‘Strategy’. Since the researcher attempted to consider this issue by counting the number of codings for each dimension, a clear gradation of the seven dimensions might be tackled by future studies to come.

Second, the interviewed experts were selected based on their availability and willingness to participate in the qualitative interviews. Thus, it should be mentioned that not all experts held the same position within their corporation and clear differences emerged with respect to their experience with BMI (see 3.1.2). Furthermore, the distribution of regions and types of players in the mobility sector was not equal. For instance, the amount of expert interviews conducted in Germany exceeded the ones from Japan significantly, and most players were from traditional corporations. As this limitation mainly occurred due to time constraints, future research might build upon this endeavor by increasing the sample size including a more consistent distribution of participating groups. In addition, the researcher might have included a certain bias due to her own experience of working in a corporate incubation unit and the interpersonal nature of the interviews (Yin, 2017). Even though this might have affected the responses of each interviewee and accordingly the resulting findings, the researcher

carefully respected the approach of semi-structured interviews, as for example suggested by Eisenhard and Graebner (2007).

Lastly, the presented benchmark study proposed requirements for designing and implementing a CIS that supports the development of new business models and a broader perspective on innovation, which were conceptual and did not include recommendations on how to meet the suggested requirements on an operational level. In this context, several existing studies emphasized that a company-agnostic recipe for success or one optimal course of innovation management does not exist (Poole and Van De Ven, 1989; Hauschildt et al., 2016). However, the following chapters aim to address this limitation by further elaborating the detected findings on a project level.

4 Case Study Comparing BMI and NPD Projects – Qualitative Analysis

Subsequent to the presented benchmark study of CIS in the mobility sector, the researcher followed the target of adding another perspective to the mentioned research problem by considering another layer of analysis. Thereby, the focus moved from a holistic view, i.e. the CIS, to a rather operational level, i.e. the innovation project. The following chapter had the aim to compare two different types of innovation (BMI and NPD) with the aid of qualitative research in order to increase the understanding regarding an advanced corporate innovation system that includes different approaches to innovation.[9] In connection with this, a single case study including several sub-cases has been conducted, which lead to specific requirements for firms to follow in case of each particular innovation type.

4.1 Methodological Approach

4.1.1 Research Design

In addition to the previous qualitative benchmark analysis, a single case study with embedded sub-cases (n=10) has been conducted with a particular focus on the comparison of the requirements for successful NPD and BMI projects. Eisenhardt and Graebner (2007) define case studies as "rich, empirical descriptions of particular instances of a phenomenon that are typically based on a variety of data sources" (p.25). The case study approach is furthermore characterized by its ability to examine "a contemporary phenomenon in its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 1981, p.59). Eisenhardt (1989) suggested that such close interaction with evidence leads to theory building that accurately reflects reality.

[9] Chapter 4 contains extracted material from the author's publication: Hirte, R. and Friedrich, S. (2018), "Comparing Requirements for New Product Development and Business Model Innovation", R&D Management Conference 2018, *R&Designing Innovation: Transformational Challenges for Organizations and Society*, June 30th – July 4th, 2018, Milan, Italy.

Furthermore, Siggelkow (2007) proposed that a single case study has the ability to describe an existing phenomenon more substantially. In order to compare the practical requirements for successful BMI and NPD, an analysis on the project-level seemed to provide an appropriate research context. Therefore and according to Yin (2017), this single case study was organized by multiple units of analysis ("sub-cases"), i.e. innovation projects of the selected corporation. Throughout the analysis, the following research question has been tackled:

> *What are specific requirements for business model innovation versus new product development in the context of corporate innovation systems in the mobility sector?*

The second step of this dissertation's qualitative research has the aim to build on the first qualitative findings (see chapter 3) and contribute to the overall research strategy. Consequently, the following sub-chapters depict a similar methodological approach to the conducted benchmark study and outline the obtained results.

4.1.2 Data Collection

The database for this qualitative case study analysis was collected during a period from March to April 2018. Specifically, n=10 semi-structured expert interviews were conducted with innovation experts, i.e. managers of BMI and NPD projects, at a large established multinational corporation in Germany. The average duration of each expert interview was 54 minutes, which allowed for sufficient time for the interviewees to collect their thoughts and to formulate responses without being under the pressure of time constraints.

Following other researchers' recommendations (Yin, 2011; Gläser and Laudel, 2014), the preferred mode of conducting the expert interviews was through in person, face-to-face conversations, which creates a comfortable environment for the participants. Resulting from this, most interviews were scheduled at German on-site locations of the respective firm. In two cases, phone interviews were arranged due to limited availability of the experts. As all interviewed experts were German native speakers, the interviews were conducted in German language in order to make them feel most comfortable during the process and to maximize the ease of communication. Selection criteria required, that each innovation project (i.e. sub-case) could clearly be classified as either

a BMI or a NPD project by following the outlined working definitions (see 3.2.1 and 2.3.2). Furthermore, the innovation projects had to be executed successfully within the past ten years in order to ensure their current relevance for this research.

After receiving the permission of the participants, all expert interviews were recorded. In this context, Patton (1990) suggested the recording of interviews being essential, as it represents the only way to avoid the loss of information. Furthermore, Froschauer and Lueger (2003) highlight that recorded interview data allows for a precise subsequent evaluation, and enables the researcher to devote full attention to the ongoing conversation. Besides taking notes during each interview, the total amount of pages transcribed from the recorded audio files accounts for 135 pages[10]. In addition to the empirical data, which was gathered by the expert interviews, the database was supplemented by other sources of evidence that ensure the required validity through triangulation (Yin, 2011). This included for instance web search results, detailed internal documents, and statements of corporate press releases on the specific innovation projects.

In accordance with Gläser and Laudel (2014), the preliminary interview guideline (Yin, 2011) included important notes for setting the timeframe and communicating the issue of anonymity (see Appendix E). Following the conducted benchmark study (chapter 3), the interview guideline for the case study approach also served as a rough orientation for the researcher to conduct the semi-structured interviews in a flexible way, depending on the flow of conversation. After asking for general information about the expert and his/her innovation project, detailed questions regarding the requirements of BMI or NPD projects, as well as success factors and lessons learned of the respective project followed. In connection with this, six pre-defined dimensions were considered for structuring the questions: cooperation, organization, market, execution, technology, and strategy. These dimensions were chosen based on an extensive literature review (see 4.2.1). Finally, the interview guideline concluded with some information about the next steps of the study and the opportunity for the experts to add any relevant aspects to the issue.

[10] Transcripts are kept at the Institute of Entrepreneurship, Technology Management and Innovation (EnTechnon). Access to an anonymized version of the transcripts requires the permission of the author.

4.1.3 Sampling

In order to dig deeper into the presented problem statement,a single case study has been conducted within one of the corporations that was already represented in the benchmark study's sample. According to the aforementioned classification of players in the mobility sector, the selected corporation represented a Traditional Player with a core business in the automotive field. The multinational firm's headquarters were located in Germany.

The rationale of this choice was based on several aspects. First, a comparison of BMI and NPD projects required the respective firm to operate in a structured way, which allowed for a clear distinction of its innovation activities. This led to the selection of a large established corporation with a suitable number of innovation projects available to analyze in this research. In this context, the selected firm represented a "common" (Yin, 2017) example of an established company, which has historically focused on NPD but needed to advance its innovation management capabilities and engage in BMI due to new competitors in the market. Furthermore, the author's access to the portfolio of innovation projects and managers at the mentioned firm favored an appropriate amount of collected data, which would not have been possible at comparable companies.

In total, n=9 innovation projects participated in this case study and covered a wide range of business units and departments within the selected firm (see Table 5). Each unit of analysis represented a "sub-case" of this study. Accordingly, four sub-cases of NPD and five sub-cases of BMI projects represented the sample of this qualitative case study analysis. Intentionally, the selected sub-cases incorporated a broad range of innovation activities originating from a variety of the corporation's sites in Germany. Thereby, the sample represented the innovation management endeavors of the mentioned firm in the best possible way. Interviewed experts all had the position of the project leader, which guaranteed deep involvement in the analyzed unit of analysis and ensured that he or she would provide a holistic overview of the innovation activities of their organization, specifically of their respective projects and departments.

Case	Project	Interviewee	Perspective	Communication medium	Duration (minutes)
NPD-1	Door bodywork	NPD-1	Project manager	In person	54
NPD-2	In-car connectivity module	NPD-2	Project manager	In person	60
NPD-3	Fuel-cell system	NPD-3	Project manager	In person	63
NPD-4	Diesel engine control unit	NPD-4a	Managing engineer	In person	69
NPD-4	Diesel engine control unit	NPD-4b	Project manager	In person	59
BMI-1	Car sharing	BMI-1	Project manager	In person	73
BMI-2	On-demand ride pooling	BMI-2	Project manager	In person	48
BMI-3	Mobility service subscription	BMI-3	Project manager	In person	53
BMI-4	Business intelligence solution	BMI-4	Project manager	By phone	25
BMI-5	Driving experience	BMI-5	Project manager	By phone	32

Table 5: Overview of sub-cases

Sub-case NPD-1 described the development of a door bodywork for a premium automobile in 2014, which introduced an innovative lase-jointed door folding concept. The interviewed expert was the project managing lead engineer for this innovation project. Sub-case NPD-2 referred to the development of a hardware for the enhanced remote-, mobility-, and emergency service, a novel in-car connectivity module introduced to the market in 2016. Again, the project manager participated in an expert interview. Sub-case NPD-3 had a focus on a fuel cell program, whereby the development of an aggregate for a premium automobile fuel cell model was conducted in 2018. The interviewed expert served as the project manager. Sub-case NPD-4 refers to the development of a diesel engine control unit. As the most relevant on-board diagnosis of the innovation project happened to be managed by a relatively unexperienced engineer (expert NPD-4b), the manager of the entire control unit (expert NPD-4b) was interviewed as well. In total, five expert interviews were conducted for four NPD sub-cases.

Sub-case BMI-1 related to a free-floating car-sharing business model, which was introduced in 2008 and recently expanded to new markets. The interviewed expert operated as the marketing manager of the mentioned project during the start-up phase. To date, he continues to function as a project leader of several BMI projects of the corporation. Sub-case BMI-2 outlined an on-demand service that digitally provided the

aggregation of various mobility offerings. Thereby, the project aimed for a demand-oriented approach to ride-pooling based on intelligent algorithms. The interviewed expert was the manager of the subsidiary, which was founded in 2013. Sub-case BMI-3 referred to the development of a mobility service that offered up to 12 different, customer-selected premium vehicles per year for a fixed monthly subscription rate. The business model was piloted in 2018 and the interviewed expert represented the project manager. Sub-case BMI-4 provided an innovative business intelligence solution offered to company-internal customers by the firm's financial and personnel service provider. The project manager represented the interviewed expert for this study. Sub-case BMI-5 depicted a business model that provided fans of classic premium cars a novel driving experience, which was based on a monthly membership fee without having to worry about the maintenance and care of each vehicle. In this case, the project manager agreed to conduct the expert interview as well. Interested readers can find more detailed descriptions of each sub-case in the attachment (see Appendix F), which allows for an even better understanding of the context of the results, outlined in the following sections.

4.1.4 Data Analysis

The analysis of the collected qualitative data has been conducted by the aid of suitable software (MAXQDA 12) and a qualitative content analysis, which was based on the approach of Mayring (2015). Therefore, a cross-section was laid through the material according to six pre-defined dimensions (Mayring, 1991) that formed a comparison framework (see 4.2.1). Carefully following the process model outlined by Mayring (2015, p.98), the qualitative content analysis built on the selection of the size range of analysis units, i.e. an interview segment, and theory-led definitions of the main content categories. A first category system was based on the six theory-based dimensions, followed by typical text passages ("anchoring examples") adhering to pre-defined coding rules whereby a coding scheme resulted that clarified the structuring work (see Appendix G). An example of this coding scheme is depicted in Table 6.

Dimension	Code	Anchoring Example	Coding Rule
Cooperation	Internal Cooperation	*"You are also dependent on the other divisions, that they simulate some things for you well and correctly, that they crash the right thing, that their sizes also fit." (Expert NPD-1)*	Strict reference to only internal partners

Table 6: Example of coding scheme

Using an iterative process, the coding system has been adjusted through induction of the material after a phase of coding and code extraction. Thereby, sub-dimensions for each of the six pre-defined dimensions developed through categorizing cohesive best practices and lessons learned of the experts. The sum of coding iterations had the aim of ensuring reliability of the data analysis and accordingly enhanced the subsequent results. In addition, an assessment of inter-coder reliability was conducted, as described in chapter 3.1.4, and resulted in a satisfying correspondence of codings (73.58%). Finally, the qualitative content analysis resulted in 1,003 codings in total. The results were compiled by paraphrasing the extracted material, the summary of each final sub-dimension, and eventually by the summary of each pre-defined dimension. In conclusion, propositions about the specific requirements for successful NPD and BMI projects were deduced based on the findings within each sub-dimension and innovation project type. After comparing the respective requirements with each (sub-) dimension, their similarities were additionally assessed in a qualitative manner. Moreover, all sub-dimensions were categorized according to their differentiation level.

Resulting from the applied qualitative research approach, an in-depth overview about the detected results will be given in the next section. Besides the development of suitable comparison dimensions, a single case study has been conducted and discussed afterwards.

4.2 Results

The following results of the conducted qualitative research include the definition of a profound comparison framework, which allowed for a systematic analysis of different innovation types, i.e. BMI and NPD. This framework incorporated six dimensions, which all related to the initially defined CIS dimensions: Cooperation, Organization, Market, Execution, Technology and Strategy. Secondly, findings from the presented qualitative benchmark study in the mobility sector have been enhanced by identifying requirements of the mentioned innovation types on an operative project level within a single case study. Thereby, the addressed research gap by Bucherer et al. (2012) has been addressed carefully.

4.2.1 Development of a Comparison Framework

As this part of the qualitative analysis focused on the innovation project level and thereby not on the organizational level of the entire CIS, the discussed dimensions of chapter 3 needed to be revised. This different, i.e. subordinate level of analysis required the assessment of an adapted framework for the comparison of NPD and BMI. However, the following dimensions can still be found within the overall CIS model.

Besides the mentioned work on BMI, none of the authors specifically linked their frameworks to the ones referring to NPD in particular (see chapter 2.3.1 and 2.3.2). Consequently, Bucherer et al. (2012) took note of this shortcoming and stated the need for a "systematic investigation of similarities and differences between business model and product innovation management" (p.183) in order to close the mentioned research gap. Therefore, they analyzed eleven qualitative cases of BMI, which were based on a previously developed framework, wherein the authors synthesized key findings of NPD management. Incorporating similarities and differences between product and business model innovation, the framework by Bucherer et al. (2012) considered the origins of innovation, the innovation process, organizational implementation, organizational anchoring, and the degree of innovativeness. However, their study was characterized by some inherent limitations, which as their limited sample of cases. Resulting from this, future research on BMI should aim for enclosing more of the "existing findings of product innovation management to further contribute to a systematic approach" (Bucherer et al., 2012, p. 195).

In connection with the previously defined CIS dimensions (chapter 3.3.2.), the conducted literature review and the analysis of existing innovation management approaches led to proposing a comparison framework for successful NPD and BMI on the project level. The researcher's findings were condensed into several success factors for both innovation types, which were clustered into six dimensions: Cooperation, Organization, Market, Execution, Technology, and Strategy. A detailed assignment of the mentioned dimensions with pre-defined CIS dimensions will be illustrated at the end of chapter 4.2.3. In the following table, the resulting dimensions for the comparison of NPD and BMI projects are presented (see Table 7), which provides the basis for this qualitative case study and the proposed findings.

Dimension	Sub-dimension	Literature (exemplary)
Cooperation	External partnerships, internal cooperation, duration	Womack et al., 1990; Liker et al., 1998
Organization	Structural integration, internal communication, teamwork support, job design, leadership / management support, technical understanding of managers	Clark and Fujimoto, 1991; Brown and Eisenhardt, 1995; Evanschitzky et al., 2012
Market	Market research, competition, market potential, regulations	Balachandra and Friar, 1997; Henard and Szymanski, 2001
Execution	Preparatory work, stakeholder background, process structure, controlling / feedback, speed, tools	Booz et al., 1982; Cooper, 1990; Osterwalder and Pigneur, 2010
Technology	Foreknowledge, innovativeness / complexity, patenting, customer orientation	Cooper and Kleinschmidt, 1995; Francis and Bessant, 2005
Strategy	Target definition, monetization, provision of venture capital, innovation culture, company fit, synergies, strategic partnerships	Schilling and Hill, 1998; Casadesus-Masanell and Zhu, 2013

Table 7: Dimensions of a comparison framework

Using the proposed comparison framework, the following section refers to the identification of distinctive characteristics of two innovation project types, which aims to increase the understanding about the research topic for an academic as well as practical target group.

4.2.2 Qualitative Comparison of BMI and NPD Projects

In order to assess the presented problem statement on a project level, BMI and NPD projects have been compared according to the six dimensions that derived from another comprehensive literature review. The following paragraphs incorporate a detailed comparison of the requirements for the analyzed sub-cases by following the previously presented comparison framework.

Cooperation

Cooperation with partners was considered essential for successful corporate innovation management, as was indicated by 154 codings in the qualitative content analysis. Accordingly, 97 NPD codings and 57 BMI codings led to the assumption of a different degree of importance for each innovation type. Throughout the analysis, three sub-

dimensions of ‘Cooperation’ have been identified: external partnerships, internal cooperation, and duration.

External partnerships were particularly important for most analyzed NPD projects, as for example described by expert NPD-1: “There was an external engineering company that created the data […], which is the basis for all this calculating, simulating, tuning – all that was operatively executed [by these firms].” In this context, expert NPD-1 and expert NPD-4b emphasized that in theory, the corporation’s internal employees would be able to get the tasks done by themselves’, however due to tight time constraints specialized external suppliers were usually hired. Furthermore, “many tasks have become so extensive, so large that it is no longer possible to do them yourself” (expert NPD-4a). Accordingly, the actual engineering is not even considered a “core business” (expert NPD-1) of the analyzed corporation, but rather coordinating, controlling and managing the cooperating suppliers (expert NPD-4a). However, expert NPD-4a explained that the ratio of partners and external development in fact often differed vastly between R&D departments or teams. Therefore, a personal network of different suppliers and service providers seemed critical as project leaders “often […] come to the same companies, the same teams” (expert NPD-1). Moreover, expert NPD-4b revealed the relevance of the personal aspect of external partnerships: “It is not about becoming friends, but that I feel that we work together well”. Development cooperation with other OEMs was also considered important for certain components, as their employees might possess an advanced level of experience in particular fields (expert NPD-3). Furthermore, more agile collaboration models were recognized as being increasingly essential (expert NPD-2). In addition, most NPD projects heavily relied on internal cooperation, as well. Thus, transparent collaboration management was required for using internal expertise: “Between the different subsections there are massive dependencies and interconnections. One can’t work until he gets something from the other. There are just a lot of connections, cross effects, positive ties, feedbacks and so on” (expert NPD-4a). Altogether, it was essential to choose a partner who had sufficient experience on the project topic and therefore “it is quite clear that you need external partners for certain components, certain technologies” (expert NPD-3). As a result, NPD projects seemed to rely on rather long-term partnerships with a selected number of contractors. Expert NPD-1 added that suppliers preferably “have done this be default for the last ten, twenty years”.

Most BMI experts (e.g. expert BMI-3) also considered cooperation being important for their respective project, while in contrast others did not rely on external partners that much (expert BMI-2). In general, BMI project managers searched for strategic collaboration partners to obtain specific expertise or assets (expert BMI-5). Furthermore, external partners represented a tool for proving internal critics of the BMI project that there was a vivid interest in the concept outside the corporation (expert BMI-1). In connection with this, another essential aspect was considered by expert BMI-5, who highlighted not only "hard facts", but especially a compatible mindset of the partner as vital for a successful BMI collaboration. Apart from that, the "not invented here" syndrome has been mentioned repeatedly (e.g. expert BMI-3) when it comes to internal cooperation. In this context, expert BMI-1 even stressed that his team was "antagonized" by their parent division at first. Due to the fear of a damaged brand image, "[the project] was not allowed to have anything to do with [the parent division], and it was not supported, not even with personnel or anything" (expert BMI-1). Therefore, a platform for an open dialogue with cooperative experts and departments willing to support the BMI project was found to be necessary. Accordingly, expert BMI-3 emphasized: "That's why it was important to get this line function on board right from the start". Expert BMI-1 added that "the ramifications of such a business model in the various areas of the corporation are so diverse that we needed exactly this steering committee, where everything was discussed and also prioritized". Considering company-internal cooperation, experts also pointed out the importance of searching for ways to link existing business models (e.g. expert BMI-2). However, the customer ultimately might reject such endeavors, as "people tick in single applications, which are very brand-bound" (expert BMI-1). On the other hand, internal cooperation leads to a wide professional network, which facilitated open knowledge transfer and collaboration (expert BMI-3). Regarding BMI cooperation in general, experts seemed to focus on rather efficient and often only temporary partnerships. Thereby, project leaders often acted opportunistically, as stated by expert BMI-1: "Long-term orientation is welcomed beforehand, but in the end the question is quickly how much dollars they bring to the table. And of course, that has to be refinanced immediately".

The following propositions have derived from the presented findings for the 'Cooperation' dimension:

Proposition C1-NPD: NPD projects require a network of specialized suppliers, which are not part of the core business, for outsourcing tasks.

Proposition C1-BMI: BMI projects require strategic collaboration to fulfil the need for specific expertise or assets.

Proposition C2-NPD: NPD projects require transparent collaboration management for using internal expertise.

Proposition C2-BMI: BMI projects require an open internal dialogue with cooperative experts and departments willing to support the project.

Proposition C3-NPD: Long-term relationships with key partners are required for NPD projects.

Proposition C3-BMI: Efficient and often temporary partnerships are required for BMI projects.

Organization

A corporation's organization represented another critical dimension within the analyzed research context and a total of 154 codings have been identified by the qualitative content analysis. Thereof, 110 codings referred to NPD and 99 codings to BMI projects, which leads to the assumption of a comparable relevance for each innovation type. The dimension 'Organization' incorporates seven sub-dimensions that derived from the conducted analysis: structural integration, teamwork support, stakeholder background, job design, responsibilities and hierarchy, leadership and management support, and technical understanding of management.

In case of NPD projects, each development task required specialized departments within the firm: "You have a gigantic chain of different technologies that actually work together. Everyone has a job to do" (expert NPD-2). Therefore, expert NPD-3 highlighted the importance of a tight organizational integration with the mother company. Many of the analyzed sub-cases were organizationally integrated in larger development projects and thus the interviewed experts considered themselves as "technical enablers" (expert NPD-2) or responsible for mere "legwork" (expert NPD-3). As a result, "it became inevitable that one has to specialize a bit more and more" (expert NPD-4a). In this context, cross-divisional teamwork was described as another critical aspect for NPD projects, whereby physical proximity seemed to be vital: "It's

brutal how much that matters" (expert NPD-1). Furthermore, a common time zone and language were recognized as equally important (expert NPD-3). In connection with this, expert NPD-3 also highlighted the need for appropriate compliance guidelines, which enable the required information exchange with suppliers. Regarding the background of involved stakeholders, engineers with various subject-specific experience should be staffed on NPD projects (expert NPD-4b; expert NPD-2), who were "increasingly difficult to find" (expert NPD-4a). Consequently, a project member's job should be designed in such a way that his or her level of expertise had the potential to increase over time. Thereby, "one is very free in finding a solution" (expert NPD-4a) when it comes to implementing new components. For employees working on NPD projects, typically no pre-defined share of their working hours was dedicated to special innovation tasks (expert NPD-1). However, a special "room with all kinds of materials" and the freedom to experiment might have supported to maintain the project members' innovative strength (expert NPD-3). In order to match the stringent innovation process for NPD projects, clear responsibilities had to be defined by a hierarchical organization: "The responsibility was clearly defined and that was a major benefit" (expert NPD-3). Expert NPD-4a supported the essential relevance of the principle of tasks, competencies, and responsibilities. All interviewed NPD experts agreed on the need for consistent management commitment (e.g. expert NPD-3) and support in case of issues (e.g. expert NPD-1). In this context, a certain technical understanding of managers represented an essential success factor (excpert NPD-1; expert NPD-4b), as they needed to be "technically competent decision-makers" (expert NPD-3).

Besides a suggested matrix organization for NPD projects (expert NPD-1), no single ideal organizational structure emerged from the analyzed BMI sub-cases. Some experts regarded a separate legal entity outside the parent company as required for their BMI project (expert BMI-1), while others referred to benefits from a tight integration into one of the company's line functions (expert BMI-4). According to expert BMI-1, a separate legal entity enabled external investments and new partnerships for BMI projects. However, in this context, expert BMI-3 addressed the importance of a long-term perspective regarding an organizational integration into the parent company: "You can't just develop some business model without thinking about what happens afterwards". Accordingly, an individual business-model specific organizational integration seemed to be required. Furthermore, cross-project information exchange

was considered important for BMI projects, as project managers and other stakeholders were able and encouraged to exchange ideas and discuss operational issues in dedicated "councils" (expert BMI-1) or "circles" (expert BMI-2). The background of involved project stakeholders was required to be diverse, both methodical and technical (e.g. expert BMI-1). In connection with this, expert BMI-4 described his BMI project consisting of "a nice mixture of colleagues who knew the corporation by heart, but external colleagues as well who got several corporate startups on the road". Concerning the professional fields of expertise, a wide range of experts was included from "computer hackers" (expert BMI-1) to "mathematicians and lawyers" (expert BMI-2) or "consultants" (expert BMI-3). All BMI experts agreed that BMI core project members should be dedicated full-time (e.g. expert BMI-1). It was also considered important "to be really put into a bubble, where one may concentrate undisturbed and exclusively on this idea" (expert BMI-4). With respect to hierarchical structures, a flat hierarchy and freedom for decision-making represented other critical requirements for BMI projects: "Not having to be so rigid for once" was relieving (expert BMI-3). In addition, stable management commitment and ideational support were named as additional essential aspects (e.g. expert BMI-2). "A project is successful only if the management addressed or affected by it recognizes the potential and supports it" (expert BMI-1). In contrast to NPD, managers of BMI projects did not require full comprehension of technical implications, but rather had to realize the potential of the BMI concept and understand the customer journey (expert BMI-4; expert BMI-2).

Resulting from the depicted findings, several propositions emerged, which are listed below:

Proposition O1-NPD: NPD projects require specialized departments for each development task.

Proposition O1-BMI: BMI projects require a business model-specific organizational integration.

Proposition O2-NPD: NPD projects require cross-divisional teamwork without organizational hurdles.

Proposition O2-BMI: BMI projects require cross-project-information exchange.

Proposition O3-NPD: NPD projects require staffing mainly subject-specific engineers.

Proposition O3-BMI: BMI projects require diverse stakeholder backgrounds.

Proposition O4-NPD: NPD projects require a job design that focuses on increasing the project members' expertise.

Proposition O4-BMI: BMI projects require a job design that allows project members to dedicate their entire capacity to BMI.

Proposition O5-NPD: NPD projects require definite responsibilities through a hierarchical organization.

Proposition O5-BMI: BMI projects require flat hierarchies and decision liberties.

Proposition O6-NPD: NPD projects require consistent management support in case of issues.

Proposition O6-BMI: BMI projects require stable ideational management commitment.

Proposition O7-NPD: NPD projects require a profound technological understanding of decision makers.

Proposition O7-BMI: BMI projects require a conceptual understanding of decision makers.

Market

Overall, 'Market' represented the dimension with the lowest number of codings, i.e. 93, of which 38 referred to NPD projects and 55 to BMI projects. Thus, an almost equal relevance for each innovation type was assumed. Based on the conducted qualitative content analysis, four sub-dimensions have been defined: research, competition, potential, and regulations.

Various experts emphasized that they conducted retrospective self-benchmarking for NPD projects instead of extensive market research (expert NPD-4a). Expert NPD-3 explained that market monitoring "is not to be valued extremely high". In this context, expert NPD-2 agreed and claimed that "market research is always done by the sales division", which was how feature lists were created. Nevertheless, the experts did have some interest in their competitors' operations (expert NPD-4b), even though "you often can't compare them one-to-one" (expert NPD-1), which mostly referred to target metrics and specifications. Such competitor observations yielded insights into actual engineering aspects, as well as contract suppliers (expert NPD-3), but did not affect the development of new products in general (expert NPD-2). Concerning the market potential, most NPD experts focused only on the corporate context and not on a single component level: "It's simply the overall concept that works, and every part contributes

to it" (expert NPD-1). Expert NPD-3 supported this aspect, since many NPD projects were part of a bigger endeavor. For example, the development of a fuell-cell stack on its own was not considered financially beneficial, as it even concurrently required adequate investments, e.g. in a widespread network of hydrogen filling stations. Thus, the market potential of a single NPD was considered "not incredibly high" (expert NPD-3), but the project tied into a bigger context, which was supposed to cater to significant market demand. Furthermore, another essential requirement for a successful NPD project was the timely compliance with all legal regulations, particularly if they affected the commercial launch (expert NPD-2). Expert NPD-1 explained that "there is not much freedom" regarding regulations and the scope of development was tight. In addition, several experts stressed the challenge of sudden changes within the legal framework they were operating in: "If a government in any part of the world decides that in one and a half years new certification rules will apply, (…) it will simply become difficult" (expert NPD-1). In connection with this, expert NPD-4b revealed that changing or new laws were often the sole reason for developing new products at all: "No one would do anything if we did not have this (…) legal date".

In case of BMI projects, market requirements seemed to be far more relevant than for NPD projects. All interviewed experts highlighted the importance of comprehensive market research at the earliest point in time possible, in order to gain customer input and to evaluate the potential of the new business model: "We've done extensive market research. Afterwards, we also made decisions based on extensive studies" (expert BMI-1). Expert BMI-3 added: "That's why it's important to me that we don't sit in cloud cuckoo land and think that the customer wants this, but immediately said that I first need a customer survey or customer study". The approach of expert BMI-2 was as followed: "We started building the [business model] relatively early and yet we still analyzed the market and tried to understand it". The connection between BMI and competition was twofold. First, the importance of being early to a market to establish oneself as an innovator in the minds of the consumers was pointed out: "I have consciously (…) presented the topic as a model for the future, (…) in order to be more or less the first one" (expert BMI-2). In addition, competition was also considered as business model validation: "The business idea seems to be so good that the closest competitor we have is doing exactly the same thing" (expert BMI-1). In line with this, "competition is always good. If there are people who do this, it means there is a market"

(expert BMI-5). Several BMI experts revealed that in multiple cases, figures of potential markets had been exaggerated. Therefore, expert BMI-1 argued that "it is individual sensitivities [of decision makers] that make the difference" and overrule prior market potential analyses. Such internal "political decisions" were perceived as "huge problems" (expert BMI-1). As a business model "always has to scale" (expert BMI-2), projects were approved because the corresponding BMI had the potential to be applicable worldwide (expert BMI-2; expert BMI-3). Similar to NPD projects, compliance with legal issues was regarded a key requirement, particularly in case of novel or unproven business models (expert BMI-2). Expert BMI-1 shared that dealing with local regulators and policy makers happened to be one of the core activities during the BMI project, whereby successful negotiations immediately translated to successful next steps of the entire project.

Based on the presented findings, which were extracted from the qualitative material, the following propositions have been defined:

Proposition M1-NPD: NPD projects require retrospective self-benchmarking.

Proposition M1-BMI: BMI projects require comprehensive market research.

Proposition M2-NPD: NPD projects require a development that is independent from competition.

Proposition M2-BMI: BMI projects require a competitor analysis for business model validation.

Proposition M3-NPD: NPD projects require market potential in at least a corporate context.

Proposition M3-BMI: BMI projects require immediate market potential with growth opportunities.

Proposition M4-NPD: NPD projects require timely compliance with all legal regulations.

Proposition M4-NPD: BMI projects require handling or negotiating legal regulations.

Execution

In accordance with the conducted data analysis, 246 codings have been connected to the dimension 'Execution'. Thereof, 157 referred to BMI codings and 89 to NPD codings, which might support the conclusion of a significant difference in the relevance for each innovation project type. This might also be explained by the assumption that

NPD processes are proven and well established, while BMI execution represents more of a challenge. Furthermore, eight sub-dimensions were identified: preparatory work, process structure, communication, reporting/feedback, speed, team size, tools, and motivation.

The preparation of NPD projects required for instance test projects (expert NPD-1) or budget seminars (expert NPD-2), especially for pushing innovative product ideas. In addition, expert-NPD3 emphasized a required "decomposition of specifications" following internal best practices of older projects. In line with this, expert NPD-1 also proposed the importance of leveraging lessons learned from pervious projects: "We have simply oriented ourselves to the predecessor series, with the given boundary conditions". In this context, internal engineering standards and a common understanding were considered vital for a successful NPD project, as "every project manager used to do it at his own convenience" (expert NPD-4a). Important knowledge spillovers included among others how to work out a rigorous project plan or how to create a tender for engineering service firms (expert NPD-4b). All interviewed experts shared detailed examples of a strict development process with pre-defined milestones and quality gates, which was required for their NPD project. Accordingly, expert NPD-1 explained: "You have a schedule, so you know when everything has to be completed". However, expert NPD-1 pointed out that there was an iterative process: "That means you're always verging on the whole". In connection with this, regular communication with different functions and stakeholders was considered particularly important (e.g. expert NPD-4a). Thereby, communication channels included hierarchical, technical, and organizational types (expert NPD-1). Furthermore, expert NPD-2 and expert NPD-3 described the crucial need for continuous face-to-face feedback of project members of the same hierarchical level. This was supplemented by strict reporting and controlling structures (e.g. expert NPD-3). Project timeline requirements were closely connected to the project type, i.e. mostly hardware and software based (expert NPD-2). Expert NPD-4b emphasized an increased speed of NPD projects, as "in the past, they have become shorter and shorter". The headcount of a project usually varied based on the respective NPD phase (expert NPD-1). A small core team of one to six (expert NPD-4a), or even twelve (expert NPD-2) project members was typically responsible for specific workloads. Therefore, a unified tool landscape accessible to other corporate divisions and external partners was considered beneficial "to avoid wasting time in

loops and resources every single night" (expert NPD-3). In order to motivate the project team, it was "very important (…) that the work is recognized" (expert NPD-3), for instance in internal or external media publications.

In case of BMI projects, timely management approval represented a crucial requirement for all interviewed experts: "Press, customers, market penetration are all criteria that are more likely to be bought or controlled than fighting against internal policies and concerns" (expert BMI-1). According to expert BMI-1, such management approvals consumed a significant amount of time and effort by the project leader, who had to pitch the business model in front of several management boards. Therefore, a minimal viable product (MVP) and a corresponding business plan were named as important tools (expert BMI-4; expert BMI-5). The innovation process structure seemed to be very project-specific, as the experts suggested a variety of approaches: milestone-based (expert BMI-1; expert BMI-3; expert BMI-5), based on the Design Thinking methodology (expert BMI-2), and more agile "trial and error" (expert BMI-4). Similar to NPD projects, BMI experts stressed that fast and regular communication with involved stakeholders was vital for the project's success. Expert BMI-1 added: "What was very valuable was the dialogue with other [BMI] project managers". In addition, fast and direct feedback cycles "help enormously to move in the right direction and become more successful or to concentrate on what is really successful" (expert BMI-1). Controlling was conducted by using business KPIs, which had to be reported to the management on a regular basis. Rapid implementation was particularly crucial in case of BMI projects, where "one gets back to basics" (expert BMI-3) and "limits oneself to the essential […] and does not even begin to get tangled up in theory" (expert BMI-4). When asked about their team size, all BMI experts referred to a small core team consisting of three (expert BMI-3), four (expert BMI-1; expert BMI-5) or five (expert BMI-4) project members. Expert BMI-4 shared: "It is always better to start with a handful of idealists (…) and then roll it out with the involvement of other colleagues". Required tools for successful BMI projects mainly included a tangible MVP (expert BMI-1), as well as modern communication software (expert BMI-2), depending on the project workflow. Another decisive aspect incorporated the intrinsic motivation of project members, as stated by expert BMI-3: "The most important thing is to have a passionate project team".

In line with the preceding results for ‘Execution’, the following propositions have emerged:

Proposition E1-NPD: NPD projects require leveraging lessons learned from previous projects during the preparatory phase.

Proposition E1-BMI: BMI projects require management approval before the project kickoff.

Proposition E2-NPD: BMI projects require strict development processes with milestones and quality gates.

Proposition E2-BMI: BMI projects require project-specific innovation process gates.

Proposition E3-NPD: NPD projects require regular communication with all relevant functions.

Proposition E3-BMI: BMI projects require fast and regular communication with stakeholders.

Proposition E4-NPD: NPD projects require continuous reporting, controlling and feedback on every hierarchical level.

Proposition E4-BMI: BMI projects require continuous reporting, controlling, and multilateral feedback from involved stakeholders.

Proposition E5-NPD: NPD projects require project type-specific timelines.

Proposition E5-BMI: BMI projects require a rapid implementation of the business model.

Proposition E6-NPD: NPD projects require a small core team.

Proposition E6-BMI: BMI projects require a small core team.

Proposition E7-NPD: NPD projects require a unified tool landscape.

Proposition E7-BMI: BMI projects require useful tools in line with the project workflow.

Proposition E8-NPD: NPD projects require team motivation through external appreciation.

Proposition E8-BMI: BMI projects require intrinsic team motivation.

Technology

The technological aspect of NPD and BMI projects included a total of 188 codings, whereby 54 codings referred to NPD and 64 codings to BMI. Resulting from this, the dimension ‘Technology” seemed to have a comparable relevance for both project types. Furthermore, the qualitative content analyses revealed the following three sub-dimensions: foreknowledge, innovativeness, and customer orientation.

Prior knowledge from related or previous projects represented one of the most crucial requirements for successful NPD projects (expert NPD-4b). Expert NPD-2 explained: "One hundred percent […] these are really key success factors, that people are familiar with their subject area". Furthermore, such foreknowledge was considered essential, especially when selecting a development concept (expert NPD-3). Even though, expert NPD-2 described his NPD project as "highly innovative", the remaining experts associated a low degree of innovativeness with most of their conducted NPD projects. In connection with this, expert NPD-4a stated: "Ideally 80 percent by standard, if possible, 20 percent by new technologies or new requirement-oriented approaches". This was supported by expert NPD-1, who revealed that "nowadays, the degree of innovation is lower because everything is standardized to a large extent". As many projects were integrated into the complex value chain of the corporation, direct end customer orientation "hardly plays a role, as strange as that sounds" (expert NPD-3). Expert NPD-1 added that the value proposition and source of customer satisfaction "is really the overall system, in which it is not so easy to trace back of which individual component it originates, but it is usually the interaction of several".

In contrast to NPD, foreknowledge was not perceived equally important for BMI projects, due to the novelty of each business model (expert BMI-4). However, basic prior knowledge was also beneficial, as stated by expert BMI-2: "Fortunately, we also had people on the team who had an excellent grip on the subject". In addition, expert BMI-3 referred to the combination of existing assets and new ideas that enabled a faster ramp up period of the BMI project. Regarding the degree of innovativeness, the interviewed project managers argued twofold. Expert BMI-1 addressed that the "innovation is based on the business model, because we in fact provide an existing product […] to customers in a different manner". Furthermore, expert BMI-1 stressed that her BMI project was mainly depending on existing technologies and therefore of a lower degree of innovativeness. At the same time, she pointed out that there was still a lot of effort required in order to combine different technologies for a complex BMI. Compared to NPD, BMI projects required strict customer orientation from the beginning: "We thought from the customer's point of view" (expert BMI-1). In this context, getting useful and direct customer feedback was considered very challenging, as "customers don't have the imagination and the knowledge" (expert BMI-1).

Nevertheless, expert BMI-4 supported this aspect by stating "it was crucial to follow up with that feedback".

In connection with the described findings for the 'Technology' dimension, several propositions have been defined:

Proposition T1-NPD: NPD projects require prior technical knowledge from related projects.

Proposition T1-BMI: BMI projects require basic prior knowledge to build upon.

Proposition T2-NPD: NPD projects generally require a lower innovativeness.

Proposition T2-BMI: BMI projects require a manageable complexity and innovativeness.

Proposition T3-NPD: NPD projects require an indirect customer orientation regarding the whole value proposition.

Proposition T3-BMI: BMI projects require a strict customer orientation and continuous integration of customer feedback.

Strategy

Based on qualitative findings, the innovation strategy dimension included 183 codings, while incorporating 83 NPD codings and 100 BMI codings. Accordingly, 'Strategy' seemed to play a slightly more important role in the context of BMI. During the qualitative content analysis, five sub-dimensions were detected: Target definition, monetization, budgeting, innovation culture, and company fit.

For NPD projects, the target was usually defined by technical requirements and less by strategic implications: "You have functional requirements, no discussions here" (expert NPD-1). Furthermore, pre-defined targets were measured by the fact that the new product "fulfils all functions, is buildable, and is of good quality" (expert NPD-1). Expert NPD-2 added that technical optimizations, such as "standardization, less variance, more quality", represented goals of each NPD project. With respect to financial requirements, expert NPD-3 explained that "the motivation of the corporation [for the NPD project] does not come from the contribution to the firm's profit". Thereby, cross-company monetization, i.e. together with other projects, was highlighted (expert NPD-2). Project budgets were set according to the planned development scope and complexity "three years in advance" (expert NPD-2). In this context, expert NPD-3 emphasized the benefits of joint ventures and development partnerships to split up the

financial burden and to provide secure budget flows. In addition, he stated that "you should invest a lot relatively early so that you can recognize and work through certain things early" (expert NPD-3). Regarding the corporate innovation culture, a focus on more iterative steps was recommended: "You can only do the innovation in relatively small amounts, because always completely different areas are affected, which means that it immediately exceeds your own scope of responsibility" (expert NPD-1). Thus, innovation connected to NPD was typically "a small improvement of details […], there is no other way" (expert NPD-1), which was also proposed by expert NPD-4a: "If you serve standard markets with standard processes and products and want to do so in the future, then you don't need to go down so many new paths". However, in case of entire new product generations, expert NPD-2 considered a certain degree of risk-taking necessary. Another requirement in the strategic context referred to the exploitation of company-wide synergies and economies of scale (expert NPD-1; expert NPD-4a). Expert NPD-2 for example highlighted other innovation projects that were enabled by his team's NPD project: "We are trailblazers".

In case of BMI projects, the definition of respective targets was often based on ideas of individuals as a source of BMI (e.g. expert BMI-1). Precisely measurable target definitions were considered a vital requirement for successful BMI projects: "We try to set objectives, which we then provide with quantifiable results, and to achieve and check these on a quarterly basis" (expert BMI-2). In connection with this, customer metrics mainly served as preferred measures of success (expert BMI-3). Expert BMI-1 additionally revealed that BMI KPIs often referred to market share, market penetration, customer penetration, and revenue growth. Resulting from this, expert BMI-4 addressed that some target definitions were "more qualitative than quantitative". Monetizing a BMI project did not represent a priority to the interviewed project managers, particularly in an early phase (e.g. expert BMI-1). The focus was on initial growth opportunities instead of short-term profitability (expert BMI-2). However, long-term commercialization potential was considered, and could be achieved through licensing or franchising (expert BMI-5). Project budgeting was described as a traditional top-down approach (expert BMI-2), which mostly depended on the perceived market potential (expert BMI-3). Sufficient freedom for utilizing this budget was highlighted: "We have our own budget and we can actually use this budget internally more or less for the topics where we say there is potential" (expert BMI-3).

Concerning the innovation culture, BMI projects required a certain openness to risks (expert BMI-1; expert BMI-2; expert BMI-4), as "it was more difficult to convince colleagues than customers" (expert BMI-1). Therefore, project managers had to express a lot of confidence: "They asked who believes in it. I was the only one who raised his hand" (expert BMI-1). Expert BMI-3 explained that especially within dedicated innovation units, a positive cultural orientation towards supporting new business ideas was critical. Another essential aspect represented a strong company fit of the business model (expert BMI-1). Therefore, BMI projects were often embedded into existing product offerings (expert BMI-2), which provided more value to the BMI as customers could tap into known platforms of the company. In line with this, expert BMI-5 explained: "That's the most important thing. You have to be able to use this 'unfair advantage', which theoretically exists, and a big corporation has".

Through analyzing the final dimension of 'Strategy', the following propositions have been detected:

Proposition S1-NPD: NPD projects require a target definition based on technical and legal requirements.

Proposition S1-BMI: BMI projects require measurable and adaptive target definitions, which are often based on customer metrics.

Proposition S2-NPD: NPD projects require cross-company monetization.

Proposition S2-BMI: BMI projects require initial growth opportunities instead of short-term profitability.

Proposition S3-NPD: NPD projects require budgeting that is dependent on the project's technological complexity.

Proposition S3-BMI: BMI projects require budgeting that is dependent on market potential.

Proposition S4-NPD: NPD projects require an innovation culture focused on iterative steps.

Proposition S4-BMI: BMI projects require an innovation culture based on the willingness to take risks.

Proposition S5-NPD: NPD projects require the possibility to exploit company-wide synergies and economies of scale.

Proposition S5-BMI: BMI projects require a definite company fit of the business model.

In order to outline the connection between the initially defined CIS dimensions (chapter 3) and the dimensions determined for the comparison framework of NPD and BMI, the following Table 8 depicts how each of the sub-dimensions is allocated to one of the seven CIS dimensions.

CIS Model Dimension	Working Definition	Aligned Comparison Framework Sub-dimension	
Innovation Process	The execution of an innovation activity from idea generation to implementation, including the application of methods and tools.	Preparatory work	E1
		Process structure	E2
		Speed	E5
		Research	M1
		Competition	M2
		Tools	E7
People & Culture	The actors involved in a firm's innovation activities, who possess a specific skillset and share a common organizational culture.	Innovation culture	S4
		Team size	E6
		Technical understanding of managers	O7
		Communication	E3
Organizational Structure	The allocation of power and authority within an organization that regulate a firm's innovation activities.	Structural integration	O1
		Responsibilities/hierarchy	O5
External Interaction	The involvement of external partners / stakeholders, who support the execution of an innovation activity.	External partnerships	C1
		Duration	C3
		Customer orientation	T3
Strategy	The goals, objectives and plan a firm pursues regarding its innovation activities.	Regulations	M4
		Target definition	S1
		Reporting/feedback	E4
		Potential	M3
		Company-fit	S5
		Leadership/management support	O6
		Innovativeness	T2
		Budgeting	S3
Resources	Tangible and intangible assets that support the execution of a firm's innovation activities.	Stakeholder background	O3
		Foreknowledge	T1
		Monetization	S2
		Internal cooperation	C2
Hygiene Factors & Rewards	The human resource policies and reward system of a firm that support employees' involvement in the innovation activities.	Motivation	E8
		Job design	O4
		Teamwork support	O2

Table 8: Alignment of dimensions

Altogether, almost an even distribution of the detected sub-dimensions to one of the seven CIS dimensions can be observed, which ensures their relevance for this study. The working definition of each CIS dimension served as a basis for an appropriate alignment. In the following section, suggested propositions have been evaluated according to their differentiation level for NPD and BMI projects, which lead to a conclusion regarding the overall research question.

4.2.3 Requirements for Successful NPD and BMI Management

While comparing the different (sub-) dimensions of corporate innovation project management, their degree of similarity regarding BMI and NPD has been evaluated in a qualitative manner. As indicated in Table 9, three differentiation levels were defined for classifying the respective (sub-) dimensions.

Differentiation level	Symbol
No / small differences	
Moderate differences	
Siginficant / extreme differences	

Table 9: Classification of differentiation levels

Accordingly, before elaborated characteristics of the analyzed NPD and BMI sub-cases (see 4.2.2) were further classified by their differentiation level, which is depicted visually for each (sub-) dimension (Table 10).

	ID	Sub-dimension	NPD projects	BMI projects	Differentiation level
Cooperation	C1	External partnerships	Network of specialized suppliers for outsourcing tasks which are not part of the core business	Strategic collaboration to fulfil the need for specific expertise or assets	
	C2	Internal Cooperation	Transparent collaboration management when using internal expertise	Open dialog with cooperative experts / departments willing to support project	
	C3	Duration	Long-term relationships with key partners	Efficient (temporary) partnerships	
Organization	O1	Structural integration	Specialized departments for each development task	Business model-specific organizational integration	
	O2	Teamwork support	Cross-divisional team-work without organizational hurdles	Cross-project information exchange	
	O3	Stakeholder background	Staffing mainly subject- specific engineers	Diverse stakeholder backgrounds	
	O4	Job design	Job design focused on increasing expertise	Dedication of full-time employees	
	O5	Responsibilities/hierarchy	Definite responsibilities through hierarchy	Flat hierarchy structure and decision liberties	
	O6	Leadership/management support	Consistent management support with issues	Stable ideational management commitment	
	O7	Technical understanding of management	Technological understanding of managers	Conceptual understanding of managers	
Market	M1	Research	Retrospective self- benchmarking instead of market research	Comprehensive market research	
	M2	Competition	Development independent of competition	Competition as business model validation	
	M3	Potential	Market potential in a corporate context	Immediate market potential with growing opportunities	
	M4	Regulations	Timely compliance with all legal regulations	Handling or negotiating legal requirements	
Execution	E1	Preparatory work	Leverage of lessons learned from previous projects	Ensuring timely management approval	
	E2	Process structure	Strict development process with milestones and quality gates	Project-specific innovation process (stages vs. agile)	
	E3	Communication	Regular communication with all relevant functions	Fast and regular communication with stakeholders	
	E4	Reporting/feedback	Continuous reporting, controlling and feedback on every hierarchical level	Continuous reporting, controlling and multilateral feedback from stakeholders	
	E5	Speed	Project type-specific timelines	Rapid implementation of business model	
	E6	Team size	Small core team size	Small team size	
	E7	Tools	Unified tool landscape	Useful tools in line with project workflow	
	E8	Motivation	Team motivation through appreciation	Intrinsic team motivation	
Technology	T1	Foreknowledge	Prior technical knowledge from related projects	Basic prior knowledge to build upon	
	T2	Innovativeness	Generally lower innovativeness	Manageable complexity and innovativeness	
	T3	Customer orientation	Indirect customer orientation regarding the whole value proposition	Strict customer orientation and continuous integration of customer feedback	
Strategy	S1	Target definition	Target defined by technical and legal requirements	Measurable and adaptive target definition (often based on customer metrics)	
	S2	Monetization	Cross-company monetization	Initial growth opportunities instead of short-term profitability	
	S3	Budgeting	Budgeting depending on technological complexity	Budgeting depending on market potential	
	S4	Innovation culture	Innovation culture focused on iterative steps	Innovation culture based on willingness to take risks	
	S5	Company fit	Possibility to exploit company-wide synergies and economies of scale	Company fit of business model	

Table 10: Framework for successful NPD and BMI management

Besides enhancing the current understanding of BMI and NPD projects from an academic point of view, the proposed framework helps project managers to successfully conduct either NPD or BMI within their corporation, as it provides an overview of the specific requirements for each innovation type. In sum, the highest levels of differentiation have been detected for instance for external partnerships, organizational integration, and market/customer focus. In contrast, both innovation types require consistent management commitment, continuous controlling and feedback, as well as a strong company fit.

Transferred to the proposed CIS model, four out of seven dimensions indicated a high differentiation level between BMI and NPD projects (see Figure 12). These included the dimensions Innovation Process, Organizational Structure, External Interaction, and Resources. The remaining CIS dimensions altogether rather indicated a medium differentiation level.

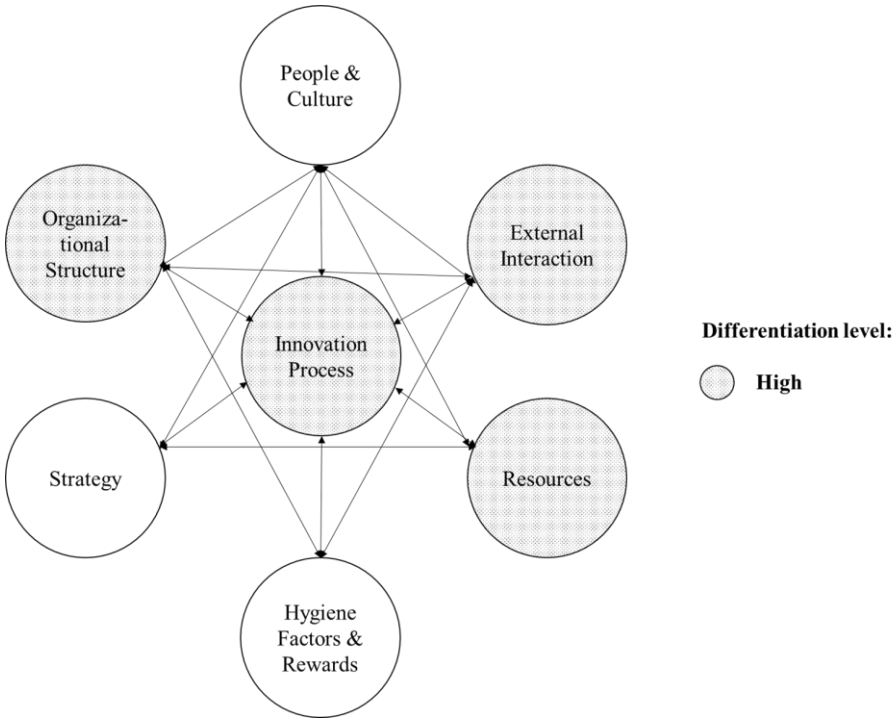

Figure 12: Qualitative comparison of BMI and NPD within CIS model

In order to determine the overall differentiation level for each CIS dimension, the researcher assessed each sub-dimension's qualitative rating with the following classification: 'low' = 1, 'medium' = 2, 'high' = 3. Afterwards, the average for each CIS dimension had to obtain a value of at least 2.5 for receiving an overall 'high'

differentiation level (see Appendix H). The following section includes a discussion of the presented results as well as implications for research and practice.

4.3 Discussion

Recognizing corporations' need to deal with an increasing complexity of their innovation activities, the purpose of this qualitative case study was to dig deeper into the findings derived from the benchmark analysis of CIS and their successful integration of BMI activities in chapter three. Therefore, two different innovation types, NPD and BMI, were analyzed on a project level with the aim to propose recommendations on how to enable advanced CIS, where traditional NPD is supplemented by BMI. In order to address this research strategy, an embedded single case study of nine sub-cases was conducted within an established corporation in the mobility sector. Through applying a sequential exploratory research design with ten qualitative expert interviews with innovation project managers, a practice-based management framework was developed. This framework served for a comparison of respective requirements for successful NPD and BMI along the pre-defined dimensions, i.e. Cooperation, Organization, Market, Execution, Technology, and Strategy. Resulting from this study, innovation managers receive specific recommendations for adapting their corporate innovation system while considering the different innovation types NPD and BMI. Thereby, the aforementioned research question was answered comprehensively. In addition to augmenting the very limited amount of studies that compare NPD and BMI (Bucherer et al., 2012), the suggested comparison framework constitutes a foundation for further studies in this field of research.

The chosen research approach for this case study was strongly justified, as the applied methodology was suitable for analyzing a current phenomenon within a practical environment (Yin, 1981). As the focused phenomenon demanded a more adequate perspective due to little empirical research, building theory from the conducted case study was appropriate (Eisenhardt, 1989). Furthermore, empirical issues were prevented by carefully following an analytical procedure and an extensive set of supportive evidence, which enables readers to assess the theory-fit on their own.

The presented case study significantly contributes to the research field of corporate innovation management, as it provides a theory-based comparison framework for two different types of innovation including six dimensions. The study clearly indicated that a one to one comparison of BMI and NPD is not applicable, however researchers may benefit greatly from knowing in which dimensions BMI might differ from NPD, two topics which academics and practitioners have studied over the last decades (e.g. Trapp et al., 2018). Based on the author's knowledge, a holistic framework for the comparison of BMI and NPD projects was proposed for the first time. Compared to the framework of Bucherer et al. (2012), the development of the presented comparison framework pointed out additional factors, such as strategic and culture-dependent aspects and therefore provides a much richer guideline for future research in this field. Consequently, the managerial implication of this case study refers to the depicted comparison framework as a whole. It offers distinctive requirements for successfully conducting BMI and NPD projects within a corporate context, which academics and practitioners have demanded for a long time (Mikusz et al., 2017; Geissdorfer et al., 2018).

Regarding cooperation and external partnerships in particular, NPD projects appeared to require a network of specialized suppliers for outsourcing certain development tasks, while BMI solely needed strategic collaboration to fulfil the need for missing assets, confirming Wozmack et al. (1990). The results further highlight the importance of internal cooperation and expertise for NPD, as stated by Trott (2012). BMI was also found to require an open dialogue with experts while seeking support.

The outstanding importance rating attached to internal cooperation should convince corporations to pay close attention to this aspect while striving for NPD and BMI within their CIS. Regarding the duration of cooperation, NPD usually seemed to require long-term relationships with selected key partners, especially suppliers (Liker et al., 1998). In contrast, BMI projects were found to favor temporary partnerships with project-specific partners. This result might be influenced by the novelty of most BMI projects and the yet missing steadiness.

Concerning the organizational structure, the findings suggest that NPD requires specialized departments for each development task, which confirms earlier studies (Clark and Fujimoto, 1991). With respect to the organizational integration of BMI

projects, the study could not reveal a universal pattern, which was also the case for the previous benchmark study. This might imply a business model-specific organizational organization. Furthermore, innovation projects require cross-divisional teamwork in general (Trott, 2012), whereby NPD expert highlighted the avoidance of organizational hurdles and BMI experts stressed the necessary transparency of information exchange.

As Dimancescu (1992) pointed out, a diverse team composition may lead to innovation success. This reasoning was confirmed by the presented results, but only in case of BMI projects. NPD projects seemingly required very subject-specific stakeholder backgrounds, which might relate to the complexity of most examined projects. Furthermore, a job design that is focused in increasing expertise among its stakeholders seemed required for successful NPD projects. On the other hand, BMI projects were found to demand the dedication of full-time employees (Trott, 2012).

Definite hierarchies might ensure NPD success but potentially hamper BMI severely, as the study results imply. Therefore, corporate executives trying to transform their corporate innovation framework have to establish an adequate organizational structure to provide BMI projects with necessary freedom of making decisions. Furthermore, general management support was found to be a decisive success factor for both NPD and BMI. Thereby, the study affirmed existing findings on the required ideational commitment (Ernst, 2002) and the consistency of support (Gassmann and Sutter, 2013). In addition, NPD might require the technological understanding of managers at least to some extent, whereby managers dealing with BMI projects seemed to only grasp details conceptually.

Most of the requirements within the market dimension were found to be relatively minor for NPD. Such innovation projects might require retrospective self-benchmarking instead of market research due to the development being conducted independent from competition. However, contradicting the findings of Ernst (2002), at this point it is essential to notice that there analyzed NPD projects mostly focused on the development itself and it might be assumed that market research was conducted by the marketing department or other internal stakeholders on a broader basis beforehand and in line with long-term strategic decisions on the firm’s project portfolio.

In contrast, BMI projects seemed to require comprehensive market research (Montoya-Weiss and Calantone, 1994). In some cases, competition was fond to be used as business model validation within a novel market (Wirtz and Draiser, 2017). For NPD projects, market potential might be required at least in a corporate context. BMI on the other hand, was found to require less immediate market potential but vast growth opportunities instead (Teece, 2010).

For NPD, the only requirement consistently rated as highly important related to the timely compliance with all legal regulations, which seemed plausible as products can only be sold with proper permissions. With respect to BMI projects, the case study revealed that legal regulations might also be an important aspect but in general were only considered for business model dependencies (Osterwalder and Pigneur, 2010), which might even be circumvented by a business model adaptation where possible.

Regarding the execution of NPD projects, the study suggests that leveraging lessons learned from previous projects during the preparatory phase was essential. For BMI projects, management approval (Frankenberger et al., 2013) was found to be the most important requirement before the project kick-off. Confirming the model of Cooper (1990), a strict development process with pre-defined milestones and quality gates seemed to be required for NPD projects. In case of BMI projects, gates might need to be more project-specific.

Furthermore, the aspect of communication presented itself among the relevant requirements for both innovation types. Affirming Kay et al. (2013), regular communication with all relevant functions seemed essential for NPD projects. The same applied for analyzed BMI projects. For NPD projects, continuous reporting, controlling and feedback was required on every hierarchical level. This as well as multilateral feedback from stakeholders (Kaplan, 2012) seemed to be required for BMI projects.

Concerning the project execution, the NPD sub-cases did not imply a certain timeline. However, BMI projects required rapid implementation of the business model. Therefore, the study confirms the importance of speed (Eckert, 2017). Both NPD and BMI projects might benefit from smaller project teams, potentially due to less efficiency losses in, among other things, communication and coordination.

NPD projects seemed to require a unified tool landscape to prevent inefficiencies along the innovation process. Useful tools in line with the project workflow were found to be demanded by successful BMI projects (Osterwalder and Pigneur, 2010).

All interviewed experts highlighted the importance of motivation through external appreciation for NPD projects and intrinsic team motivation for BMI projects respectively, which confirms presented findings from the conducted benchmark study as well as existing research (Gassmann and Sutter, 2013).

Referring to the dimension of technology, technical knowledge from prior projects (Trott, 2012) seemed to be required for NPD projects. BMI projects were found to rely on basic foreknowledge to build upon. Generally, a lower innovativeness seemed to be related to NPD projects, as they often had the tendency to be overloaded with complexity (Moore, 2008). For BMI projects, the complexity and innovativeness were not revealed as critical success factors in this case study. This might be due to the fact that established corporations can usually utilize cast assets to overcome technical challenges.

Furthermore, the study results indicate that NPD projects require a rather indirect customer orientation, which seemed to be based on the overall value proposition of the firm (Cooper, 1994). In contrast, strict customer orientation and continuous integration of customer feedback were regarded as requirements for BMI projects.

Patenting turned out to be less relevant in case of NPD and BMI projects, which contradicts existing studies on the matter (Casadeus-Masanell and Zhu, 2013), which was mainly due to the fact that hardware-based NPD and BMI projects were found to be developed in close conjunction with external engineering service providers, losing the rights to patent.

Regarding the strategic dimension, this case study revealed that technical and legal requirements might be required to define the target of NPD projects, whereas BMI projects seemed to demand for measurable and adaptive target definitions, which were often found to be based on customer metrics (Affenzeller et al., 2016). In addition, cross-company monetization might be needed for NPD, as some projects got subsidized by others and only generated the desired customer benefit as a whole. BMI projects

focused on initial growth opportunities instead of short-term profitability. Still, a promising business model has to scale eventually (Chesbrough, 2007).

The budgeting of NPD projects seemed to be dependent on the respective technological complexity, which usually determined the required resources. For BMI projects, budgets seemed to be granted in line with the identified market potential, which often relied on rough estimates and a certain gut feeling of managers.

The study further revealed that NPD projects might require an innovation culture focused on iterative steps, whereas companies necessarily might have to establish a tolerance regarding uncertainty (Wohlfeil and Terzidis, 2015) based on the willingness to take risks to allow for successful BMI.

In addition, the possibility to exploit company-wide synergies and economies of scale seemed to be required for NPD (Cooper, 1994). Considered one of the most important aspects for BMI, this innovation type seemingly required a definite company fit for the business model to become successful.

The main takeaway for managers indicates that complementing NPD with BMI is of particular value when mere product or service innovations are not sufficient for sustainable success (Lindgardt et al., 2009). The proposed comparison framework serves as clear guidance for implementing an ambidextrous organization.

Several limitations were attached to this case study, which need to be addressed carefully. As for the conducted benchmark study, a prioritization of the presented dimensions of the comparison framework could only be expressed vaguely. Future research might aim for a more balanced segmentation when possible.

Referring to data validity, more expert interviews per sub-case and additional secondary data could have provided further insights and might have supported the proposed findings (Yin, 2017). This aspect was omitted due to time and resource constraints.

Also external validity seems limited, as a single case study has been conducted (Yin, 2017). Admittedly, innovating differs markedly between industries and even among direct competitors (EIRMA, 2004). However, it can be argued that the innovation endeavors, corporate structure and firm history are comparable to those of many established multinational players of the manufacturing sector. Besides the preceding

benchmark study, which did consider a wider range of corporations, the findings can be considered applicable for several industries, regardless of the limited empirical evidence. Still, future research could include other innovation types and various industries in this research context.

Last but not least, this qualitative case study suffers from lacking precisely defined measured of innovation project success, which lead to a certain degree of uncertainty concerning the actual results. Although the interviewed NPD and BMI experts were asked to provide insights about the outcome and performance of their project, further research should consistently apply a concrete, more quantitative measurement framework (Adams et al., 2006) to promote project comparability and to validate stated best practices. This endeavor will be addressed in the following chapter, where the conducted case study comparing NPD and BMI projects will be enriched by a qualitative data analysis.

5 Case Study Comparing BMI and NPD Projects – Quantitative Analysis

In line with the illustrated research strategy for the empirical part of this dissertation, the following chapter will draw on the previous benchmark study (chapter 3) as well as the qualitative comparison of BMI and NPD projects (chapter 4). Thereby, obtained findings and propositions have been operationalized with the aid of a quantitative survey, which was conducted within the same corporation as the case study in chapter 4. As a result of this analysis, considerable recommendations for combining different types of innovations within one CIS were derived and provide a valid guideline for managers in addition to suggestions for future research in this field.

5.1 Model Development

The following sub-chapter will outline the procedure that lead to conceptualizing and defining the research model for the quantitative analysis. Based on previously identified qualitative findings, a definition of constructs and measurement scales will lead to the specification of a statistical model. Thereby, the researcher ensured high quality results by prioritizing validity and reliability throughout the statistical analysis.

5.1.1 Derivation of Propositions and Hypotheses

By adhering to the described research strategy of a sequential exploration of the problem statement, the first step for defining a research model referred to merging obtained propositions from the previous chapters. An overall proposition for each CIS dimension resulted, and represented the basis for defining suitable hypotheses and constructs. At this point, it is essential to recall that the problem statement of this study clearly targeted the CIS as a whole, i.e. a superior level of analysis. Thus, the researcher had to focus on one proposition per CIS dimension in order to adhere to the given limited scope of this work.

For instance, in case of the CIS dimension ‘External Interaction’ the researcher extracted the following propositions from the qualitative part of this study (see Figure 13).

Benchmark Study of CIS in the Mobility Sector (Chapter 3)

Proposition CIS_EE: Flexible collaboration models and project-specific external partners are required for a corporate innovation system that supports the development of new business models.

Case Study Comparing BMI and NPD Project – Qualitative Analysis (Chapter 4)

C1-NPD: NPD projects require a network of specialized suppliers, which are not part of the core business, for outsourcing tasks.

C1-BMI: BMI projects require strategic collaboration to fulfil the need for specific expertise or assets.

C3-NPD: Long-term relationships with key partners are required for NPD projects.

C3-BMI: Efficient and often temporary partnerships are required for BMI projects.

T3-NPD: NPD projects require an indirect customer orientation regarding the whole value proposition.

T3-BMI: BMI projects require a strict customer orientation and continuous integration of customer feedback.

Figure 13: Overview of propositions for ‚External Interaction‘

By also considering main quotes from interviewed experts, the researcher merged obtained propositions from the qualitative empirical analysis, whereby one overall proposition emerged for ‘External Interaction’ (P1). Hereby, the proposition had to reflect the comparative aspect of the quantitative analysis, i.e. the comparison of BMI and NPD projects.

P1: There is a significant positive relationship between the relationship quality with external partners and the success of a NPD project, while there is no significant positive relationship between the relationship quality with external partners and the success of a BMI project.

Accordingly, the following propositions emerged for all remaining CIS dimensions, as a basis for their operationalization (Table 11). An overview of the entire derivation of the propositions can be found in the Appendix I.

CIS dimension	#	Proposition
External Interaction	P1	There is a significant positive relationship between relationship quality with external partners and the success of a NPD project, while there is no significant positive relationship between relationship quality with external partners and the success of a BMI project.
Hygiene Factors & Rewards	P2	There is a significant positive relationship between extrinsic motivation and the success of a NPD project, while there is a significant positive relationship between intrinsic motivation and the success of a BMI project.
Resources	P3	There is a significant positive relationship between a specialized background of internal stakeholders and the success of a NPD project, while there is a significant positive relationship between a generalized background of internal stakeholders and the success of a BMI project.
People & Culture	P4	There is a significant positive relationship between a risk-averse organizational culture and the success of a NPD project, while there is a significant positive relationship between a risk-tolerant organizational culture and the success of a BMI project.
Innovation Process	P5	There is a significant positive relationship between an innovation process based on exploitation and the success of a NPD project, while there is a significant positive relationship between an innovation process based on exploration and the success of a BMI project.
Organizational Structure	P6	There is a significant positive relationship between a mechanic organizational design and the success of a NPD project, while there is a significant positive relationship between an organic organizational design and the success of a BMI project.
Strategy	P7	There is a significant positive relationship between financial resource allocation based on a quantitative approach and the success of a NPD project, while there is a significant positive relationship between financial resource allocation based on a qualitative approach and the success of a BMI project.

Table 11: Overview of propositions

In order to lead to the following constructs carefully, the derivation of propositions and hypotheses has been enriched by another comprehensive literature review. Thereby, the importance of this empirical study was highlighted once again, as a limited body of literature was discovered in the research context and for BMI in particular. Overall, the process of deriving propositions and hypotheses for the quantitative part of this study was conducted in an iterative manner.

External Interaction

In case of NPD, the relationship with external partners was addressed repeatedly within a large number of studies (e.g. Parker, 2012; McManus, 2004) and indicates this construct is highly relevant. Thus, long-term commitment to major projects (Poolton and Barclay, 1998) as well as long-term relationships in general (Pitta et al., 1996) appeared to be essential. Furthermore, research suggests that external relationships, which mainly referred to buyer-supplier relationships, should be actively managed in order to increase the NPD project's performance (Walter, 2003; Dyer and Ouchi, 1993). In this context, Lin and Huang (2013) added that the efficiency and the effectiveness of the NPD process clearly depend on strong inter-firm relationships, as they facilitate the capture of valuable knowledge. However, in contrast other researchers explained that

NPD-outsourcing was rather related to short-term relationships between customer and supplier (Narula, 2001) and for projects of low duration (Croisier, 1998). In line with this, weak ties were considered to encourage a higher diversity of information that might enrich existing know-how within the firm. Overall, existing literature on firms' relationship with the external ecosystem focused on the relationship quality of such interactions (e.g. Benasou, 1999; Knudsen, 2007; Dyer and Chu, 2011). Thereby, several factors positively influenced the relationship quality between two partners. According to various authors, trust represented a significant factor, as it increased more co-operative negotiations and communication as well as the willingness to share knowledge and information (Wognum, Fischer and Weenink, 2002; Walter, 2003; Cantista and Tylecote, 2008; Bunduchi, 2013). In addition, it was suggested that commitment between two or more parties improved the relationship in general and created a larger amount of opportunities for both partners (Seppännen et al. 2007; Barnes et al., 2007). Two other factors also had a strong impact on the relationship quality: loyalty (Rajendran et al., 2012) and the relationship history (Handfield et al., 1999; Zhao and Lavin, 2012).

Consistent with research regarding external ecosystem relationships in the context of NPD, experts interviewed in the qualitative studies claimed: "Often [we] come to the same companies, the same teams, but it is rare that you only have one contact person or a cooperation partner (…) Suppliers have done this by default for the last ten, twenty years" (expert NPD-1). The same experience was shared by expert-NPD-4b: "We have three of four partners who have worked with us time and again. Some have built up a great deal of know-how in some areas, of course we will stick with them". Expert NPD-3 added: "Suppliers who were good five years ago can look quite different today. New market participants have developed. We also changed suppliers on the way, because we saw, 'Oh, there is someone who (...) is more capable there, he reaches his goals faster'. That is a very important part of supplier market observation in the context of development to see which possibilities open up there".

According to (Rezazadeh, 2017), BMI represents a new type of innovation, which involves novel cooperation and collaboration models. In line with this, collaboration represents a crucial aspect of creating an innovative business model, which requires firms to deploy enhanced collaboration capabilities (Perryman and Combs, 2005;

Osterwalder and Pigneur, 2010; Giesen et al., 2007). Chesbrough and Schwartz (2007) highlight the potential of co-development with external partners, as it increased the effectiveness of this type of innovation. Furthermore, benefits of co-development for BMI include R&D expense reduction, innovation output expansion, and access to new markets that would otherwise never been conquered (Chesbrough, 2003). In this context, several authors name the term 'collaborative entrepreneurship', which refers to "the exploration or exploitation of new opportunities through cooperation with individuals, businesses, or government entities" (Ratten, 2014, p. 301). Thus, a firm advanced its ability to build relationships with external parties by the connecting intrapreneurship with inter-firm collaboration (Franco and Haase, 2012). In addition, Ribeiro-Soriano and Urbano (2009) argue that collaborative entrepreneurship "promotes innovation in a continuous way" (p.301).

In accordance with the rather limited number of studies on BMI and external partnerships, experts interviewed in the qualitative research study remained rather vague concerning this phenomenon. However, IP15_SV_DP agreed: "Yes, this [BMI] requires other types of collaboration. Nothing is standardized, there are always new collaborations for each project and there has to be a win-win for both sides". Furthermore, in this context IP14_SV_TP stressed: "It drives me crazy when my colleagues back in [the headquarter] use the word supplier with startups. Because a supplier to me is someone who has been working with you for the last 10, 20, maybe 30 years (…) It represents a very well established relationship in the traditional business model. Startups are scruffy little things that have the idea that we need to help them grow and bring them into the supply chain. (…) From a startup what you can get are radical ideas that can really transform your business. When a traditional supplier brings something to us, it's three years later to the original idea and all the other OEMs have seen it already." Resulting from this, the following hypothesis emerged:

Hypothesis_H1: The relationship quality with external partners is significantly more relevant for the project success of NPD projects than BMI projects.

Initially, the researcher divided the construct 'Relationship Quality' into 'High Relationship Quality' and 'Low Relationship Quality', which was later merged into one sub-construct due to the conducted reliability analysis (see 5.2.5).

Hygiene Factors and Rewards

In connection with rewarding and motivating employees, Ryan and Deci (2000) suggested a taxonomy of human motivation, which basically distinguishes between extrinsic motivation and intrinsic motivation. The first study that addressed reward systems in connection with NPD was conducted by Booz, Allen and Hamilton (1982). Several authors corroborated to the view that members of NPD projects should be rewarded on the basis of the entire team performance (Pitta et al., 1996; Smith, 1997). Kuczmarski (1992) added that NPD professionals' motivation could be enhanced by creating rewards based on the new product's performance. Malanowski (2007) suggested five types of reward-programs for technical innovation professionals: recognizing long-standing excellence, distinguishing individual and team contributions, rewarding patent inventions, royalty compensation plans, and separate companies or innovation banks. Contrary to the mentioned focus on team performance, Leonard-Barton (1992) emphasized that the success or failure of new products was mostly attributed to individual high performers, whose visibility and status confirmed the dominance of their discipline at all times. Furthermore, manufacturing firms often provide bonuses or additional compensation on top of their base salary for employees involved in NPD (Spaulding and Woods, 2002). However, Kanama and Nishikawa (2015) labeled this approach of monetary compensation as a counterproductive measure as it had a negative impact on the development of new products and services.

Supporting the suggested connection between NPD performance and extrinsic drivers of motivation, expert_NPD-3 shared: "It's very important for the motivation of the team that the work is recognized. […] I regard publications on the corporate intranet as very motivating for the development team. Press reports are also important". However, expert-NPD_3 did not "consider the possibility of motivation through patents as high".

In case of BMI, existing studies predominantly described intrapreneurs as "dreamers who do. Those who take hands-on responsibility for creating innovation of any kind, within a business" (Pinchot, 1985, p.10). Thereby, the term 'entrepreneurial spirit' was often mentioned (e.g. Hisrich, 1990), as it highlights the need for creativity and the willingness to transform an entire organization (Pinchot, 1985). In line with this, Hayton and Kelley (2006) proposed several benefits of a competency-based approach for corporate entrepreneurship: enhanced person-organization fit, greater flexibility

within the HR system, and positive effects on intrinsic motivation. With respect to drivers for BMI, a high degree of personal commitment was considered essential (Stampfl, 2016) as well as the following motivators: the joy of discovering new things, the motivation of creating superior value, and the acknowledgement through first positive customer feedback (Stampfl, 2016).

Experts interviewed in the qualitative analysis consistently noted that drivers of BMI include intrinsic motivation and rewards, such as IP15_SV_DP explained: "(…) being able to work on cool topics. To contribute and test their own ideas. That's very motivating for a lot of people and they are having fun." IP6_GER_TP added: "It's about lighting the fire in these people and from there on, it's voluntary." Other experts also highlighted passion (expert-BMI_2; expert-BMI_3; IP22_CN_DP) as well as commitment and persistence (expert-BMI_5; IP27_JPN_TP) as important success factors. In connection with this, a platform for enabling employees to present their ideas (IP12_SV_AP) was considered as relevant as a safe and open-minded environment for new business ideas (IP13_SV_NP). Based on the above stated findings, the following hypotheses emerged.

Hypothesis_H2a: Extrinsic employee motivation is significantly more relevant for the project success of NPD projects than BMI projects.

Hypothesis_H2b: Intrinsic employee motivation is significantly more relevant for the project success of BMI projects than NPD projects.

Resources

In literature, critical resources for NPD projects often refer to human capital and internal stakeholders (e.g. Chandler et al., 2005; Cooper, 1999). According to Cooper (2011), internal stakeholders and customers should be involved in the development process as early as possible. Aaltonen and Kujala (2010) explained that internal stakeholders represent primary stakeholders and incorporate formal organization or project members. In the context of NPD, cross-functional experience and qualification of team members have been highlighted as critical success factors (Lynn et al., 1999; Lester, 1998). Traditionally, a large number of highly educated and highly specialized personnel were employed in business functions, such as research, development, and engineering (Allen, 2001). Carlile (2002) added that the primary functions involved in

the development of new products at a large scale referred to sales and marketing, design engineering, manufacturing engineering, and production. This aspect was supported by Leonard-Barton (1992), who claimed that NPD required technically skilled employees with an advanced level of qualification. Furthermore, he stressed that firms assign a high status to technical disciplines in order to attract the top talent (Leonard-Barton, 1992). Several authors pointed out that the outcome of a product development process is advanced by a good synergy between a corporation's technical capabilities and the NPD project (Cooper and Kleinschmidt, 1993; Song and Parry, 1997; Montoya-Weiss and Calantone, 1994).

Supporting existing studies, experts interviewed in the qualitative part of this empirical analysis revealed that in the case of NPD projects, "it can only work if you bring together experts from their respective fields" (expert-NPD_1). Expert-NPD_4a argued, "This has progressed so far that it became inevitable that one has to specialize a bit more and more". According to expert-NPD_3, a highly specialized and qualified background was not only sufficient on the operative level, as managers had to be "technically competent decision-makers, and very intelligent people with a great and fast technological grasp, also with a lot of experience" in order to succeed in NPD.

In case of BMI, authors claimed that a wide range of new and different capabilities were required (Johnson, 2010; Lindgardt et al., 2009). According to several studies (Bantel and Jackson, 1989; Chandler et al., 2005; Deeds et al., 1998, Hayton, 2005a), suitable characteristics of human capital are neglected by existing corporate entrepreneurship literature, which solely refers to a high degree of diversity in connection with education and experience.

Several statements from the conducted qualitative interviews enriched this limited amount of existing research on essential human resource characteristics for BMI. For instance, IP1_GER_TP shared: "In the meantime, for business model innovation and new mobility services one is really able to think and tackle innovations together with people from different backgrounds and diverse education and I believe this brings a lot of opportunities. (…) I think that topics will get more and more interdisciplinary." Expert-BMI_4 also highlighted that for his project "there was a nice mixture of different colleagues who knew the corporation by heart". Following the mentioned findings, two hypotheses emerged.

Hypothesis_H3a: A specialized background of internal stakeholders is significantly more relevant for the project success of NPD projects than BMI projects.

Hypothesis_H3b: A generalized background is significantly more relevant for the project success of BMI projects than NPD projects.

People and Culture

According to Cooper and Kleinschmidt (1995), NPD depends on a positive culture and working climate. In this context, several authors referred to required support related to rewards, risk, autonomy, and treatment of failures as critical factors for successful NPD (Gupta and Wilemon 1990; Hegarty and Hoffman, 1990; Leder, 1989; Shrivastava and Souder, 1987). According to Nakata and Sivakumar (1996), a low level of uncertainty avoidance positively affects the initial phase of the NPD process, while the actual development phase benefits from high levels of uncertainty avoidance, as risk aversion facilitates tight planning and control. Overall, Belassi et al. (2007) highlighted that the relationship between organizational culture and NPD performance largely remained overlooked by existing studies.

In line with findings from previous studies, interviewed experts emphasized a risk-averse cultural orientation for successful NPD. As analyzed NPD projects mostly referred to incremental innovations (expert-NPD_4a), the scope of innovation typically incorporated a low level of risk (expert-NPD_1). Expert-NPD-4b also stressed that his development results could not be considered as “true innovation”, but were instead a constant improvement of familiar technologies. However, expert-NPD_2 suggested a certain degree of risk-taking is involved in the context of developing completely new product generations.

Similar to NPD, existing studies highlight that BMI heavily depends on the underlying organizational culture (Aspara et al., 2013; Wiewiora et al., 2013; Hogan and Coote, 2014). With respect to the development of new business models, a creative culture was considered essential in order to cope with competitive threats (Amabile and Khaire, 2008) and to realign structural change and resource reconfiguration (Gulati and Puranam, 2009). In line with this, Johnson et al. (2008) described BMI as an outward-facing and highly creative exploratory process. Hock et al. (2015) argued that BMI is supported by novelty-oriented cultural values, while efficiency-oriented cultural values

provoke the opposite. Furthermore, Cameron and Quin (2011) associated BMI with the "adhocracy culture type", which includes creativity and risk-taking. In line with this, Girotra and Netessine (2011) explained that coping with risk defines how a company moves towards a new business model. Altogether, studies combining organizational culture and BMI are very limited (Spieth et al., 2014).

In line with existing studies, experts interviewed in the qualitative portion of this dissertation supported the perception that a culture based on openness to risks was required for sustainably successful BMI (expert-BMI_1; expert-BMI_2; expert-BMI_4). In connection with this, expert-BMI-1 shared that removing financial risks from the project team directly resulted in innovative risk-taking. Trying out and testing new ideas was generally considered vital for successful BMI (expert-BMI_2), which included courage (IP5_GER_TP) as well as the willingness to fail (IP4_GER_TP). Accordingly, the following two hypotheses were depicted for the 'people and culture' dimension.

Hypothesis_H4a: A risk-averse organizational culture is significantly more relevant for the project success of NPD projects than BMI projects.

Hypothesis_H4b: A risk-tolerant organizational culture is significantly more relevant for the project success of BMI projects than NPD projects.

Innovation Process

In the case of NPD, successful projects oftentimes rely on lessons learned from past development endeavors (Lynn et al., 1999; Lester, 1998). According to Landau and Stout (1979), NPD is related to the terms 'benchmarking' and 'best practice', which adheres to organizational controls, compliance to, and convergence of the firm's decision-making process (Flamholtz et al., 1985). Even though the relationship between NPD and lessons learned was considered statistically significant (Norang and Nooshin, 2016), engineers mostly aimed for learning from past project experience, while neglecting to learn effectively from present projects (Lantada et al., 2013). Following Osterwalder et al. (2015), existing R&D structures of established corporations rarely target the identification of new value propositions and business models, but instead aim for technology or product innovations that assist the existing business model.

Supporting the identified link between the NPD process and existing knowledge, expert-NPD_3 claimed that his project team needed "decomposition of specifications" following internal best practices of older projects. This point of view was confirmed by expert-NPD_1: "We have simply oriented ourselves to the predecessor series with the given boundary conditions. Thereby, the project team asked itself what they had learned from the past project and 'what do we want to do better'". Furthermore, expert-NPD_4 addressed that it was essential for a successful project execution that the corporation developed engineering standards and a common understanding on the innovation process.

As suggested by Bucherer et al. (2012), a certain similarity between high-level process steps should be considered for NPD and BMI projects, while at the same time "significant deviations for the concrete activities performed" (p.190) occurred. While early prototypes could be shared and tested with potential customers during an early phase of NPD, BMI projects often required a full implementation before they could be tested in reality (Frankenberger et al., 2013).

In line with existing literature, experts interviewed in the qualitative empirical analysis of this work stated that for BMI projects "you cannot rely on any previous knowledge from yourself neither from others, because this is totally new […] This is just what the pioneers faced or experienced in every new sector" (IP22_CN_DP). According to IP14_SV_TP, the innovation process for BMI is "driven by a particular goal, we have a revenue model in mind, and we have a profit model in mind, so it's very much driven by the business side of things". Throughout the process, regular pitches in front of the management were required in order to receive sufficient investment in the business idea and to ensure a strategic fit (expert-BMI_2; IP2_GER_TP). Altogether, overcoming company-internal barriers was considered the biggest hurdle of BMI projects (expert-BMI_1). Based on the above elaborated findings, the following two hypotheses emerged.

Hypothesis_H5a: An innovation process based on exploitation is significantly more relevant for the project success of NPD projects than BMI projects.

Hypothesis_H5b: An innovation process based on exploration is significantly more relevant for the project success of BMI projects than NPD projects.

Organizational Structure

According to Bucherer et al. (2012), the most established organizational design for NPD refers to the traditional R&D line organization, which contains several project teams. In general, the organizational structure for NPD has been associated with centralization, role formalization and mechanistic structures (e.g. Gupta et al., 1986). In this context, the exploitation of existing business models has been characterized by efficiency, centralization, and tight cultures (Benner and Tushman, 2003). Sosa and Mihm (2008) addressed a segmentation of the overall endeavor of developing new products into various different development tasks. Thereby, the requirements of the responsible individual or organizational subunit differ with respect to knowledge and skills. However, as these organizational entities repeatedly work on similar tasks, development organizations need to apply specialization (Sosa and Mihm, 2008). Song et al. (1998) claimed that firms often apply a functional approach to NPD, whereby various specialized departments, such as R&D or manufacturing, operate independently. Furthermore, Griffin (1997) suggested that the functional approach to structure NPD represents a cross-functional structure that enables close collaboration between specialists from different departments.

Confirming previous studies, the interviewed experts revealed that a tight organizational integration with the mother company was essential for NPD (expert-NPD_3). Furthermore, he stressed an ongoing trend that each research division "has diversified extensively into smaller or new departments, which now have to be coordinated" (expert-NPD_3). Expert-NPD_1 elaborated on a component development department that divided the development of components and corresponding parts for different product groups into smaller tasks.

With regard to BMI's complexity, Govindarajan and Trimble (2010) point out the difficulty of locating tasks within a large organization for this type of innovation. Nevertheless, Benner and Tushman (2003) regarded flexibility, decentralization, and loose cultures as essential traits for exploration, which are typical for organic structures (Slevin and Covin, 1997). Bucherer et al. (2012) recognized a general difference in the organizational implementation between BMIs that completely replace traditional

business models and BMIs that operate in parallel. In the first case, firms typically tested the new business model in one business unit or a designated target market in order to mitigate risk before they replace the previous business model. In the second case, business models run simultaneously for a longer period of time, which is for instance justified for distinctive target markets or business units. Furthermore, Osterwalder et al. (2015) stressed that existing R&D structures of large firms do not comply with BMI-specific requirements.

In line with that, experts involved in the previous qualitative analysis highlighted the need for an autonomous setup for BMI in order to develop innovations and to attract the right talent (IP10_SV_TP). Moreover, IP12_SV_AP assigned "clearly more freedom" and "less responsibility for regular topics" to employees involved in BMI, who were located in separate offices. IP16_SV_TP addressed that internal startups had different procurement and HR processes, which allowed for a quicker execution and more flexibility. Resulting from this, the following hypotheses were defined.

Hypothesis_H6a: A mechanic organizational design is significantly more relevant for the project success of NPD projects than BMI projects.

Hypothesis_H6b: An organic organizational design is significantly more relevant for the project success of BMI projects than NPD projects.

Strategy

Traditionally, one of the most critical choices of top management refers to the allocation of scarce resources among competing strategic investment opportunities (Donaldson, 1984). According to Godener and Söderquist (2004), performance measurement related to R&D activities and NPD has gained increasing attention, as a firm's competitive advantage and ultimately its survival depends on the effectiveness and efficiency of these activities. On the project level, financial performance (e.g. ROI) strongly depends on a sophisticated matching, organization, and deployment of skills and resources (Song and Perry, 1997). Following Griffin and Plage (1993), essential measures for financial NPD performance include break-even time, margin goals, profitability goals, and return on investment. In line with this, a large number of authors refer to the maximization of ROI as the primary target of traditional portfolio management within established firms (Fornell, 1992; Calantone et al., 1995; Evans, 1996). With respect to

the experts interviewed in the qualitative study, no clear statement was given concerning the financial resource allocation for NPD.

In case of BMI, hardly any literature was found in the context of financial resource allocation or budgeting of innovation projects. Clauß (2017) addressed the lack of a measurement scale for BMI, which needs to be commonly agreed and comprehensively validated. However, he proposed several ways of measuring BMI. The first one refers to 'value creation innovation' including new capabilities, new technology or equipment, new partnerships, and new processes. Second, the 'value proposition' ca be measured by the introduction of new offerings, new customers and markets, new channels, and new customer relationships. Lastly, 'value capture innovation' describes new revenue models as well as new cost structures (Clauß, 2017).

Confirming the current state-of-the-art around BMI in this context, IP15_SV_DP shared: "Yes, we don't look at the ROI (…) We look at the market potential instead. We think you have to start doing something quickly and then look at the numbers later." IP3_GER_TP supported this view by adding: "I don't want to say this [BM] innovation, if I do that in the next few years, gives me so much return on investment." Expert-BMI-3 and expert-BMI_5 also highlighted a BMI's market potential as an important measure for budget allocation. Finally, IP7_GER_TP explained: "These are different requirements [for BMI] (…) above all, we need another attitude and another system of values, as well as other KPIs for the management. When I'm mainly measured by what I bring in for the next [vehicle model], I decide things differently than if I'm measured by how many millions of active users I bring to a platform in how many years. I also invest differently." Accordingly, the following two hypotheses emerged.

Hypothesis_H7a: Financial resource allocation based on a quantitative approach is significantly more relevant for the project success of NPD projects than BMI projects.

Hypothesis_H7b: Financial resource allocation based on a qualitative approach is significantly more relevant for the project success of BMI projects than NPD projects.

After defining overarching research hypotheses for the quantitative part of this study, constructs and measures are outlined in the following sub-chapter.

5.1.2 Conceptualization of Constructs and Development of Measures

Throughout the process of defining a suitable research model, the suggested approaches suggested by MacKenzie et al. (2011) served as a template for the following successive steps. Due to lack of comparable studies, the researcher had to identify relevant factors from existing literature carefully, whereby the following constructs emerged (Table 12). As illustrated below, each construct served for operationalizing one of the seven pre-defined CIS model dimensions, which were initially analyzed in the qualitative part of this study.

CIS dimension	Proposition #	Construct	Definition
External Interaction	P1	External Relationship Quality	The perceived degree of commitment and trust of the relationship with external partners who are involved in the project.
Hygiene Factors & Rewards	P2	Employee Motivation	The underlying reasons of employees for their involvement in the project.
Resources	P3	Internal Stakeholder Identification	The required capabilities of the core internal stakeholders who are involved in the project.
People & Culture	P4	Perceived Risk Culture	The extent to which project members perceive and deal with risk.
Innovation Process	P5	Innovation Process Modeling	The extent to which the innovation process is following repetitive and predictable patterns.
Organizational Structure	P6	Organizational Design	The extent to which rules, hierarchy and decision making are regulated within the project.
Strategy	P7	Financial Resource Allocation	The approach considered for the allocation of project funding.
-		Project Success	The perceived degree of success of the last completed innovation project.

Table 12: List of construct definitions

The subsequent sections will go into detail regarding each construct's definition and measurement, which were derived from previous qualitative findings and existing studies in literature.

External Relationship Quality

In order to operationalize the CIS dimension 'External Interaction' the researcher measured the construct 'External Relationship Quality'. According to the illustrated

working definition, external relationship quality refers to the perceived degree of commitment and trust of the relationship with external partners who are involved in the innovation project. Though the collaboration with stakeholders outside the firm plays a significant role for BMI and NPD projects alike, the qualitative results indicated differing intensities and forms of partner involvement. For instance, NPD projects mostly relied on the same long-term suppliers, while new collaborations constantly emerged in BMI projects.

Relationship quality refers to a construct that has been utilized by past researchers before, but within a different context (e.g. Moorman et al., 1992; Palmer and Bejou, 1994). According to Williams et al. (2015), a large number of scholars regard dimensions of inter-firm relationships as essential aspects of project management. In line with this, several studies in the field of marketing research emphasized the importance of relationship quality between suppliers and customers (Fruchter and Sigué, 2005; Grönroos, 2011; Harker and Egan, 2006; Lusch and Vargo, 2011). Supplier-customer relationship quality has also been incorporated repeatedly in project management literature (Piercy, 2009; Zou et al., 2014). However, it is recognized that very little research to date has analyzed the influence of relationship quality on project success (Williams et al., 2015).

Following MacKenzie et al. (2011), the dimensionality of a construct is determined by listing its fundamental characteristics. For external relationship quality, the following factors were named to have a positive impact: trust, commitment, communication quality, cultural similarity, and balanced interdependence (Chakrabarty et al. 2008). Athanassopoulou (2008) confirmed these characteristics by suggesting the following factors to affect the relationship quality: communication quality, development of strong relationship bonds, partner relationship quality, strong customer orientation, and proficiency in knowledge brokering. For NPD projects specifically, several authors refer to the importance of relationship history as having a positive influence on the relationship quality (Handfield et al., 1999; Zhao and Lavin, 2012). Altogether, three main characteristics clearly dominated existing literature on relationship quality: trust (Crosby et al., 1990; Moorman et al., 1992; Myhal et al., 2008), loyalty (e.g. Rajendran et al., 2012), and commitment (Moorman et al., 1992; Pepur et al., 2011). Moreover, these three items align with the presented qualitative findings of this work, which

supports their assignment to represent the construct. As the aforementioned characteristics of relationship quality can be measured as 'high' or 'low', the researcher chose to define relationship quality as a two-dimensional construct, which was later redefined as a one-dimensional construct (see 5.2.5).

Employee Motivation

With the aim of operationalizing the CIS dimension 'Hygiene Factors and Rewards', the construct Employee Motivation defines the underlying reason for employees' involvement in the innovation project. Throughout the qualitative analyses of this dissertation, interviewed experts strongly emphasized the importance of passion and voluntary contributions, for BMI in particular. In case of NPD, extrinsic motivators seemed to play a bigger role, as the recognition of teamwork was highlighted in this context.

Existing literature includes three prominent theories on motivation: Maslow's hierarchy of needs (1943), Herzberg's two-factor theory (1959), and Hackman and Oldham's job characteristics theory (1975). As noted throughout the qualitative analysis of this study, Facteau et al. (1995) suggested that employee motivation depends on the support of subordinate, superior, and top management. Furthermore, supervisory support has the potential to foster satisfaction and motivation, which reduces stress and increases employees' job performance (Babin and Boles, 1996). In line with this, several authors detected that motivated employees are typically more oriented towards freedom and autonomy, while they are more self-driven than less motivated employees (Ryan and Deci, 2000; Thomas, 2002; Grant, 2008).

In general, two types of motivation have been addressed and analyzed by a large number of studies: extrinsic and intrinsic motivation (e.g. Lin, 2007). According to Ryan and Deci (2000), extrinsic motivation relates to activities that are conducted with the aim of obtaining external outcomes or rewards. In contrast, intrinsic motivation refers to activities that are executed based on the inherent satisfaction arising from the activity (Ryan and Deci, 2000). Moreover, extrinsic motivation has a focus on goal-driven benefits, such as rewards (Deci and Ryan, 1985), while intrinsic motivation points out a certain pleasure in performing the activity itself (Deci, 1975). Confirming these findings, Deckers (2010) claimed that extrinsic sources of motivation include

rewards, such as money, social recognition, and praise. On the other hand, intrinsic sources of motivation arise from within an individual. Explicit measures of employee motivation have been proposed by Tremblay et al. (2009) and include the following items: perceived organizational support, work climate, organizational commitment, job satisfaction, work strain, and turnover intentions. As his measures of extrinsic and intrinsic motivation could clearly be related to the obtained findings from the qualitative part of this work, the items were used to represent the construct. Resulting from these two opposite poles, i.e. extrinsic and intrinsic motivation, the researcher determined the two-dimensionality of the construct employee motivation.

Internal Stakeholder Identification

In order to operationalize the CIS model's 'Resources' dimension, the researcher measured the construct 'Internal Stakeholder Identification'. Based on the depicted working definition, internal stakeholder identification refers to capabilities required of the core internal stakeholders who are involved in the project. Qualitative findings of this study revealed that specialization and technical skills are a requirement for NPD projects. In case of BMI projects, experts suggested recruiting generalists with a broader range of expertise.

Although the stakeholder identification concept was originally depicted as a tool for strategic management (Langtry, 1994), it has been applied in the context of project management repeatedly (Beringer et al., 2013; Leana and Rousseau, 2000). From a practical and academic perspective, profound stakeholder management is crucial for achieving project success (Beringer et al., 2013). In line with this, several authors agree on the importance of identifying the right stakeholders, as well as to understanding their interests and needs (Pacagnella Júnior et al., 2015; Webb, 2017; Frooman, 1999; Greenwood, 2001). Johansson (2008) suggested that in identifying essential stakeholder groups and their agendas, one should consider the following aspects: perceived legitimacy, influence, as well as urgency and coherence of stakeholder claims (adapted from Simmons and Lovegrove, 2005).

According to Berman et al. (1999), employees represent one of the key stakeholder relationships with the organization. With respect to innovation projects, McDermott and O'Connor (2002) revealed that people who participate in the development of radical innovations are usually characterized by breath of experience, complemented

by depth of experience. For radical innovations and new business models, a multi-dimensionality, or cross-discipline experience, within core team members was considered vital (Dermott and O'Connor, 2004). In contrast, NPD teams are composed of cross-functional specialists from the required fields of expertise (Holahan and Markham, 1996). According to McDermott and O'Connor (2002), such NPD teams are typically created in a formal way and team members are deployed until the project is completed. Combining qualitative findings with previous research, this construct incorporated two opposing dimensions: cross-functionality and specialized skills versus cross-discipline and general skills.

Perceived Risk Culture

In order to operationalize the CIS dimension 'People and Culture', the construct 'Perceived Risk Culture' was measured. Taking into consideration the depicted working definition, the construct perceived risk culture represents the extent to which project members perceive and deal with risk. Findings from the qualitative empirical part of this study indicated that NPD projects mainly referred to incremental innovations with minor risk-taking, while BMI projects were characterized by a high level of risk-taking and uncertainty.

According to Raz and Michael (2001), risk management refers to one of the key areas of project management, which has been recognized in the Project Management Body of Knowledge (PMBOK) by the Project Management Institute. In this context, the fundamental work of Hofstede (1980) outlined uncertainty avoidance as one of the cultural dimensions of project management, which describes whether a person prefers structured or unstructured situations (Dorfman and Howell, 1988). Furthermore, weak uncertainty avoidance is associated with the willingness to take risks including less resistance to change (Hofstede, 1980). Accordingly, Keegan and Turner (2002) characterize risk-taking in typical projects low as the objectives are precisely defined and processes are established. In contrast, projects with a higher degree of innovativeness incorporate loosely defined and ambiguous objectives and processes, as well as strong experimentation and exploration thus risk-taking is high (Keegan and Turner, 2002).

According to Duymedjian and Rüling (2010), large organizations typically tend to implement structures and mechanisms that minimize risk, while also pursuing the development of boundary-breaking innovations and new businesses (Olsen and Boxenbaum, 2009). Intrapreneurs represent a group of people that are characterized by their willingness to operate beyond conventional limitations, whereby they consciously take on additional risks that other employees would try to avoid (Carrier, 1994; Pinchot, 1987). In line with this and obtained findings from the qualitative analysis of this work, the construct was characterized by the following skills that were also suggested by the Institute of Risk Management (2012): risk leadership and risk skills, which are either characterized by a risk-tolerant or risk-averse attitude. Therefore, a two-dimensional construct is given.

Innovation Process Modeling

In order to operationalize the CIS dimension 'Innovation Process', the researcher measured the construct 'Innovation Process Modeling', which describes the extent to which the innovation process is following repetitive and predictable patterns. With respect to the qualitative analysis, a strong focus on lessons learned was emphasized for NPD projects, which required a certain degree of standardization. For BMI projects, interviewed experts did not mention the possibility of relying on previous knowledge but instead mentioned the challenge of convincing internal stakeholders to buy into totally new business ideas in order to proceed with the implementation.

Building on existing approaches of knowledge management, NPD is considered particularly difficult when project members lack previous expertise with the product or technologies they intend to implement in the development process (Gupta and Wilemon, 1990; Wheelwright and Clark, 1992; Swink, 1998). In this context, existing studies on organizational learning revealed that a well-established business model enables the exploitation of existing capabilities to perform predictable and routinized activities (Brady and Davies, 2004). In contrast, exploration is characterized by innovative behavior including risk-taking and experimenting with unfamiliar approaches (Hedberg and Wolff, 2001). Furthermore, Greve (2007) explained that organizational exploitation represents the application and refinement of existing knowledge, technologies and products, which leads to more certain and immediate outcomes. Organizational exploration on the other hand, builds on the search for new knowledge, the application

of novel technologies, and the creation of products within an uncertain demand. Thus, exploration mostly leads to unknown and distant benefits (Greve, 2007).

Furthermore, 'within project' learning incorporates an accumulation of knowledge by the stakeholders involved in the project (Keegan and Turner, 2001), whereas 'double loop learning' requires project members to "break the rules to invent new routines and ways of working more effectively" (Ayas and Zeniuk, 2001, p.63). According to Sosna (2010), established routines and beliefs potentially change through the following learning mechanisms: trial-and-error experimentation and organizational search. Due to a clear alignment with obtained qualitative results and related literature, the construct innovation process modeling includes the following two-dimensional poles: an innovation process based on exploitation versus an innovation process based on exploration.

Organizational Design

With the aim of operationalizing the CIS dimension 'Organizational Structure', the construct 'Organizational Design' was measured. Organizational design incorporates the extent to which rules, hierarchy and decision-making are regulated within the project. Based on findings from the qualitative study, an autonomous setup with adapted processes and structures was considered particularly important for BMI projects. In the context of NPD projects, a formal and tight organizational integration was considered important for for a successful project outcome.

Using organizational theory (e.g. Burns and Stalker, 1994; Mintzberg, 1979), Homburg et al. (2000) differentiate between two paradigms of organizational design: 'organization as a machine' versus 'organization as an organism'. According to various authors (e.g. Slevin and Covin, 1997, Burns and Stalker, 1961), mechanic organizations are classified by rigid, tight and traditional bureaucratic structures where power is centralized, communication occurs through hierarchical channels, and rules and regulations control the decision-making process. On the other hand, organic organizations represent the opposite, as structures are flexible, loose and decentralized with informal lines of authority and less rules and regulations influencing the decision-making process (Khandwalla, 1977; Lawrence & Lorsch, 1967). In connection with this, Miles et al. (1978) associate an organic organizational design with the coordination of numerous and diverse operations within a firm, while a mechanic organizational

design primarily has the focus of controlling the organization to maximize efficiency. Overall, organizational design is believed to affect organizational performance (Covin and Slevin, 1989; Jennings and Seaman, 1990; Parthasarthy and Sethi, 1993). By considering the literature as well as obtained qualitative findings, the construct was measures by following a two-dimensional approach with organic and mechanic poles.

Financial Resource Allocation

In order to operationalize the CIS dimension 'Strategy', the researcher measured the construct 'Financial Resource Allocation'. The working definition for the construct financial resource allocation describes the approach considered for the allocation of project funding. With respect to previously detected qualitative results, interviewed experts highlighted that ROI was used as a means ot allocate budget to traditional projects. In the case of BMI, the projects market potential was regarded as more important when it came to planning the required investment of financial resources.

According to Donaldson (1984), "the most critical choices top management makes are those that allocate resources among competing strategic investment opportunities" (p.95). In this context, resource allocation usually refers to the distribution of financial resources among competing groups or initiatives (Kaiser, 2004). Supported by Trigeorgis (1996), a firm's value creation and competitive position significantly depend on corporate resource allocation and a strategic evaluation of investment alternatives. However, Schwindt (2005) emphasized that resource allocation implies a high degree of complexity, as the interaction between activities of a project incorporate explicit and implicit dependencies, which may include some uncertainty.

When it comes to measuring adequate resource allocation, accounting literature recommends focusing on achieving the best return possible using provided resources (Northcraft and Wolf, 1984). In line with this, Sond and Parry (1997) suggested that financial performance on the project-level (e.g. ROI) is a consequence of how well competencies and resources are coordinated and deployed in the NPD process. Confirming the qualitative findings from this study, several authors propose quantitative measures for successful NPD projects, such as ROI, break-even time or margin goals (Griffin and Plage, 1993; Evans, 1996; Matheson et al., 1994). Though very little research exists on performance measurement of BMI projects, Clauß (2017) proposed the following considerations for allocating resources adequately, all of which

were utilized for this study: value creation innovation (new capabilities, new technology, new partners, new processes), value proposition innovation (new offerings, new customers and markets, new channels), and value capture innovation (new revenue models, new cost structures). Overall, these items clearly differ from strictly quantitative reporting structures and rather include qualitative measures. Resulting from this, financial resource allocation represents a two-dimensional construct consisting of qualitative and quantitative measures.

Project Success

In order to measure the successful outcome of the respective innovation project as a dependent variable, the working definition for this construct refers to the perceived degree of success of the last completed innovation project. As the experts interviewed in the qualitative study referred to project success without further specificity, the construct definition and measurement was entirely based on existing approaches in the literature.

In general, project success is typically measured by evaluating the adherence to budget, time, and pre-defined specifications for the delivered project (Lechler and Dvir, 2010; Pinto and Prescott, 1990). According to Pinto and Mantel (1990), the success or failure of a project can be determined based on three benchmark criteria: financial performance, the window of opportunity, and market impact. While to the researcher's knowledge, no general acknowledged recommendation concerning the specific measurement of NPD or BMI project success existed, a widely recognized approach was defined by Shenhar et al. (2001), who designed a framework including the following short-term and long-term project objectives: efficiency (meeting schedule and budget goals), impact on customers (customer benefits in performance of end products and meeting customer needs), business success (project benefits in commercial value and market share), and preparing for the future (creating new technological and operational infrastructure and market opportunities). In addition, Shenhar et al. (2001) complemented the measure-assessment of overall project success in order to obtain a dependent variable. Due to the explained reasons, the multi-dimensional project success items suggested by Shenhar et al. (2010) have been applied for this quantitative analysis.

However, as highlighted by Müller and Turner (2007), projects generally differ in size, uniqueness and complexity, which leads to the conclusion that success criteria vary

from project to project as well. Thus, a universal approach to project success criteria will not be determined (Westerveld, 2003), neither for each innovation project type. As the definition of project success may vary across industries (Chan and Chan, 2004), individuals and stakeholders often come to their own conclusions in different ways (Cleland and Ireland, 2006; Lim and Mohamed, 1999).

5.1.3 Model Specification

Following the presented conceptualization of constructs and respective items, the overall research model consists of eight theoretical constructs and seven hypotheses. As the main target of this quantitative study incorporates a comparison between BMI and NPD projects' requirements for a successful outcome, a moderation model was chosen to depict the concerned relationships. Based on Aiken and West (1991), the combined effect of two variables on another describes the concept of moderation, which refers to an interaction effect in statistical terms (Field, 2013). The conceptual model (Figure 14) depicts the relationship between a predictor variable (in this case one of the (sub-) constructs adhering to a selected CIS dimension, e.g. Employee Motivation) and the outcome variable (in this case the Overall Project Success), which is affected by the moderator variable, i.e. the Project Type.

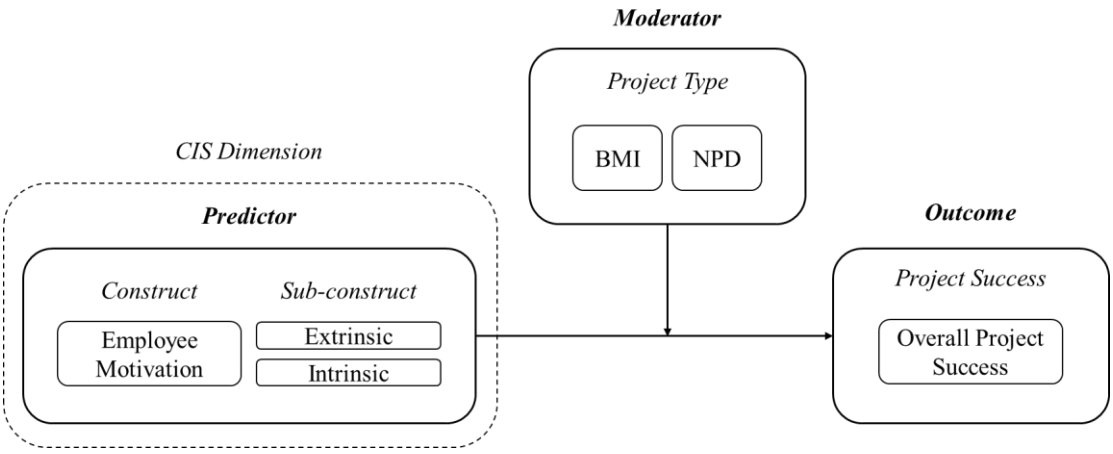

Figure 14: Conceptual model by the example of ‚Employee Motivation' (adapted from Field, 2013)

In general, a statistical moderation model is tested by the aid of a linear regression analysis, where the predictor variable, the suggested moderator, and the interaction of both predict the outcome (see example based on the construct 'Employee Motivation' in Figure 15). Only a significant interaction leads to the conclusion that a moderator effect has occurred. However, the predictor and moderator need to be included for the

interaction to be valid (Field, 2013). The basic moderator model is depicted by the following regression equation:

$$Y_i = (\beta_0 + \beta_1 A_i + \beta_2 A_i + \beta_3 AB_i) + \varepsilon_i$$

$$Y_i = (\beta_0 + \beta_1 Predictor_i + \beta_2 Moderator_i + \beta_3 Interaction_i) + \varepsilon_i$$

Where:

Y_i is the dependent variable or outcome $_i$

β_0 is the regression coefficient of the constant

β_1 is the regression coefficient of the predictor

β_2 is the regression coefficient of the moderator

β_3 is the regression coefficient of the interaction term

The regression coefficients indicate to what extent the outcome changes when the predictor increases by 1, keeping all other variables constant.

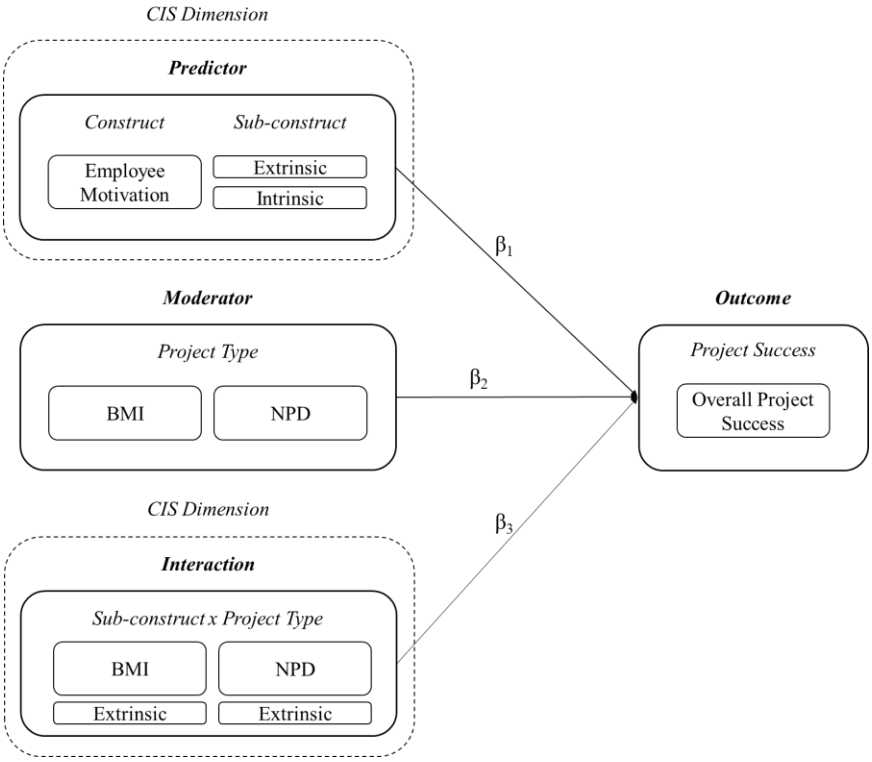

Figure 15: Statistical model by the example of ‚Employee Motivation' (adapted from Field, 2013)

Building on the described derivation of the research model, the following sections will provide details concerning the methodological approach of this quantitative study.

5.2 Methodological Approach

5.2.1 Research Design

In order to operationalize findings from the qualitative study, a quantitative case study has been conducted to compare requirements for successful BMI and NPD projects in a survey of n=107 employees. The focus of quantitative research incorporates "deduction, confirmation, theory/hypothesis testing, explanation, prediction, standardized data collection, and statistical analysis" (Johnson and Onwuegbuzie, 2004, p.18). According to Gable (1994), a survey refers to a common approach "where data for a large number of organizations are collected through methods such as mail questionnaires, telephone interviews, or from published statistics, and these data are analyzed using statistical techniques" (p.16). In this case, the sample represented a single firm, which has been explained in detail in chapter 4.1.3. Furthermore, the analysis of a representative sample allows a researcher to identify common relationships across the units of analysis and thereby to derive generalizable findings about the object of study (Gable, 1994).

In connection with the previous qualitative approaches (see chapter 4 and 5), this dissertation applied mixed methods research, which depicts "methodological pluralism or eclecticism, which frequently results in superior research (compared to monomethod research)" (Johnson and Onwuegbuzie, 2004, p. 14). Following Yin (2017), mixed methods research "can permit researchers to address more complicated research questions and collect richer and stronger array of evidence than be accomplished by any single method alone" (p.83). With the aim of being more confident of her results, the researcher utilized qualitative methods "as the critical counter-point to quantitative methods" (Jick, 1979, p. 609). While qualitative research refers to a subjective approach for exploratory analyses, quantitative research represents an objective approach for conclusive analyses (Surbhi, 2016). In this context, the target was to conduct qualitative research for the purpose of internal validity, whereas the quantitative part of this study rather supported the external validity of the overall research (see Lincoln and Guba, 1985).

Accordingly, the research question from chapter 4 was adopted for the quantitative case study analysis of this chapter.

> *What are specific requirements for business model innovation versus new product development in the context of corporate innovation systems in the mobility sector?*

The subsequent sections further elaborate the methodological approach of this quantitative analysis, followed by a description of obtained results and a conclusive discussion of the presented findings.

5.2.2 Data Collection

Upon completion of the qualitative part of this study, data was collected in November 2018 to conduct the quantitative part of the study. An online survey was chosen in order to access individual project members in different locations of the selected firm (Wright, 2005). In accordance with the qualitative part of this research, the sample for the quantitative part also included the following regions: Europe, USA, and Asia. Besides the international factor, an online survey was selected with the intention to adhere to available resources throughout the research process (Llieva, Baron and Healey, 2002; Yun and Trumbo, 2000).

Potential participants in the online survey were identified based on the researcher's internal network, which was developed through her participation in innovation projects, access to the network of PhD candidates within the firm, and attendance at internal events over a period of several years. Furthermore, senior managers of suitable departments were contacted and asked to spread the survey among their teams and extended network within the company. In addition, executive assistants of business unit managers were approached for support through their network (see Table 13). The utilization of a large-scale mailing list was not possible due to restrictions of the firm's workers council.

Approached contact persons	Comment
• Contacts obtained through participation in innovation projects (across business units) • Network of internal PhD candidates (across business units • Contacts obtained through participation in internal events (across business units)	The researcher asked her personal contacts to forward the survey to further suitable colleagues within their own company-wide network
• Senior managers from suitable departments • Executive assistants of business unit managers	Without previous contact, the researcher asked for their support in form of spreading the survey within their departments/divisions

Table 13: Approach for data collection

Overall, the researcher put a lot of effort in obtaining a representative sample of the target group. Nevertheless, certain limitations regarding a completely random sample might have occurred due to the researcher's personal relationships within the firm (Hopkins, 2008). The prerequisite for an invitation to the survey referred to the status of a permanent full-time employee of the selected firm and an active participation in at least one innovation project, either NPD or BMI, during the past 5 years. All participants remain anonymous, which was addressed during the process of data collection.

5.2.3 Survey Structure

The final version of the online survey (see Appendix J), operated by SurveyGizmo, included 68 questions and the time to complete the survey took about 17 minutes on average. In the online survey, respective project members individually assessed the importance of each characteristic for their last completed innovation project on a Likert scale from 1 to 7 (ranging from 1 = "strongly disagree" to 7 = "strongly agree"). Content wise, the conducted survey started with an initial question regarding the participant's last completed innovation project with the two options "BMI" or "NPD". In order to avoid misunderstandings, both innovation types were explained by the aid of a working definition. Afterwards, general characteristics of the participants were identified, such as their role in the project, their field of expertise and tenure within the company. This section was followed by questions regarding market and technology uncertainty within the respective innovation project, as well as questions relating to the seven pre-defined constructs: Organizational Design, Innovation Process Modeling, Financial Resource

Allocation, Internal Stakeholder Identification, External Relationship Quality, Perceived Risk Culture, Employee Motivation, and Overall Project Success. In order to support the participants, the dimensions of each scale were explained and items were introduced by an overall question. In general, the researcher put a lot of effort in preventing a common method bias (e.g. Podsakoff et al., 2003), for example by providing a short introduction to each construct with a clarifying definition and purpose for this study. However, it must be assumed that some participants' answers were influenced by social desirability to some extent.

5.2.4 Sampling

With the aim to operationalize findings from the conducted qualitative analyses, the quantitative part of this empirical study incorporated a single case study within the same firm as mentioned in the qualitative case study (see chapter 4). Thereby, the researcher intended to increase the value of obtained results, as for instance the organizational culture and the business area were the same, which would otherwise probably have led to inconclusive findings. In total, n=107 employees participated in the online survey and represented a wide range of business units and departments within the multinational company. As the survey was anonymous, specific departments could not be identified explicitly. However, some of the contact persons who agreed to spread the survey were working in the following exemplary business units/departments: Research and Development, Finance and Controlling, Strategy, and Innovation Management. Overall, 61% of the participants represented NPD project members, while 39% represented BMI project members.

In order to increase the participation rate and to include a broader perspective in the data analysis, project members represented both regular employees as well as project leaders, i.e. (senior) managers. As in the conducted benchmark-study and due to an easier accessibility of potential participants compared to the qualitative case study, the sample included employees from the following four regions: Germany, USA, Japan, and China. However, the majority of the participating employees were working in Germany, which might have been the case due to the German headquarters of the analyzed firm. Accordingly, 90% of the sample represented employees who completed their last innovation project in Germany, 6% in Asia, and 4% in the USA. As a result, a differentiated interpretation of the quantitative data based on cultural backgrounds did

not seem appropriate, whereby all participants were considered to share a common corporate culture.

5.2.5 Validity and Reliability

Following MacKenzie et al. (2011), two initial pre-tests were conducted in advance as a measure to enhance the quality of the survey. First, a pilot was sent to five random employees of the target group for feedback on general understanding, wording and order of the questions. After incorporating minor recommendations, the second pilot was sent to 13 employees, representing the target group, for a more precise assessment of the constructs' validity. Therefore, a calculation of Cronbach's alpha (CA) of the pre-tested database has been conducted. The CA value reflects the degree of internal consistency within the observed variables (Osburn, 2000) and can be calculated by analyzing the variance a construct's items (Peterson, 1994).

$$\alpha_x = \frac{n}{n-1}\left(1 - \frac{\sum_{i=1}^{n} \sigma_{x_i}^2}{\sigma_x^2}\right)$$

Where:

n is the number of items of construct *x*

$\sigma_{x_i}^2$ is the variance of items *i* of the construct *x*

σ_x^2 is the variance of the sum over all items of construct *x*

While existing studies suggest different CA thresholds (e.g. Hair et al., 1999; Bagozzi and Yi, 1988), the researcher decided that CA values ≥ 0.60 verified reliable internal consistency of the associated sub-construct. Accordingly, the CA analysis revealed several weak values, which are displayed below (see Table 14). In order to improve the affected (sub-) constructs, another iteration of literature review including the alignment with qualitative findings served for a final adaptation of the respective items of the survey.

Construct	Characteristic	Cron. Alpha (n=13)	Cron. Alpha (n=107)	Δ
Organizational Design	Organic	0.421	0.629	+0.208
	Mechanic	0.604	0.711	+0.107
Innovation Process Modeling	Exploitation	0.328	0.654	+0.326
	Exploration	0.781	0.731	-0.050
Financial Resource Allocation	Quantitative	0.699	0.762	+0.063
	Qualitative	0.714	0.734	+0.020
Internal Stakeholder Identification	Specialized	0.896	0.491	-0.405
	Generalized	0.821	0.647	-0.174
External Relationship Quality	High	0.659	0.501	-0.158
	Low	0.651	0.294	-0.357
Perceived Risk Culture	Risk-averse	0.598	0.612	+0.023
	Risk-tolerant	0.884	0.614	-0.270
Employee Motivation	Extrinsic	0.636	0.698	+0.062
	Intrinsic	0.722	0.794	+0.072

adapted items to increase survey quality values still below threshold

Table 14: Cronbach's alpha of (sub-) constructs

In accordance with both test-runs, the online survey was re-designed for the final quantitative data collection. After completing the data collection, another CA analysis followed for n=107, which indicated an improvement of most critical values (see table 14). However, two (sub-) constructs still depicted a low CA value, i.e. Specialized Internal Stakeholders (0.491), as well as low and High Relationship Quality (0.294 and 0.501).

By the aid of a correlation matrix for each sub-construct with low CA values the item with the lowest mutual correlation was excluded for the respective sub-construct (see Appendix K). This improved CA values considerably for Low and High Relationship Quality (0.394 and 0.730). In the case of Specialized Internal Stakeholders, each sub-construct solely consisted of two items, which did not allow for any further exclusion of items. However, as its CA value was close to 0.50, the researcher acknowledged the detected weakness as a limitation for further analysis.

In addition to the presented CA analysis, an exploratory factor analysis (EFA) was conducted for all constructs. Thereby, the purpose was to validate the two-dimensionality of each construct (Costello and Osborne, 2005). Throughout the EFA analysis, two components could be extracted for each construct (see Appendix L) with

a Kaiser-Meyer-Olkin (KMO) value of > 0.50. The only exception referred to External Relationship Quality, where no two-dimensionality was confirmed (see Table 15), which supported the researcher's decision resulting from the above considered correlation analysis to exclude two items.

Item	Component 1	Component 2
Rel.Qual.High_1	0.836	
Rel.Qual.High_2		-0.818
Rel.Qual.High_3	0.803	
Rel.Qual.Low_1	-0.594	
Rel.Qual.Low_2		0.885
Rel.Qual.Low_3	-0.655	

Extraction Method: Principal Component Analysis
Rotation Method: Varimax with Kaiser Normalization

Table 15: Factor loading – External Relationship Quality

Following the depicted factor loading of the items of external relationship quality, Rel.Qual.High_2 and Rel.Qual.Low_2 loaded on component two, while all other items loaded on component one. Consequently, the researcher decided to exclude both deviating items, which measured the relationship history with external partners, from further analysis. In line with existing literature (Knudsen, 2007; Dyer and Chu, 2011) and the conducted factor analysis, the researcher decided to declare External Relationship quality as a one-dimensional construct.

Altogether, the reliability and validity of operationalized constructs resulted by combining existing literature, qualitative findings and adaptations based on statistically accepted approaches, as suggested by MacKenzie et al. (2011). Table 16 depicts an overview of the described approach and outcomes.

#	Construct	Approach for operationalization	Dimensionality	Validity & Reliability
C1	External Relationship Quality	Newly measured	One-dimensional	Verified
C2	Employee Motivation	Based on existing measures	Two-dimensional	Verified
C3	Internal Stakeholder Identification	Partially based on existing measures	Two-dimensional	Verified with limitation regarding 'specialized internal stakeholders'
C4	Perceived Risk Culture	Partially based on existing measures	Two-dimensional	Verified
C5	Innovation Process Modeling	Newly measured	Two-dimensional	Verified
C6	Organizational Design	Partially based on existing measures	Two-dimensional	Verified
C7	Financial Resource Allocation	Newly measured	Two-dimensional	Verified
C8	Project Success	Based on existing measures	Two-dimensional	Verified

Table 16: Operationalization of constructs

In order to ensure a valuable quantitative analysis, obtained results including the researcher's calculations were discussed with an expert, who worked for the Federal Statistical Office ("Statistisches Bundesamt") in Germany and confirmed the applied approaches, validity and reliability as well as the researcher's interpretations.

5.2.6 Data Analysis

After the data collection phase, all completed surveys were exported from the utilized online tool and processed locally via Microsoft Excel. The selected tool for analyzing the quantitative data was SPSS. Before the actual analysis, the researcher followed a data cleansing process including the elimination of errors and inconsistencies, such as missing data or normal distribution (based on Kline, 2011 and Galhardas et al., 2001). In this context, the raw data was decomposed and reassembled (Maletic and Marcus, 2005) in order to proceed with the analysis and interpretation.

First, the researcher checked for missing values in the database. Except for one section referring to the construct 'External Relationship Quality', the participants were urged to answer all questions of the online survey – otherwise it did not count as completed. On the topic of 'External Relationship Quality', project members were asked whether they involved external partners at all and if so, how many. In the case of no external partnerships, some participants (12.3%) skipped the following questions regarding this construct. Baltes-Götz (2013) proposed several options of how to deal with missing values: individual mean values from existing items, exclusion of variables, exclusion of cases, pair-wise exclusion of missing values, replacement of missing values by

sample mean or regression imputation. The researcher decided to exclude cases with missing values due to the small number of cases and her intention to prevent a distortion of the variables' variance for the subsequent regression analysis. Furthermore, the construct 'Financial Resource Allocation' included a "not applicable" option as the researcher assumed that some project members might not have specific insights into the funding of their project. This option was chosen by 41% of the respondents, and as a consequence the construct was regarded separately for the calculation of model fit.

While testing for multivariate outliers, the researcher conducted a multiple regression analysis and observed one case (case 94) in the casewise diagnostics over all constructs with a standardized residual of -3.210. Following Fox (1991), cases with residuals exceeding the threshold of ± 3 are considered as outliers that weaken the predictability of the overall model fit. As the outlier represented an NPD project, the researcher compared the model fit (ΔR^2) with and without the outlier and detected an improvement by $\Delta R^2 = 0.036$. In addition, the overall model for NPD turned significant from $p = 0.085$ to $p = 0.044$ (see Appendix M). Therefore, the researcher decided to exclude case 94 from the database. Furthermore, due to marginal participation of employees outside of Germany (see 5.2.3) a homogenization of the sample was tested as well, whereby cases from Asia or USA were considered as outliers. However, an increase of R^2 by only 0.008 did not support the exclusion of those cases.

Before conducting further analyses of the data, dummy variables were defined for the variables 'Project Type', i.e. 0 = NPD and 1 = BMI. According to Skrivanek (2009), a dummy variable describes "an artificial variable created to represent an attribute with two or more distinct categories/levels" (p.1). Regarding the measurement scales, SPSS provided a quasi-metric scale (as $n > 100$) for the construct items, i.e. questions with a Likert scale, which indicates the same contribution of each item to the overall construct and thereby justifies further calculations of mean values. In case of 'Project Type', a metric scale was applied (Völkl and Korb, 2018).

Overall, the variables indicated an approximation to normal distribution for both project types, as values for skewness and kurtosis ranged between ±2 (Trochim & Donnelly, 2006; Field, 2000 & 2009; Gravetter & Wallnau, 2014). While skewness describes a measure of asymmetry, kurtosis refers to a measure of 'peakedness' of a distribution. A perfectly normal distribution obtains a skewness and kurtosis value of zero.

Furthermore, the Shapiro-Wilk test revealed that all variables were normally distributed except for the following: Specialized Internal Stakeholders (NPD and BMI projects), Intrinsic Motivation (NPD and BMI projects), Risk-tolerant Culture (BMI projects), and Overall Project Success (see Appendix N). However, despite missing normal distribution in some cases, where some sub-constructs were slightly skewed right, the quantitative data was considered robust for conducting further parametric tests. This was based on the large sample size of n > 30 (Ramsey, 1980) and the central limit theorem (CLT), which states that the sampling distribution of the mean of any independent, random variable will be normal or nearly normal, of the sample size is large enough (Wilcox, 1995). The following graph depicts an exemplary normal distribution, which was obtained for generalized internal stakeholders of NPD projects (Figure 16).

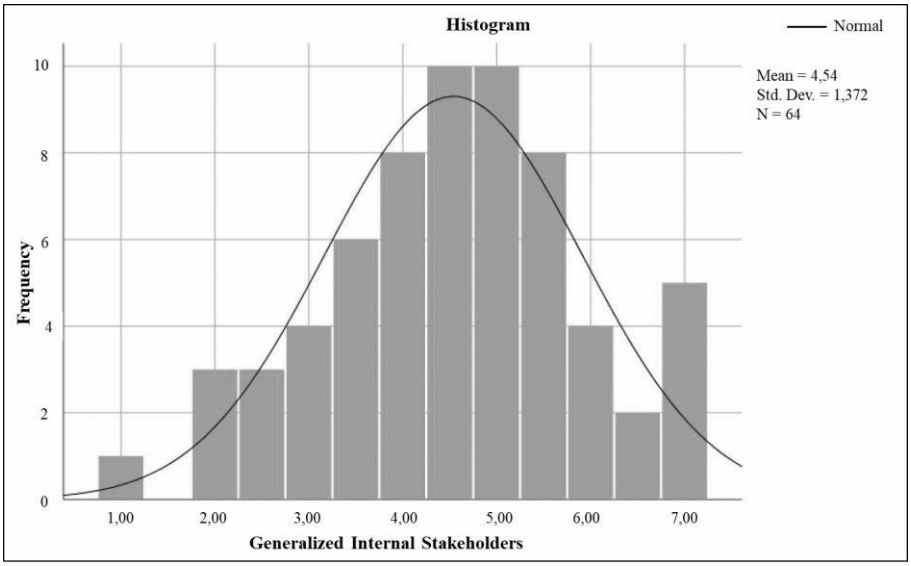

Figure 16: Normal distribution ‚Generalized Internal Stakeholders' of NPD projects

In addition, the homogeneity of variances has been determined for both project types by the aid of Levene's test for equality of variances (see Appendix O). Hereby, only small discrepancies were examined for the sub-constructs 'Innovation Process Exploration' and 'Qualitative Resource Allocation', which indicated significant values ($p = 0.027$ and $p = 0.000$). As the sample size was $n > 30$ and both project types obtained similar proportions, this inequality of variances was not considered to affect the robustness of data for the further analysis (Ramsey, 1980).

After the depicted steps were conducted, the database was ready for the subsequent statistical analysis. In line with the context of this study, a correlation matrix for each project type, i.e. BMI and NPD, served for an evaluation of significant relationships between each sub-construct (e.g. intrinsic/extrinsic) and the overall project success (Creswell, 2002; Williams, 2007). The following regression analysis had the aim to determine the model fit as well as the moderator effect for each construct, which was based on Field (2013) and other existing studies. Resulting from this, the presented hypotheses were evaluated depending on the significance of interactions.

5.3 Results

The subsequent sections will provide a detailed overview of obtained results from the statistical analysis and therefore include the following structure: First, descriptive statistics serve to illustrate a clear description of the sample. Second, a factor analysis and a correlation matrix for each innovation project type lead to the final evaluation of the moderator effect.

5.3.1 Descriptive Statistics

By considering the outlier (see 5.2.6), the sample included n=106 employees, who have referred to their last completed innovation project within the analyzed corporation. Thereof, 60.4% represented a NPD project, while 39.6% were working on a BMI project, which depicted a reasonable allocation of the two project types for further analysis (see Figure 17).

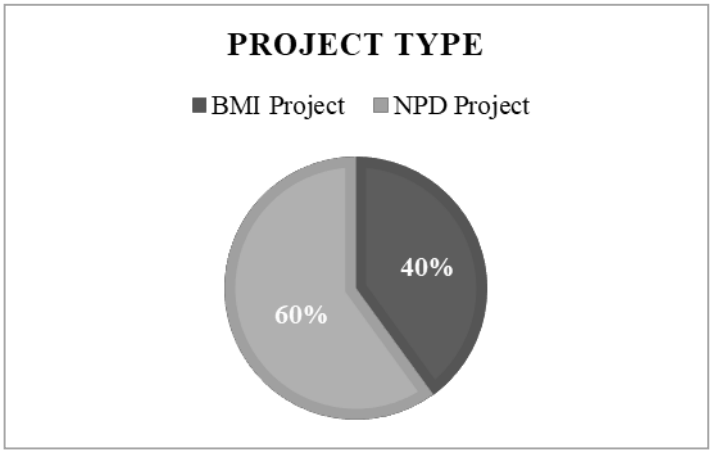

Figure 17: Sample proportion of project types (rounded values)

Furthermore, the analysis of descriptive statistics demonstrated an almost even distribution of the participants' role within the project, i.e. project leader or project member, for each innovation project type. Approximately 57% of the respondents represented project members, while 43% referred to project leaders. Consequently, no differences between project members and project leaders were considered during further analysis of quantitative data. Even though the survey was open to all employees worldwide, most participants operated in Europe (90%), followed by Asia (6%), and North America (4%). Regarding their corporate affiliation, most participants were part of the firm for more than 10 years (34%), followed by a tenure of 1-2 years (23%). Team sizes of the respective innovation projects differed slightly for each innovation project type. Most BMI projects were conducted by teams of 1-5 employees (48%) or 6-10 employees (36%), while 12% worked with a team of 11-20 people, and only 5% with a team of more than 20 people. In case of NPD, similarly most participants worked in teams of 1-5 colleagues (25%) or teams of 6-10 colleagues (37%), while teams of 11-20 people incorporated 18% of NPD project members, teams of 21-50 represented 14%, and teams larger than 50 people represented 6% (see Figure 18).

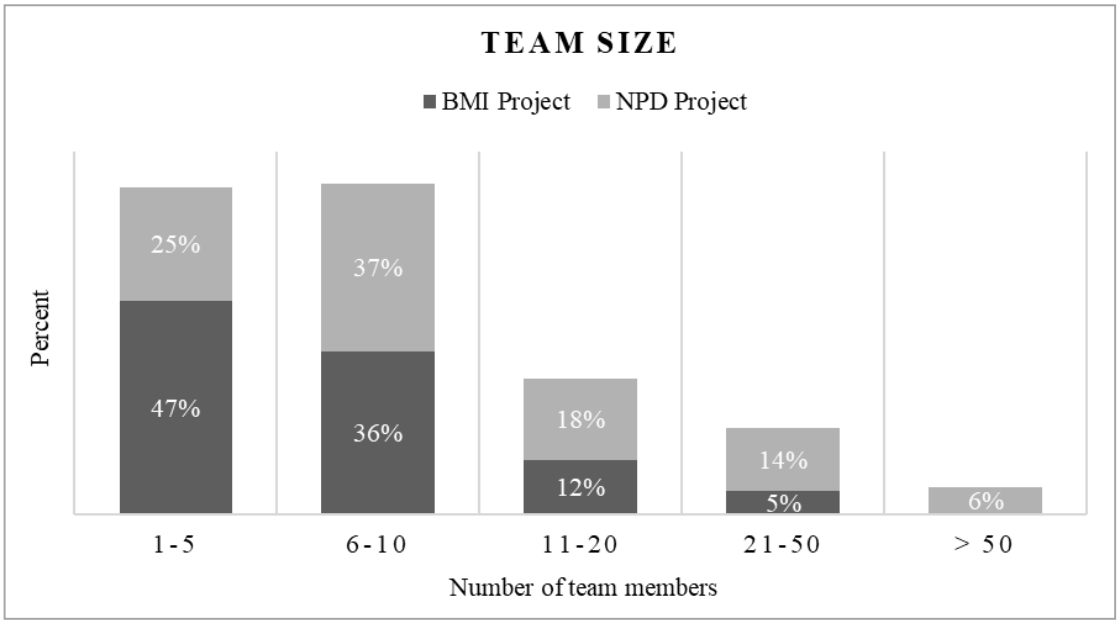

Figure 18: Team sizes per project type

Based on prior findings and existing literature (e.g. Teece, 2010; Zott, 2010; Bottani et al., 2013; Leonard-Barton, 1992), the business development function was expected to be represented largely by BMI project members, and engineering by NPD project members, which was confirmed partially. The function business development was

composed of 83% BMI project members and 23% NPD project members, while the engineering function was mainly represented by NPD project members (62%) compared to BMI project members (15%). In both cases, many employees described their function by project management: 61% of BMI project members, and 62% NPD project members. In general, all participants had the option to select multiple functions simultaneously. Last but not least, participants were asked about their involvement in the following innovation phases: planning, execution, and market launch. For both project types, the planning and execution phase represented the major field of activities, while a considerable amount of BMI project members also participated in the market launch (see Appendix P for graphic illustrations descriptive statistics).

With respect to the sub-constructs, the following table (Table 17) illustrates the mean values as well as the standard deviation for n=106 datasets (considering the outlier, see 5.2.3). Overall, the average mean was rather high on a Likert-scale ranging from 1 to 7. Especially Intrinsic Motivation and Overall Project Success were rated exceptionally high, while Extrinsic Motivation and Mechanic Organizational Design obtained the lowest mean values.

Sub-construct	N	Mean	Std. Deviation	z
Organic Organizational Design	106	4.77	1.23	0.21
Mechanic Organizational Design	106	3.75	1.45	-1.41
Innovation Process Exploration	106	4.63	1.28	-0.02
Innovation Process Exploitation	106	4.16	1.21	-0.76
Generalized Internal Stakeholders	106	4.70	1.28	0.10
Specialized Internal Stakeholders	106	4.95	1.25	0.49
Risk-tolerant Culture	106	4.62	1.15	-0.03
Risk-averse Culture	106	4.31	1.40	-0.52
Intrinsic Motivation	106	6.19	0.80	2.46
Extrinsic Motivation	106	3.70	1.36	-1.49
Relationship Quality	93	4.86	1.05	0.34
Qualitative Measures	85	5.01	1.40	0.59
Quantitative Measures	81	4.24	1.55	-0.64
Overall Project Success	106	5.41	1.41	1.22

Table 17: Descriptive statistics of sub-constructs for overall dataset

Regarding the standard deviation, Intrinsic Motivation provided the lowest value, which indicated a high concentration of data around the mean. Following the provided insights into the descriptive statictics of this study, the following sections will go into detail regarding the actual findings regarding the comparison of BMI and NPD projects.

5.3.2 Determinants of Project Success

Initially, a factor analysis was conducted for all sub-constructs based on an eigenvalue >1 (see Appendix Q). Thereby, three factors have been identified, opposed to two project types of this analysis, which explained 48.39% of the variance. The KMO measure accounted for 0.658, which indicates that the data was suitable for the factor analysis (Kline, 2011). The results of the conducted factor analysis revealed a classification of the following sub-constructs: (1) Organic Org. Design, Innovation Process Exploration, Risk-Tolerant Culture, Intrinsic Motivation, Qualitative Measures; (2) Innovation Process Exploitation, Specialized Internal Stakeholders, Generalized Internal Stakeholders, Risk-averse Culture, Relationship Quality; (3) Mechanic Org. Structures, and Exrinsic Motivation. Though most of the classifications turned out as intended, 'Specialized Internal Stakeholders' and 'Generalized Internal Stakeholders' loaded on the same factor, even though they were expected to represent two opposite poles. Resulting from this, the two project types have not been explained by the conducted factor analysis, which led to testing every sub-construct in relation to Overall Project Success without the use of pre-defined clusters. Accordingly, correlation of the respective sub-constructs with 'Overall Project Success' was calculated via SPSS. Resulting from this, a separate correlation matrix was created for each project type, i.e. BMI and NPD (see Appendix R). However, only some sub-constructs provided significant correlations with 'overall project success' (see Figure 18).

BMI Projects		NPD Projects	
Organic Organizational Design	0.308*		
Innovation Process Exploration	0.306*		
Specialized Stakeholders	0.331*	Specialized Stakeholders	0.299**
Generalized Stakeholders	0.348*	Generalized Stakeholders	0.237*
Risk-Tolerant Culture	0.317*	Risk-Tolerant Culture	0.338*
Extrinsic Motivation	0.287*	Extrinsic Motivation	0.305**
Intrinsic Motivation	0.368*	Intrinsic Motivation	0.391*

* significant at 5% level; ** significant at 1% level

Table 18: Significant correlations with overall project success

As depicted above, both project types included similar significant correlations with the dependent variable 'Overall Project Success': Specialized Internal Stakeholders, Generalized Internal Stakeholders, Risk-tolerant Culture, Extrinsic Motivation, and Intrinsic Motivation. In contrast to NPD projects, BMI projects indicated a significant correlation between 'Organic Organizational Design' and 'Innovation Process Exploration' with Overall Project Success.

The successful outcome of the respective projects was represented by 'Overall Project Success', i.e. a uni-dimensional variable in order to determine success factors for each project type. However, the suggested sub-dimensions by Shenhar (2010) were included in the collected database with the target of identifying potential differences for BMI or NPD. Therefore, another factor analysis was conducted solely for the project success items (see Appendix S). Resulting from this, as in Shenhar (2010), four factors have been identified, which explained 68.26% of the variance, with a KMO measure of 0.697. However, the factor loadings deviated from his proposed classification. In contrast to Shenhar's findings, this study defined the following new sub-dimensions of project success: 'Performance Benchmarks' (meeting the budget goal, meeting the schedule goal, commercial success), 'Technological Capabilities' (meeting functional performance, meeting the technical specifications), 'Customer Fit' (fulfilling the customer needs, solving a customer's problem, the customer is using the product or service, customer satisfaction), and 'Future Business Opportunities' (creating a large market share, creating a new market, creating a new product or service line, developing a new technology). The reason for different EFA outcomes might be based on a varying research design as well as a disparate methodology for data collection and another sample. Nevertheless, the correlation coefficients between 'Overall Project Success'

and the new project success items revealed considerable differences regarding BMI and NPD projects. In case of BMI projects, significant correlations were found for 'Technological Capabilities' (0.535**) and 'Future Business Opportunities' (0.597**). For NPD projects, the 'Overall Project Success' correlated with 'Performance Benchmarks' (0.537**), 'Technological Capabilities' (0.463**), 'Customer Fit' (0.555**), and 'Future Business Opportunities' (0.295*). This indicates that BMI projects might be measured adequately by focusing on performance measures in the fields of technology and future value propositions, which contrasts existing literature to some extent, as the customer perspective usually plays an important role for BMI as well (e.g. Zott et al., 2011).

5.3.3 Moderator-Effect

In order to test whether the sub-constructs can predict the success of BMI or NPD projects (hypotheses 1-7), a hierarchical moderated linear regression analysis was conducted for all hypotheses. Thereby, each hypothesis addressed the two sub-constructs of the respective CIS dimension. In case of 'External Interaction', solely the overall construct ('External Relationship Quality') was analyzed due to its one-dimensionality (see chapter 5.2.5).

With respect to the obtained model summaries, the overall sample data revealed that five sub-constructs were able to predict the outcome reliably, with an error probability of $p < 0.05$. Similar to the before presented regression analysis for the BMI and NPD model, these constructs included the following (see Table 19).

Sub-construct	R^2	Coefficient (β)	Sig. (p)
Specialized Internal Stakeholders	0.084	0.326	0.003**
Generalized Internal Stakeholders	0.076	0.275	0.004**
Risk-tolerant Culture	0.099	0.384	0.001**
Intrinsic Motivation	0.144	0.667	0.000***
Extrinsic Motivation	0.076	0.285	0.004**

Table 19: Significant model summaries of overall sample data

These findings regarding the model summary confirm prior results of the correlation analysis (see 5.3.3), whereby the successful outcomes of NPD and BMI projects likewise depends on capabilities of internal stakeholders, a risk-tolerant culture, as well

as the motivation of involved employees. Based on Field (2013), testing for a moderator effect requires regression models with a significant model fit, which is only given partially for this analysis, due to low R^2 values (see Appendix T). Besides this limitation, the researcher nevertheless decided to proceed with the analysis for moderation, due to the mentioned diversification of various (sub-) constructs, which present a possible explanation for the poor model fit of most sub-constructs.

Keeping in mind that only a significant interaction term allows for the conclusion of an occurred moderator effect (see 5.3.1), the researcher assessed the interaction terms for the proposed hypotheses. Resulting from this, no significant interaction was identified due to high p-values clearly > 0.05. However, four interactions revealed several promising p-values that indicated a trend towards moderation (see Table 20).

Hypothesis	Interaction term	β	t	p
H4a	Risk-averse Culture * Project Type	-0.360	-1.332	0.186
H5b	Organic Org. Design * Project Type	0.341	1.503	0.136
H6b	Innovation Process Exploration * Project Type	0.329	1.308	0.194
H7a	Quantitative Measures * Project Type	-0.293	-1.303	0.197

Table 20: Regression coefficients of the most promising interaction terms

In order to demonstrate these trends for interaction, the following section describes the conducted analysis for a possible moderation-effect graphically. Due to the limited scope of this dissertation, presented illustrations refer to the example of 'Perceived Risk Culture', which includes the sub-constructs 'Risk-tolerant culture' and 'Risk-averse culture'. Referring to the above-mentioned regression coefficients, the model summary of the interaction of 'Risk-averse Culture' with the project type incorporated an R^2 of 0.019, whereby the variance of 'Overall Project Success' was explained by 1.9% of the variable. With respect to the statistical moderator model (see 5.1.3), the following regression equation emerged for the sub-construct 'Risk-averse Culture':

*Overall Project Success = 5.405 – 0.67 * (Risk-averse Culture) – 0.120 * (Project Type) – 0.360 * (Risk-averse Culture * Project Type)*

For further explanation, Figure 19 depicts the statistical moderator model for ‘Risk-averse Culture’ including the calculated coefficients. In this case, the effect of a risk-averse culture on the project success differs by 0.360 when comparing BMI and NPD projects.

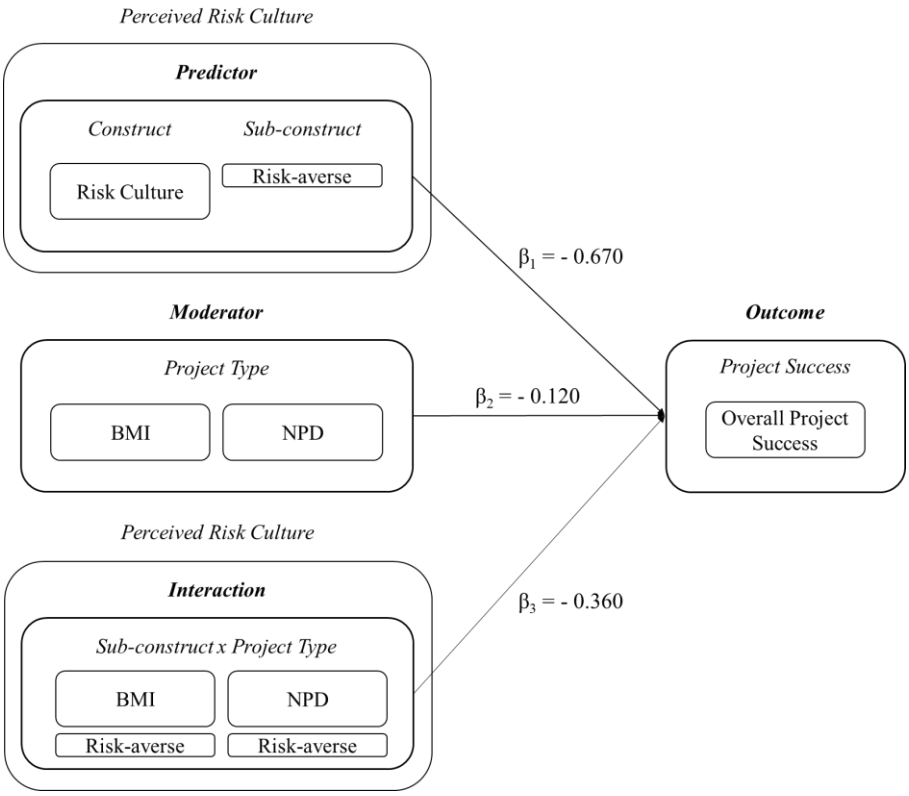

Figure 19: Statistical moderator model for 'Risk-averse Culture‘

In case of ‘Risk-tolerant Culture’, the model summary indicated an R^2 of 0.107 with an interaction term of 0.12 and a p-value of 0.633. Accordingly, no significant interaction occurred and the low interaction term not even indicated any trend for moderation. This result is graphically explained by the following scatterplots, which is indicated by the opposite slopes for ‘Risk-averse Culture’ and the almost parallel slopes for ‘Risk-tolerant Culture’ (see Figure 20).

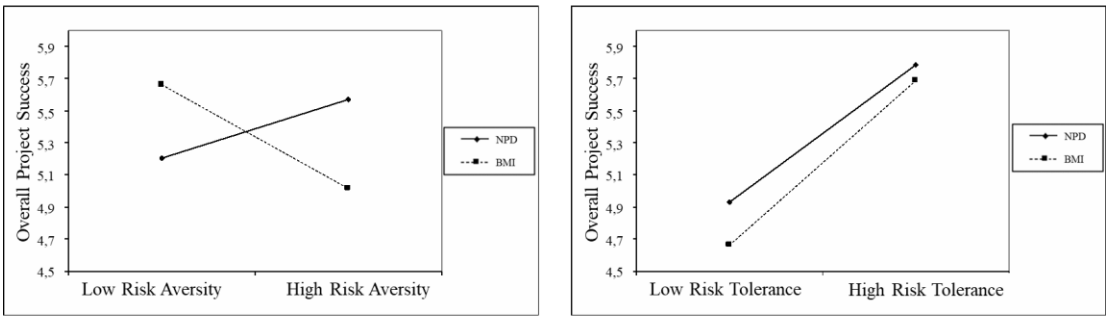

Figure 20: Scatterplots of 'Perceived Risk Culture' Interaction

More precisely, the depicted trend for moderation explains that in case of NPD, the overall project success might be increased by putting a lot of effort in making well-informed risk decisions and by preparing for situations of uncertainty by, for example, developing risk management skills. In contrast, for BMI projects, such measures might have a negative impact on the overall project success. Moreover, both innovation project types seemed to require a project team that is not afraid of taking risks within an uncertain environment including the support of their executives.

Following the illustrated example of 'Perceived Risk Culture', a moderator effect was tested for all sub-constructs of the overall model, in order to detect trends for future research to build upon (see further scatterplots of interaction effects in Appendix U). Overall, the interaction effect has not been significant for any (sub-) construct, as all p-values were considerably higher than 0.05. Therefore, it needs to be mentioned that obtained results from the moderator analysis are limited by this weakness and only depict trends for each respective construct without measurable significance.

Resulting from this, 4 out of 13 hypotheses were verified conditionally, while considering the limitation of no significant model fit, for the following sub-constructs: Risk-averse Culture (H4a), Innovation Process Exploration (H5b), Organic Organizational Design (H6b), and Quantitative Measures (H7a). This means, that the respective project type (i.e. NPD or BMI) seemed to play an important role regarding the sub-constructs' impact on the overall project success. An overview of all tested hypotheses is presented in the following table (see Table 21).

#	Hypothesis	Result
H1	The relationship quality with external partners is significantly more relevant for the project success of NPD projects than BMI projects.	×
H2a	Extrinsic employee motivation is significantly more relevant for the project success of NPD projects than BMI projects.	×
H2b	Intrinsic employee motivation is significantly more relevant for the project success of BMI projects than NPD projects.	×
H3a	A specialized background of internal stakeholders is significantly more relevant for the project success of NPD projects than BMI projects.	×
H3b	A generalized background of internal stakeholders is significantly more relevant for the project success of BMI projects than NPD projects.	×
H4a	A risk-averse organizational culture is significantly more relevant for the project success of NPD projects than BMI projects.	(✓)
H4b	A risk-tolerant organizational culture is significantly more relevant for the project success of BMI projects than NPD projects.	×
H5a	An innovation process based on exploitation is significantly more relevant for the project success of NPD projects than BMI projects.	×
H5b	An innovation process based on exploration is significantly more relevant for the project success of BMI projects than NPD projects.	(✓)
H6a	A mechanic organizational design is significantly more relevant for the project success of NPD projects than BMI projects.	×
H6b	An organic organizational design is significantly more relevant for the project success of BMI projects than NPD projects.	(✓)
H7a	Financial resource allocation based on a quantitative approach is significantly more relevant for the project success of NPD projects than BMI projects.	(✓)
H7b	Financial resource allocation based on a qualitative approach is significantly more relevant for the project success of BMI projects than NPD projects.	×

Note: "✓" hypothesis supported, "×" hypothesis rejected, "(✓)" trend detected supporting the hypothesis

Table 21: Results of tested hypotheses

In order to obtain a conclusion regarding the analyzed research question and the comparison of BMI and NPD projects, the researcher transferred the obtained results to the initial CIS model and the respective dimensions. The following table (Table 22) provides an overview of the detected similarities and differences between the two project types by the quantitative analysis.

CIS Dimension	Sub-construct	Sig. Similarities	Sig. Differences
Organizational Structure	Organic Organizational Design		(✓)
	Mechanic Organizational Design		
Innovation Process	Innovation Process Exploration		(✓)
	Innovation Process Exploitation		
Resources	Generalized Internal Stakeholders	✓	
	Specialized Internal Stakeholders	✓	
People & Culture	Risk-tolerant Culture	✓	
	Risk-averse Culture		(✓)
Hygiene Factors & Rewards	Intrinsic Motivation	✓	
	Extrinsic Motivation	✓	
External Interaction	Relationship Quality		
Strategy	Qualitative Measures		
	Quantitative Measures		(✓)

Note: "✓" sig. results identified; "(✓)" important trends identified

Table 22: Conclusion regarding the quantitative comparison of BMI and NPD projects

Furthermore, the researcher once again referred to the original CIS model in order to illustrate the mentioned findings graphically. As presented in Figure 21, three CIS dimension indicate significant similarities: People & Culture, Resources, and Hygiene Factors & Rewards. Moreover, a trend towards differences has been identified for the following four CIS dimensions: People & Culture, Organizational Structure, Innovation Process, and Strategy. In case of People & Culture, a risk-tolerant culture seemed to be relevant for the overall project success for both innovation types. At the same time, a risk-averse culture was rather harmful for BMI projects' success, while it supported the successful outcome of NPD projects.

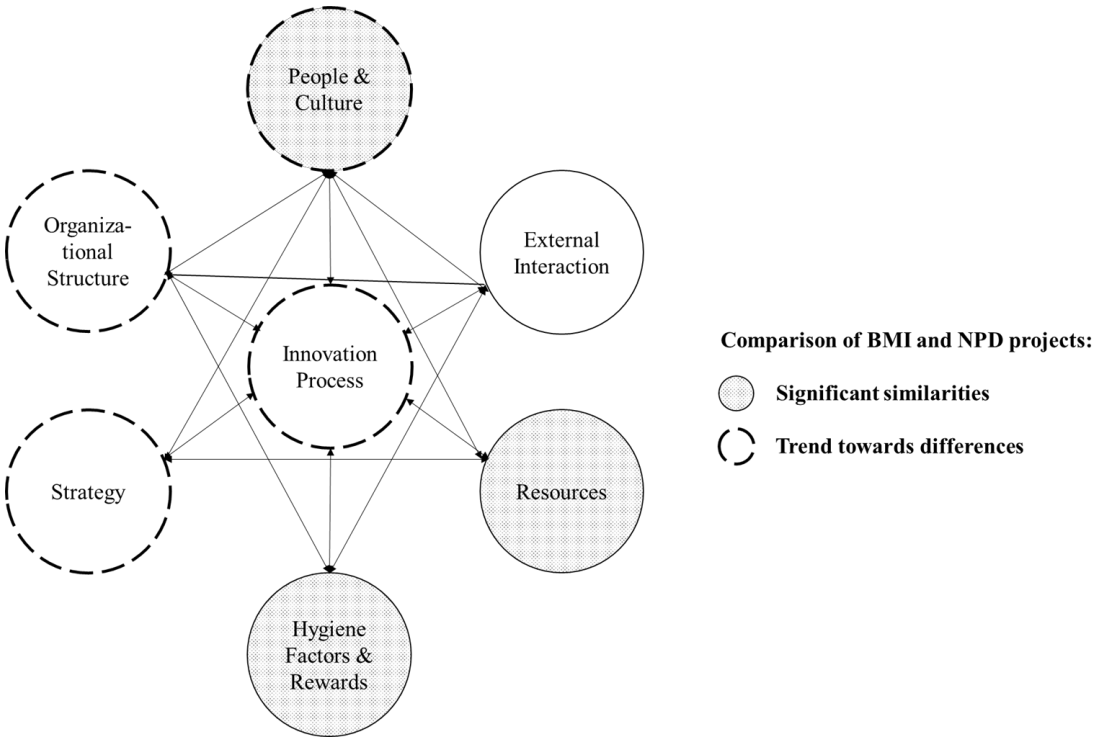

Figure 21: Quantitative comparison of BMI and NPD within CIS model

The following section synthesizes obtained results in a detailed discussion and critically outlines the limitations of this quantitative study, which certainly had an effect on the interpretation of presented findings.

5.4 Discussion

Building on the obtained qualitative findings from chapter three and four, this quantitative study had the purpose of operationalizing the constructs representing the seven above-mentioned CIS dimensions. By the aid of an online survey within the same corporation as in chapter four, the two project types, i.e. BMI and NPD, have been compared regarding their impact on project success. The target of this study was to determine whether the project type significantly mattered for creating an advanced innovation framework and if so, what specific requirements each innovation type were revealed. Resulting from this quantitative analysis, innovation managers can identify which areas of their corporate innovation system need to be considered carefully for developing different types of innovation simultaneously within their firm. In this context, the stated research question was analyzed profoundly, which contributed to the limited existing studies in this field (e.g. Bucherer et al., 2012).

In line with the explorative research strategy of this dissertation and mixed-methods research (Mayoh and Onwuegbuzie, 2013), the selected quantitative approach represented a valid methodology for analyzing the depicted research question comparing BMI and NPD. Thereby, an online survey ensured a broad participation of suitable innovation project members within the selected corporation. By following the procedure of MacKenzie et al. (2011), the researcher put a lot of effort in executing a high quality statistical analysis.

In addition to the qualitative studies in chapter three and four, the submitted quantitative study significantly contributes to the research field of corporate innovation management in several ways. So far, no quantitative comparison of BMI and NPD has been conducted to the researcher's knowledge. Furthermore, the link to corporate innovation systems, which is represented by the consideration of the seven pre-determined CIS dimensions, depicts a unique research design in this field. Furthermore, the issue of measuring project success has been re-evaluated by analyzing the proposed items of Shenhar et al. (2001) in the given context. Altogether, this work provides numerous propositions for future research to build upon. Resulting from this study, managerial implications of this study include precise recommendations for implementing the concept of an ambidextrous organization, which represents one of the biggest challenges for many corporations across different industries (e.g. Tushman, 2015; Kaulio et al. 2017). Besides rather general and vague propositions of existing studies regarding such an endeavor, this work addressed two types of innovation, which resulted in clear statements concerning their required approaches on the project level.

Based on significant correlations with overall project success, the conducted analysis revealed that successful BMI and NPD projects seemed to require a focus on similar dimensions of a CIS equally i.e. generalized and specialized internal stakeholders, a risk-tolerant culture, extrinsic as well as intrinsic motivation of project members. Confirming O'Connor and Dermitt (2004), a cross-functional team composition not only seemed to be highly relevant for NPD projects, but also for BMI projects' success. However, in case of NPD, the researcher observed an ongoing discussion regarding the background of internal stakeholders and whether they needed to be more specialized or generalized in existing literature (e.g. Song and Parry, 1997; Lester 1998). It is noticeable that the coefficients for 'generalized' and 'specialized' internal stakeholders had similar values in both cases, which might have occurred due to a certain extent of

a common method bias. Overall, these findings complement the limited existing research on this construct for BMI by stating that identifying the right project stakeholders within a firm has a significant impact on the project's success. Furthermore, in line with the perceived risk-culture, Keegan and Turner (2002) claimed that risk-taking in innovation projects is high due to vaguely defined and ambiguous outcomes. However, they did not specify their findings with respect to a certain innovation type. This study revealed that the correlation between a risk-tolerant culture and the overall project success was high for both NPD and BMI projects. Thereby, the study of Hock et al. (2015) was confirmed, as it suggested that BMI requires novelty-oriented cultural values. Regarding the motivation of project members, many existing studies associated intrinsic factors (Hayton and Kelley, 2006) and a high degree of personal commitment (Stampfl, 2014) with successful BMI projects in particular. However, the results of this study indicated a high correlation between intrinsic as well as extrinsic motivation and overall BMI project success, whereby the intrinsic coefficient was slightly higher. Confirming existing research on NPD (e.g. Pitta et al. 1996; Malanowski, 2007), both forms of motivation seemed to be relevant for successful NPD projects. Besides the previously noted similarities, two constructs stood out for BMI projects that did not indicate any significant correlations with overall project success for NPD projects. These constructs include an organic organizational design and an innovation process based on exploration. Accordingly, the presented results lead to the conclusion that the right setting for novelty-centered innovation processes (Johansson and Abrahamsson, 2014) as well as flexible, loose, and decentralized structures (Ambrose and Schminke, 2003) are of critical importance for the success of BMI projects.

By considering the mentioned limitation of the conducted moderator analysis, the presented results indicated the tendency of a risk-averse organizational culture being more relevant for the success of NPD projects than for BMI projects. Thereby, findings from previous studies have been confirmed, which revealed that support in terms of handling risk and failures represents a significant factor for a positive NPD environment (Gupta and Wilemon 1990; Hegarty and Hoffman, 1990; Leder, 1989; Shrivastava and Souder, 1987). In connection with a suitable setting for innovation projects, an innovation process based on exploration might be more important for successful BMI projects. As existing studies scarcely researched the BMI process empirically

(Frankenberger et al., 2013; Sosna et al., 2010), the presented results suggest to explore unfamiliar process alternatives and new routines for BMI projects by a trial-and-error approach, which confirmed related studies in the field of innovation management (e.g. Brady, 2004; Ayas and Zenuik, 2001; Sosna et al., 2010). Another important aspect referred to the trend that an organic organizational design seemed to be more relevant for the successful outcome of BMI projects than for NPD projects. Confirming Ambrose and Schminke (2003), this includes an informal way working and communicating with relevant project stakeholders, as well as a project team that is able to make its own decisions. Furthermore, financial resource allocation relying on a quantitative approach seemed to be more relevant for NPD projects than for BMI projects, which is in line with suggested findings from existing studies that consider measures such as ROI or Break-Even-Point as decisive for the allocation of project budget (e.g. Northcraft and Wolf, 1984). For the remaining constructs, an interaction with the project type did not seem to influence the successful outcome of an innovation project.

Based on the results of this study, managers may conclude that requirements for successful BMI and NPD projects differ in certain areas. These differences should be considered in their decision-making process around implementing the right corporate innovation framework within their individual firm. Nevertheless, a higher number of significant similarities between the two project types have been identified.

As mentioned in previous sections of this study, several limitations need to be considered in connection with the presented results. Regarding the data collection, the selected approach for attaining an appropriate sample size might be biased by the researcher's own employment in the company. Even though the researcher did not solely ask colleagues from her own personal network to participate in the study, a completely random sample might not be given. With respect to the participants' evaluation of the survey questions, a common method bias might have occurred in terms of an individual interpretation of respective constructs and items (Podsakoff et al., 2003). Overall, a high variance of all variables was detected, which might be explained by the large number of dimensions – all focusing on completely different aspects of a CIS. This means that the dimensions only explain a very small proportion of the overall variance, which limits the explanatory power of the overall model. In connection with this, a considerably larger sample size might have limited this effect.

Even though the researcher put a lot of effort in ensuring the validity and reliability of the constructs, certain limitations have been addressed, as for instance the weak CA for specialized internal stakeholders. Most importantly, the tested moderator effect did not incorporate significant interactions, which only allows for an indication of trends regarding moderation by project type.

The following chapter will finally summarize the conducted study including a brief summary and discussion of the overall results, implications for future research and practice, as well as a note on limitations of this work.

6 Conclusion and Outlook

At the beginning of this study, the researcher highlighted considerable research gaps in the fields of CIS in general, the differentiation of BMI compared to other types of innovation, as well as the combination of both research streams. Throughout the previous chapters of this dissertation, the study addressed the mentioned need for further research. The overall study had the goal of analyzing the corporate innovation framework of multinational corporations in the mobility sector, while focusing on how a firm successfully incorporates different innovation activities, such as BMI and NPD. In order to answer the research questions in detail, the researcher applied a mixed methods approach referring to a sequential exploration of the problem statement enriched by a conducted SLR.

6.1 Summary of Findings

The initial SLR (chapter 2) provided a foundation for the empirical analysis by identifying components of a CIS and related fields of research that were incorporated in the subsequent steps of the study. Thereby, a wide dispersion of CIS literature was discovered, and included literature on open innovation, organizational learning or corporate entrepreneurship. Results of the conducted SLR were used to define a CIS model for the empirical analysis, incorporating the following seven dimensions: Innovation Process, People and Culture, Organizational Structure, Strategy, Hygiene Factors and Rewards, Resources, and External Interaction (see chapter 3).

Following from the exploratory benchmark study on CIS and BMI activities of worldwide firms in the mobility sector (see chapter 3), the researcher classified four relevant types of players in the mobility space, including Traditional Players, New Mobility Players, Adjacent Players, and Digital Players. By providing insights into their lessons learned regarding the analyzed issue, interviewed experts from these distinctive mobility players revealed once more that paradigm shifts in the market significantly increase the complexity of firms' innovation activities. For BMI in particular, the importance of having a flexible and dynamic innovation process with investment-based gates allows for early management approval was stressed repeatedly. Furthermore, an autonomous setup within a CIS was considered as an essential requirement for

successful BMI, as well as a flexible resource allocation with a link to technological capabilities. Concerning a suitable reward system for employees involved in BMI activities, intrinsic motivation seemed to be particularly important, while a combination of intrinsic and extrinsic rewards was applied especially by Silicon Valley-based firms. In addition to a diverse skillset of internal stakeholders, a risk-tolerant culture backed by strong leadership support was highlighted as a crucial success factor for a CIS supporting BMI. Regarding the performance measurement of BMI, a qualitative reporting seemed more suitable than traditional KPIs. Above all, the interaction with external partners was highlighted as a key factor for the successful transformation of a firm's business model. Therefore, flexible and dynamic collaboration models were also considered to be essential aspect.

By further exploring the research problem on a project level, the qualitative case study comparing BMI and NPD projects revealed a theory-based comparison framework for two different types of innovation (see chapter 4). Following obtained propositions from the benchmark study, the comparison of BMI and NPD projects also supported the importance of cooperation and external partnerships. While NPD projects required long-term relationships with specialized key partners, BMI projects relied on temporary and project-specific partnerships for strategic collaboration. Apart from this, internal cooperation was also highlighted as a critical success factor for both innovation types. Regarding the required organizational structure, NPD projects demanded specialized development departments, whereas BMI projects seemed to require project-specific organizational integration. With respect to the team composition, NPD projects mainly involved specialized stakeholders, while BMI projects benefit from a diverse team composition. Both project types preferred small core teams for their respective project. Besides beneficial effects of management support for both project types, definite hierarchies seemed far more relevant for NPD projects, while hierarchical structures potentially hindered BMI projects. Throughout the innovation process, NPD projects benefited from a review of lessons learned from previous projects as well as pre-defined quality gates and milestones. On the other hand, BMI projects thrived with project-specific gates and early management approval. With respect to employees' motivation and rewards, extrinsic team motivation was associated with NPD projects, while intrinsic motivation seemed more relevant for BMI projects. Furthermore, NPD projects were characterized by an innovation culture focused on iterative steps, whereas

successful BMI projects required significant risk-tolerance and comfort with uncertainty. In line with the strategic dimension, NPD projects' target definition was mainly based on technical and legal requirements, whereas BMI projects required adapted target definitions based on customer metrics. Overall, the most striking differences of both innovation types were detected regarding external partnerships, organizational integration, and market/customer focus. Accordingly, regarding the proposed CIS model, the main differences between BMI and NPD projects were detected for the following dimensions: Organizational Structure, Innovation Process, External Interaction, and Resources.

Following the suggested mixed-methods approach (e.g. Johnson and Onwuegbuzie, 2004), the quantitative comparison of BMI and NPD projects combined findings derived from the qualitative parts of this study with the aim of operationalizing the seven constructs, i.e. External Relationship Quality, Employee Motivation, Internal Stakeholder Identification, Perceived Risk-Culture, Innovation Process Modeling, Organizational Design, and Financial Resource Allocation (see chapter 5). With respect to their relevance to a project's successful outcome, a similar focus on particular dimensions of a CIS surfaced for both innovation types. Accordingly, significant similarities between both innovation project types included the importance of individual job motivation, the demand for complementary and multi-dimensional team capabilities as well as a risk-tolerant culture. Comparing NPD and BMI projects, the quantitative study revealed that an innovation process characterized by exploration, organic organizational structures, quantitative measures for allocating project budget as well as advocating a risk-averse culture encompassed detected differences between both innovation types. However, the analysis resulted in the conclusion that more significant similarities than differences were identified. The constructs Relationship Quality, Process Exploitation, Mechanic Organizational Design and Qualitative Resource Allocation were not part of the key findings as they neither correlated with the overall project success nor indicated any considerable difference between NPD and BMI projects. In sum, the main differences were detected for the following CIS dimensions: Organizational Structure, People & Culture, Innovation Process, and Strategy. With respect to the qualitative study's results, both approaches identified differences between the twp project types with redard to Organizational Structure and

the Innovation Process, which further emphasized their relevance in the presented CIS model.

6.2 Limitations

At this point, several limitations of the overall dissertation need to be considered, and will be addressed in the following section. First, the conducted SLR resulted in the definition of seven particular CIS dimensions. However, the qualitative weighting of each dimension's relevance within such a system, which was conducted by following the number of codings, may include certain weaknesses. Furthermore, the researcher, who was employed by one of the sample firms, a traditional player in the mobility sector, might have been biased to some extent by unconsciously considering her own perspective as an expert as well as practical experiences in the analyzed research domain. The selection of interviewed experts might also incorporate notable limitations, as the interview partners were selected based on their availability and willingness to share their insights for this study. Nevertheless, the researcher adhered to pre-defined selection criteria, which allowed for a similar perspective of the experts, even though they did not obtain the exact same positions within their respective firm in case of the benchmark study. In addition, the researcher's personal and professional network served as a catalyst for obtaining the required sample sizes for all three parts of the empirical study. Moreover, the distribution of analyzed worldwide regions was not equal, nor was the proportion of each type of player represented in the sample. In addition, the overall study was conducted within one industry, the mobility sector, which thereby excluded the impact of other sectors' firms.

In case of the comparison of BMI and NPD projects, both qualitative and quantitative analyses have been conducted within a single firm. Thereby, the presented findings might be limited to a particular corporate and cultural setting. Extending this uni-dimensional view was omitted due to time and resource constraints. While the expert interviews for the qualitative case study were limited to one expert per sub-case, the quantitative study included 107 participants who completed the online survey. In line with this, the researcher received critical feedback regarding the survey's high complexity including a broad variety of constructs, as well as the large number of questions, which was overwhelming to some participants. This might have led to a lack of predictability of several constructs throughout the analysis. With respect to the

moderated regression analysis, several characteristics of the constructs (e.g. 'intrinsic' motivation) violated key assumptions of a regression model, such as the threshold of normality. Besides the large variety of analyzed constructs, the limited sample size might have had an impact on this outcome. Instead of very few items per construct, additional items might have resulted in different findings. Moreover, the definition of project success included a certain common method bias, as study participants might have perceived success differently. Apart from that, the researcher also collected quantitative data concerning technology and market uncertainty, which was neglected throughout the analysis, as the amount of data was already very complex to handle under given time constraints. Finally, the overall study highlighted a large amount of requirements for BMI and NPD in the context of an advanced CIS. However, due to time and resource constraints, the study does not precisely explain how to implement specific recommendations in detail. However, one ideal framework that ensures an optimal implementation of a firm's innovation activities certainly does not exist, as CIS are characterized as being flexible and dynamic in nature.

6.3 Implications for Research and Practice

In sum, this dissertation provided multiple noteworthy contributions. First, the theoretical CIS model represents a tool for analyzing a holistic innovation management approach within firms, regardless of their industry or size. Second, the suggested comparison framework of BMI and NPD projects facilitates the comparison of several innovation types at a project-level. Third, key findings regarding the specific requirements for BMI including propositions on how to adapt a CIS for a successful integration of this type of innovation serves an essential benefit for solving issues in practice. Fourth, the comparison between NPD and BMI projects contributed to limited research on combining several types of innovation at the same time within an ambidextrous organization.

In particular, the theoretical contributions of this study include providing a systematic literature review on CIS, which is a neglected research field across various publications. With respect to the increased complexity of firms' innovation activities and the need to engage in BMI to survive in the long run, this dissertation provides the first known approach of combining CIS and BMI research. As both fields indicate considerable overlaps, the researcher encourages future studies to explore potential spillovers and

mutual issues, such as the importance of engaging with the external innovation ecosystem. In connection with the analyzed worldwide regions, scholars should dig deeper into regional and cultural idiosyncrasies, which seem to have an impact on both CIS and BMI. Furthermore, future research might certainly benefit from analyzing the prioritization of the seven dimensions within a CIS, especially when it comes to transforming an existing corporate innovation framework.

As the comparison between NPD and BMI projects was conducted with a mixed-methods approach for the first time, the obtained findings are highly relevant for future studies to build upon. In addition to the selected innovation types, future studies might incorporate process or service innovations into the analysis. Considering the fact that the qualitative and quantitative case study took place within a single firm, future research might apply the suggested comparison framework to a larger database of different firms and/or industries. Again, a prioritization of selected dimensions might enhance the informative value of the overall framework. Furthermore, a larger number of expert interviews per sub-case might increase the internal validity of obtained results. Regarding the conducted online survey comparing NPD and BMI projects, an expansion of the sample size might increase the significance of presented results. This could be achieved by opening the target group to more firms within various industries. Alternatively, a reduction of constructs, i.e. CIS dimensions, might one the one hand simplify the survey and thereby increase the completion rate, while on the other hand more items per dimension could enhance the accuracy of presented findings. In addition, an analysis of interdependencies between the suggested constructs might lead to promising results regarding a firm's CIS. Finally, applying to the comparison of different innovation projects in general, a closer examination of how to measure project success may certainly contribute to establishing a competitive CIS. For instance, the presented analysis revealed different factor loadings of existing project success measures (e.g. Shenhar et al., 2010), which lead to a new classification of items. Building on this endeavor, future studies might also challenge existing approaches of measuring successful projects and apply obtained results to BMI.

The practical implications of this dissertation are manifold. First, managers are encouraged to utilize the suggested CIS model in order to structure and develop their firm's corporate innovation system. While advancing their innovation management approaches as a result of paradigm shifts, practitioners should consider mentioned

characteristics and requirements of BMI, such as the need for more flexible and dynamic collaboration models. Moreover, particular attention should be paid to the identified ‘white spots’, or areas of improvement that were observed in all analyzed firms. Accordingly, an internal community of innovation activities creates an environment where a firm may benefit from knowledge spillovers and lessons learned across different innovation types, as well as a better strategic alignment despite of an increased complexity within a CIS. In addition, an internal platform for knowledge and capability exchange is essential in an environment where a lager variety of skills and know-how is required for transforming a firm’s business model. Furthermore, the go-to-market execution of BMIs needs to be integrated into the overall innovation process carefully, as many firms still neglected this aspect.

Resulting from the presented comparison of BMI and NPD projects, managers are encouraged to create an ambidextrous organization, where different types of innovation can be pursued at the same time. The study revealed that both innovation types depend on consistent management commitment, a suitable company fit of the respective innovation activity as well as a culture where feedback and knowledge exchange thrive. In order to improve their understanding regarding a successful implementation of two different innovation types, i.e. BMI and NPD, managers can clearly benefit by making use of the proposed comparison framework, which includes very precise characteristics of each innovation endeavor, as well as their level of differentiation. Thereby, they receive a structured guideline for debating over the right course of action for their firm’s survival during uncertain market conditions. Furthermore, the quantitative study highlighted several similarities and parts of a CIS that are essential for both innovation types alike. These results support managers in connection with their firm’s strategic focus as well as an appropriate resource allocation, while mastering the transition towards a more advanced CIS.

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Appendices

Appendix A: Interview Guideline Benchmark Study

PhD Study

Rebecca Hirte

Expert Interview Guideline

General terms:

Expert interviews are recorded and transcribed afterwards. Interviewed experts will receive the transcript before the analysis, if they want. It is guaranteed that all interviewed experts remain anonymous and all company-specific information remain confidential.

A. General Information About the Expert and the Organization

Organization:

- Sector/Industry focus
- Type of organization
- Geographical region
- Innovation Activities

Expert:

- Position and function
- Experience in innovation/years within the organization
- Main (innovation) activities

B. Understanding the Mobility Sector

Main questions:

- **How would you describe your corporation's role in the mobility sector?**
- **What are the strengths and weaknesses of your current business model?**
- **Who are your strongest competitors? Has it changed within the past years?**

C. Organizational Structure

Main questions:

- **How would you describe your company's general framework for innovation?**
- **What organizational form is required for business model innovations? Why?**
- **How do hierarchies affect your business model innovation activities?**

D. Strategy

Main questions:

- **Is there a certain type of innovation that you focus on?**
- **How business model innovations fit into your overall strategy?**
- **How does top management prioritize business model innovations?**

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E. Innovation Process

Main questions:

- How would you describe your general process for innovations? (from idea to innovation)
- Is there a difference between the processes for product innovation vs. business model innovation? If yes, what is the main difference?
- How do you balance control and flexibility within your innovation process?
- How do you ensure a continuous adaptation of your innovation process as a reaction to internal / external changes?

F. External Interaction with the Innovation Ecosystem

Main questions:

- How do you interact with the external innovation ecosystem to develop (business model) innovations? Who (what type) and where are the most relevant partners? How do you find them?
- How is open innovation implemented into your corporate innovation framework?
- How do you master the balance between openness and risk-averse behavior when it comes to sharing new ideas and sensitive knowledge?

G. Hygiene Factors and Rewards

Main questions:

- How do you create incentives for your employees to work on business model innovations?
- Which employees are mainly involved in (business model) innovation activities and how?
- What measures support your employees to generate new ideas and develop innovations?

H. People and Culture

Main questions:

- How do you foster intrapreneurship within your firm? Are there any intrapreneurs?
- How are peoples trained for business model innovations?
- How would you described the required culture for business model innovations?

I. Resources

Main questions:

- What internal/external resources are required for business model innovations (compared to other types of innovation)?
- Where do you inform yourself about new trends, ideas and technologies (internal/external sources)?

Appendix B: Sample Overview Benchmark Study

IP	Region	Medium	Type of Player	Duration (h)	Pages transcribed
1	Germany	By phone	Traditional Player	00:47	12
2	Germany	By phone	Traditional Player	00:37	9
3	Germany	In person	Traditional Player	01:05	16
4	Germany	By phone	Traditional Player	00:38	10
5	Germany	By phone	Traditional Player	00:55	11
6	Germany	In person	Adjacent Player	01:17	20
7	Germany	In person	Traditional Player	01:08	16
8	Germany	In person	Traditional Player	00:50	12
9	Germany	In person	Traditional Player	00:58	17
10	USA	In person	Traditional Player	01:30	3
11	USA	In person	New Player	00:55	5
12	USA	In person	Adjacent Player	00:53	16
13	USA	In person	New Player	02:05	21
14	USA	In person	Traditional Player	00:46	12
15	USA	In person	Digital Player	00:50	5
16	USA	By phone	Traditional Player	00:52	12
17	USA	In person	Traditional Player	00:46	9
18	USA	In person	New Player	01:00	3
19	USA	By phone	Traditional Player	01:00	19
20	China	In person	New Player	00:53	11
21	China	In person	Adjacent Player	01:05	7
22	China	In person	Digital Player	01:02	13
23	China	In person	Adjacent Player	01:07	11
24	Japan	In person	Traditional Player	00:44	8
25	Japan	In person	Traditional Player	01:02	14
26	Japan	In person	Traditional Player	00:53	10
27	Japan	In person	Traditional Player	01:02	9
28	Japan	In person	Traditional Player	01:02	14
29	China	By phone	Digital Player	00:51	7

Appendix C: Coding Scheme Benchmark Study

Innovation Process

Sub-dimension	Success factor	Anchoring example
Idea Generation	Support of intrapreneurship by IT platform	In 2010 we created an innovation management platform for collecting ideas and we called it "Connecting People and Ideas". (IP9)
	Community as an enabler for transformation	We've learned from your platform that you need a community. You need to build up a community, those crazy people within the firm, who are optimistic regarding change. (IP9)
	Challenge-based process for idea generation	Last year we piloted several crowdsourcing campaigns where we address the internal crowd. These are challenges for our accelerator program that we launched. (IP7);
	Combination of internal and external sources	So we are very open to to external ideas. But also internally, yes we have a couple of platforms where employees can suggest ideas. (IP14)
	Early definition of sponsorship and revenue model	If within that, someone can suggest certain ideas certainly but we are very driven by a particular goal, and we have a revenue model in mind and we have a profit model in mind, so it's it's very much driven by the business side of things. (IP14)
Validation	Initial management evaluation	If you can explain the idea on three Din-A4 pages within six minutes and it makes sense, then you'll receive the budget from our management. (IP13)
	Focus on customer	At the beginning we start with the customer journey. What is the customer doing today, where can I support him or his customer journey. (IP8)
	Functional prototype	In the second section we start building first prototypes, we call this section the "foundry". This is where the best 10% of all the ideas receive resources to proceed. (IP15);
	Bottom-up approach	I think at the beginning, it's a very small team. So who is leading is not very important. Maybe a very low-level guy. (IP23)
Development	Project-specific innovation process	Yes, of course we apply a stage-gate process. The number of stages depends on the innovation project. (IP11);
	High degree of freedom	On the one side you have freedom where employees are not restricted in what they do and where they can be very innovative. Sometimes this works, sometimes it doesn't. (IP15)
	High tolerance of failures	We also have a lot of failures and this is very important. (…) 90% of the projects get killed. (IP15)
	Investment-based gates	This is an important issue: Control in the sense of investments - What do you have to invest for which innovation and what is the return of this innovation. (IP6)
	Focus on quick execution	Speed. Because we have departments that are operating in the field of software services and we can't wait for 18 months to launch a new product. The customer is expecting the new product to be ready within only a few months. (IP6)
Implementation/ Go-to-market	Transfer to line function	It depends. The project should become either part of a division or maybe a new division if it's a big enough project. (IP16)
	Spin-off	Afterwards, when the projects are mature and sustainable, they graduate and become own separate legal entities. This is rather a long-term process – however, usually less than a year. (IP15)
Methods and Tools	Pitching/Storytelling	We also developed so-called "Primers", which refer to 1-2 hour sessions that also include Storytelling. (IP9)
	Co-creation/Swarm	Co-creating, that you don't sit in your office by yourself but actually with the customer, that you have this friendly customer who develops this together with you. (IP3)
	Problem Framing	There are three basic questions that we always ask: Who needs? Who makes? Who pays? (...) with a strong focus on business modeling, but we also do a lot in the area of problem framing, because it's important to clearly define the problem. (IP9)
	Bootcamps/Hackathons	Then there is a bootcamp where I bring people together and teach them these methods. (IP9);
	Lean Startup	Yes. The processes are typical Silicon Valley… such as MVP and Lean Startup. We just make a very simple prototype and throw it in the market to test it with the consumer. (IP23)
	Scrum	Die IT guys already do it, because their work is based on Scrum with these team boards and less hierarchical structures. (IP6);
	Business Model Canvas	We did a lot in the field of methodology. For instance, we established the Business Model Canvas early on. In the meantime it's a very well-known tool within our company. (IP9)
	Rapid Prototyping	First a prototype and then we validate our first hypotheses through quick customer feedback. (IP3)
	Business Case	Even if someone says "I want to optimize the manufacturing process", I would respond "Ok, what's the business case behind it?" (IP9)
	Design Thinking	We have been encouraging a lot of good learning development around Design Thinking, we have a strong partnership with the D-School at Stanford as well as developing programs to teach and to practice Design Thinking. (IP17)

Resources

Sub-dimension	Success factor	Anchoring example
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Organizational Structure

Sub-dimension	Success factor	Anchoring example
Legal / Organizational Embedding	Foundation of separate legal entities	We discussed the pros and cons and came to the conclusion that the advantages of a small separate legal entity clearly dominate. And that's why we chose this path for our incubators. (IP8)
	Link to strategic departments	And of course something like this is always in close collaboration with strategy. I have a counterpart in the central strategy department, who is also concerned with mobility issues and also tackles digital topics and disruptive business models. (IP4)
	Bundling of digital innovation initiatives	All these labs that are common and also exist per brand (...) these are the things that are just a bit more centrally controlled. (IP1)
	Close connection to Board of Management	We as Corporate Innovations represent an independent organizational unit, the [prototyping team] represents an independent innovation unit in the engineering resort. At the end it's all about who is financed by whom. (...) We are located directly under the CEO. (IP9)
	Autonomous setup	An autonomous setup is required in order to develop products and to attract the right talent for our team. (IP10)
Venture Capital Arm	Focus on series A ventures	[VC name] is our investment arm typically focused on investing in sort of A-stage companies that are developing technologies that we feel are gonna be beneficial to the company. (IP17)
	Admission of internal spin-offs	I support this [VC arm], because it makes a company dynamic and it does not cost a lot of money. It allows for a certain risk, as a lot of projects are spun-off into our venture capital arm. (IP19)
	Instrument for strategic partnerships	And in the third instance, our venture fonds gives us the opportunity to invest in companies. (IP2)
Corporate Incubator	Utilization of agile methods	Incubation is really important, how do you use agile methodologies, how can you be lean and prototype and test ideas and start to grow those. And then a real go-to-market launch unit that takes those incubated concepts and and gives them the right business structure and the right back-office support to bring them to market. (IP17)
	Cross-divisional incubation initiatives	Each division has such an incubator and there they play a lot with business model innovations, not necessarily with new technologies - sure they are tested there, but the technological innovations are conducted by the corporate technology division. (IP3)
	Instrument for intrapreneurship	I would say there is some type of internal acceleration program. (…) And so it will give the employees a chance to pause their existing work if they are chosen. If they get selected, they can get some people and budget support, depending on what they ask for, depending on how good or important the proposals are. (IP29)
	Focus on company building	We are actually a company builder, as we focus on creating new businesses. (IP15);
	Stringend incubation process	We basically implemented three phases that we want to manage professionally. (…) All this happens during a stringent pre-incubation phase. When the phase has been successfully completed, we bring our incubators into play. (IP8)
Accelerator	Instrument for open innovation	… das ist im Prinzip so eine Art Startup Accelerator, wo wir halt einen regelmäßigen „Call for Startups“ machen, wo wir dann auch sozusagen Startups von außen mit reinbringen... (IP9)
	Partnerships with external accelerators	We partnered with [accelerator name], one of the biggest accelerators worldwide. (IP3)
	Attaching tenants to core business	But for Microsoft it’s different, because we will link the technology… because finally, the companies in our accelerator, they will use Microsoft technology, so this is why they have a strong linkage. (IP22);
Innovation Hubs/Tabs	Diversification of innovation activities	And that’s the strength and I think [company name] is doing that right, because they are doing this – diversifying their innovation hubs. (IP20)
	Adequate allocation of resources	Of course, we can develop all innovative topics in our labs in Berlin, San Francisco or Beijing. But then there's the question: Do you really want this string separation? Then you have this old world where every penny is turned around and this beautiful, colorful new world where a lot of investments happen. (IP1)
	Network/Community of innovation hubs	We don't have a central overview (...) We have a loose network and in the community one knows each other a bit (...) I would say we know half of them, and a quarter of them is relevant for us and we don't know the other half. I hope not too many of them are relevant for us - but you never know. (IP7)
	Leadership with corporate background	The leader should have a corporate background in order to understand internal policies and processes etc. and also to use his or her established network within the corporation. (IP10)
	Long-term/disruptive focus	They don’t have to be linked too much to the strategy of the mother-company. Because the strategy of the mother-company is always like for the next five years and in a very clear direction. The innovation centers have another purpose. They should find things that are NOT in the strategy of the mother-company that can re-define the business model. (IP20)

Hygiene Factors and Rewards

Sub-dimension	Success factor	Anchoring example
Monetary Rewards	Flexible remuneration	But in this shifting market with new IT talent you need a more flexible approach regarding the issue of remuneration and incentives. (IP8)
	Career opportunities	Yes, definitely. If the project grows very fast and there is positive feedback from the market, the people definitely will get promoted and will get more financial benefits, shares, salary increase – definitely. (IP21)
	Individual bonus linked to personal development	But now part of our performance evaluation is whether or not we archieve our personal goals and this is linked to bonuses. So you have a fixed pay and a variable pay – the bonus. (IP16)
	Shareholding	You want the company you work for to grow. And then at some point you receive shares that eventually go up. (...) Thus you identify much more with the company. (IP13)
	Financial resources for idea development	We always ask ourselves: How can we encourage people to participate in the campaign? Often it's enough when the sponsor says "Yes, I am willing to support the Top 3 ideas with an investment of 15.000 Euro so they can work on a proof-of-concept". (IP9)
Intrinsic Rewards	Team/Company goals	This means that we no longer only work for our own career, but we always contribute to the larger team or company goal. And I firmly believe that if you have a common goal, that you stand together for success, then the topic of innovation is guaranteed. (IP6)
	Appealing working conditions	To be able to work on cool topics. To bring in your own ideas and to test them. That's very motivating for people and they are really having fun. And you should not forget to celebrate milestones and success stories. (IP5)
	Convincing of leadership level	And you can also create some incentive for the manager, that he says: „Although I realize that it makes sense business-wise, I have a problem at the moment and that's where he is missing". And that we say how can we create tools that this does not only rely on his goodwill and the understanding of a few (...). (IP7)
	Influence of role models	It's about lighting the fire in these people and from there it's based on voluntariness. And you only generate that when you have these energizers and role models in your organization. (IP6)
	Holocracy	If people wanted to do something, they would always find a way to propose something. Yes, there were also systems in place, but ultimately it depends on the people who are managing. So if there are some people who are open to new ideas (...) But at [...], there is a reasonable amount of freedom compared to most Japanese companies. (IP27)
	Communication of success stories	People get very discouraged when they submit all these ideas and nothing happens to it. And it doesn't have to be them personally, so let's say even if out of a thousand ideas you fund only ten, but it's critical to fund those ten and and and publicize that you've done it. (IP14)
	Internal innovation awards	There's even an Innovation Award each year at the end of the year for the best units, the best entrepreneurs too. (IP6)
HR Policies	Flexible career opportunities	Yes and that is about to change, also to say, it's ok if youleave for three years and come back. And it does not have to be the goal, to become a board member, but to be able to further develop and to live your passion. (IP6)
	Early involvement of HR functions	What definitely helps in our case is that our workers council is involved in the innovation fund. Accordingly, our HR processes are very simple. (IP4)
	Hospitation and temporary release	Of course the temporary release is still a big issue. Because how can I coordinate thi (...) hospitation concepts play an important role. (IP2)
	Flexible working conditions	This distinction of: this is a day job and that is ... that does not exist here. That means we do not have a time clock. You come to the office or you work from home - nobody's interested in that. (IP13)

People and Culture

Sub-dimension	Success factors	Anchoring example
Organizational Culture	Reference to innovation DNA	That's in our values, in our DNA. We are an engineering company, founded by an engineer, who developed an innovation. Accordingly, if you survived as long as we did, you have to reinvent yourself constantly to work at the pulse of time. That's the value for every employee, so it's the job of every employee to foster innovations. (IP3)
	Access to leadership	"I have an idea", then I'll go to my manager - or if I think my manager is not the right contact person, I go to another employee's manager. These classical hierarchies, where you have to climb up (...) we don't have that here. (IP13)
	Promotion of entrepreneurial mindset	And when you look at Israel for example. When you look at all these young entrepreneurs, their entrepreneurial spirit, their shining eyes, their hunger and desire for excellent performance - this desire for excellent performance is essential. (IP6)
	Target group specific transformation	But of course when you talk about real transformation, you have to reach the critical mass in order to change something and you have to convince the critics. And my experience is that you have to take their concerns seriously and try to test new things with them live and in color. (IP4)
	Focus on motivated employees	Fact is, we've learned from our platform: You need a community, you need to identify those crazy people in the company, who are looking forward to change. Because it's useless to work against the people who don't want to change. But it's important to focus on the ones who want to. (IP9)
	Open-minded and sensitive leadership	The founders of [company name] are very open-minded people, they would like their employees to also be very open-minded. (...) So if other people come to visit the company, they will not be able to tell the difference, which one is the leader and which one is the employee. The personality of the leaders is just like that, they will not put any limitations on their employees. (IP21)
Actors/Roles	Scouts	The first stage refers to Scouting for technologies, this means I go outside and talk to partners and other people. (IP15)
	Mentors	There are mentors, for example somebody like me, who do this in their leisure time, it's a lot of voluntariness. (IP6)
	Energizers	What do you do with the people from these innovation hubs, who work as expats, when their visa expires and they cannot work in Silicon Valley anymore? A solution could be to place them as "visionaries" in traditional departments at headquarter so they can promote change and motivate other employees. (IP10)
	Innovation Managers	That means we have an innovation manager crew around the world in every business unit. (IP6)
	Sponsors	For example the CTO, my customer and sponsor. Together with him I define certain fields where I drive innovations forward. (IP3)
	Experts	We have those so-called "central teams", which are employees that are not assigned to one specific project. This is more like a pool of employees – all with a different background. So for example they have skills in Marketing, Legal Issues, Procurement and all the administrative stuff that the people on the projects don't have to worry about. They only support the projects with respect to their field of expertise. (IP15)
	Board Member for Innovation/Digital Transformation	Since two years ago, we have a Chief Digital Offices, so really someone in the executive board, who is responsible for the entire topic of digitalization. (IP9)
	Intrapreneurs	And you know, an entrepreneur – for them it's an entrepreneur. But other people also have the spirit, (...) it's a bigger scope of definition. You need the organization to have some alignment, shared vision you know. You cannot have the view "I work for the core business, so I'm not an entrepreneur, I'm not an innovator." And other people "Oh they are innovators". You cannot do this, you share, you do the same thing. (IP22)
Qualification	Project-based training	What we already do now is to coach and support people during current projects. It's not a detached training, but we provide support during while doing. (IP5)
	Enabling by business model related coaching	We also developed so-called "primers", which refer to 1-2 hour sessions regarding six elementary fields. They include the topics Design Thinking, System Thinking, Agile Methods, Business Model Canvas, simple Business Case, Pivoting and Storytelling. (IP9)
	Wide range of capabilities	We also have a lot of diversity and people always switch between projects. I think that's very important. As soon as a project gets killed, you move on to another one. We have people from different backgrounds, different cultures, different expertise and gender. That's very important. (IP15)
	Need for Software-related skills	Because we need those new software skills. But we also have 20% that moved in from [headquarter], because you need that grounding in the automotive industry, you need a link that goes back to the mothership. Otherwise, if I hire only from here, we are now going to develop a phone, not a car. (IP15)
Involvement of employees	Broad involvement in innovation activities	I think it's healthy to give all employees an opportunity to participate. (IP17);
	Profile-specific involvement	We have an internal accelerator program where people can apply for with their own ideas. (...) The second option is that we have areas where employees say "Oh cool, I want to work on new topics, I want to be innovative", then we invite the ones with certain competencies to workshops to work in innovation tandems. (IP6)
	Ownership of idea generators	[Company name] culture is very open and encouraging and likes people to be more innovative. But definitely, the people will take their own responsibility. (IP22);
	Temporary support of projects	Therefore, we have working models where we say "Ok, we do a temporary release, so you'll get the possibility to work on your idea until the end of the business year, or at least part-time (...)". (IP4)
	Holocrary	There are so many approaches regarding team-of-teams structures and holocracy. (IP9)
Communication	Non-hierarchical and direct communication	Whenever an employee has an issue regarding his job, he is supposed to go to his manager. If he can't help him, he should go up to a higher level manager and in the last step (if nobody can help him), he should send an e-mail to our CEO. (IP18)
	Company-wide education and storytelling	There are different activities, there are crowd-activities and sourcing, voting, idea management, where we explain what business models actually are in order to excite employees and encourage them to think differently. (IP8)
	Internal networking platform	Yes, we have an internal WeChat. We built it ourselves. We call it "Elephant". (IP23)
	Stakeholder involvement	And of course you should not forget about the commitment of the leadership team, so you need the respective stakeholder management and involve them into decision-making. (IP5)

Strategy

Sub-dimension	Success factor	Anchoring example
Strategic Objectives	Combination of hardware and software business	So we have a clear strategy, which is called [...], and thereby we understand zero emissions and zero accidents. And if you put this into a single product, I would say we remain a hardware player plus some intelligence. (IP19)
	Flexible definition of strategic issues	Regarding a successful transformation towards a mobility company, we need to focus on the relevant topics (...) However, there has to remain a certain freedom to grasp quick changes. (IP8)
	Increasing complexity of strategic issues	Even if we can manufacture great cars, this does not enable us to build up a competitive business model agains Uber. Because what we've learned there, will not help us in a different area - it will actually slow us down. (IP7)
	Company-wide scope of innovation	Four years ago, our company was re-organized and our new CEO said "I need a Chief Innovation Officer" (...) „Innovations for the entire company“. (IP9)
	Link to core business	All innovation projects must be fundamentally important for the core business of the company. (IP11)
Performance Measurement / Reporting Structure	Adapted reporting structure for disruptive projects	There are different requirements, different processes and especially a different mindset and other KPIs are needed. If I'm measured by the contribution to the next [car model], I decide things differently, as when I'm measured by how many million active users are using our platform. (IP7)
	Focus on market potential	Yes, we don't look at the ROI. All the European traditional companies, look at the ROI first. We look at the market potential instead. (IP15)
	Qualitative performance measurement	We don't have very specific KPIS, it's more just a feeling, they have a lot of experience. (IP23)
	Investment-related evaluation	So this is not a balance, this is a risk. I mean, you should evaluate how much risk you can afford. (IP22)
IP and Patent Management	Increasing complexity of IP issues (for Software)	The topics of IP, data security, everything that's involved in the field of IT. These are no simple issues, for example who owns the data. (P6)
	Region/Technology-specific patent requirements (for Software)	The second issue for software-related innovations, most of them are very digital when you talk about business models, is that you cannot patent anything anymore. (...) You only have software patents in the US, not in Europe. (IP19)
	Partner-specific NDA process	I mean in in general, startups are for a very narrow solution to a very narrow problem as they should, because they don't have the bandwidth to be too broad, so typically we have the NDAs drafted pretty narrowly for that specific area. (IP14)
Leadership	Empowerment and Protection	Making innovation a strategic initiative that's driven from the very top and this these initiatives have the attention and the protection of our senior leaders. (IP17)
	Decision-making of strategic scope	In the sense of every idea counts, at the end our management decides "Yes" or "No". (IP25)
	Responsibility for initiating transformation	I think the CEO does not always have to be responsible for everything. You need experienced people in the Board of your company who see the need to provide enough flexibility. So my recommendation is that you pick the Board very carefully. (…) I think culture has to come from top-down, the CEO and the top management has to represent the culture that they want to implement within the company. (IP11)
	Challenging of innovative projects	The management presentation in front of our board is about critically evaluating the topic and to consider whether our customers can identify with it. (IP12)
	Committment to innovation	The pecularity of our innovation fond is that you cannot only submit an idea, but you already need the support of the CTO from one division, for example. (…) And then you automatically have this senior management commitment. (IP4)

External Interaction

Sub-dimension	Success factor	Anchoring example
Partners	Universities	Of course we have a lot of cooperation with universities. (IP1)
	Accelerator-Platforms	Right, our external partner in the field of accelerators is [accelerator partner]. This is based on our need to profit from their acceleration expertise including their worldwide screening network. (IP2)
	Venture Capitalists	In the area of our venture fonds, we collaborate with a dealflow company, which helps us to connect with interesting investment targets quickly that we would not be able to reach on our own at the moment (...). (IP2)
	Startups	Absolutely "yes", we look at the startup scene, because that's where new ideas are born. (IP5)
	Government	We are also in contact with the government to let them know that (…) we want to make the society better and better. (IP23)
	Customers	Customers (IP6)
	Technology Partners	Or we look for something in the field of autonomous driving, there it makes sense to collaborate with a few technology partners. (IP7)
	Consulting Firms	For example consulting firms. (IP12)
	(Marketing) Agencies	In connection with this, you need marketing agencies to enrich the topic marketing-wise. (IP12)
	Consortia	Recently, there have been some announcements made that [firm name] is participating in consortia around things like technology development (...). (IP17)
	Large corporations	Also, the other purpose is to have some early feedback from the market and from the OEMs or the car makers – those are along the value chain. (IP29)
	Medium-sized firms	We are sub-contracting this to a shop, I think it's in LA. We give them the spec and they are building the structure for us. (IP16)
Partner Selection	Compatible mindset and experience	The partner selection depends on the experience of the partners. For example at the [project name], we had to find a partner with a lot of experience. Our criteria are that it has to be a solid company, international and the culture has to be compatible with ours. (IP15)
	Diversified scope of partners	Yes, [business model innovation] requires other types of collaborations. Nothing is standardized, there are always new collaborations for each project and there has to be a win-win for both sides. (IP15)
	Flexible collaboration models	It it drives me crazy when my colleagues back in [headquarter] use the word supplier with startups. Because a supplier to me is someone, who has been working with you for the last 10, 20, maybe 30 years. With whom you have a pretty clear relationship, who brings us technology that is already pretty mature, and more or less is ready to put in a in a car. (...) Startups are scrutty little things that have a that have the idea that we need to help them to grow and bring into that supply chain. And sometimes we can't even allow them to come in directly because most of the time we are not going to buy technology from a 2, 3, even 10% startup. (IP14)
Type of Collaboration	Collaboration based on partnerships instead of acquisitions in disruptive fields	We rather prefer collaborations than acquisitions. (...) The costs are also very high and sometimes there are IP issues when they bring in a new technology. So for us, it's easier to develop technology internally, as we have really good engineers and very diverse teams with a lot of expertise. (IP15)
	Setting industry standards with larger partners	Of course, if you define standards, for example for traffic lights, there is a public standard and there are consortia. There are consortia in the field of standardization, Open Data (...) Every large corporation has to be involved in this. (IP3)
	Supplementing lacking resources	We have projects with only about 50 [startups], but we are constantly looking. And even the ones that don't do anything with us – they give you ideas, they give you at least a sense of direction or they give you signals and say "hey, something is happening in that space". So we we get to to at least learn about and from the entire space here. So we are very open to to external ideas. (IP14)
	Increased demand for social collaboration	Are you familiar with the buzzword "Working out Loud"? That's what this is connected with (...) it's about the issue of Social Collaboration, which will be one of the main enablers in the future, especially when you want to survive in the IT-related field. (IP6)
	Speeding up transformation by strategic partnerships/ acquisitions	We did buy some startups, but I think not for ideas or capabilities. For the business, not for technology. But I think in the future we should do something like this. Because of AI… driverless cars. Maybe we buy a team, this is much faster. (IP23)
	Strong demand for partnerships in early prototyping stage	I collaborate with academia and industry partners to develop or to define some joint projects so we can accelerate the research to prototypes and the product feature process. Also, the other purpose is to have some early feedback from the market and you know from the OEMs or the car makers – those are along the value chain. (IP29)

Appendix D: Publications on Corporate Incubators

Hirte, R., Münch, J. and Drost, L. (2017), "Incubators in multinational corporations – Development of a corporate incubator operator model", In: Jardim- Gonçalves, R. (ed.), *"Engineering, technology & innovation management beyond, 2020: new challenges, new approaches"*, 2017 International Conference on Engineering, Technology and Innovation (ICE/ITMC), Conference Proceedings, pp. 195-202, Funchal, IEEE, Piscataway, NJ.

Hirte, R. (2018), "The role of middle managers in the implementation of a corporate incubator: a case study in the automotive sector", *Technology Innovation Management Review (TIM)*, Vol. 8, No. 7, pp. 31-39.

Hirte, R. and Speidel, L. (2018), "Regulatory requirements for corporate incubation – Analyzing organizational and institutional parameters", *2018 International Society for Professional Innovation Management (ISPIM) Innovation Conference*, Conference Proceedings.

Schoell, L. and Hirte, R. (2018), "Incubation in multinational corporations – How to enhance the flow of resources between key stakeholders", *2018 International Conference on Engineering, Technology and Innovation (ICE/ITMC)*, Conference Proceedings.

Appendix E: Interview Guideline Qualitative Comparison of NPD and BMI

Karlsruhe Institute of Technology

LAB1886
DAIMLER

Interview-Leitfaden

Case / Projekt:	**[NPD-X / BMI-X]**
Interviewee:	[Herr / Frau XYZ]
Standort:	[Stadtname]

Allgemeines

0. Begrüßung und Einführung

0.1. Persönliche Vorstellung

0.2. Ablauf und zeitlicher Rahmen des Interviews

0.3. Inhalt und Ziel der Masterarbeit / Case Study (Voraussetzungen erfolgreicher NPD vs. BMI)

0.4. Erwartungen an das Interview (Validierung Theorie)

0.5. Einverständnis zur Aufnahme des Interviews + Transkription-Kopie

1. Informationen zur Person

1.1. Was ist Ihre aktuelle Position und Tätigkeit?

1.2. In aller Kürze: Wie war Ihr bisheriger beruflicher Werdegang?

1.3. Bitte geben Sie mir einen kurzen inhaltlichen Überblick zu Ihrer Abteilung / Business Unit.

1.4. Was waren Ihre letzten persönlichen Projekte und die Ihrer Abteilung?

2. Informationen zum Case / Projekt

2.1. Was war/ist der Inhalt des Projektes?

2.2. Was waren die Zielvorgaben? Wer hat die Ziele definiert? Wie werden sie gemessen?

2.3. Woher stammte die Idee zum Projekt?

2.4. Wie war der zeitliche Ablauf?

2.5. Welche Personen (Abteilung / Position, Anzahl) waren beteiligt?

2.6. Was ist der aktuelle Stand und welche Ergebnisse sind entstanden?

2.7. Wie sieht Ihr weiteres Vorgehen im Projekt aus?

1

3. **Voraussetzungen für erfolgreiche Innovationsprojekte**
   3.1. Wie würden Sie „Erfolg“ in Innovationsprojekten definieren und wie messen?
   3.2. Was sind für Sie, aus Ihrer bisherigen Erfahrung heraus, die drei wesentlichen Erfolgsfaktoren für Neuproduktentwicklungen bzw. Geschäftsmodelinnovationen?

Dimensionen / Erfolgsfaktoren

Waren/sind die folgenden Faktoren relevant für den Erfolg Ihres Innovationsprojektes? Inwiefern? Beschreiben Sie bitte jeweils kurz, was die Faktoren konkret im Rahmen Ihres Projektes bedeuten.

4. **Kooperation**
   4.1. Externer Input / Partnerschaften (wer?, wo?)
   4.2. Daimler-interne Kooperationen
   4.3. Wie war jeweils die Art und Dauer der Zusammenarbeit?
   4.4. Waren noch weitere Faktoren dieser Dimension relevant?
5. **Organisation**
   5.1. Einbettung in die Daimler-Organisationsstruktur (auch rechtlich)
   5.2. Interne Kommunikationswege (Effizienz, Effektivität)
   5.3. Teamwork Support / Förderung von Zusammenarbeit
   5.4. Job Design (freie Zeit für Innovationen?)
   5.5. Unterstützung des (Top-)Managements (ideell, Leadership)
   5.6. Technisches Verständnis des (Top-)Managements
   5.7. Waren noch weitere Faktoren dieser Dimension relevant?
6. **Markt**
   6.1. Durchführung von Marktstudien
   6.2. Marktumfeld / Wettbewerbssituation
   6.3. Identifiziertes Marktpotential
   6.4. Regulatorisches Umfeld
   6.5. Waren noch weitere Faktoren dieser Dimension relevant?
7. **Ausführung**
   7.1. Erfolg von Vorarbeiten zum Projekt
   7.2. Qualifikation der involvierten Stakeholder (Backgrounds)
   7.3. Prozesse (Stage Gates, Iterationen)
   7.4. Laufendes Controlling / Feedbackkultur
   7.5. Geschwindigkeit / Speed to Market
   7.6. Kapitaleinsatz (wie viel?, wann?, woher?)
   7.7. Waren noch weitere Faktoren dieser Dimension relevant?

8. Technologie

8.1. Vorhandenes technisches Vorwissen

8.2. Innovationsgrad / technische Komplexität

8.3. Möglichkeit zur Patentierung

8.4. Integration von Kundenfeedback

8.5. Waren noch weitere Faktoren dieser Dimension relevant?

9. Strategie

9.1. Art der Monetarisierung / Refinanzierung

9.2. Bereitstellung von (Wagnis-)Kapital für Innovationsprojekte

9.3. Unternehmenskultur bezüglich Innovation / Risikobereitschaft

9.4. Company Fit des Projektes

9.5. Synergien mit anderen Projekten

9.6. Strategische Partnerschaften

9.7. Waren noch weitere Faktoren dieser Dimension relevant?

Abschluss

10. Next Steps

10.1. Transkribieren (Kopie?)

10.2. Weitere Interviews für Case Study

10.3. Allgemeine Unterlagen zum Projekt vorhanden?

10.4. Fragebogen zur Bewertung der Wichtigkeit der finalisierten Anforderungen

11. Abschluss

11.1. Offenheit für weiteren Input (jederzeit)

11.2. Persönliches Nachfragen bei Bedarf

11.3. Danksagung und Verabschiedung

Appendix F: Sub-cases Qualitative Comparison of NPD and BMI

Case NPD-1: Door Bodywork

During the development of the [premium car model], several engineering innovations were incorporated into the final production version. For example, the suspension, lighting and safety equipment were modernized. The goal of the engineers was the attainment of all defined requirements to ensure successful production and driving safety. All components were designed based on the strict specifications with regard to crash, fatigue strength and NVH (noise, vibration and harshness) properties. For this case, specifically the Body in White phase was examined which refers to the R&D phase in which the bodywork's final contours are worked out, before ordering the costly production stamping dies. Thereby, the engineers extensively simulate crash-worthiness and manufacturability to turn the design team's ideas into production ready models. The design and construction of the doors required considerable effort as the [premium car model] doors are not only particularly long, but also built without window frames.

With the [premium car model], the engineering team tasked with the development of the doors' bodywork mainly focused on innovating the mating concept besides respecting the typical bodywork hallmarks of quality, costs and especially weight. The bodywork of the doors consisted entirely of aluminium components, which were joined together by laser welding, solid punch riveting and bonding. High-strength aluminium profiles were used inside the door, both as side impact protection and on the inside of the board edge for achieving the best possible side crash or frontal offset crash behavior. In order to be able to produce the inner door part despite the large component depth and length, a new process was used.

Case NPD-2: In-car connectivity module

The project team is integrated into department name], which is mainly responsible for developing connectivity and infotainment features for [premium brand] vehicles within Research and Development. The [project name] unit was developed to be used as a gateway module for several company-internal platforms in entry level as well as high-end segments. Adoption started with the [premium car model], which was introduced to the market as the leading [project name] carline in 2016. In line with usual

development practices, the firm's engineers designed and developed the specifications where after a contracted supplier developed the actual implementation.

[Project name] provides features such as remote diagnostics, remote door lock/unlock, speed alerts, stolen vehicle tracking, navigation data download, remote system updates, mainte- nance information, and eCall functionalities. Being specifically designed for automotive usage, the box contains connectivity features such as GSM, LTE, Bluetooth, Wi-Fi, and USB. The unit provides various telematic services and works as the interface between different types of car head units and public networks. Therefore, the head unit can be connected either via USB or Bluetooth as well as via Wi-Fi with the [project name] box. Once connected to the in-car system, the unit provides access to the public network through one of the implemented high-speed telecommunication standards and wireless interfaces. Due to the fact that the [project name] box was intended for different target markets, i.e. regions, multiple versions were developed to support the respective GSM, UMTS, and LTE bands depending on the needs within the target markets. As a result, the five variants for the markets of USA, Canada, China, Russia, and Europe are all using identical housings and the same hardware and software platform but include the different network modules form the same supplier. Although the NAD (network access device) varies between the five aforementioned markets, the other hardware and software of the [project name] unit is the same for every variant, which was novel and marks the main product innovation regarding this NPD case.

Case NPD-3: Fuell-cell System

The third NPD case examines the fuel cell program project at [firm name] subsidiary in Germany. As part of the global fuel cell activities of [firm name], the subsidiary is responsible for research and development in the field of fuel cell systems for motor vehicles including hydrogen tank systems as well as the preparation of the hydrogen infrastructure and the implementation of demonstration projects. This also includes the assembly of prototypes, repairs to existing systems and the sale of these systems and individual components. In particular, the fuel cell program is the fuel cell system and the tank system that is installed in the [premium car model] which will debut in fall 2018. In the development and production of this innovative fuel cell drive system, the firm relies on its worldwide R&D network.

Regarding the [premium car model] fuel cell, the main product innovations relate to the fuel cell aggregate, battery, and hydrogen tank. Building upon the findings of earlier test vehicles with fuel cells, the firm's engineers have developed a completely new fuel cell system for this world, first. The entire drive system offers around 40 percent more power, while the fuel cell system being around 30 percent more compact than before. In addition, it was developed to be completely housed in the engine compartment for the first time and is mounted at the familiar suspension points like a conventional engine. Furthermore, the use of platinum in fuel cells was reduced by 90 percent. This saves resources and reduces system costs without compromising performance. The newly developed high-capacity lithium-ion battery serves as an additional energy source for the electric motor. For the first time, it can also be charged externally using plug-in technology. An advanced operating strategy in combination with the fuel cell and battery system was designed to provide a maximum of efficiency and comfort.

Case NPD-4: Diesel Engine Control Unit

The last NPD case studies a project at [firm name division], which is a global full-range supplier in the division's business and related services. The division marks one of the main automobile brands of [firm name]. The production of the [vehicle models] is part of the strategic alliance with [external partner]. The new concept vehicle was the internal designation for the second generation of the predecessor model, which was introduced to the market in April 2006. This vehicle was available in various body configurations. Thereby, the wheelbase and total length differed, and the box body could be ordered with normal roof, high roof and the newly introduced super high roof. In early summer 2009, the 4-cylinder diesel engines were replaced by a new engine model, which was coupled to a six-speed manual transmission specially designed for commercial vehicles. In September 2013, all vehicle models were revised. The new model featured a modified front end and improved engines, all of which now complied with the Euro 6 emissions standard. At the same time, the fuel consumption of the engine could be reduced.

In parallel to the development and refinement of the diesel engine, its corresponding engine control unit (ECU) had to be engineered. The design of an ECU is generally implementing iterative improvements to both the software and hardware. Most ECUs are developed by Tier 1 suppliers on basis of the specifications provided by an OEM.

At the [firm name] division, the department responsible for the application of the ECU includes 15 subdivisions: Of particular interest for this NPD case was the development of a new on-board diagnostics (OBD) unit. In automotive engineering, OBD refers to the self-diagnostic and reporting capabilities of a vehicle. While the vehicle is in operation, all systems that influence the exhaust gas are monitored through various sensors, whose data is accessible via their software. Any occurring faults are indicated to the driver via a control lamp and permanently stored in the respective control unit. error messages, i.e. standardized diagnostic trouble codes (DTCs), can then be queried later by a qualified technician via standardized interfaces. Development engineers in OBD motor applications are tasked with planning, defining, developing, optimizing, calibrating, and validating OBD functions of engine control units up to series production. This includes the creation, execution and evaluation of test series on the test bench, as well as real test drives with prototypes under extreme environmental circumstances. For this NPD case, project specific challenges were the development of robustness enhancing measures in sensor diagnostics, the adaptation to two new performance variants, and the introduction of new sensor hardware to comply with the new Euro 6 emission standard for commercial vehicles, which came into effect in 2017.

Case BMI-1: Car sharing

Several years ago [firm name] launched a completely new mobility concept – the world's first free-floating carsharing service. Thereby, it aimed to providing a forward-looking response to the increasing traffic volume in conurbations, and for being mobile with environmentally friendly vehicles in a simple, flexible and economical manner. At launch, the car sharing service worked as follows: vehicles were available throughout the city and could be hired around the clock by anyone interested. After a one-time registration, customers had the option of accessing the vehicles spontaneously or with advance booking and were able to use them for as long as they liked. The concept provided for the reliable availability of a free vehicle within a few minutes' walk. The goal was to allow a customer to get in, immediately drive off and simply return the rental smart to a parking space within the city area at the end of the journey. Billing was simplified to a flexible rate on per minute basis.

Developing this BMI demanded parallel product innovations. When registering for the car sharing service, the customer's driving license was provided with an electronic seal

that allowed the vehicle to be opened. In line with the overarching goal of flexible urban mobility, customers could hold their driver's license to a reader in the windscreen area of any unused [brand name] vehicle, get in, enter a personal identification number in the vehicle dashboard and drive off. Free vehicles could also be found quickly and easily at any time via the internet or a telephone service hotline. As an alternative to renting spontaneously, booking up to 24 hours in advance was supported. In this case, the customer received an SMS with the exact location of the reserved vehicle before the planned departure. This system of card and SMS based transactions was deprecated and superseded by a smartphone application, which aggregated the outlined features for easier and faster usage. Still, the rental period can last as long as desired. During intermediate stops, the vehicle remains reserved for the customer. If the customer wishes to return his vehicle, he or she simply parks the vehicle in a parking lot in the city area. All so-called "unoccupied" parking spaces in the city area, such as on the roadside or within marked parking areas, can be used. In addition, specially marked parking spaces are available at airports or railway stations, for example.

Case BMI-2: On-demand ride pooling

The [brand name] is a wholly owned subsidiary of [firm name] with locations around the world and set itself the goal of simplifying mobility in cities. It is working on an operating system for urban mobility that offers access to suitable mobility options and paves the way for a future with autonomous vehicles. Thereby, [brand name] acts as a partner of cities, transport associations and customers. On the German market, [brand name] is represented with the application for smartphones. The [brand name] mobility app combines public transport, a car sharing provider, a taxis service, rental bicycles and Deutsche Bahn, the German railway operator. Most offers can be booked and paid for directly via the [brand name] app, which sets [brand name] as the only customer-facing solution for easier ticket handling. With its transit product portfolio, [brand name] offers white label solutions for transport associations and companies worldwide. In the USA, the brand is the market leader for mobile ticketing solutions for transport associations.

To broaden its portfolio and diversify its business model, [brand name] established an additional on-demand service. In 2017, the new mobility offering was piloted and thereby allowed customers to book flexibly and according to their needs. The new on-

demand offer was tested as part of a pilot operation in an inner-city area. To increase adoption, there were no costs for the use of the new mobility offer during the test phase. Accordingly, the necessary app was available as a free download from the Apple App Store and Google Play Store. When launched, the app will display all travel options with public transport, which can be booked and paid for directly via the app. The new mobility service is based on the [brand name] on-demand platform, which enables the efficient use of a demand-oriented, flexible fleet through intelligent routing and pooling of travel requests. If other people want to cover a similar distance, the on-demand algorithm bundles the requests so that several passengers can share a vehicle ("ride sharing").

Case BMI-3: Mobility service subscription

With [project name], the goal is to take the next step to becoming an integrated mobility provider. In addition to purchasing, financing and leasing, customers and interested parties should have the choice of selecting and driving up to twelve new [brand name] vehicles at a fixed monthly rental rate for one year. The various vehicle models are divided into a total of four vehicle categories. The monthly rate covers insurance, maintenance and repairs up to tires including 36,000 kilometers per year. The core of the mobility offering is the [project name] app, with which the customer can handle the complete handling of the vehicles digitally around the clock. This ranges from the individual selection of a person's car choice, to collecting and returning the vehicle. Thus, the entire rental process is digitized and no further interaction with staff is necessary.

However, the advantages of digitization go beyond the mere handling of the rental process. In contrast to conventional vehicle rental services, the customer can select the motorization, color and interior equipment of the vehicle by means of an app. Therefore, the specifically booked vehicle is guaranteed. An upgrade to a higher vehicle class is also possible at any time but subject to surcharges. The app also provides a complete overview of rental history and costs as well as vehicle data, such as fuel level and mileage, thanks to in-vehicle connectivity features. With that, [firm name] aims to use their existing mobility and financial services expertise to offer their customers maximal flexibility in vehicle use, from digital vehicle selection and booking to vehicle exchange.

Development of the necessary IT solution resulted in a frontend smartphone application, which is powered by a backend with the business logic. The backend infrastructure has interfaces to [firm name] rental system and connectivity platform to allow for the opening and closing of the car, and telemetry data transfer. The business model has been trialed through a pilot phase. The new offering was intended for existing customers and new customer segments equally. During the pilot, customers can use up to twelve vehicles per year flexibly according to their wishes and requirements which is called "car on demand". Using an app, it is therefore possible to order a convertible on the weekend or an SUV for family holidays, for example. This system is designed to enable anyone to choose an adequate [brand name] for every occasion.

Case BMI-4: Business intelligence solution

A team of the controlling division pitched the idea of an easier and more mobile approach to delivering reports to internal customers. This idea was mainly born out of the fact that a vast number of individual Microsoft Excel sheets on similar or identical data had to be processed for similar reports. Consequently, presenting reports in the form of dashboards was considered more user-friendly and cost-efficient. As a result of the successful pitch in front of executives, the project was transferred to a then newly established internal incubator unit. There, the project went through a six-week program, where managers decided to further pursue the idea.

As aforementioned, the goal of [project name] was to provide intelligent reporting that is easy to use, tailored to the individual customer needs, and optimized for mobile work. The resulting report was able to provide a visualization of attention items at a glance via highlight indicators which eliminated redundant information. At the same time, a single dynamic on-demand dashboard replaced numerous static reports, which facilitated adequate interaction with financial data. Various tools for the operation and gateways for the connection of different data sources are available around the cloud-based solution. It can be used to analyze business data and present the results graphically. With these analyses, it is possible to monitor business processes and the success of a corporation or department. The findings can be used to make well-founded decisions. Achieving results is facilitated by the integrated platform for connection, preparation, modelling and visualization of the data. The integration in MS Excel and MS SharePoint, which are both used wildly throughout [firm name], extends the

application possibilities of the solution. In that, the business intelligence tool contributes to minimizing risk or increasing earnings. Generally, the solution can be used in marketing, sales, human resources, finance, production and other areas.

Case BMI-5: Driving experience

The [firm name] driving experience aimed to provide fans of classic cars a novel way of driving a classic car regularly without having to worry about maintenance and care. The [brand name] wanted to unite a community of people who enjoy modern-era and older classic cars but live in urban spaces and, for example, neither have the space to park an (additional) car nor want to commit themselves to just one model. Therefore, for a monthly membership fee of 300 euros, [brand name] allowed customers to try out different classics, modern-era and older, and enjoy driving the unique vehicles without worrying about additional corresponding costs, e.g. overnight parking or repairs. To cater to a broader audience, not only vintage cars from [brand name] were available to club members but vintage cars from other brands were also integrated into the fleet. The classic cars could be booked by the members via a smartphone application. The firm envisioned the [brand name] being established through a franchising system at international locations in the long term and that members will have been able to use classic cars everywhere. Thereby, the classic cars in the fleet remained the property of the club operator who could only be accepted as such if he owned several classic cars and could also afford the maintenance and care of the cars.

Servicing the models lied within the responsibility of the club operators, who had many years of previous experience in the maintenance and care of [brand name] vehicles and other classic cars. As an additional member benefit, the so-called [location name] served as a meeting place with the showcase of available classic cars, a lounge and a bar. In addition, the club offered its members exclusive events such as vintage car rallies, vintage car picnics, whiskey tasting or technical workshops. The reservation of the vehicles worked via the app, in which the members could also examine what vehicles are available. Over the course of the pilot project, the team gathered data on whether the integration of private vehicles into the fleet could present an opportunity for an additional offering of the [brand name]. At the same time, various pricing models were offered and constantly adapted to customer needs. Thus, an acceptable pricing for the novel offering that ensured sustainable success of the business model should be found.

Appendix G: Coding Scheme Qualitative Comparison of BMI and NPD

Category	Definition	Anchoring example	Coding rule
C1: External partnerships	Every text passage about cooperation with company-external partners	Expert NPD-1: "For example, there is or was an external engineering company that then created the data. So what you arranged with other areas, adjustments and so on, the (...) actually the CAD data, the 3D geometry, which is the basis for all this calculating, simulating, tuning, who then just did this operative activity."	Strictly only external partners
C2: Internal cooperation	Every text passage about company-internal partners / divisions	Expert NPD-1: "You are also dependent on the other divisions, that they simulate some things for you well and correctly, that they crash the right thing, that their sizes also fit."	Strictly only internal partners
C3: Duration	Every text passage about the timeframe of the cooperation and know-how built up over time	Expert NPD-3: "This alliance between the OEMs to advance the infrastructure is of course a very important aspect for such a cooperation and such a long-term cooperation."	Both, internal and external cooperation
O1: Structural integration	Every text passage about the integration of the project into the Daimler structure	Expert BMI-2: "Otherwise moovel is an absolutely independent division. We are an autonomous GmbH and have relatively little to do with the machinery".	Organizational and also legally
O2: Teamwork support	Every text passage about actions that encourage/discourage teamwork	Expert BMI-1: "What was very valuable / within BI / was the exchange with other project managers, as we still have today in the Council. This means ex- changing ideas with E3 colleagues and discussing operational issues on a daily basis, so to speak."	Only fundamentally organizational aspects, no one-time actions
O3: Stakeholder Background	Every text passage about the backgrounds of the project stakeholder	Expert NPD-1: "Well, in any case it can only work if you bring together the experts from their respective fields, who then together do such a project because it is so diverse. Everyone is an expert in their field and that's the deciding factor why this can work, because as a BTV, of course, you can't keep an overview."	Background / expertise must be the focus of the statement
O4: Job design	Every text passage about the job profile and attached freedoms	Expert BMI-2: "It is my opinion, yes, that it was important to have a kind of spearhead internally, which takes care of nothing else but to advance the project."	Fundamental job design, not temporary

Category	Definition	Anchoring example	Coding rule
O5: Responsibilities / hierarchy	Every text passage about the responsibilities and decision freedom given to project members	Expert BMI-1: "But I do well remember that every single decision in the steering committee was always highly debated. And everything had to be justified and deduced. Even the color and the name and so on and so on. That was not so that everyone said 'Hooray and wave through', on the contrary and Smart they were the worst."	Only hierarchy-dependent aspects
O6: Leadership / management support	Every text passage about the support of higher management during and the style of leading	Expert BMI-4: "So it's not possible to do this on the side or sweat it off somehow in day-to-day business. And that has to do with management support. That they also think, 'I think it's important that you deal with this now' and allow yourself to get out."	Also situational aspects
O7: Technical understanding of managers	Every text passage about the expertise of higher management	Expert NPD-3: "We do not know everything yet, but the decision-makers involved were very well suited to make a technical assessment."	Only managers directly involved with the project
M1: Research	Every text passage about conducting market research	Expert NPD-2: "Market research and so, of course, always is done by Sales, i.e. by M/S here with us, Sales (...) in the sense of what features do the customers want."	Only the actual doing
M2: Competition	Every text passage about the state of competition	Expert BMI-1: "So we were the first free floater, we are particularly proud of it, and that was exactly what we were / that was the revolutionary thing we had to get on the road very quickly."	Both, current and future competitors
M3: Potential	Every text passage about the market potential of the project	Expert BMI-1: "But otherwise it soon became clear that this was a successful topic and that if you get behind it, you can achieve a lot of success."	Monetary or market share
M4: Regulations	Every text passage about legal regulations concerning the project	Expert NPD-4b: "Level C approval was important in this case in order to obtain new registrations from 2015, for the Sprinter, for commercial vehicle registrations."	All legalities in regard to the project, e.g. not only the product
E1: Preparatory work	Every text passage about important actions before project start	Expert BMI-2: "So we strategically evaluated it, we got the management approvals, then we had to re-sort our team accordingly in order to deliver it, especially in product development."	Only actions directly related to the project

Category	Definition	Anchoring example	Coding rule
E2: Process structure	Every text passage about the process structure during the project	Expert NPD-1: “Because it is such an ongoing process, such an iterative process. That means you're always getting close.”	Only fundamental a pects of the process, no communication details
E3: Communication	Every text passage about the communication channels during the project	Expert NPD4a: “Transparent communication is always the basis for good project work. And that has to be ensured and you often have to demand it. That's not a sure thing, the communication.”	No fundamental process aspects
E4: Reporting / feedback	Every text passage about the reporting and feedback	Expert BMI-1: “So I think these faster feedback cycles help to go enormously in the right direction and to become more successful, or to concentrate on what is really successful and everything else then not.”	Including cultural aspects as well as controlling details
E5: Speed	Every text passage about the speed of the project execution	Expert BMI-2: “And we actually built it there very quickly, in less than ten months.”	Only fundamental aspects leading to a shorter time to market
E6: Team size	Every text passage about size of the project team	Expert BMI-4: “In the beginning there were three and now there are (...) five, six people.”	Preferably numerical answers
E7: Tools	Every text passage about the usage of software tools	Expert NPD-3: “The hurdles that still have to be overcome (...) / are the tools, the tool landscape. That should be unified, so as not simply lose time every night in the loop and resource.”	Also tools for communication
E8 Motivation	Every text passage about the motivation /motivating of team members	Expert NPD-3: “It is very important for the motivation of the team that the work is also seen. I see this as very motivating for the development team. Press reports are also important. The Tech Days, which have now been held, last year, this year, with the corresponding / with the corresponding media response.”	Source of motivation must be visible
T1: Foreknowledge	Every text passage about the technical knowledge regarding the project topic prior to start	Expert NPD-3: “Well, basically I would estimate that in such a way that we have a lot of previous knowledge, even at the start of the project. (...) This means that at certain points we also knew how we did not want to proceed, because it was too time-consuming before, because it led to other problems. So the / to choose the concept it was very important to have all this prior information and experience. In technical detail, that didn't do us much good in some places.”	Only knowledge, no preparatory work

Category	Definition	Anchoring example	Coding rule
T2: Innovativeness	Every text passage about the level of innovativeness concerning the project	Expert NPD-1: “The level of innovation is now, I would say, lower because we are very standardized.”	Including technical complexity which leads to higher innovation
T0: Patenting	Every text passage about the relevance of patenting a product	Expert NPD-2: “No, HERMES itself is not patented, I don't think that would work either. But certain sub-projects / sub-functions, there are patents, yes.”	Only legally valid patenting
T3: Customer orientation	Every text passage about directly involving the customer and deriving decisions out of that	Expert BMI-4: “And then the exchange with potential users, who then gave feedback again, ‘Okay, I don't need that. I'm interested, not interested.’”	Gathering feedback as well as implementing it, but no market research
S1: Target definition	Every text passage about defining the project goal	Expert NPD-2: “Yes, all (...) functions are fulfilled, is buildable, is of good quality, is good in the corrosion duration run, that is how success is measured.”	Only strategic targets, no customer orientation
S2: Monetization	Every text passage about the possibilities of monetizing the project	Expert BMI-2: “The second success fator, I would say, is that the product can be commercialized. This means that it can be offered on the market as a business model.”	No general targets, but actual focus on the way of commercializing
S3: Budgeting	Every text passage about strategically providing financial resources	Expert BMI-3: “The second thing is, of course, to have enough resources (...) of a financial nature and enough freedom. So not like this, not to be so tight, in line with capacity and budget re- strictions and so on, but to really/that is to have this freedom and to have the possibilities.”	No simple head counts (see team size)
S4: Innovation culture	Every text passage about the corporate innovation culture and willingness to take risks	Expert BMI-2: “So in general I think we are very open-minded for new topics and new innovations and in principle (...) would like to evaluate that at least once.”	Only fundamental aspects concerning the corporate culture, no aspects in regard to individual
S5: Company fit	Every text passage about the company fit of a project and use of synergies	Expert NPD-4a: “And I say we always try to orientate ourselves towards the world of passenger cars and also take advantage of all the car synergies with the Sprinter. If that's possible.”	Only strategic fits, e.g. no personal collaboration

Appendix H: Comparison NPD/BMI CIS Model Integration

CIS Model Dimensions	Working Definition	Aligned Comparison Framework Sub-Dimensions		Level of differentiation	Overall differentiation between BMI and NPD projects
Innovation Process	The execution of an innovation activity from idea generation to implementation, including the application of methods and tools.	Preparatory work	E1-NPD E1-BMI	High	High
		Process structure	E2-NPD E2-BMI	Medium	
		Speed	E5-NPD E5-BMI	High	
		Research	M1-NPD M1-BMI	High	
		Competition	M2-NPD M2-BMI	High	
		Tools	E7-NPD E7-BMI	Medium	
People & Culture	The actors involved in a firm's innovation activities, who possess a specific skillset and share a common organizational culture.	Innovation culture	S4-NPD S4-BMI	Medium	Medium
		Team size	E6-NPD E6-BMI	Low	
		Technical understanding of managers	O7-NPD O7-BMI	High	
		Communication	E3-NPD E3-BMI	Low	
Organizational Structure	The allocation of power and authority within an organization that regulate a firm's innovation activities.	Structural integration	O1-NPD O1-BMI	Medium	Medium/High
		Responsibilities/hierarchy	O5-NPD O5-BMI	High	
External Interaction	The involvement of external partners/stakeholders, who support the execution of an innovation activity.	External partnerships	C1-NPD C1-BMI	High	High
		Duration	C3-NPD C3-BMI	High	
		Customer orientation	T3-NPD T3-BMI	High	
Strategy	The goals, objectives and plan a firm pursues regarding its innovation activities.	Regulations	M4-NPD M4-BMI	Low	Medium
		Target definition	S1-NPD S1-BMI	Medium	
		Reporting/feedback	E4-NPD E4-BMI	Low	
		Potential	M3-NPD M3-BMI	High	
		Company-fit	S5-NPD S5-BMI	Low	
		Leadership/management support	O6-NPD O6-BMI	Medium	
		Innovativeness	T2-NPD T2-BMI	Medium	
		Budgeting	S3-NPD S3-BMI	High	
Resources	Tangible and intangible assets that support the execution of a firm's innovation activities.	Stakeholder background	O3-NPD O3-BMI	High	Medium/High
		Foreknowledge	T1-NPD T1-BMI	Medium	
		Monetization	S2-NPD S2-BMI	High	
		Internal cooperation	C2-NPD C2-BMI	Medium	
Hygiene Factors & Rewards	The human resource policies and reward system of a firm that support employees' involvement in the innovation activities.	Motivation	E8-NPD E8-BMI	High	Medium
		Job design	O4-NPD O4-BMI	Medium	
		Teamwork support	O2-NPD O2-BMI	Low	

For determining the overall differentiation level, the following classification was applied: ‘low’ = 1, ‘medium’ = 2, ‘high’ = 3. The average value of the sub-dimensions’ differentiation level evaluation resulted in the CIS model dimensions’ overall differentiation level.

Appendix I: Derivation of Propositions

#	Proposition Benchmark Study	#	Propositions Qualitative Case Study	Overall Proposition
CIS_IP	Early management approval, investment-based and project-specific quality gates as well as management support for exploration are required within a corporate innovation system that supports the development of new business models.	O6-NPD	NPD projects require consistent management support in case of issues.	There is a significant positive relationship between an innovation process based on exploitation and the success of a NPD project, while there is a significant positive relationship between an innovation process based on exploration and the success of a BMI project.
		O6-BMI	BMI projects require stable ideational management commitment.	
		M1-NPD	NPD projects require retrospective self-benchmarking.	
		M1-BMI	BMI projects require comprehensive market research.	
		M2-NPD	NPD projects require a development that is independent from competition.	
		M2-BMI	BMI projects require a competitor analysis for business model validation.	
		S5-NPD	NPD projects require the possibility to exploit company-wide synergies and economies of scale.	
		E1-NPD	NPD projects require leveraging lessons learned from previous projects during the preparatory phase.	
		E1-BMI	BMI projects require management approval before the project kickoff.	
		E2-NPD	BMI projects require strict development processes with milestones and quality gates.	
		E2-BMI	BMI projects require project-specific innovation process gates.	
		E5-NPD	NPD projects require project type-specific timelines.	
		E5-BMI	BMI projects require a rapid implementation of the business model.	
CIS_OS	An autonomous setup with policies independent from corporate reporting structures is required for a corporate innovation system that supports the development of new business models.	O1-NPD	NPD projects require specialized departments for each development task.	There is a significant positive relationship between a mechanic organizational design and the success of a NPD project, while there is a significant positive relationship between an organic organizational design and the success of a BMI project.
		O2-BMI	BMI projects require a business model-specific organizational integration.	
		O5-NPD	NPD projects require definite responsibilities through a hierarchical organization.	
		O5-BMI	BMI projects require flat hierarchies and decision liberties.	
CIS_R	A high resource capacity with stakeholders of various backgrounds as well as flexible financial resources are required for a corporate innovation system that supports the development of new business models.	C2-NPD	NPD projects require transparent collaboration management for using internal expertise.	There is a significant positive relationship between a specialized background of internal stakeholders and the success of a NPD project, while there is a significant positive relationship between a generalized background of internal stakeholders and the success of a BMI project.
		C2-BMI	BMI projects require an open internal dialogue with cooperative experts and departments willing to support the project.	
		O3-NPD	NPD projects require staffing mainly subject-specific engineers.	
		O3-BMI	BMI projects require diverse stakeholder backgrounds.	
		O2-NPD	NPD projects require cross-divisional teamwork without organizational hurdles.	
		O2-BMI	BMI projects require cross-project-information exchange.	
		E7-NPD	NPD projects require a unified tool landscape.	
		E7-BMI	BMI projects require useful tools in line with the project workflow.	
		T1-NPD	NPD projects require prior technical knowledge from related projects.	
		T1-BMI	BMI projects require basic prior knowledge to build upon.	

#	Proposition Benchmark Study	#	Propositions Qualitative Case Study	Overall Proposition
CIS_HR	A strong focus on intrinsic motivation and flexible working conditions are required for a corporate innovation system that supports the development of new business models.	E8-NPD	NPD projects require team motivation through external appreciation.	There is a significant positive relationship between extrinsic motivation and the success of a NPD project, while there is a significant positive relationship between intrinsic motivation and the success of a BMI project.
		E8-BMI	BMI projects require intrinsic team motivation.	
		O4-NPD	NPD projects require a job design that focuses on increasing the project members' expertise.	
		O4-BMI	BMI projects require a job design that allows project members to dedicate their entire capacity to BMI.	
CIS_PC	A risk-tolerant organizational culture enabled by strong leadership support and a diverse skill-set are required for a corporate innovation system that supports the development of new business models.	S4-NPD	NPD projects require an innovation culture focused on iterative steps.	There is a significant positive relationship between a risk-averse organizational culture and the success of a NPD project, while there is a significant positive relationship between a risk-tolerant organizational culture and the success of a BMI project.
		S4-BMI	BMI projects require an innovation culture based on the willingness to take risks.	
		E6-NPD	NPD projects require a small core team.	
		E6-BMI	BMI projects require a small core team.	
		E3-NPD	NPD projects require regular communication with all relevant functions.	
		E3-BMI	BMI projects require fast and regular communication with stakeholders.	
CIS_S	An adapted performance measurement based on qualitative factors as well as a company-wide commitment to innovation grounded in the strategic portfolio process are required for a corporate innovation system that supports the development of new business models.	M4-NPD	NPD projects require timely compliance with all legal regulations.	There is a significant positive relationship between financial resource allocation based on a quantitative approach and the success of a NPD project, while there is a significant positive relationship between financial resource allocation based on a qualitative approach and the success of a BMI project.
		M4-BMI	BMI projects require handling or negotiating legal regulations.	
		S1-NPD	NPD projects require a target definition based on technical and legal requirements.	
		S1-BMI	BMI projects require measurable and adaptive target definitions, which are often based on customer metrics.	
		S2-NPD	NPD projects require cross-company monetization.	
		S2-BMI	BMI projects require initial growth opportunities instead of short-term profitability.	
		E4-NPD	NPD projects require continuous reporting, controlling and feedback on every hierarchical level.	
		E4-BMI	BMI projects require continuous reporting, controlling, and multilateral feedback from involved stakeholders.	
		T2-NPD	NPD projects generally require a lower innovativeness.	
		T2-BMI	BMI projects require a manageable complexity and innovativeness.	
		M3-NPD	NPD projects require market potential in at least a corporate context.	
		M3-BMI	BMI projects require immediate market potential with growth opportunities.	
		O7-NPD	NPD projects require a profound technological understanding of decision makers.	
		O7-BMI	BMI projects require a conceptual understanding of decision makers.	
		T3-NPD	NPD projects require an indirect customer orientation regarding the whole value proposition.	
		T3-BMI	BMI projects require a strict customer orientation and continuous integration of customer feedback.	
		S3-NPD	NPD projects require budgeting that is dependent on the project's technological complexity.	
		S3-BMI	BMI projects require budgeting that is dependent on market potential.	
		S5-BMI	BMI projects require a definite company fit of the business model	
CIS_EI	Flexible collaboration models and project-specific external partners are required for a corporate innovation system that supports the development of new business models.	C1-NPD	NPD projects require a network of specialized suppliers, which are not part of the core business, for outsourcing tasks.	There is a significant positive relationship between the relationship quality with external partners and the success of a NPD project, while there is no significant positive relationship between the relationship quality with external partners and the success of a BMI project.
		C1-BMI	BMI projects require strategic collaboration to fulfil the need for specific expertise or assets.	
		C3-NPD	Long-term relationships with key partners are required for NPD projects.	
		C3-BMI	Efficient and often temporary partnerships are required for BMI projects.	

Appendix J: Online Survey

Comparing New Product Development and Business Model Innovation - A Quantitative Analysis at Daimler AG

General Information

My last completed innovation project has been in the field of:*

- Business Model Innovation (Offering value on the basis of a new business model)
- New Product Development (Developing new technologies/products/services within existing business models)

I was working in the following region during the last completed innovation project.*

- North America
- Europe
- Asia

I joined the company*

- less than 1 year ago.
- 1 - 2 years ago.
- 3 -5 years ago.
- 5- 10 years ago.
- more than 10 years ago.

What was your role within the project.*

- ○ Project Leader
- ○ Project Member

What phase of the project were you involved in? (Choose one or more options)*

- ☐ Planning
- ☐ Execution/ Development
- ☐ Market Launch/Commercialization

Please define your function or field of expertise? (Choose one or more options)*

- ☐ Marketing
- ☐ Business Development
- ☐ Engineering
- ☐ Research
- ☐ Manufacturing
- ☐ Controlling
- ☐ Project Management
- ☐ Legal
- ☐ Other:

How many members worked in your project team.*

- ○ 1-5
- ○ 6-10
- ○ 11-20
- ○ 21-50
- ○ more than 50

Market & Technology Uncertainty

This scale operationalizes the level of uncertainty regarding the market and technology or product developed during the innovation project.

Using the scale below please indicate to what extent each of the following items correspond to the perceived market and technology uncertainty of the innovation project.

The project included the development or application of truly novel or unique technology or products, that were new to the firm.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The firm was very unfamiliar with new technology or product.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The target market was not well developed or not existent at the start of the project.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The target market was totally new to the firm without any infrastructure or existing offerings in place.

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Prior to this, the firm had no experience in offering the new product or service in the target market.

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project focused on the development or application of minor changes in technology or products, like incremental product improvements.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Organizational Design

This scale operationalizes the extent to which rules, hierarchy and decision making was regulated within the project.

Using the scale below please indicate to what extent each of the following items correspond to the organizational design of the innovation project.

The project team's way of working was very informal without prescribed rules or adherence to hierarchy.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project's progress was communicated informally within the project team and across other projects.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project team was in control of making own decisions and acting accordingly regarding issues relevant to the project.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project team's way of working was characterized by a strict adherence to formally prescribed rules and hierarchy.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Project members had to report any progress formally to an upper hierarchy level on a regular basis.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

In general, no decisions could be made without approval by an upper hierarchy level.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Innovation Process Modeling

This scale operationalizes the extent to which the innovation process is characterized by standardized and predictable patterns.

Using the scale below please indicate to what extent each of the following items correspond to the approach of organizing the project's innovation process.

The project team strictly followed a well-established and routinized innovation process.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The innovation process consisted of sequential working patterns (quality gates).*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project team's work built upon existing knowledge, products or services.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project team explored unfamiliar process alternatives compared to usual routines.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project team invented new routines/processes on a learning based approach.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project team explored uncertain innovation opportunities by a trial-and-error approach.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Financial Resource Allocation

This scale operationalizes the extent to which quantitative and qualitative measures are considered for the allocation of project funding.
If you have no insight regarding the allocation of financial resources to your innovation project, please choose the option "not applicable".

Using the scale below please indicate to what extent each of the following items has been taken into account for the allocation of project budget.

Based on the Return of investment.*

	1	2	3	4	5	6	7		Not applicable
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree	○

Based on the Break-Even-Point.*

	1	2	3	4	5	6	7		Not applicable
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree	○

Based on the Time to Market.*

	1	2	3	4	5	6	7		Not applicable
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree	○

Based on the creation of value through new partnerships, innovative technologies, alternative processes or capabilities.*

	1	2	3	4	5	6	7		Not applicable
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree	○

Based on the proposition of new offerings to new customers and attractive markets through new channels.*

	1	2	3	4	5	6	7		Not applicable
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree	○

Based on the capability to monetize the proposed value through new and innovative revenue models or cost structures.*

	1	2	3	4	5	6	7		Not applicable
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree	○

Internal Stakeholder Identification

This scale operationalizes the extent to which specialization or diversification was required for involved project members.

Using the scale below, please indicate to what extent each of the following items correspond to the composition of internal stakeholders during the last completed innovation project.

The project team was composed of a cross-functional work group. *

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project team was composed of specialists, each of one particular discipline.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project team was composed of individuals that have deep knowledge and experience across several disciplines.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Each project member was characterized both by a broad range of experience in several fields and a high level of professional skills in each of them.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

External Relationship Quality

Please indicate with how many external partners the project team collaborated during the last completed innovation project.

We collaborated with...*

- ... no external partner.
- ... 1-2 external partner(s).
- ... 3-6 external partners.
- ... 7-10 external partners.
- ... more than 10 external partners.

External Relationship Quality (Skip if "...no external partner." has been chosen)

This scale operationalizes the quality of external partnerships regarding the perceived degree of commitment and trust of the relationship.

Using the scale below, please indicate to what extent each of the following items correspond to your perceived relationship with external partners during the last completed innovation project.

Overall, the relationships between our project team and the external partners were considered very loyal and supportive.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Overall, our project team collaborated with external partners that were well known from previous projects.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

In general, our project team trusted our external partners to fully deliver things we agreed on.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Overall, the relationships between our project team and the external partners were considered very inconsistent.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Overall, our project team collaborated with external partners that were new to our project team.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

In general, our project team could not fully rely on our external partners.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Perceived Risk Culture

This scale operationalizes the extent to which project members perceive a risk-averse or risk-tolerant attitude.

Using the scale below, please indicate to what extent each of the following items correspond to the perceived risk attitude of project members during the last completed innovation project.

The project team has put a lot of effort in making well informed risk decisions.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project team tried to prevent situations with high uncertainty in order to mitigate risk.

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project team's capabilities included risk management skills (e.g. strong analytical skills, budget and time management).*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project team was not afraid to take the risk of making innovations within an uncertain environment.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project team was eager to innovate by choosing options based on potential higher rewards despite greater inherent risks.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The project team was supported in taking appropriate risks.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Employee Motivation

This scale operationalizes the underlying reasons of employees for being involved in the project.

Using the scale below, please indicate to what extent each of the following items correspond to your motivation for participating in the last completed innovation project.

Because I derive much pleasure from learning new things.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

For the satisfaction I could experience from taking on interesting challenges.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Because I enjoy the experience of accomplishing difficult tasks successfully.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

For the income it provides me.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Because it secures my position within the company.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Because of the increased promotion opportunities it could lead to.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Project Success

This scale operationalizes success factors regarding project efficiency, customer satisfaction, business success and future preparation.

Using the scale below please rate the degree of success you perceived for each performance measure regarding the last completed innovation project.

Meeting the budget goal.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Meeting the schedule goal.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Meeting the functional performance.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Meeting the technical specifications.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Fulfilling the customer needs.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Solving a customer's problem.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The customer is using the product or service.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Customer satisfaction.*

	1	2	3	4	5	6	7	
Very Dissatisfied	○	○	○	○	○	○	○	Very Satisfied

Commercial success.*

	1	2	3	4	5	6	7	
Total Failure	○	○	○	○	○	○	○	Great Success

Creating a large market share.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Creating a new market.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Creating a new product or service line.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Developing a new technology.*

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The overall project success.*

	1	2	3	4	5	6	7	
Total Failure	○	○	○	○	○	○	○	Great Success

Thank you for the great support!

Thank you for taking our survey. Your response is very important to us.

Appendix K: Correlations of Low Cronbach's Alpha Values

Low Relationship Quality

		LowRel.Qual._1	LowRel.Qual_2	LowRel.Qual._3
LowRel.Qual._1	Pearson Correlation	1	0.153	0.246*
	Sig. (2-tailed)		0.143	0.017
	N	93	93	93
LowRel.Qual._2	Pearson Correlation	0.153	1	- 0.014
	Sig. (2-tailed)	0.143		0.894
	N	93	94	94
LowRel.Qual._3	Pearson Correlation	0.246*	- 0.14	1
	Sig. (2-tailed)	0.017	0.894	
	N	93	94	94

Note: * significant at 5% level; ** significant at 1% level

High Relationship Quality

		HighRel.Qual._1	HighRel.Qual_2	HighRel.Qual._3
HighRel.Qual._1	Pearson Correlation	1	0.076	0.575**
	Sig. (2-tailed)		0.471	0.000
	N	93	93	93
HighRel.Qual._2	Pearson Correlation	0.076	1	0.224*
	Sig. (2-tailed)	0.471		0.031
	N	93	93	93
HighRel.Qual._3	Pearson Correlation	0.575**	0.224*	1
	Sig. (2-tailed)	0.000	0.031	
	N	93	93	94

Note: * significant at 5% level; ** significant at 1% level

Specialized Internal Stakeholders

		Specialized_1	Specialized_2
Specialized_1	Pearson Correlation	1	0.331**
	Sig. (2-tailed)		0.00
	N	107	107
Specialized_2	Pearson Correlation	0.331**	1
	Sig. (2-tailed)	0.000	
	N	107	107

Note: * significant at 5% level; ** significant at 1% level

Appendix L: Exploratory Factor Analysis per Construct

Item	Component 1	Component 2
IntrinsicMo_1	.879	
IntrinsicMo_2	.882	
IntrinsicMo_3	.758	
ExtrinsicMo_1		.841
ExtrinsicMo_2		.807
ExtrinsicMo_3		.709

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Item	Component 1	Component 2
Specialized_1		0,791
Specialized_2		0,822
Generalized_1	0,88	
Generalized_2	0,823	

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Item	Component 1	Component 2
Quantitative_1	.809	
Quantitative_2	.900	
Quantitative_2	.745	
Qualitative_1		.815
Qualitative_2		.873
Qualitative_3		.710

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Item	Component 1	Component 2
OrganicDe_1	.779	
OrganicDe_2	.869	
OrganicDe_3	.304	-.593
MechanicDe_1	-.371	.645
MechanicDe_2		.774
MechanicDe_3		.838

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Item	Component 1	Component 2
Exploitation_1		.845
Exploitation_2		.762
Exploitation_3		.695
Exploration_1	.808	
Exploration_2	.813	
Exploration_3	.797	

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Item	Component 1	Component 2
RiskAverse_1	0.824	
RiskAverse_2	0.612	
RiskAverse_3	0.760	
RiskTolerant_1		0.797
RiskTolerant_2		0.697
RiskTolerant_3		0.627

Extraction Method: Principal Component Analysis
Rotation Method: Varimax with Kaiser Normalization

Appendix M: Outlier Analysis

Model summary (n=107)

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
Overall	0.576	0.332	0.243	1.273	0.332	3.708	11	82	0.000

a. Predictors: (Constant) Relationship Quality, Extrinsic Motivation, Intrinsic Motivation, Specialized Stakeholders, Generalized Stakeholders, Risk-averse Culture, Risk- tolerant Culture, Process Exploitation, Process Exploration, Organic Design, Mechanic Design
b. Dependent Variable: Overall Project Success

Regression diagnostics

Case Number	Std. Residual	Overall Project Success	Predicted Value	Residual
94	- 3.210	1	5.09	4.086

a. Predictors: (Constant) Relationship Quality, Extrinsic Motivation, Intrinsic Motivation, Specialized Stakeholders, Generalized Stakeholders, Risk-averse Culture, Risk- tolerant Culture, Process Exploitation, Process Exploration, Organic Design, Mechanic Design
b. Dependent Variable: Overall Project Success

Model summary – NPD with case 94 (n=65)

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
NPD	0.551	0.304	0.134	1.334	0.304	1.786	11	45	0.085

a. Predictors: (Constant) Relationship Quality, Extrinsic Motivation, Intrinsic Motivation, Specialized Stakeholders, Generalized Stakeholders, Risk-averse Culture, Risk- tolerant Culture, Process Exploitation, Process Exploration, Organic Design, Mechanic Design
b. Dependent Variable: Overall Project Success

Model summary – NPD without case 94 (n=64)

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
NPD	0.583	0.340	0.175	1.210	0.340	2.063	11	44	0.044

a. Predictors: (Constant) Relationship Quality, Extrinsic Motivation, Intrinsic Motivation, Specialized Stakeholders, Generalized Stakeholders, Risk-averse Culture, Risk- tolerant Culture, Process Exploitation, Process Exploration, Organic Design, Mechanic Design
b. Dependent Variable: Overall Project Success

Model summary – Overall with North America and Asia (n=106)

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
Overall	0.600	0.360	0.273	1.199	0.360	4.142	11	88	0.000

a. Predictors: (Constant) Relationship Quality, Extrinsic Motivation, Intrinsic Motivation, Specialized Stakeholders, Generalized Stakeholders, Risk-averse Culture, Risk- tolerant Culture, Process Exploitation, Process Exploration, Organic Design, Mechanic Design
b. Dependent Variable: Overall Project Success

Model summary – Overall without North America and Asia (n=95)

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
Overall	0.607	0.368	0.273	1.215	0.368	3.866	11	73	0.000

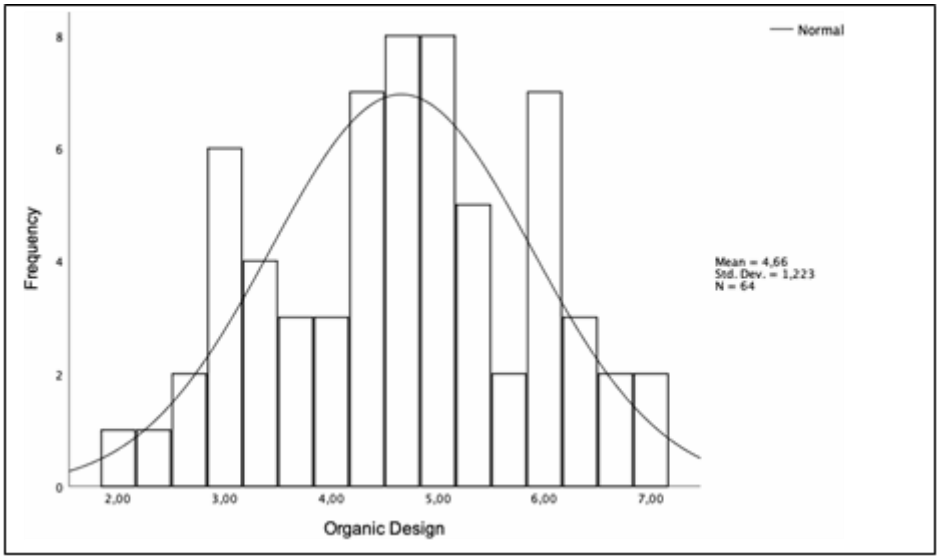
a. Predictors: (Constant) Relationship Quality, Extrinsic Motivation, Intrinsic Motivation, Specialized Stakeholders, Generalized Stakeholders, Risk-averse Culture, Risk- tolerant Culture, Process Exploitation, Process Exploration, Organic Design, Mechanic Design

b. Dependent Variable: Overall Project Success

Appendix N: Testing for Normal Distribution

NPD

Characteristic		Statistic	Shapiro-Wilk (Sig.)
Organic	Skewness	-0.094	0.273
	Kurtosis	-0.697	
Mechanic	Skewness	-0.007	0.312
	Kurtosis	-0.766	
Exploitation	Skewness	0.050	0.646
	Kurtosis	-0.274	
Exploration	Skewness	-0.410	0.148
	Kurtosis	-0.329	
Specialized	Skewness	-0.557	0.007
	Kurtosis	0.633	
Generalized	Skewness	-0.198	0.217
	Kurtosis	-0.185	
Risk-Averse	Skewness	0.212	0.356
	Kurtosis	-0.237	
Risk-Tolerant	Skewness	-0.204	0.659
	Kurtosis	-0.318	
Intrinsic	Skewness	-0.769	0.000
	Kurtosis	0.102	
Extrinsic	Skewness	-0.046	0.124
	Kurtosis	-0.823	
Quantitative	Skewness	-0.237	0.163
	Kurtosis	-0.598	
Qualitative	Skewness	-0.629	0.019
	Kurtosis	-0.289	
Relationship Quality	Skewness	-0.260	0.192
	Kurtosis	-0.387	
Overall Project Success	Skewness	-1.101	0.000
	Kurtosis	1.618	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Frequency
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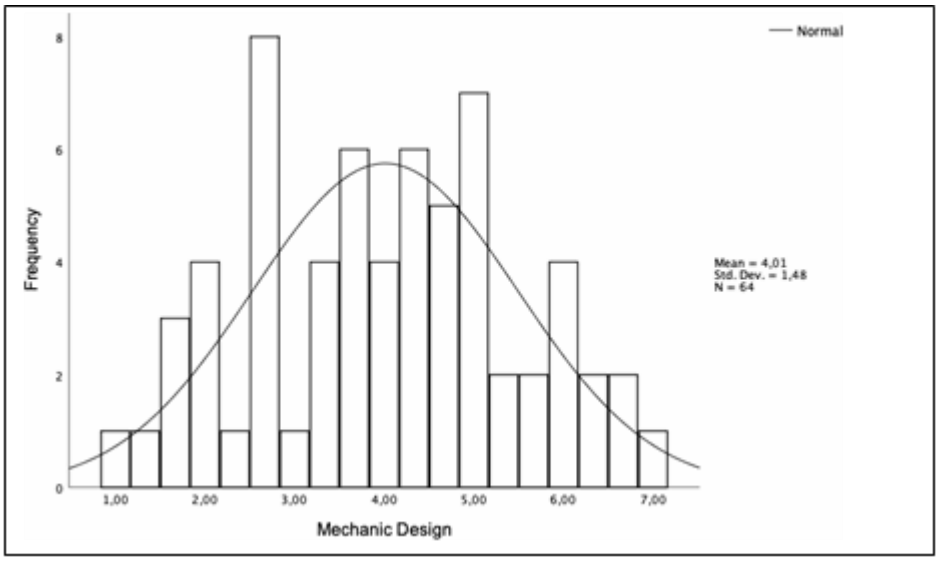
Std. Dev. = 1,223
N = 64
2,00
3,00
4,00
5,00
6,00
7,00
Organic Design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1,00
2,00
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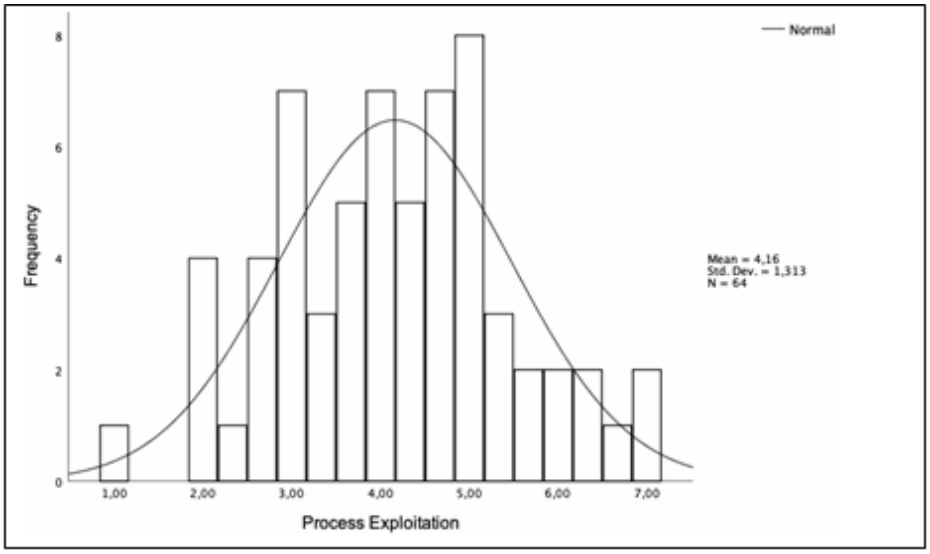
5,00
6,00
7,00
Mechanic Design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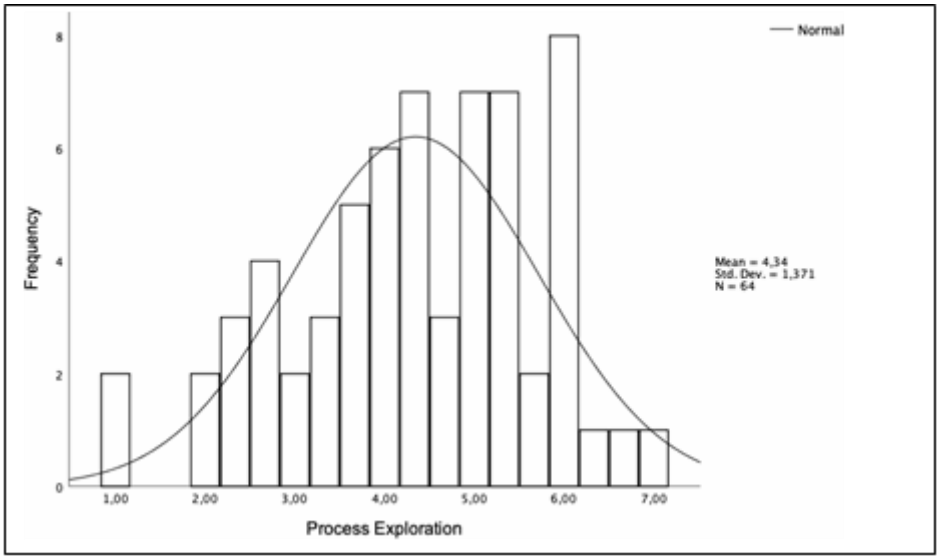
1,00
2,00
3,00
4,00
5,00
6,00
7,00
Process Exploitation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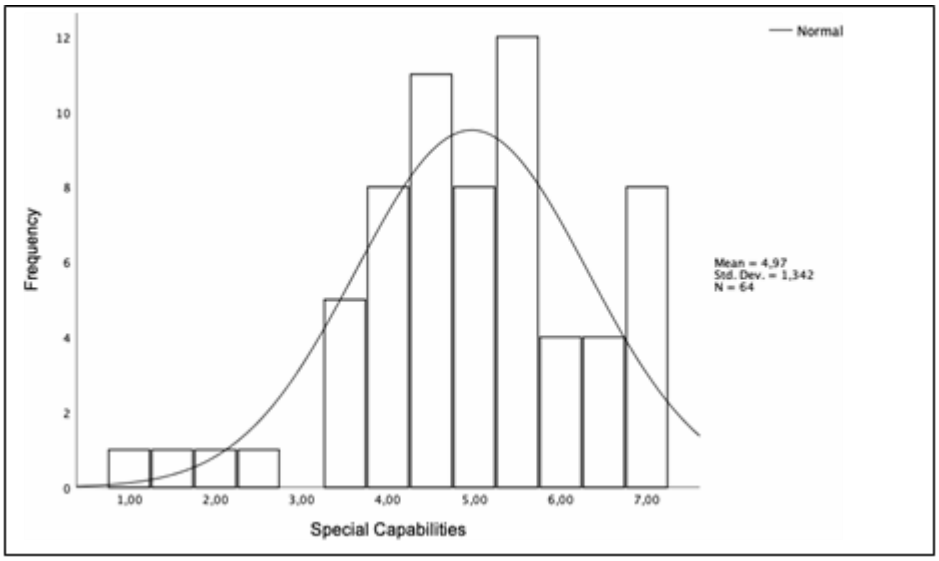
Process Exploration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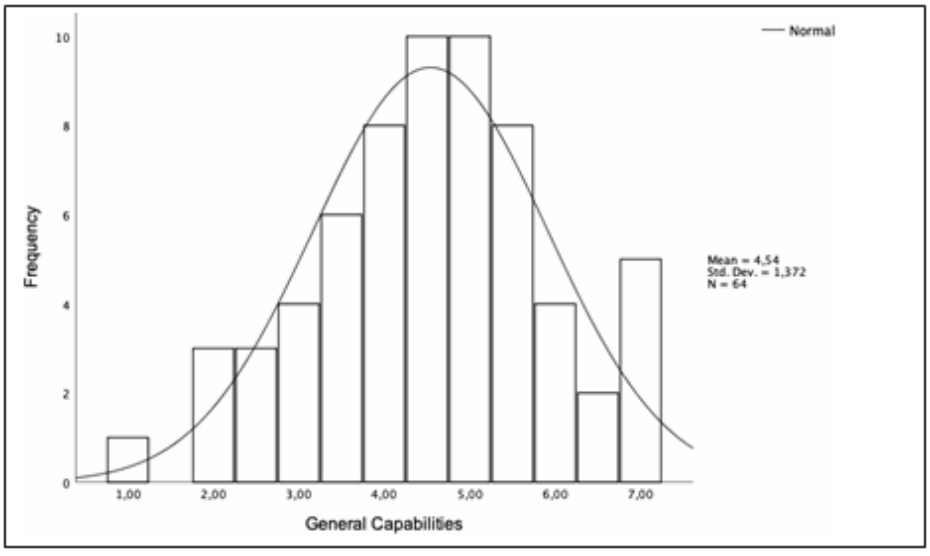
Special Capabilities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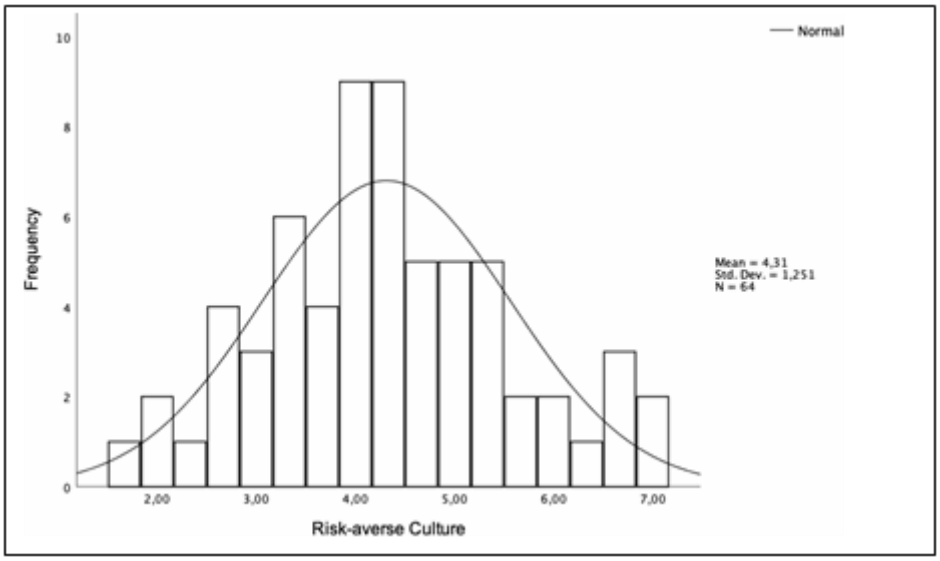
Std. Dev. = 1,372
N = 64
General Capabilities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Frequency
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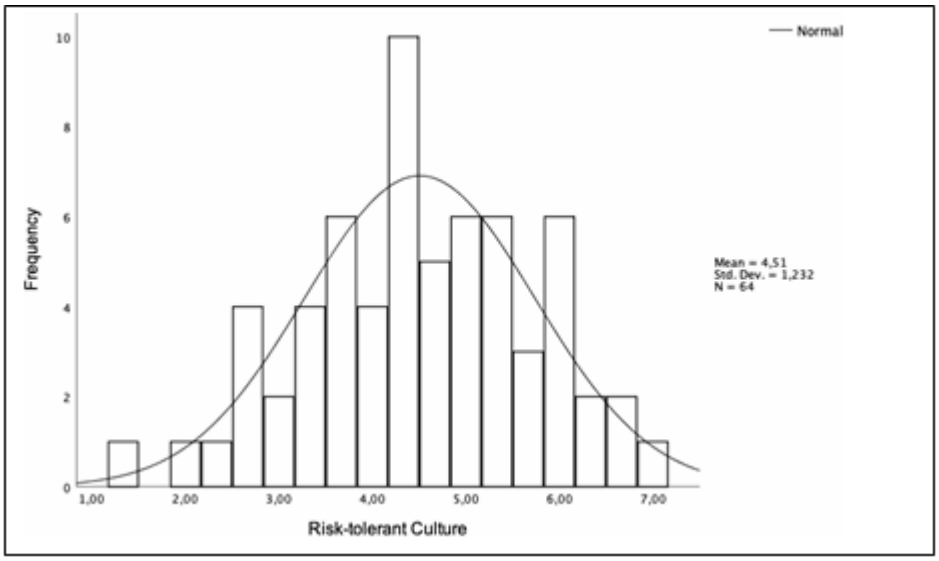
Std. Dev. = 1,251
N = 64
Risk-averse Culture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Frequency
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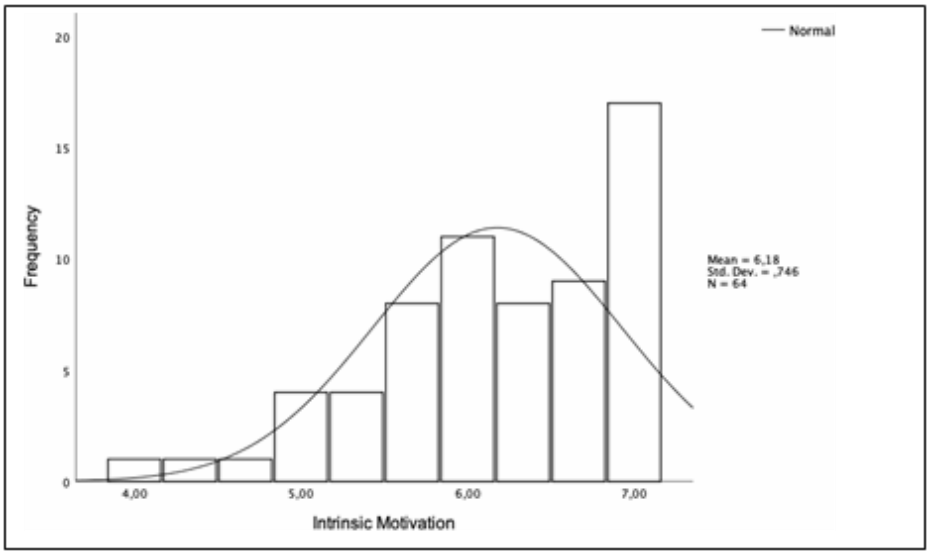
N = 64
Risk-tolerant Culture


Normal
Frequency
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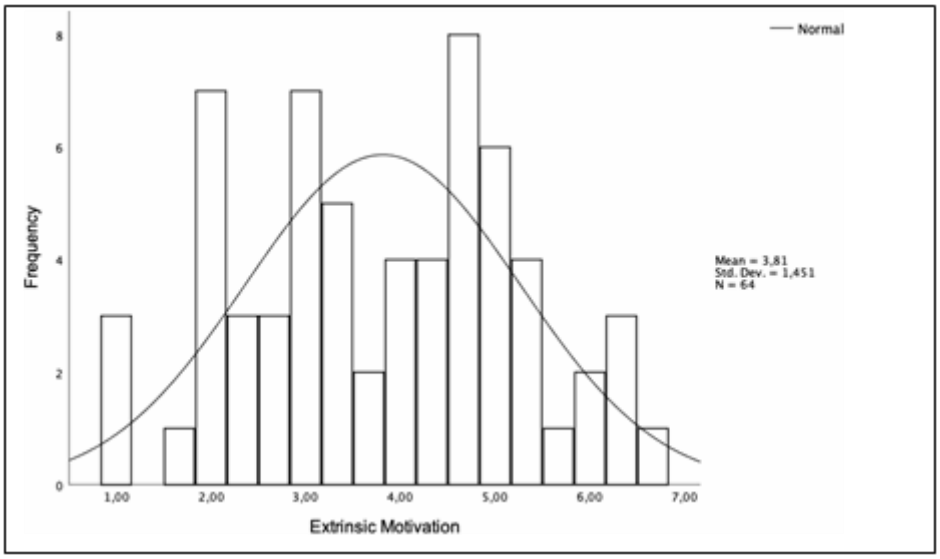
Std. Dev. = ,746
N = 64
Intrinsic Motivation


Normal
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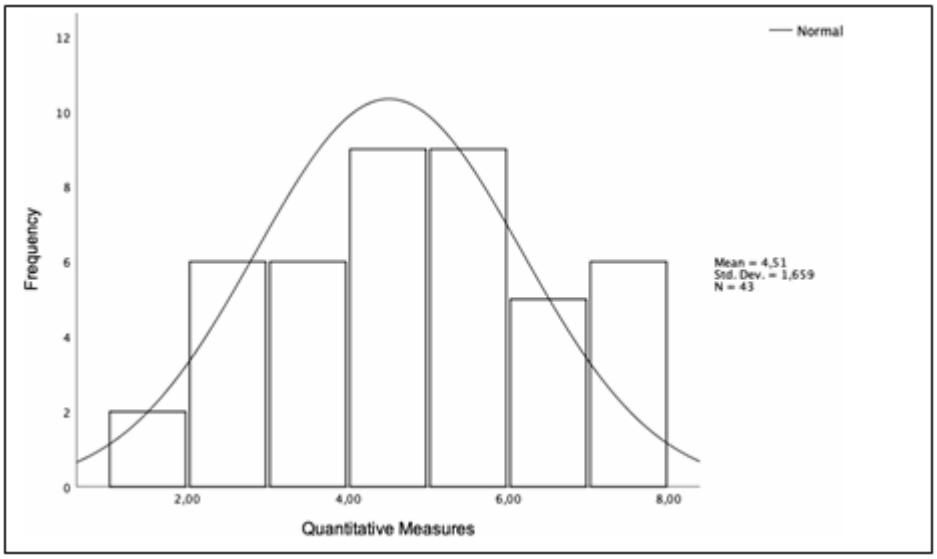
N = 64
Extrinsic Motivation


Normal
Frequency
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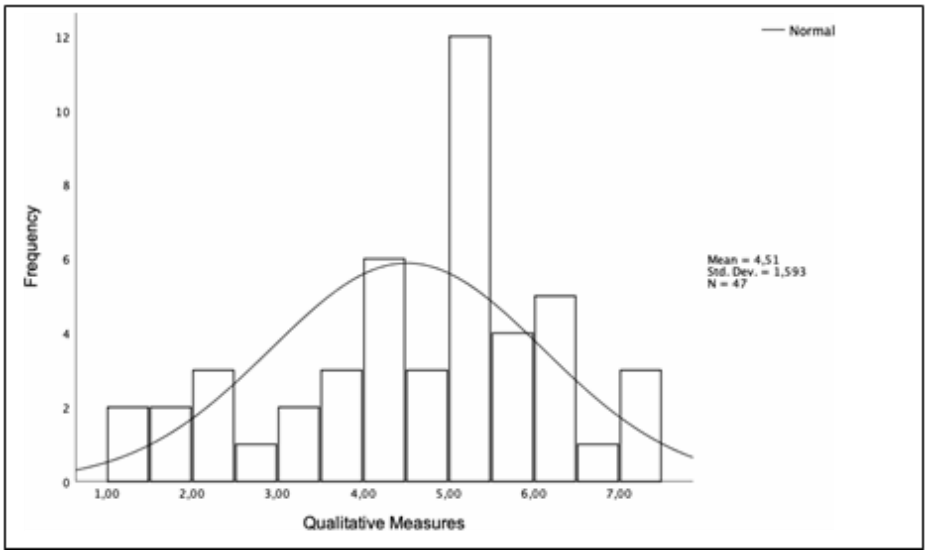
Std. Dev. = 1,659
N = 43
Quantitative Measures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Std. Dev. = 1,593
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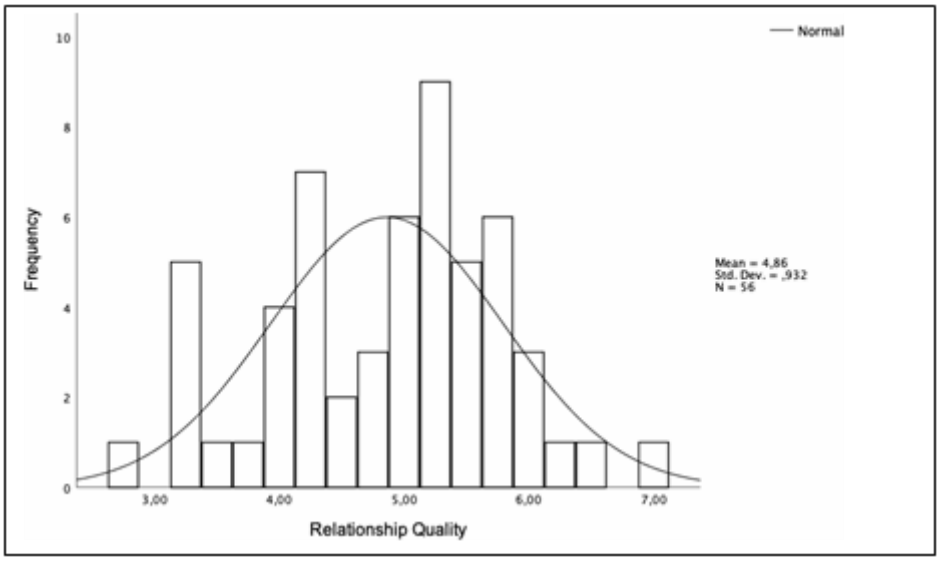
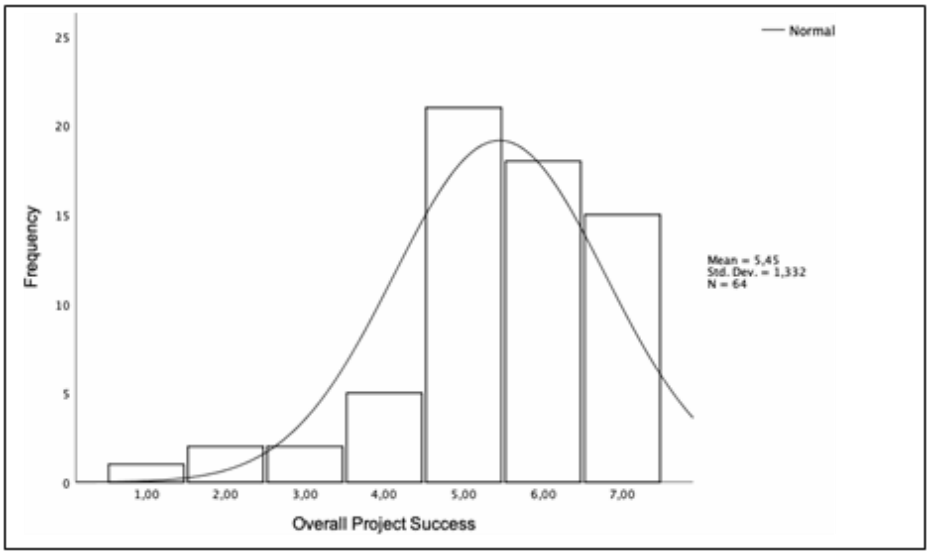
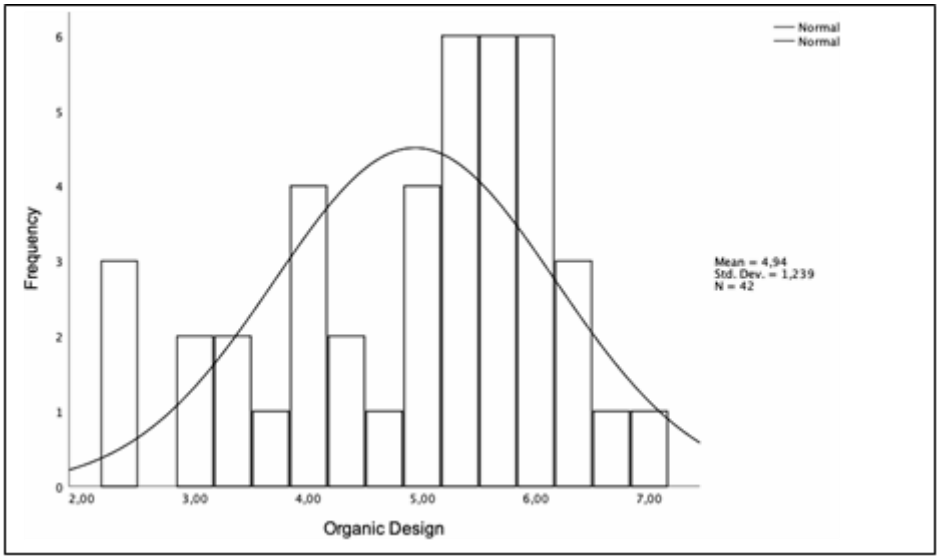
Qualitative Measures


Normal
Frequency
10
8
6
4
2
0
3,00
4,00
5,00
6,00
7,00
Relationship Quality
Mean = 4,86
Std. Dev. = ,932
N = 56


Normal
Frequency
25
20
15
10
5
0
1,00
2,00
3,00
4,00
5,00
6,00
7,00
Overall Project Success
Mean = 5,45
Std. Dev. = 1,332
N = 64

BMI

Characteristic		Statistic	Shapiro-Wilk (Sig.)
Organic	Skewness	-0.665	0.012
	Kurtosis	-0.440	
Mechanic	Skewness	0.191	0.036
	Kurtosis	-1.013	
Exploitation	Skewness	-0.229	0.222
	Kurtosis	-0.497	
Exploration	Skewness	-0.330	0.124
	Kurtosis	-0.153	
Specialized	Skewness	-0.423	0.038
	Kurtosis	0.196	
Generalized	Skewness	-0.207	0.115
	Kurtosis	-0.742	
Risk-Averse	Skewness	0.069	0.310
	Kurtosis	-0.017	
Risk-Tolerant	Skewness	-1.091	0.006
	Kurtosis	1.459	
Intrinsic	Skewness	-1.107	0.000
	Kurtosis	0.288	
Extrinsic	Skewness	0.419	0.098
	Kurtosis	-0.131	
Quantitative	Skewness	0.250	0.792
	Kurtosis	-0.251	
Qualitative	Skewness	-0.371	0.085
	Kurtosis	-0.461	
Relationship Quality	Skewness	-0.213	0.686
	Kurtosis	-0.494	
Overall Project Success	Skewness	-1.335	0.000
	Kurtosis	1.689	


Normal
Normal
Frequency
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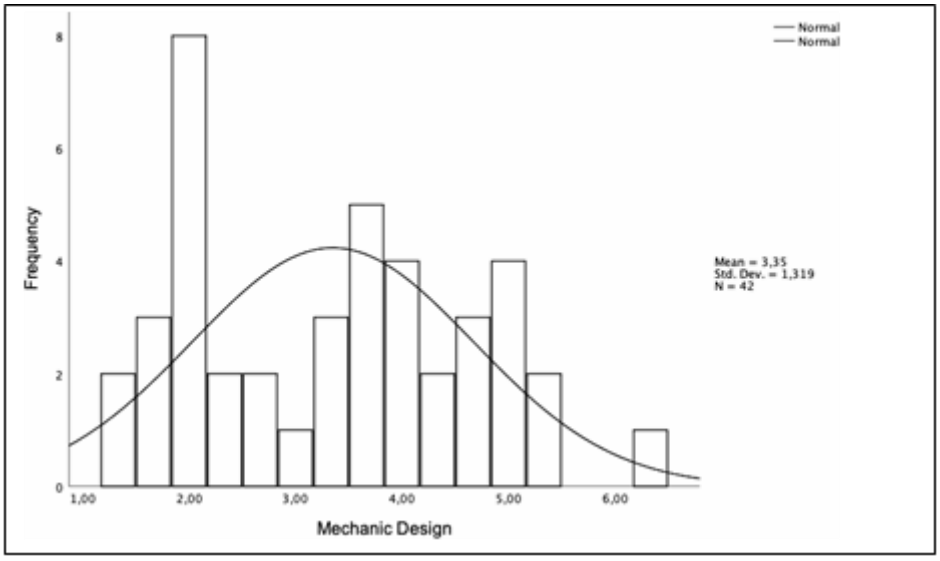
Std. Dev. = 1,239
N = 42
Organic Design


Normal
Normal
Frequency
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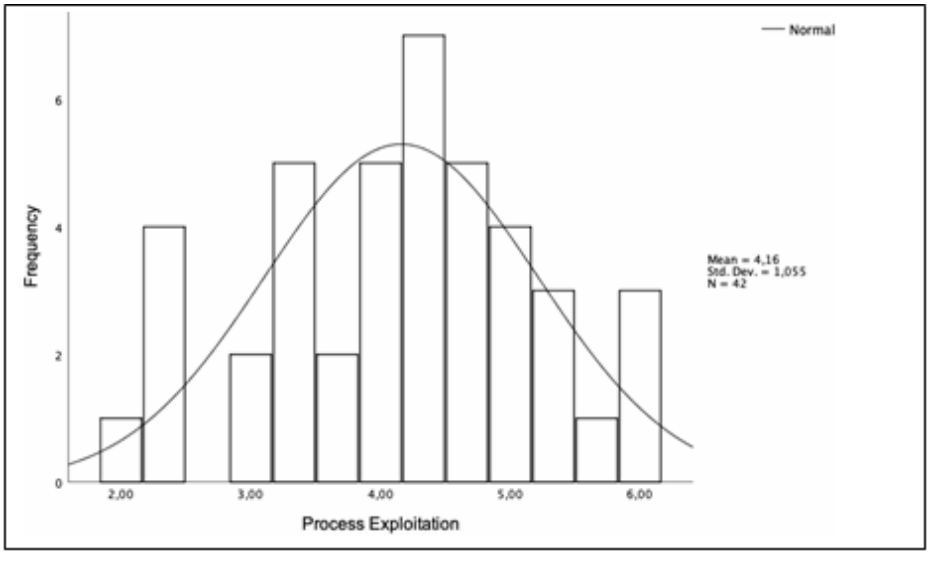
Std. Dev. = 1,319
N = 42
Mechanic Design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Frequency
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Std. Dev. = 1,055
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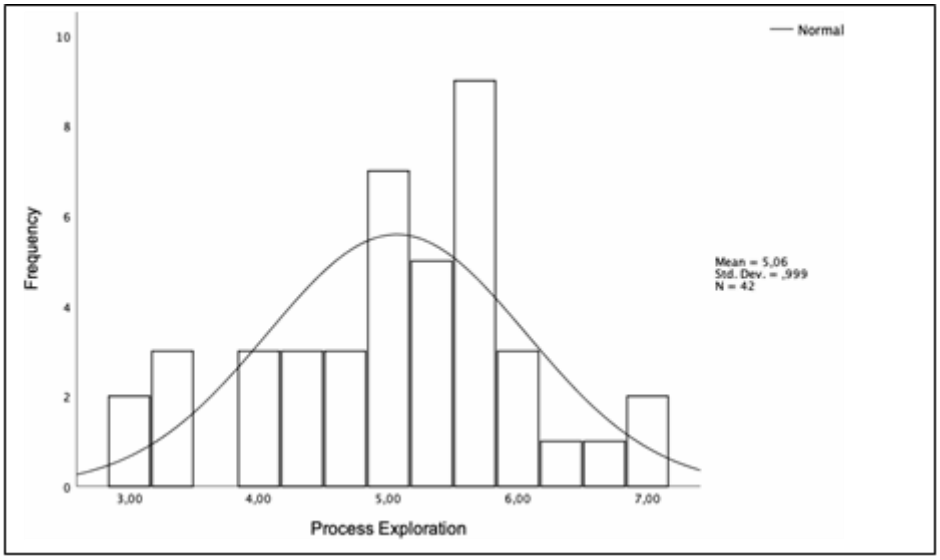
Process Exploitation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Frequency
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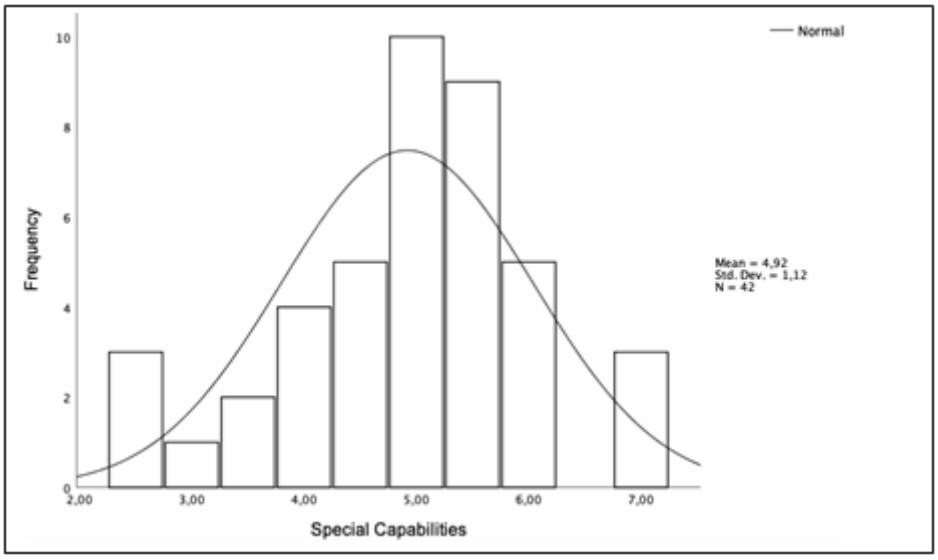
Std. Dev. = ,999
N = 42
Process Exploration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Frequency
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Std. Dev. = 1,12
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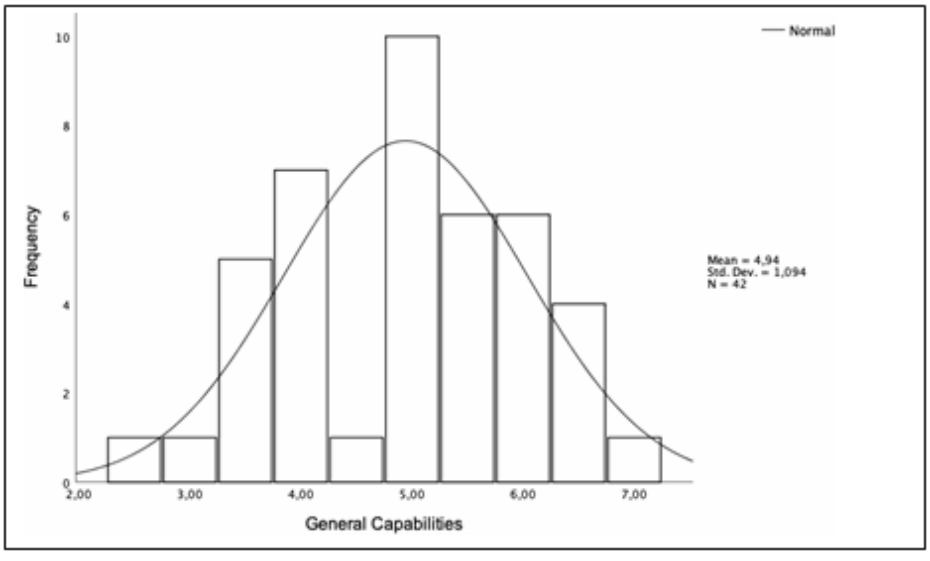
Special Capabilities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Std. Dev. = 1,094
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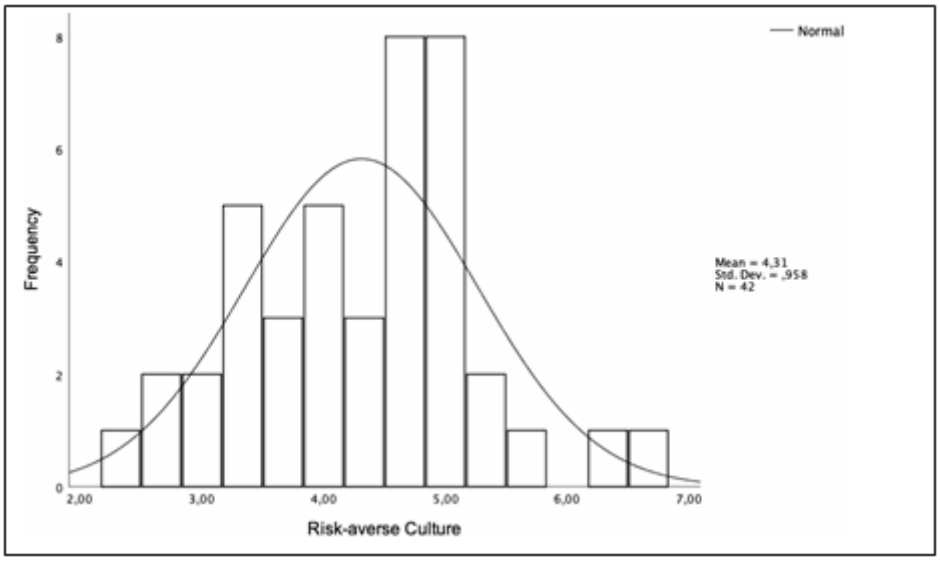
General Capabilities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Frequency
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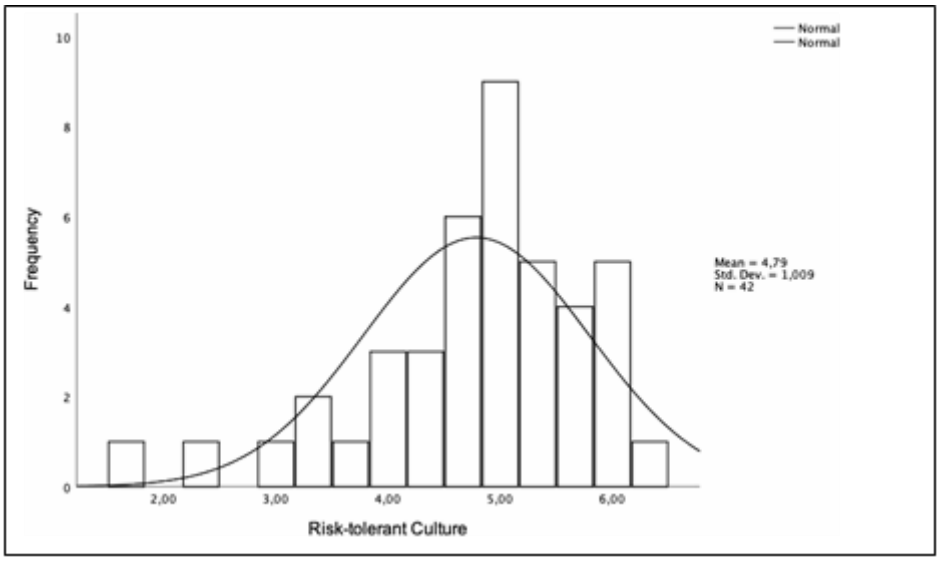
Std. Dev. = ,958
N = 42
Risk-averse Culture


Normal
Normal
Frequency
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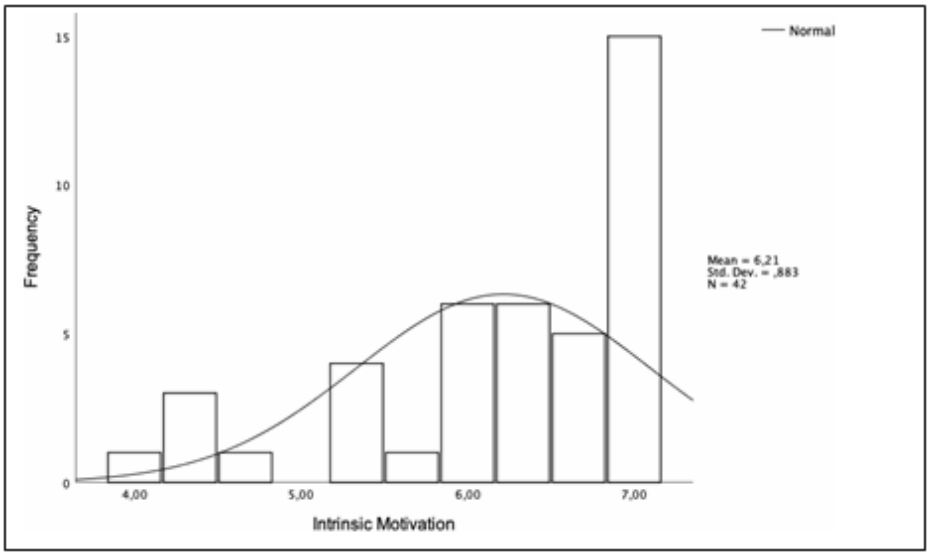
Std. Dev. = 1,009
N = 42
Risk-tolerant Culture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Frequency
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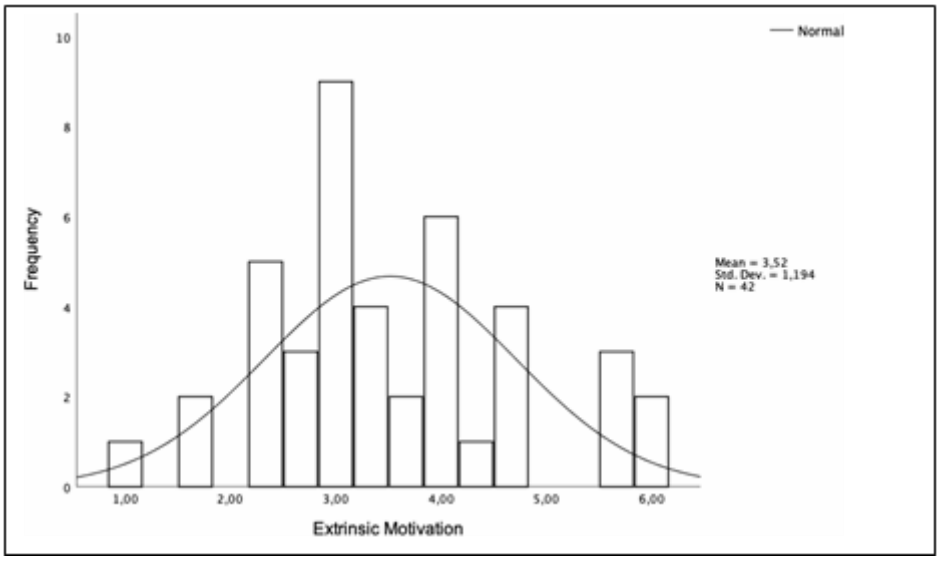
Std. Dev. = ,883
N = 42
Intrinsic Motivation


Normal
Frequency
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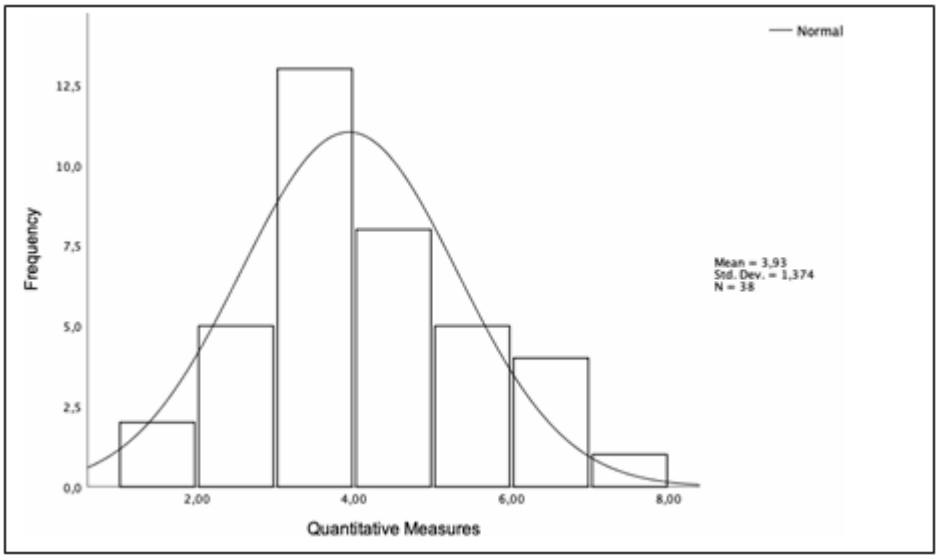
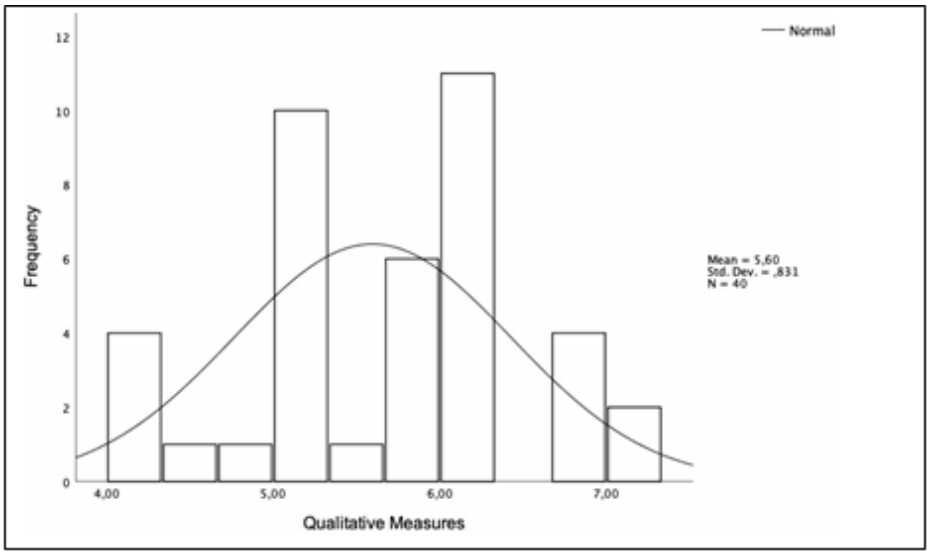
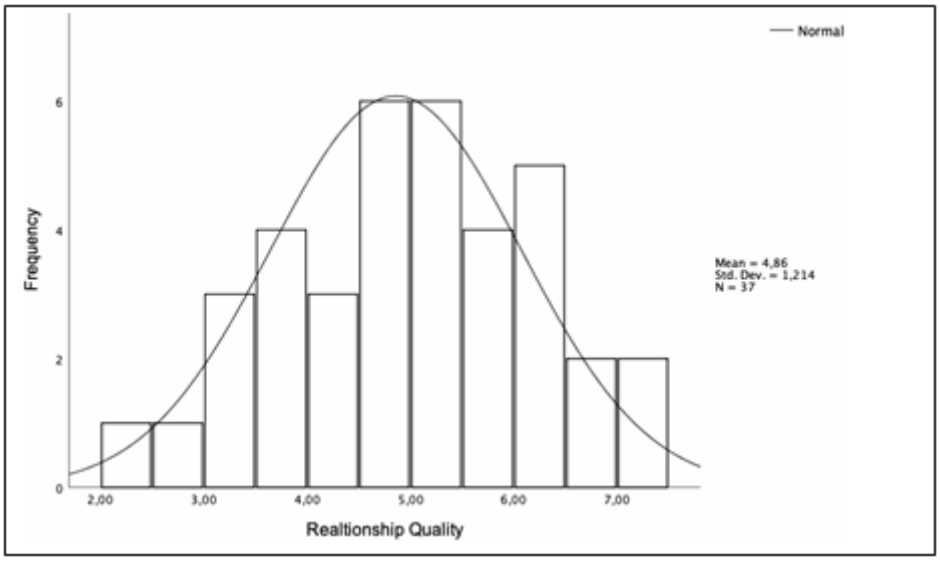
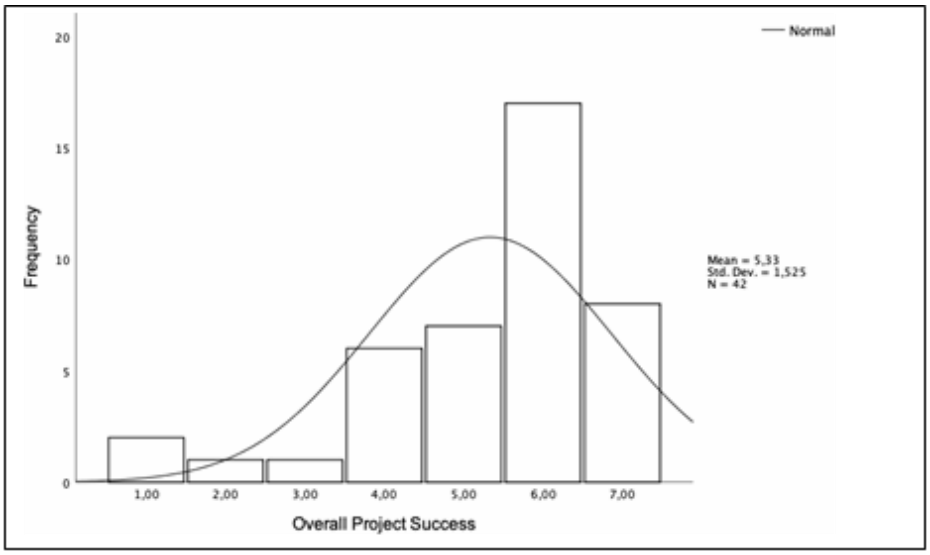
Std. Dev. = 1,194
N = 42
Extrinsic Motivation


Normal
Frequency
Mean = 3,93
Std. Dev. = 1,374
N = 38
Quantitative Measures


Normal
Frequency
Mean = 5,60
Std. Dev. = ,831
N = 40
Qualitative Measures

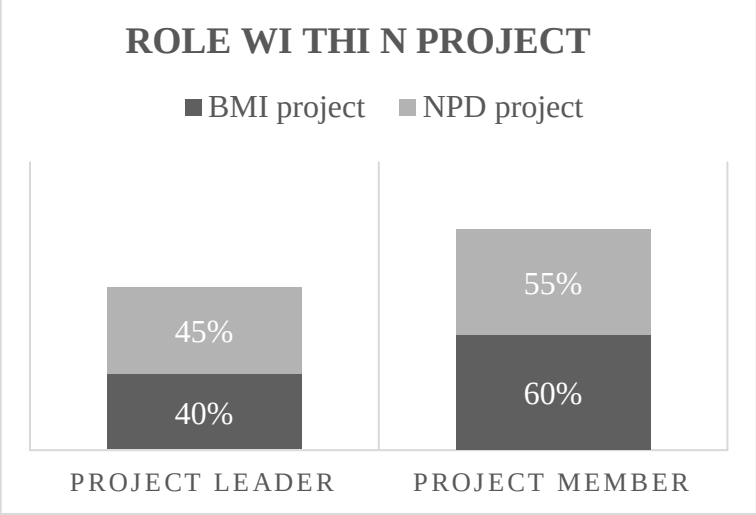

Normal
Frequency
6
4
2
0
2,00
3,00
4,00
5,00
6,00
7,00
Realtionship Quality
Mean = 4,86
Std. Dev. = 1,214
N = 37

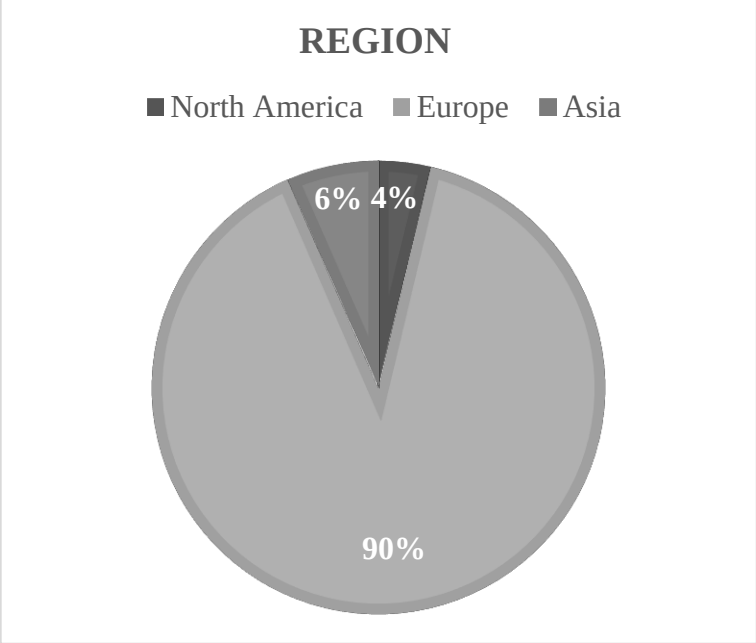

Normal
Frequency
20
15
10
5
0
1,00
2,00
3,00
4,00
5,00
6,00
7,00
Overall Project Success
Mean = 5,33
Std. Dev. = 1,525
N = 42

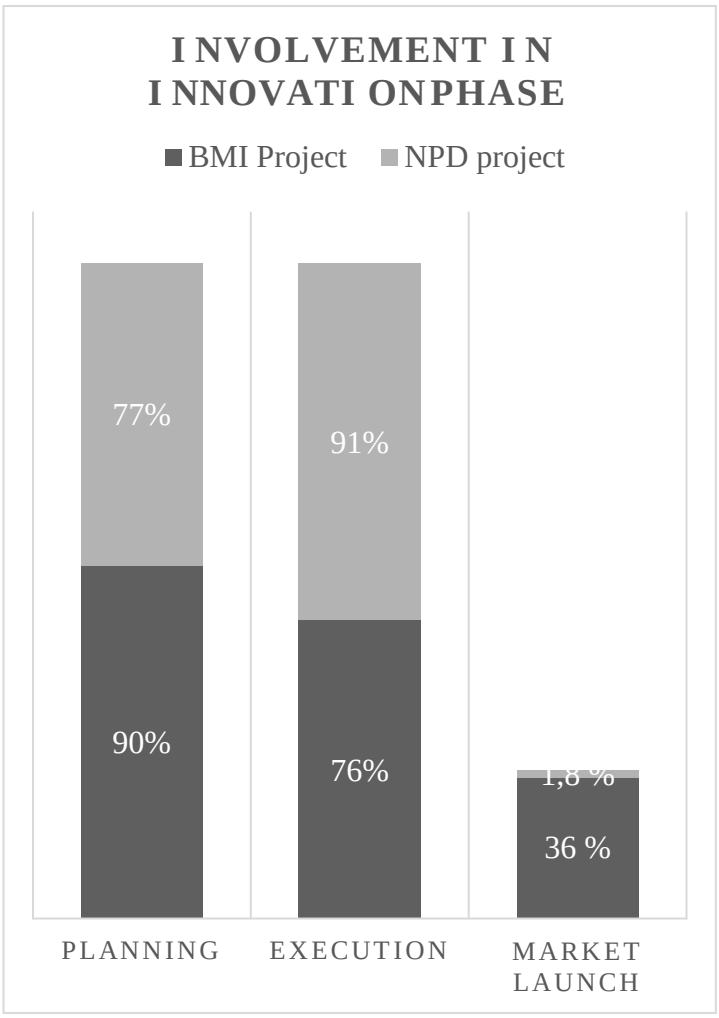
Appendix O: Levene's Test for Equality of Variances

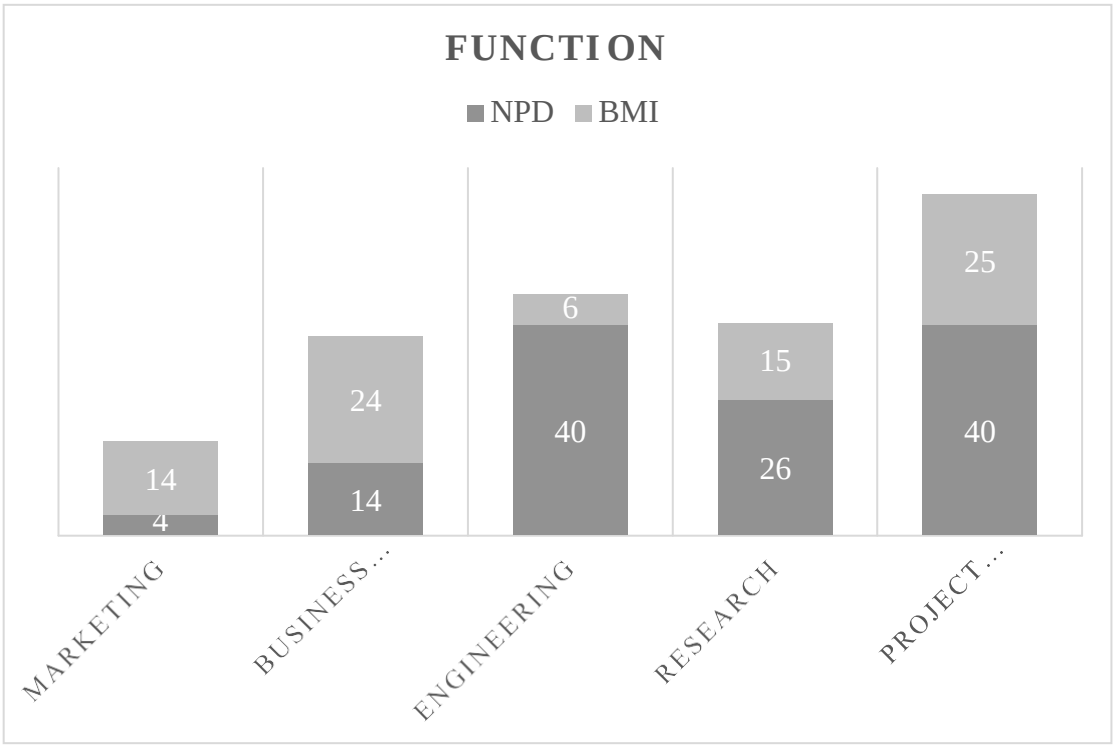
Characteristic	Levene's Test (Sig.)
Organic	0.791
Mechanic	0.368
Exploitation	0.132
Exploration	0.027
Specialized	0.234
Generalized	0.219
Risk-Averse	0.160
Risk-Tolerant	0.091
Intrinsic	0.334
Extrinsic	0.055
Quantitative	0.195
Qualitative	0.000
Relationship Quality	0.686
Overall Project Success	0.420

Appendix P: Descriptive Statistics






I NVOLVEMENT I N
I NNOVATI ONPHASE
BMI Project
NPD project
77%
91%
90%
76%
1,8 %
36 %
PLANNING
EXECUTION
MARKET LAUNCH


FUNCTI ON
NPD
BMI
14
4
24
14
6
40
15
26
25
40
MARKETING
BUSINESS...
ENGINEERING
RESEARCH
PROJECT...

Appendix Q: Factor Analysis

Item	Component 1	Component 2	Component 3
Organic Org. Design	0.614		
Mechanic Org. Design			0.327
Exploitation		0.707	
Exploration	0.695		
Specialized		0.535	
Generalized		0.551	
RiskAverse		0.798	
RiskTolerant	0.638		
Intrinsic	0.449		
Extrinsic			0.748
Rel.Qual.		0.433	
Quantitative Measures			0.718
Qualitative Measures	0.734		

Extraction Method: Principal Component Analysis
Rotation Method: Varimax with Kaiser Normalization

Appendix R: Correlations between Sub-constructs and Project Success

NPD

Sub-construct	N	Mean	SD	r^{α}
Extrinsic Motivation	64	3.813	1.451	0.264*
Intrinsic Motivation	64	6.177	0.747	0.305**
Process Exploitation	64	4.162	1.313	0.086
Process Exploration	64	4.344	1.371	0.072
Risk-tolerant Culture	64	4.313	1.251	0.338**
Risk-averse Culture	64	4.505	1.232	0.140
Specialized Stakeholders	64	4.969	1.342	0.299**
Generalized Stakeholders	64	4.539	1.372	0.237*
Quantitative Measures	43	4.512	1.659	0.123
Qualitative Measures	47	4.514	1.593	0.174
Relationship Quality	56	4.862	0.932	0.083
Mechanic Org. Design	64	4.010	1.480	- 0.058
Organic Org. Design	64	4.656	1.223	0.032
Overall Project Success	64	5.450	1.332	1

Note: $^{\alpha}$dependent variable: Overall Project Success; * significant at 5% level; ** significant at 1% level

BMI

Sub-construct	N	Mean	SD	r^{α}
Extrinsic Motivation	42	3.516	1.194	0.287
Intrinsic Motivation	42	6.214	0.883	0.368*
Process Exploitation	42	4.159	1.055	- 0.024
Process Exploration	42	5.064	0.999	0.306*
Risk-tolerant Culture	42	4.310	0.958	- 0.178
Risk-averse Culture	42	4.786	1.009	0.317
Specialized Stakeholders	42	4.917	1.120	0.331*
Generalized Stakeholders	42	4.941	1.094	0.348*
Quantitative Measures	38	3.934	1.374	- 0.131
Qualitative Measures	40	5.596	0.831	0.096
Relationship Quality	37	4.858	1.214	0.262
Mechanic Org. Design	42	3.349	1.319	- 0.241
Organic Org. Design	42	4.937	1.239	0.308*
Overall Project Success	42	5.330	1.525	1

Note: $^{\alpha}$dependent variable: Overall Project Success; * significant at 5% level; ** significant at 1% level

Appendix S: Factor Analysis 'Project Success'

Item	Component 1	Component 2	Component 3	Component 4
Meeting the budget goal			0.825	
Meeting the schedule goal			0.684	
Meeting the functional performance				0.745
Meeting technical specifications				0.729
Fulfilling the customer's needs	0.859			
Solving a customer's problem	0.800			
The customer is using the product or service	0.846			
Customer satisfaction	0.657			
Commercial success			0.685	
Creating a large market share		0.746		
Creating a new market		0.822		
Creating a new product or service line		0.736		
Developing a new technology		0.627		

Extraction Method: Principal Component Analysis
Rotation Method: Varimax with Kaiser Normalization

Proposed success dimensions by Shenhar et al. (2010):

Success Measure	Factor 1	Factor 2	Factor 3	Factor 4
Meeting functional performance	**0.694**	0.401	−0.279	0.123
Meeting technical specifications	**0.572**	0.401	−0.161	−0.105
Meeting schedule goal	0.115	**0.872**	0.169	−0.030
Meeting budget goal	0.227	**0.834**	0.017	0.060
Fulfilling customer needs	**0.727**	0.058	0.019	−0.042
Solving a customer's problem	**0.555**	−0.161	0.174	0.406
The customer is using the product	**0.499**	−0.024	0.492	−0.345
Customer satisfaction	**0.678**	0.431	0.195	−0.011
Commercial success	0.002	0.386	**0.730**	−0.038
Creating a large market share	−0.055	−0.158	**0.701**	0.422
Creating a new market	−0.008	0.125	0.550	**0.650**
Creating a new product line	0.096	−0.017	0.146	**0.825**
Developing a new technology	−0.085	0.019	−0.118	**0.822**
Eigenvalue	3.435	1.456	1.239	2.575
Variance percentage explained	24.6	11.2	9.5	19.8

[a] Note: Factors with Eigenvalues greater than 1.0 were rotated using a varimax solution.

Appendix T: Moderated Regression Analyses

Model summary – moderation Extrinsic Motivation

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
1	0.275[a]	0.076	0.067	1.358	0.076	8.517	1	104	0.004
2	0.277[b]	0.077	0.050	1.370	0.001	0.070	2	102	0.932

a. Predictors: (Constant) Extrinsic Motivation
b. Predictors: (Constant), Extrinsic Motivation, Project Type, Extrinsic Motivation × Project Type

Anova– moderation Extrinsic Motivation

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.711	1	15.711	8.517	0.004[b]
	Residual	191.846	104	1.845		
	Total	207.557	105			
2	Regression	15.973	3	5.324	2.835	0.042[c]
	Residual	191.583	102	1.878		
	Total	207.557	105			

a. Dependent Variable: Overall Project Success
b. Predictors: (Constant), Extrinsic Motivation
c. Predictors: (Constant), Extrinsic Motivation, Project Type, Extrinsic Motivation × Project Type

Regression coefficients– moderation Extrinsic Motivation

Model[a]		β	SE	Std. β	t	Sig.
1	(Constant)	5.406	0.132		40.977	0.000
	Extrinsic Motivation	0.285	0.098	0.275	2.918	0.004
2	(Constant)	5.404	0.133		40.589	0.000
	Extrinsic Motivation	0.283	0.099	0.273	2.852	0.005
	Project Type	- 0.037	0.274	- 0.013	- 0.134	0.893
	Extrinsic Motivation x Project Type	0.116	0.331	0.033	0.351	0.727

a. Dependent Variable: Overall Project Success

Model summary – moderation Intrinsic Motivation

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
1	0.379[a]	0.144	0.136	1.307	0.144	17.467	1	104	0.000
2	0.383[b]	0.147	0.122	1.318	0.003	0.172	2	102	0.843

a. Predictors: (Constant) Intrinsic Motivation
b. Predictors: (Constant), Intrinsic Motivation, Project Type, Intrinsic Motivation × Project Type

Anova– moderation Intrinsic Motivation

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.847	1	29.847	17.467	0.000[b]
	Residual	177.71	104	1.709		
	Total	207.557	105			
2	Regression	30.443	3	10.148	5.844	0.001[c]
	Residual	177.114	102	1.736		
	Total	207.557	105			

a. Dependent Variable: Overall Project Success
b. Predictors: (Constant), Intrinsic Motivation
c. Predictors: (Constant), Intrinsic Motivation, Project Type, Intrinsic Motivation × Project Type

Regression coefficients– moderation Intrinsic Motivation

Model[a]		β	SE	Std. β	t	Sig.
1	(Constant)	5.406	0.127		42.567	0.000
	Intrinsic Motivation	0.667	0.160	0.379	4.179	0.000
2	(Constant)	5.404	0.128		42.223	0.000
	Intrinsic Motivation	0.674	0.163	0.383	4.139	0.000
	Project Type	- 0.144	0.262	- 0.050	- 0.552	0.582
	Intrinsic Motivation x Project Type	- 0.063	0.322	- 0.018	- 0.194	0.846

a. Dependent Variable: Overall Project Success

Model summary – moderation Process Exploitation

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
1	0.003[a]	0.000	- 0.010	1.413	0.000	0.001	1	104	0.974
2	0.045[b]	0.002	- 0.027	1.425	0.002	0.104	2	102	0.901

a. Predictors: (Constant) Process Exploitation
b. Predictors: (Constant), Process Exploitation, Project Type, Process Exploitation × Project Type

Anova– moderation Process Exploitation

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.002	1	0.002	0.001	0.974[b]
	Residual	207.555	104	1.996		
	Total	207.557	105			
2	Regression	0.426	3	0.142	0.070	0.976[c]
	Residual	207.131	102	2.031		
	Total	207.557	105			

a. Dependent Variable: Overall Project Success
b. Predictors: (Constant), Process Exploitation
c. Predictors: (Constant), Process Exploitation, Project Type, Process Exploitation × Project Type

Regression coefficients– moderation Process Exploitation

Model[a]		β	SE	Std. β	t	Sig.
1	(Constant)	5.406	0.137		39.396	0.000
	Process Exploitation	- 0.004	0.114	- 0.003	- 0.032	0.974
2	(Constant)	5.405	0.138		39.051	0.000
	Process Exploitation	- 0.008	0.118	- 0.007	- 0.070	0.945
	Project Type	- 0.120	0.283	- 0.042	- 0.423	0.673
	Process Exploitation x Project Type	- 0.043	0.251	- 0.017	- 0.172	0.864

a. Dependent Variable: Overall Project Success

Model summary – moderation Process Exploration

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
1	0.176[a]	0.031	0.022	1.391	0.031	3.321	1	104	0.071
2	0.236[b]	0.056	0.028	1.386	0.025	1.333	2	102	0.268

a. Predictors: (Constant) Process Exploration
b. Predictors: (Constant), Process Exploration, Project Type, Process Exploration × Project Type

Anova– moderation Process Exploration

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.424	1	6.424	3.321	0.071[b]
	Residual	201.133	104	1.934		
	Total	207.557	105			
2	Regression	11.546	3	3.849	2.003	0.118[c]
	Residual	196.011	102	1.922		
	Total	207.557	105			

a. Dependent Variable: Overall Project Success
b. Predictors: (Constant), Process Exploration
c. Predictors: (Constant), Process Exploration, Project Type, Process Exploration × Project Type

Regression coefficients– moderation Process Exploration

Model[a]		β	SE	Std. β	t	Sig.
1	(Constant)	5.406	0.135		40.02	0.000
	Process Exploration	0.193	0.106	0.176	1.822	0.071
2	(Constant)	5.348	0.142		37.792	0.000
	Process Exploration	0.270	0.116	0.246	2.333	0.022
	Project Type	- 0.362	0.293	- 0.127	- 1.235	0.220
	Process Exploration x Project Type	0.329	0.251	0.133	1.308	0.194

a. Dependent Variable: Overall Project Success

Model summary – moderation Risk-averse Culture

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
1	0.018[a]	0.000	- 0.009	1.412	0.000	0.034	1	104	0.853
2	0.138[b]	0.019	- 0.010	1.413	0.019	0.978	2	102	0.380

a. Predictors: (Constant) Risk-averse Culture
b. Predictors: (Constant), Risk-averse Culture, Project Type, Risk-averse Culture × Project Type

Anova– moderation Risk-averse Culture

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.068	1	0.068	0.034	0.853[b]
	Residual	207.488	104	1.995		
	Total	207.557	105			
2	Regression	3.973	3	1.324	0.663	0.576[c]
	Residual	203.584	102	1.996		
	Total	207.557	105			

a. Dependent Variable: Overall Project Success
b. Predictors: (Constant), Risk-averse Culture
c. Predictors: (Constant), Risk-averse Culture, Project Type, Risk-averse Culture × Project Type

Regression coefficients– moderation Risk-averse Culture

Model[a]		β	SE	Std. β	t	Sig.
1	(Constant)	5.406	0.137		39.402	0.000
	Risk-averse Culture	- 0.022	0.121	- 0.018	- 0.185	0.853
2	(Constant)	5.405	0.137		39.388	0.000
	Risk-averse Culture	- 0.067	0.126	- 0.054	- 0.534	0.594
	Project Type	- 0.120	0.281	- 0.042	- 0.428	0.669
	Risk-averse Culture x Project Type	- 0.360	0.271	- 0.136	- 1.332	0.186

a. Dependent Variable: Overall Project Success

Model summary – moderation Risk-tolerant Culture

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
1	0.315[a]	0.099	0.090	1.341	0.099	11.427	1	104	0.001
2	0.328[b]	0.107	0.081	1.348	0.008	0.481	2	102	0.619

a. Predictors: (Constant) Risk-tolerant Culture
b. Predictors: (Constant), Risk-tolerant Culture, Project Type, Risk-tolerant Culture × Project Type

Anova– moderation Risk-tolerant Culture

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	20.547	1	20.547	11.427	0.001[b]
	Residual	187.01	104	1.798		
	Total	207.557	105			
2	Regression	22.295	3	7.432	4.092	0.009[c]
	Residual	185.262	102	1.816		
	Total	207.557	105			

a. Dependent Variable: Overall Project Success
b. Predictors: (Constant), Risk-tolerant Culture
c. Predictors: (Constant), Risk-tolerant Culture, Project Type, Risk-tolerant Culture × Project Type

Regression coefficients– moderation Risk-tolerant Culture

Model[a]		β	SE	Std. β	t	Sig.
1	(Constant)	5.406	0.130		41.504	0.000
	Risk-tolerant Culture	0.384	0.114	0.315	3.380	0.001
2	(Constant)	5.397	0.132		40.889	0.000
	Risk-tolerant Culture	0.407	0.117	0.334	3.467	0.001
	Project Type	- 0.241	0.270	- 0.084	- 0.891	0.375
	Risk-tolerant Culture x Project Type	0.120	0.250	0.046	0.479	0.633

a. Dependent Variable: Overall Project Success

Model summary – moderation Specialized Stakeholders

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
1	0.290[a]	0.084	0.076	1.352	0.084	9.577	1	104	0.003
2	0.302[b]	0.091	0.065	1.360	0.007	0.390	2	102	0.678

a. Predictors: (Constant) Specialized Stakeholders
b. Predictors: (Constant), Specialized Stakeholders, Project Type, Specialized Stakeholders× Project Type

Anova– moderation Specialized Stakeholders

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.501	1	17.501	9.577	0.003[b]
	Residual	190.056	104	1.827		
	Total	207.557	105			
2	Regression	18.944	3	6.315	3.415	0.020[c]
	Residual	188.613	102	1.849		
	Total	207.557	105			

a. Dependent Variable: Overall Project Success
b. Predictors: (Constant), Specialized Stakeholders
c. Predictors: (Constant), Specialized Stakeholders, Project Type, Specialized Stakeholders × Project Type

Regression coefficients– moderation Specialized Stakeholders

Model[a]		β	SE	Std. β	t	Sig.
1	(Constant)	5.406	0.131		41.17	0.000
	Specialized Stakeholders	0.326	0.105	0.290	3.095	0.003
2	(Constant)	5.408	0.132		40.931	0.000
	Specialized Stakeholders	0.341	0.108	0.304	3.163	0.002
	Project Type	- 0.100	0.207	- 0.035	- 0.371	0.712
	Specialized Stakeholders x Project Type	0.182	0.229	0.077	- 0.797	0.427

a. Dependent Variable: Overall Project Success

Model summary – moderation Generalized Stakeholders

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
1	0.275[a]	0.076	0.067	1.358	0.076	8.525	1	104	0.004
2	0.304[b]	0.093	0.066	1.359	0.017	0.941	2	102	0.393

a. Predictors: (Constant) Generalized Stakeholders
b. Predictors: (Constant), Generalized Stakeholders, Project Type, Generalized Stakeholders× Project Type

Anova– moderation Generalized Stakeholders

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.724	1	15.724	8.525	0.004[b]
	Residual	191.832	104	1.845		
	Total	207.557	105			
2	Regression	19.201	3	6.400	3.466	0.019[c]
	Residual	188.356	102	1.847		
	Total	207.557	105			

a. Dependent Variable: Overall Project Success
b. Predictors: (Constant), Generalized Stakeholders
c. Predictors: (Constant), Generalized Stakeholders, Project Type, Generalized Stakeholders × Project Type

Regression coefficients– moderation Generalized Stakeholders

Model[a]		β	SE	Std. β	t	Sig.
1	(Constant)	5.406	0.132		40.979	0.000
	Generalized Stakeholders	0.302	0.104	0.275	2.92	0.004
2	(Constant)	5.382	0.134		40.206	0.000
	Generalized Stakeholders	0.343	0.108	0.312	3.179	0.002
	Project Type	- 0.277	0.275	- 0.097	- 1.008	0.316
	Generalized Stakeholders x Project Type	0.238	0.231	0.100	1.032	0.305

a. Dependent Variable: Overall Project Success

Model summary – moderation Quantitative Measures

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
1	0.034[a]	0.001	- 0.011	1.485	0.001	0.093	1	79	0.762
2	0.155[b]	0.024	- 0.012	1.486	0.023	0.907	2	77	0.408

a. Predictors: (Constant) Quantitative Measures
b. Predictors: (Constant), Quantitative Measures, Project Type, Quantitative Measures × Project Type

Anova– moderation Quantitative Measures

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.204	1	0.204	0.093	0.762[b]
	Residual	174.117	79	2.204		
	Total	174.321	80			
2	Regression	4.212	3	1.404	0.635	0.594[c]
	Residual	170.109	77	2.209		
	Total	174.321	80			

a. Dependent Variable: Overall Project Success
b. Predictors: (Constant), Quantitative Measures, Project Type, Quantitative Measures × Project Type
c. Predictors: (Constant), Quantitative Measures, Project Type, Quantitative Measures × Project Type

Regression coefficients– moderation Quantitative Measures

Model[a]		β	SE	Std. β	t	Sig.
1	(Constant)	5.346	0.165		32.407	0.000
	Quantitative Measures	0.033	0.107	0.034	0.304	0.762
2	(Constant)	5.304	0.168		31.513	0.000
	Quantitative Measures	0.012	0.111	0.013	0.110	0.913
	Project Type	0.089	0.337	-0.030	0.264	0.792
	Quantitative Measures x Project Type	- 0.293	0.225	- 0.149	- 1.303	0.197

a. Dependent Variable: Overall Project Success

Model summary – moderation Qualitative Measures

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
1	0.092[a]	0.008	0.002	1.446	0.008	1.418	1	166	0.235
2	0.132[b]	0.017	- 0.001	1.449	0.009	0.751	2	164	0.473

a. Predictors: (Constant) Qualitative Measures
b. Predictors: (Constant), Qualitative Measures, Project Type, Qualitative Measures × Project Type

Anova– moderation Qualitative Measures

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.968	1	2.968	1.418	0.235[b]
	Residual	347.312	166	2.092		
	Total	350.28	167			
2	Regression	6.12	3	2.040	0.972	0.407[c]
	Residual	344.159	164	2.099		
	Total	350.28	167			

a. Dependent Variable: Overall Project Success
b. Predictors: (Constant), Qualitative Measures
c. Predictors: (Constant), Qualitative Measures, Project Type, Qualitative Measures × Project Type

Regression coefficients– moderation Qualitative Measures

Model[a]		β	SE	Std. β	t	Sig.
1	(Constant)	5.351	0.112		47.951	0.000
	Qualitative Measures	0.091	0.076	0.092	1.191	0.235
2	(Constant)	5.364	0.112		47.743	0.000
	Qualitative Measures	0.060	0.080	0.061	0.744	0.458
	Project Type	0.098	0.225	0.034	0.433	0.666
	Qualitative Measures x Project Type	- 0.192	0.165	- 0.095	- 1.165	0.246

a. Dependent Variable: Overall Project Success

Model summary – moderation Relationship Quality

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
1	0.169[a]	0.029	0.018	1.369	0.029	2.680	1	91	0.105
2	0.189[b]	0.036	0.003	1.379	0.007	0.326	2	89	0.722

a. Predictors: (Constant) Relationship Quality
b. Predictors: (Constant), Relationship Quality, Project Type, Relationship Quality × Project Type

Anova– moderation Relationship Quality

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.023	1	5.023	2.680	0.105[b]
	Residual	170.547	91	1.874		
	Total	175.57	92			
2	Regression	6.265	3	2.088	1.098	0.354[c]
	Residual	169.305	89	1.902		
	Total	175.57	92			

a. Dependent Variable: Overall Project Success
b. Predictors: (Constant), Relationship Quality
c. Predictors: (Constant), Relationship Quality, Project Type, Relationship Quality × Project Type

Regression coefficients– moderation Relationship Quality

Model[a]		β	SE	Std. β	t	Sig.
1	(Constant)	5.366	0.142		37.797	0.000
	Relationship Quality	0.223	0.136	0.169	1.637	0.105
2	(Constant)	5.366	0.143		37.519	0.000
	Relationship Quality	0.199	0.142	0.150	1.401	0.165
	Project Type	0.112	0.292	0.040	0.383	0.703
	Relationship Quality x Project Type	0.196	0.275	0.076	0.712	0.479

a. Dependent Variable: Overall Project Success

Model summary – moderation Mechanic Org. Design

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
1	0.155[a]	0.024	0.015	1.369	0.024	2.565	1	104	0.112
2	0.191[b]	0.037	0.008	1.400	0.013	0.666	2	102	0.516

a. Predictors: (Constant) Mechanic Org. Design
b. Predictors: (Constant), Mechanic Org. Design, Project Type, Mechanic Org. Design × Project Type

Anova– moderation Mechanic Org. Design

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.996	1	4.996	2.565	0.112[b]
	Residual	202.561	104	1.948		
	Total	207.557	105			
2	Regression	7.607	3	2.536	1.294	0.281[c]
	Residual	199.95	102	1.960		
	Total	207.557	105			

a. Dependent Variable: Overall Project Success
b. Predictors: (Constant), Mechanic Org. Design
c. Predictors: (Constant), Mechanic Org. Design, Project Type, Mechanic Org. Design × Project Type

Regression coefficients– moderation Mechanic Org. Design

Model[a]		β	SE	Std. β	t	Sig.
1	(Constant)	5.406	0.136		39.879	0.000
	Mechanic Org. Design	- 0.151	0.094	- 0.155	- 1.602	0.112
2	(Constant)	5.378	0.140		38.468	0.000
	Mechanic Org. Design	- 0.178	0.098	- 0.184	- 1.826	0.071
	Project Type	- 0.260	0.288	- 0.091	- 0.905	0.368
	Mechanic Org. Design x Project Type	- 0.168	0.204	- 0.081	- 0.823	0.413

a. Dependent Variable: Overall Project Success

Model summary – moderation Organic Org. Design

Model	R	R^2	Adj. R2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change
1	0.147[a]	0.022	0.012	1.397	0.022	2.298	1	104	0.113
2	0.215[b]	0.046	0.018	1.393	0.025	1.314	2	102	0.273

a. Predictors: (Constant) Organic Org. Design
b. Predictors: (Constant), Organic Org. Design, Project Type, Organic Org. Design × Project Type

Anova– moderation Organic Org. Design

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.470	1	4.470	2.289	0.133[b]
	Residual	203.086	104	1.953		
	Total	207.557	105			
2	Regression	9.571	3	3.190	1.644	0.184[c]
	Residual	197.986	102	1.941		
	Total	207.557	105			

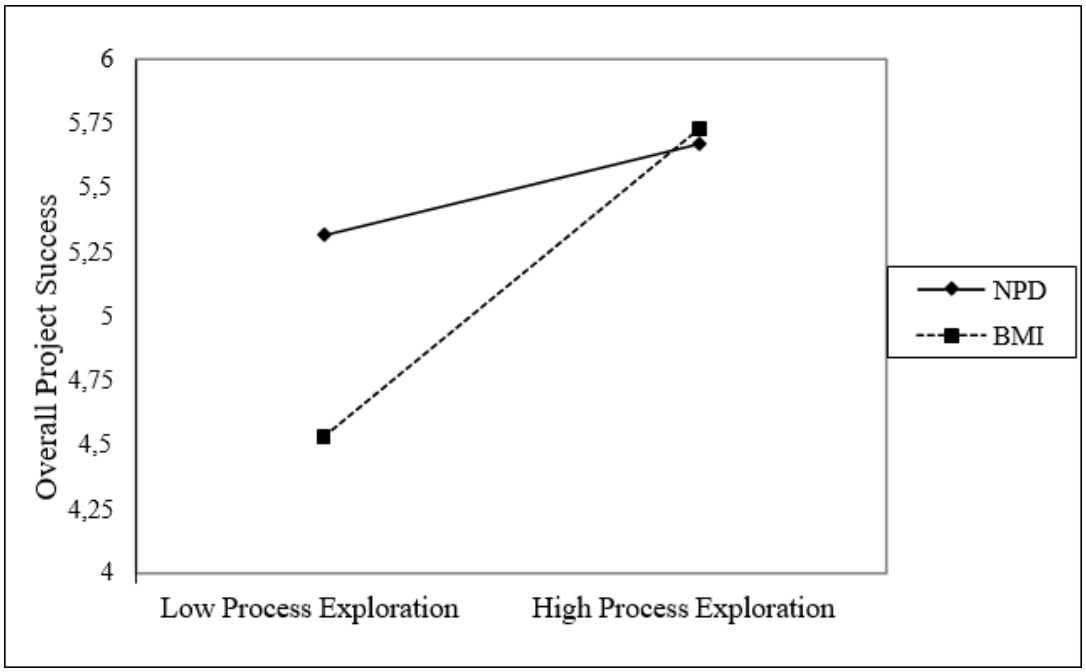
a. Dependent Variable: Overall Project Success
b. Predictors: (Constant), Organic Org. Design
c. Predictors: (Constant), Organic Org. Design, Project Type, Organic Org. Design × Project Type

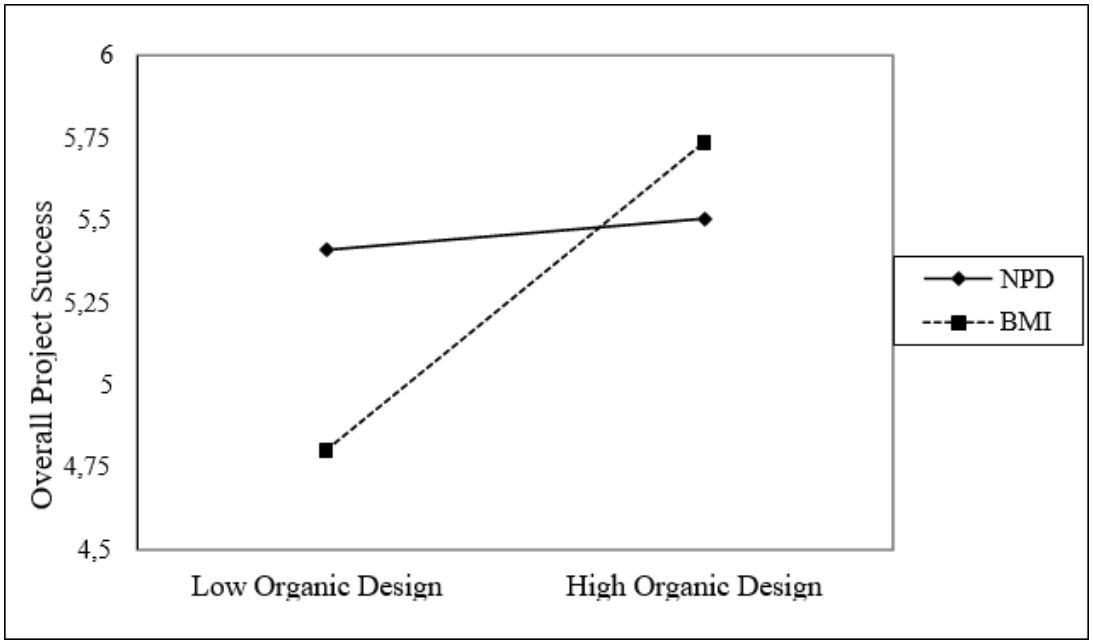
Regression coefficients– moderation Organic Org. Design

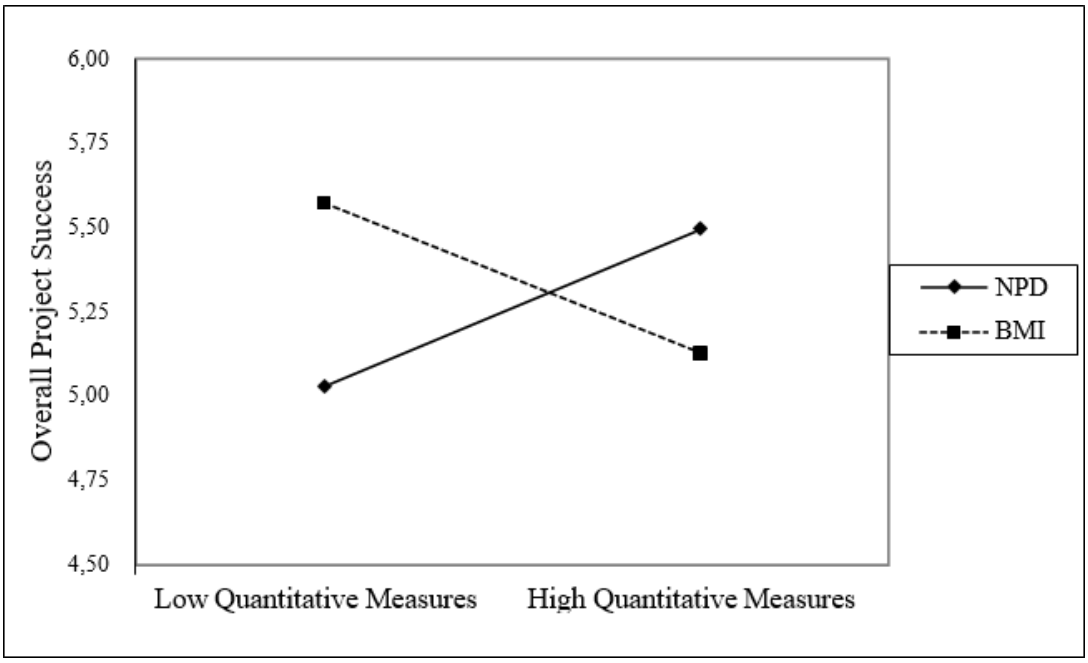
Model[a]		β	SE	Std. β	t	Sig.
1	(Constant)	5.406	0.136		39.827	0.000
	Organic Org. Design	0.168	0.111	0.147	1.513	0.133
2	(Constant)	5.382	0.136		39.521	0.000
	Organic Org. Design	0.175	0.111	0.153	1.574	0.118
	Project Type	- 0.188	0.279	- 0.066	- 0.676	0.501
	Organic Org. Design x Project Type	0.341	0.227	0.146	1.503	0.136

a. Dependent Variable: Overall Project Success

Appendix U: Scatterplots Moderation Effect






6,00
5,75
5,50
5,25
5,00
4,75
4,50
Overall Project Success
Low Quantitative Measures
High Quantitative Measures
NPD
BMI