Beyond the Obvious:
Understanding and Integrating Producer-led and User-led Innovation Paradigms from New Perspectives

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Summary

Innovation is key to ensuring sustained performance, generating economic growth, and driving progress – not only for individual organizations but also for societies as a whole. Yet, globalization, rapid technological change, and advances in information and communication technologies have turned innovation from an exclusive province of producers into a multilayered sphere that equally encompasses established manufacturing firms and entrepreneurs, as well as open collaboration communities and innovating end users. Hence, the traditional producer-led innovation paradigm is increasingly complemented and contested by a user-led counterpart. To understand the intricacies of this paradigm shift and successfully manage innovation efforts, both, from an organizational and a national level, management and policy makers are in dire need of new perspectives and differentiated insights into the two innovation paradigms, and especially their key drivers.

Scientific research has greatly contributed to this quest by extensive investigations of internal and external drivers of organizational innovation, as well as person-related drivers of user innovation. But findings of central drivers are inconclusive and key areas for drivers, for example user innovators' work environment, remain largely unexplored. Building on the conceptual distinction between producer-led and user-led innovation that frames today's scientific and managerial discourse, this thesis is dedicated to the identification of central innovation drivers and the investigation of potentially arising interactions between the two paradigms. Specifically, to follow up on research gaps and provide new insights, organizational-level and individual-level resource-based theories are employed and two empirical studies on selected drivers of producer- and user-led innovation are conducted. Both studies extend traditional views on innovation in the two innovation paradigms and advance research by introducing *new perspectives* that explore *beyond the obvious*.

First, study 1 investigates leadership as a key driver of innovation in the producer-led innovation paradigm by adopting a cross-dimensional perspective that combines innovation and efficiency performance dimensions. The study theoretically introduces and empirically analyzes newly developed scales of dual innovation leadership, a new leadership approach tailored to the unique requirements of the innovation process. Results of structural equation modeling with data from 194 executives of organizational units collected at two points in time empirically

substantiate evidence that dual innovation leaders ensure sustainable organizational performance, and hence advance producer-led innovation. With regard to the user-led innovation paradigm, study 2 identifies user innovators' work environment as a key driver of innovation and adopts a cross-domain perspective that bridges user innovators' home and work sphere. Specifically, study 2 advances research by investigating a largely unexplored area and corroborating the notion of resource spillovers between different domains. Based on data of 147 work-inspired consumer innovators and three independent raters, results of structural equation modeling show that consumer innovators build job-related resources from their work environment that enhance the outcome of their household sector innovation efforts in terms of novelty, general use value, and technical feasibility.

Second, innovation is a resource-intense undertaking and resources are increasingly in short supply. Thus, resource-protecting and mutually beneficial interactions may offer a sustainable approach to manage innovation in the new era of 'dual paradigms'. Combining insights from study 1 and study 2, the thesis therefore illuminates the potential for interactions between the producer and user innovation sphere by elaborating how producer innovators may indirectly support user innovators. Moreover, the thesis exemplarily illustrates how (dual innovation) leadership targeted to producer-led innovation can foster cross-fertilization between the two paradigms by equally enhancing user-led innovation. To this end, an integrative perspective on the two paradigms is introduced.

With these comprehensive, yet differentiated insights on key drivers and their interactions in producer- and user-led innovation, the thesis extends the scientific state of knowledge and suggests important implications for future research. Moreover, the thesis provides management and policy makers with a valuable guiding framework that may support innovation initiatives targeted to the successful realization of innovation endeavors and, hence, the fostering of economic, as well as societal progress.

Zusammenfassung

Innovation ist der Schlüssel für nachhaltige Wertgenerierung, wirtschaftliches Wachstum und Fortschritt – sowohl für einzelne Unternehmen als auch ganze Gesellschaften. Die Globalisierung, der rasante technologische Wandel, sowie neue Entwicklungen im Bereich der Informations- und Kommunikationstechnologien stellen die Alleinstellung von Produzenten[1] als Innovationsgeneratoren allerdings zunehmend in Frage. Innovation umfasst heute ein facettenreiches Tätigkeitsfeld, in dem langjährig etablierte Anbieter und Unternehmen wie auch offene Innovationsgemeinschaften und innovierende Endkonsumenten in gleichen Maßen aktiv sind. Entsprechend sieht sich das traditionelle produzentenzentrierte Innovationsparadigma zunehmend von einem nutzerzentrierten Ansatz komplementiert und herausgefordert. Um die Feinheiten dieses Paradigmenwechsels zu verstehen und zukünftige Innovationsbestrebungen erfolgreich zu realisieren, sind Unternehmenspraxis und Politik zwingend auf neue Perspektiven und differenzierte Erkenntnisse in Bezug auf die zwei Innovationsparadigmen, und im Speziellen auf ihre zentralen Treiber, angewiesen.

Bisherige Forschungsarbeiten haben fundierte Erkenntnisse im Hinblick auf externe und interne Treiber organisationaler Innovativität, als auch personenbezogene Treiber von Nutzerinnovativität generiert. Ungeachtet dessen sind wissenschaftliche Erkenntnisse zu einzelnen Treibern jedoch widersprüchlich und zentrale Bereiche, wie beispielsweie die Arbeitsumgebung von Nutzinnovatoren, bislang unzulänglich erforscht. Vor diesem Hintergrund widmet sich die vorliegende Dissertation der Identifizierung zentraler Innovationstreiber sowie der Erforschung möglicher Interaktionen zwischen den zwei Innovationsparadigmen. Im Speziellen baut die Dissertation auf organisational- und individual-fokussierten Ressourcentheorien auf und umfasst zwei empirische Studien zu ausgewählten Treibern produzenten- und nutzerzentrierter Innovation, um Lücken in bisherigen Forschungsarbeiten zu schließen und neue Erkenntnisse zu generieren. Beide Studien erweitern dabei den wissenschaftlichen Kenntnisstand hinsichtlich Innovationsparadigmen „*beyond the obvious*“ durch die Einführung neuer Perspektiven auf Schnittstellen.

[1] Aus Gründen der besseren Lesbarkeit werden bei Personenbezeichnungen weibliche und männliche Formen nicht unterschieden.

Im Einzelnen untersucht Studie 1 Führung als zentralen Treiber des produzentenzentrierten Innovationsparadigmas und verwendet hierzu eine interdimensionale Perspektive, die die Leistungsindikatoren Innovation und Effizienz miteinander verknüpft. Zu diesem Zweck führt die Studie einen neuen Führungsansatz, Dual Innovation Leadership, theoretisch ein und überprüft dessen neuentwickeltes Konstrukt empirisch anhand von Strukturgleichungsanalysen. Die Ergebnisse der Analysen, die auf einer Datengrundlage von 194 Geschäftsbereichsmanagern und zwei Messzeitpunkten beruhen, zeigen, dass „Dual Innovation" Führungskräfte die organisationale Leistung ihrer Geschäftsbereiche nachhaltig steigern und entsprechend (produzentenzentrierte) Innovation vorantreiben. Im Hinblick auf das nutzerzentrierte Innovationsparadigma identifiziert Studie 2 die Arbeitsumgebung als Innovationstreiber mit Hilfe einer bereichsübergreifenden Perspektive, die Arbeits- und Privatbereich von Nutzerinnovatoren miteinander verknüpft. Die Studie liefert dabei eine systematische Analyse eines weitgehend unerforschten Feldes und belegt fundiert Ressourcen-Spillover Effekte zwischen einzelnen Bereichen. Die Ergebnisse der Strukturgleichungsanalysen, die auf einer Datengrundlage von 147 innovierenden Endkonsumenten und drei unabhängigen Bewertenden beruhen, belegen, dass innovierende Endkonsumenten im Zuge ihrer Tätigkeit als Angestellte arbeitsbezogene Ressourcen aufbauen, die sie in die Entwicklung ihrer privathaushaltlichen Innovationen einfließen lassen. Dadurch steigern innovierende Endkonsumenten die Neuheit, den allgemeinen Nutzwert sowie die technische Realisierbarkeit ihrer Innovationen.

Ferner stellt Innovation ein ressourcenintensives Unterfangen dar, das ein systematisches Managen teils knapper werdender Ressourcen erfordert. Ressourcenschonende, beidseitig vorteilhafte Interaktionen zwischen den Innovationsparadigmen könnten daher einen Ansatzpunkt zur nachhaltigen Förderung von Innovation liefern. Aus diesem Grund verknüpft die vorliegende Dissertation die Erkenntnisse der beiden empirischen Studien und beleuchtet Interaktionspotenziale, die durch die indirekte Unterstützung von Nutzerinnovatoren durch Produzenten entstehen. Ferner veranschaulicht die vorliegende Arbeit am Beispiel von Dual Innovation Leadership, wie Führung zu positiven Innovations-Wechselwirkungen beitragen kann, indem Führungskräfte Innovationen gleichermaßen im produzenten- als auch nutzerzentrierten Innovationsparadigma fördern. Diese integrative Perspektive wird insbesondere im Hinblick auf ihren übergeordneten Mehrwert für Unternehmenspraxis und Politik diskutiert.

Die vorliegende Dissertation trägt zu einem umfassenden und gleichermaßen differenzierten Verständnis von zentralen Innovationstreibern und deren Interaktionen in produzenten- und nutzerzentrierter Innovation bei. Sie liefert damit maßgebliche Implikationen für zukünftige Forschung. Darüber hinaus stellt die Arbeit Vertretern von Unternehmenspraxis und Politik einen wertvollen Orientierungsrahmen zur Verfügung, der sie in der erfolgreichen Umsetzung von Innovationsunterfangen und der Förderung des ökonomischen und gesellschaftlichen Fortschritts unterstützen kann.

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Gernsheim, in March 2019 Carmen S. Lukoschek

Content Overview

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AVE	Average Variance Extracted
BCG	Boston Consulting Group
CFI	Confirmatory Fit Index
COR	Conservation of Resources
CR	Composite Reliability
df	Degrees of Freedom
FIML	Full Information Maximum Likelihood
HHS	Household-sector
ICC	Interconstruct Correlation
ICTs	Information and Communication Technologies
JD-R	Job Demands-resources (Model)
LMX	Leader-member Exchange
Ls	Leadership
M	Mean
n.s.	Non-significant
OECD	Organization for Economic Coorperation and Development
OI	Organizational Innovativeness
p	Significance Level
RBV	Resource-based View

R&D	Research and Development
RMSEA	Root Mean Square Error of Approximation
RQ	Research Question
SD	Standard Error
SEM	Structural Equation Modeling
SRMR	Standardized Root Mean Residual
TLI	Tucker-Lewis Lndex
VRIN	Valuable, Rare, Imperfectly Imitable, Non-substitutable
W-HR	Work-home Resources (Model)

1 Introduction

"*The limits of the possible can only be defined by going beyond them into the impossible*"

Arthur A. Clarke (1917 – 2008)

In today's digital era, traditional approaches to innovation are increasingly upended (Harhoff/Lakhani 2016). Globalization, rapid technological change, and highly dynamic market environments have resulted in a world where innovation has turned from being an exclusive province of producers to become the province of societies at large (Baldwin/von Hippel 2011; Stock/von Hippel/Gillert 2016; von Hippel 2017). In addition to competing with established rivals from their own markets, producers must increasingly cope with unexpected and equally unpredictable innovators in the guise of incumbents from other markets, uprising user firms, open collaboration communities, and innovating end users (Bogers/Afuah/Bastian 2010; Chesbrough 2006; von Hippel 2005; West/Lakhani 2008). As a result, the Schumpeterian view of manufacturing firms and entrepreneurs as sole drivers of innovation is in dire need of reconceptualization. In fact, "we are in the middle of a paradigm shift" (Gambardella/Raasch/von Hippel 2017, p. 1463). To understand the intricacies of this shift and successfully manage innovation efforts, new perspectives extending beyond traditional views, hence *perspectives exploring beyond the obvious*, are required.

To this end, this thesis builds on the conceptual distinction between producer- and user-led innovation (Baldwin/von Hippel 2011; Gambardella et al. 2017) and adopts the most recent definition of innovation of the Oslo Manual, a joint publication by the Organization for Economic Cooperation and Development (OECD) and Eurostat dedicated to the coordinated generation of internationally comparable statistics on innovation. According to the Oslo Manual, *innovation* is "a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)." (OECD/Eurostat 2018, p. 20). As Gault (2018) stresses, this definition includes innovation by producers and by users.

Producer innovators are "a single firm or individual anticipating profiting from their designs by selling design information or products based on that 'recipe' to others" (Gambardella et al. 2017, p. 1452). Hence, producer innovators comprise commercial enterprises, service providers, or self-employed entrepreneurs that realize commercial aspirations by identifying and creating customer needs, and selling their novel products and services on the market (Hauser/Tellis/Griffin 2006; Rogers 2010; van der Boor/Oliveira/Veloso 2014). In contrast, *user innovators* are "firms or individual consumers that benefit from using a product or a service they develop" (de Jong/von Hippel 2009, p. 1182). As users typically innovate to satisfy personal, unmet needs, they generally possess perfect need knowledge that places them in a position to develop highly need-suited innovations. In this respect, user innovations are often superior to market-researched products offered by producers (Lüthje/Herstatt/von Hippel 2005; Schreier/Prügl 2008). Yet, user innovations are not primarily developed with commercial aspirations and so only few are diffused in user communities or on the market (de Jong/Gillert/Stock 2018; von Hippel/de Jong/Flowers 2012). If they are, however, user innovations can rival those of producers and equally contribute to societal and economic progress, as elaborated in more detail below (Baldwin/von Hippel 2011; Henkel/von Hippel 2004).

1.1 Practical and Empirical Relevance of the Thesis

Globalization and rapid technological change related to consumer goods and information and communication technologies (ICTs) have not only changed customer needs and habits fundamentally, but also resulted in the advent of unpredicted market competitors (Aggarwal 1999; Calantone/Garcia/Dröge 2003; Xu/Chen/Xie/Liu/Zheng/Wang 2007). For example, when Apple Inc. introduced its first iPhone in 2007, leading mobile manufacturers were not just taken by surprise by its success, but also at an entire loss as to why consumers suddenly demanded a mini computer capable of making calls with only reasonable quality, as opposed to purchasing traditional mobile phones that offered high quality calls and texting features (Ashton 2015). Similarly, Airbnb Inc. blindsided the hotel industry in 2009 when it successfully introduced its B&B-based concept that catered to the diversity of needs and desires of consumers, as opposed to offering a standard range of high quality accommodations (Guttentag 2015). Indisputably, the success of both organizations speaks for itself, with Apple Inc. ranking number one in the Boston Consulting Group's (BCG) latest list of most innovative companies and Airbnb Inc. just missing the top 10 with an eleventh place (BCG 2018).

Against the requirements of highly heterogeneous and changeable customer needs, innovation has become a critical cornerstone to organizations' success. In fact, managers consider sustained performance and long-term survival of today's organizations to critically depend on the

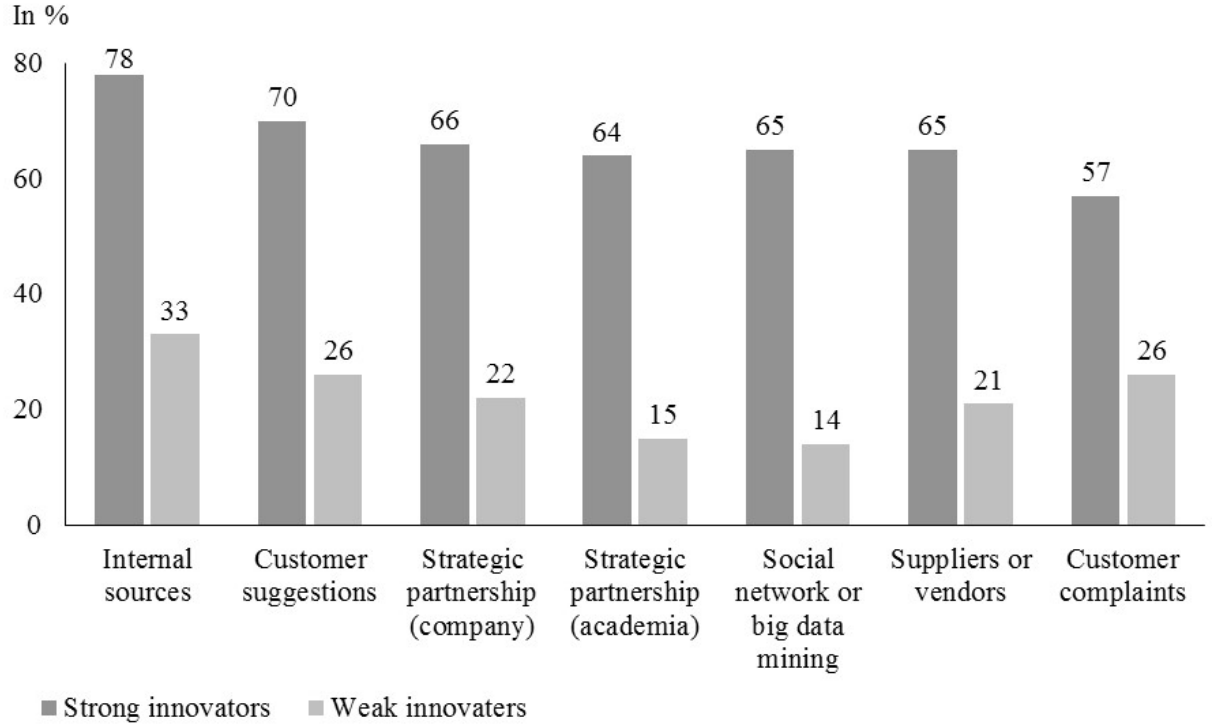
ability to innovate and innovate the right ideas at the right time (Stock 2011; Yuan/Woodman 2010). In accordance with this, 79% of executives surveyed in a special issue on leadership listed innovation as one of their top three strategic priorities – the highest rating since the global survey was first conducted (BCG 2015). But despite this general consensus regarding the importance of innovation, innovation continues to be more of a trial-and-error experiment that encompasses high failure rates and short-lived successes as opposed to a structured process (Cooper/Edgett/Kleinschmidt 2004; Morris/Abrams/de Moura/Durlach 2003). Hence, gaining a profound understanding of central and reliable drivers of organizational innovation to reap its considerable benefits remains a topic of key interest for managers.

Yet, the benefits of innovation are not restricted to innovating organizations alone, but are also shared by societies (Ahlstrom 2010; Baumol/Strom 2007). As economic investigations of innovation demonstrate, increased innovation results in economic growth, raises national wealth, and reduces poverty (Du/O'Connor 2018; McMullen 2011; Urbano/Aparicio/Audretsch 2018). Specifically, innovating organizations' investments in infrastructure and resources raise employment levels and contribute to economies' GDP, which, in turn, enhances social welfare (Ahlstrom 2010; Baldwin/von Hippel 2011; Baumol/Strom 2007). Moreover, innovation generates immediate benefits through advancements in technology, medicine, or leisure-related activities that increase living standards for all members of a society (Harhoff/Lakhani 2016; von Hippel 2017). Thus, gaining a better understanding of innovation drivers to successfully foster innovation activities has also become a central topic for policy makers.

Increasingly, this interest is expanded to user innovators, who have been shown to make significant contributions with their innovations (Franke/Shah 2003; Lettl/Herstatt/Gemünden 2006; Riggs/von Hippel 1994). For example, studies comparing user-led to producer-led innovation reveal that users' innovation projects may compete with those of organizations, both in terms of expenditure and width of innovation fields covered (de Jong 2013; de Jong/von Hippel/Gault/Kuusisto/Raasch 2015; Kim 2015; von Hippel et al. 2012; von Hippel/Ogawa/de Jong 2011). Moreover, although diffusion of user innovations is low, studies demonstrate that innovations by users may complement and even rival those of producers (de Jong 2016; von Hippel et al. 2012). While this leads to more diverse product offerings for societies, competition between user- and producer-generated innovations can also increase price pressure and encourage enhancements to the quality of producer products in the long run (Gambardella et al. 2017). As a result, it is of vital importance for policy makers aiming to foster innovation and sustain national economies to complement their producer-focused innovation initiatives by nurturing and enhancing user-led innovation.

The importance of alternative sources of innovation is also recognized by organizations, who increasingly face resource shortages, particularly with regard to skilled personnel and knowledge (Berchicci 2013; Köhler/Sofka/Grimpe 2012; Tarique/Schuler 2010; Vaiman/Scullion/Collings 2012). As a consequence, organizations draw more and more on external sources for the generation of new innovation projects and ideas. In fact, strong innovators substantially rely on strategic partnerships with other companies and academia, but also increasingly on customer suggestions and social networks as a global survey among leading organizations reveals (see Figure 1-1, adapted from BCG 2016). In addition, studies highlight that incumbents, as for example, Lego or Muji (Antorini/Muniz/Askildsen 2012; Nishikawa/Schreier/Ogawa 2013), even actively seek the support of (lead) user innovators for the development of new products (Franke/Piller 2004; Füller/Hutter/Faullant 2011; von Hippel/Katz 2002; West/Lakhani 2008). However, reliable determinants of collaboration success that hold for a variety of organizations and industries remain to be uncovered. Accordingly, it is in the interest of both, management and policy makers, to identify areas and mechanisms for how producer- and user-led innovation may interact or even benefit from cross-fertilization. In order to do so, management and policy makers require a deeper understanding of the central drivers of producer- and user-led innovation and, subsequently, their interrelations.

Figure 1-1: The Importance of Alternative Sources of Innovation for Organizations (adapted from BCG 2016)



Notes: Numbers indicate % of innovators, who responded that new ideas and projects generally come “often” and “very often” from the indicated source.

Against this background of prevalent interest from managers and policy makers, scientific research has a long tradition of studying the phenomenon of innovation. Building on the seminal work of Schumpeter on creative destruction and entrepreneurship, innovation research has been primarily devoted to the study of producer-led innovation (Harhoff/Lakhani 2016). More recently, this field has been complemented by von Hippel and his colleagues with a stream on user-led innovation and the introduction of a user-led innovation paradigm (Baldwin/von Hippel 2011; von Hippel 2005).

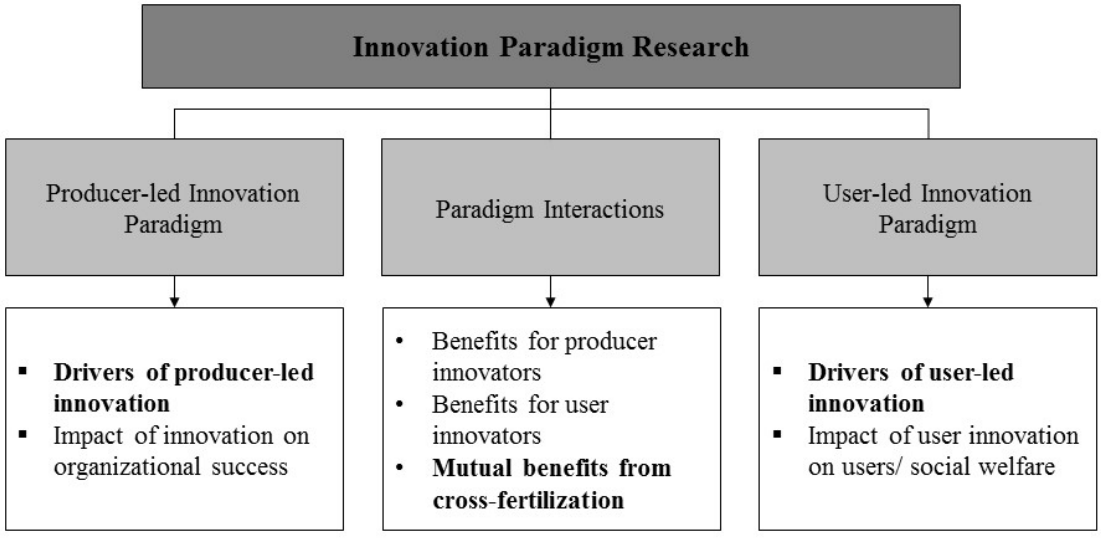
With regard to the producer-led stream, research has extensively investigated the effects of innovation on organizations' success, highlighting its potential to increase market shares and growth, contribute to competitive advantages, enhance performance, and ensure long-term survival (Banbury/Mitchell 1995; Hult/Hurley/Knight 2004; Jansen/van den Bosch/Volberda 2006; Love/Roper/Bryson 2011; Roberts/Amit 2003). In addition, a significant amount of research is devoted to uncovering its drivers (Anderson/Potočnik/Zhou 2014; Damanpour 1991; Hauser et al. 2006). For example, empirical studies have identified a variety of drivers, including strategic networks, availability of resources, strategy, culture, or leadership (Büschgens/Bausch/Balkin 2013; Dhanarag/Parkhe 2006; He/Wong 2004; Mumford 2000; Stock/Totzauer/Zacharias 2013b). Owing to the fact that it is leaders who decide upon resource investments and encourage innovation-related behaviors among employees, leadership has been ascribed a, if not the central role in driving organizational innovation (Amabile/Conti/Coon/Lazenby/Herron 1996; Mumford/Scott/Gaddis/Strange 2002; Rosing/Frese/Bausch 2011). Yet, the results of multiple studies on individual leadership approaches' impact on innovation remain heterogeneous and partially contradictory (Denti/Hemlin 2012; Kesting/Ulhøi/Song/Niu 2015; Rosing et al. 2011), emphasizing that no single best leadership approach has yet been identified. In light of the central importance of leadership in driving innovation, this shortcoming calls for a *new perspective* on *leadership* that extends the unidimensional focus on innovation and systematically contributes to the exploration of new leadership approaches.

With regard to the user-led stream, considerable research has been devoted to the benefits of user innovations for users and social welfare (de Jong et al. 2015; Gambardella et al. 2017; Henkel/von Hippel 2004). In contrast, comprehensive approaches investigating its drivers are still in the early stages. However, several empirical studies have identified person-related drivers, particularly gender, personality, and motives (de Jong 2013; Jeppesen/Frederiksen 2006; Stock et al. 2016). Moreover, studies have selectively shed light on drivers related to user innovators' external environment, for example, user innovators' involvement in communities or collaboration with companies (Franke/Shah 2003; Henkel 2008; Prügl/Schreier 2006). Nonetheless, due to the predominant focus on user innovators' home domain as innovation sphere, a

systematic investigation of external drivers, and specifically user innovators' work environment, is still missing. External drivers that can be actively shaped through initiatives and policies, however, constitute a central lever in managers' and policy makers' attempts to foster user-led innovation. As a result, a *new perspective* capable of spanning user innovators' home and work domains is required to systematically explore the *work environment* as a driver of user-led innovation.

Finally, a comparatively new stream in innovation research has devoted itself to shedding light on potential interactions between the producer- and user-led innovation paradigm (Baldwin/von Hippel 2011; Gambardella et al. 2017; West/Bogers 2013). Drawing on earlier research from the field of organizational innovation, much of this work focusses on user innovators' contributions to producer-led innovation. To a lesser extent, this work has begun to illuminate the opposite side and to identify interactions in which producers invest resources to support user-led innovation activities (Füller et al. 2011; West/Lakhani 2008). Yet, innovation is a resource intense undertaking for innovators in both paradigms and resources are increasingly in short supply. An alternative approach to view interactions between the two innovation paradigms may therefore lie in focusing on interactions based on indirect resource investments, i.e., interactions in which one side benefits without explicit investments of the other side. Moreover, instead of assessing the value of interactions unilaterally, investigating areas capable of fostering cross-fertilization between the two paradigms may offer a more sustained approach. To successfully pinpoint and design such mutually beneficial interactions, a new, *integrative perspective* on drivers of the two innovation paradigms is needed. Figure 1-2 summarizes the three research streams of innovation paradigms and highlights major gaps.

Figure 1-2: Streams in Scientific Research of Innovation Paradigms



Notes: Major gaps highlighted in bold.

1.2 Major Goals of the Thesis

In light of innovation's key role in determining organizations' success, shaping economic growth, and enabling societal progress, it is of vital importance for management and policy makers to reliably identify critical drivers of innovation and gain a profound understanding of the interrelations between producer- and user-led innovation efforts. Scientific research has greatly contributed to this quest by substantiating the importance of both innovation paradigms and shedding light on a broad variety of innovation drivers. Nonetheless, the question remains what the *central* drivers are and if they may *link* the two innovation paradigms.

In order to address these critical gaps of previous research, this thesis builds on resource-based theories and seeks to make two central contributions with the aid of two empirical studies (Chapter 3 and 4) and an overarching discussion (Chapter 5) that introduce *new perspectives to explore beyond* what has traditionally been studied. Figure 1-3 provides an overview of the two central contributions and the major goals of this thesis.

Figure 1-3: Central Contributions of the Thesis

Contribution 1	**Identify Central Drivers of the Innovation Paradigms**	
	Study 1: Producer-led innovation paradigm	Study 2: User-led innovation paradigm
	Combine insights from leadership for innovation and ambidexterity theory to investigate dual innovation leadership as a driver of producer-led innovation.	Combine insights from user innovation literature and conservation of resources theory to investigate the work environment as a driver of user-led innovation.
Contribution 2	**Elucidate Interactions between the Innovation Paradigms**	
	Study 2: User-led innovation paradigm	Overarching discussion
	Investigate interactions between the paradigms by focussing on spillover effects from user innovators' work environment to HHS innovations.	Discuss the importance of leadership for cross-fertilization between the paradigms.

First, the thesis seeks to provide more nuanced insights and generate a profound understanding of selected central drivers of the two innovation paradigms. Hence, the thesis' *first contribution* is:

(1) *Identification of central drivers of the producer- and user-led innovation paradigms.*

To this end, study 1 combines insights from literature on producer-led innovation and organizational-level resource-based theories (Gibson/Birkinshaw 2004; Tushman/O'Reilly 1996) to develop a *cross-dimensional perspective* on leadership. Theoretically introducing and empirically investigating a new leadership approach that is specifically tailored to innovation, i.e., dual innovation leadership (Lukoschek/Gerlach/Stock/Xin 2018), the study substantiates support for leadership's positive effect on sustainable organizational innovation. Complementing these insights, study 2 merges literature on user-led innovation and individual-level resource-based theories (Hobfoll 1998; 2001) to introduce a *cross-domain perspective* on user innovators. In particular, study 2 empirically confirms user innovators' work environment as a driver of household-sector (HHS) innovations, i.e., consumer products that have been developed or modified by individual consumers during unpaid discretionary time at private costs for their own benefit (Gault 2018; von Hippel et al. 2012).

Second, based on the profound understanding of selected central drivers, the thesis aims to shed light on interactions between the two innovation paradigms in order to aid management and policy makers in uncovering promising hotbeds for cross-fertilization. Thus, the thesis' *second contribution* is:

(2) *Elucidation of interactions, especially the potential for cross-fertilization, between the producer- and user-led innovation paradigms*.

First, by focusing on the contribution of the work environment to HHS innovation in the home domain, study 2 solidifies the notion that producer and user innovation sphere may interact and expands insights with the investigation of a new type of interaction. Specifically, the study generates support for the notion of resource transferability between different domains and substantiates evidence for producer innovators' ability to indirectly contribute to user-led innovation. Building on these insights, the thesis' overarching discussion of implications then adopts an *integrative perspective* on the two paradigms and combines insights on leadership from study 1 with insights on the work environment from study 2 to exemplarily discuss how leadership targeted to producer-led innovation may foster cross-fertilization between the two innovation paradigms by equally enhancing user-led innovation.

In order to realize these overarching contributions, the thesis is structured as follows. Having elaborated the relevance of the thesis for management, policy makers, and scientific research

(Section 1.1) and derived major research goals (Section 1.2), the theoretical framework of the thesis is next presented in chapter 2. Here, core concepts of innovation, relevant to the empirical studies of chapter 3 and 4, and the two innovation paradigms are elaborated (Section 2.1). Analogous to the thesis' separate discussion of the two innovation paradigms, an overview of organizational- and individual-level resource-based theories follows (Section 2.2). Next, the state of scientific research on innovation drivers in the respective paradigms is presented on basis of a comprehensive literature review (Section 2.3). In connection with this, critical research gaps are identified and key research questions derived (Section 2.4). Subsequently, these questions are addressed in study 1 and 2 (Chapter 3 and 4). The thesis concludes with a discussion of its overarching implications, specifically highlighting potentials for cross-fertilization between the two paradigms in chapter 5. In connection with this, avenues for future research (Section 5.1) and contributions to management and policy makers (Section 5.2) are elucidated.

2 Theoretical Framework

2.1 Conceptual Foundations of Innovation

Innovation is a complex and highly heterogeneous phenomenon that is observable at multiple levels of analysis, from individuals to entire organizations (Anderson et al. 2014). Accordingly, various definitions of the concept have been introduced by research over time, mirroring its multifacetedness as well as its evolution within the two innovation paradigms. In a first step, section 2.1.1 presents central definitions of innovation, highlights common denominators and presents a systematic classification to support the categorization of the thesis' main studies. Next, the conceptual foundations of the two innovation paradigms (Section 2.1.2) are presented and their potential interactions (Section 2.1.3) discussed.

2.1.1 Definitional Foundations of Innovation

From an etymological perspective, innovation stems from the Latin word *innovare*, a combination of *in-* (in or into) and *novare* (make new) that translates into "to renew, alter, or introduce as new" (Onions/Friedrichsen/Burchfield 1966). Broadly defined, innovation encompasses the successful generation and implementation of new ideas (Anderson et al. 2014; Kanter 1988; Shalley/Zhou 2008; West/Farr 1990). Innovation thus differs critically from creativity that is restricted to the suggestion of creative ideas and lacks their subsequent realization (Amabile 1982; Oldham/Cummings 1996). While research generally agrees on the distinction between creativity and innovation (Amabile et al. 1996; De Dreu 2006; Shalley/Zhou/Oldham 2004), various definitions of innovation continue to exist in parallel, contributing to the concept's ambiguity (Anderson et al. 2014; Garcia/Calatone 2002).

Fundamentally, innovation literature distinguishes two major streams: an *outcome-oriented* and a *process-oriented* (also referred to as activities-oriented) *perspective* (Garcia/Calatone 2002; OECD/Eurostat 2018). In the former, innovation is the outcome of supportive activities and resource investments that result in some form of value generation (Garcia/Calatone 2002; Li/Atuahene-Gima 2001). In the latter, innovation is conceived as a process that encompasses

several separate activity stages from idea generation to idea implementation (Edgerton 2004; Rogers 2010). As the chronological overview in Table 2-1 exemplifies, early definitions of innovation tended to adopt either an outcome- (Li/Autuahene-Gima 2001) or a process-oriented perspective (Damanpour 1991; Kanter 1983; Schumpeter 1934). In contrast, more recent conceptualizations show a tendency to build on West/Farr's (1990) seminal definition and combine both perspectives (Anderson et al. 2014; Austin/Devin/Sullivan 2012; Birdi/Leach/Magadley 2016; Crossan/Apaydin 2010). Among these conceptualizations, some definitions, as for example those by Stock (2011) and Stock/Zacharias (2011), even highlight their combinatorial foundation by employing the term *innovativeness* (as opposed to innovation), which comprises the ability of an organization to equally engage in innovative processes and develop innovative outcomes.

Table 2-1: Selected Definitions of Innovation

Perspective	Author(s)	Definition	Focus of the Definition
Outcome-oriented	Li/Atuahene-Gima (2001, p. 1124)	Innovation "refers to a new product that an organization has created for the market; it represents the commercialization of an invention, where invention is an act of insight."	Focusses on products and their monetary value.
Process-oriented	Schumpeter (1934, p. 88)	"Innovation combines factors in a new way."	Focusses on activity of combining.
	Kanter (1983, p. 20)	Innovation "refers to the process of bringing any new, problem-solving idea into use. […] Innovation is the generation, acceptance, and implementation of new ideas, processes, products, or services. It can thus occur in any part of a corporation, and it can involve creative use as well as original invention."	Focusses primarily on innovation activities.
	Damanpour (1991, p. 556)	Innovation "is defined as adoption of an internally generated or purchased device, system, policy, program, process, product, or service that is new to the adopting organization."	Focusses on activity of adoption.
Combined	West/Farr (1990, p. 9)	Innovation is "the intentional introduction and application within a role, group or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to systematically benefit the individual, the group, organization or wider society."	Focusses on activity of implementation and the resulting benefits.
	Crossan/ Apaydin (2010, p. 1155)	Innovation "is: production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems. It is both a process and an outcome."	Focusses on innovation activities and their value generation.

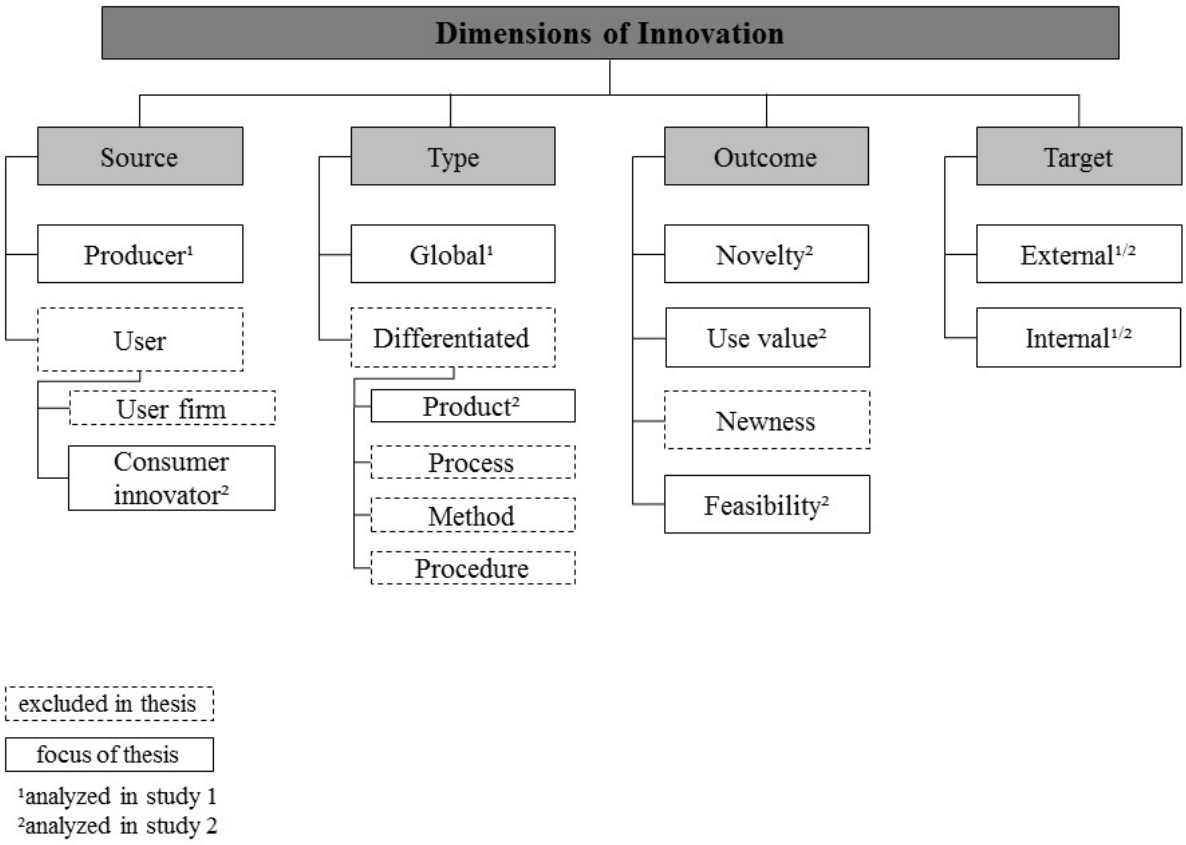
Perspective	Author(s)	Definition	Focus of the Definition
Combined (cont.)	Stock (2011, p. 814)	Innovativeness is "a company's ability to generate a range of goods or services that are new and meaningful to customers and that differ from existing alternatives."	Focusses on ability to innovate and the resulting value generation.
	Stock/Zacharias (2011, p. 873)	Innovativeness is "defined as the degree of newness and value of a company's new product program and the frequency of its new product introductions."	Focusses on process of product introductions and their value.
	Austin/Devin/ Sullivan (2012, p. 1508)	Innovation is "an activity intended to create original, beneficial outcomes."	Focusses on activity and benefits perspective.
	Anderson/ Potočnik/Zhou (2014, p. 1298)	Innovation "at work [is] the process, outcomes, and products of attempts to develop and introduce new and improved ways of doing things. The creativity stage of this process refers to idea generation, and innovation refers to the subsequent stage of implementing ideas toward better procedures, practices, or products. […] [I]nnovation can occur at the level of the individual, work team, organization, or at more than one of these levels combined but will invariably result in identifiable benefits at one or more of these levels of analysis."	Focusses on innovation activities and their value generation.
	Birdi/Leach/ Magadley (2016, p. 19)	Innovation is "the intentional generation and introduction of potentially useful new ideas, products, services, and ways of working into roles, groups, organizations, and society […]."	Focusses on activity and benefits perspective.
Holistic	OECD/Eurostat (2018, p. 20)	Innovation is "a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)."	Focusses on product and process perspective encompassing producer and user innovators

Bearing the advancement of the user innovation paradigm in mind, it remains striking that none of the more recent definitions, however, explicitly acknowledge users as potential sources of innovation. Although the definition of Crossan/Apaydin (2010) may be interpreted to include the wider society as a source for innovations, producers decidedly remain the definitions' main addressees. In an attempt to extend the various (producer-centered) definitions of innovation by integrating the phenomenon of user-led innovation, Gault (2012; 2018) has suggested to broaden the definition in the Oslo Manual by the OECD and Eurostat from 2005. Specifically, he stresses the importance of including "firms, public institutions, non-profit institutions serving households, and households (including individuals)" (2018, p. 618) as potential sources of

innovation, thus suggesting a holistic perspective on innovation. Following this recommendation, the Oslo Manual's latest definition now includes both, innovations by producers and by users (OECD/Eurostat 2018). As a result of this thesis' focus on producer-led and user-led innovation, the thesis thus adopts it as its definitional basis.

Moreover, building on the definitions of Table 2-1 as well as extant research on categorizing innovation (Anderson et al. 2014; Crossan/Apaydin 2010; Garcia/Calatone 2002), the thesis differentiates four dimensions of innovation that are relevant to its subsequent chapters. Specifically, the four dimensions help to systematically categorize the two innovation studies of chapter 3 and chapter 4 of the thesis and to position them within the producer- and user-led innovation paradigms presented in section 2.1.2. Figure 2-1 depicts the four dimensions and highlights the individual factors relevant to this thesis.

Figure 2-1: Differentiating Dimensions of Innovation



Central to this thesis is, first and foremost, the conceptual distinction between producer- and user-led innovation. Accordingly, two *sources* of innovation, i.e., producers and users, are distinguished. In study 1 (Chapter 3), a producer-centered view is adopted that investigates how

organizational-level drivers (i.e., leadership of executives of organizational units with profit-and-loss responsibility) foster producer-led innovation. By contrast, in study 2 (Chapter 4), a user-centered view is adopted that focusses on consumer innovators as a subcategory of user innovators. Consumer innovators are users who develop "a functionally novel product, service, process or application […] at private cost in their unpaid discretionary time" (de Jong et al. 2018, p. 487). Critically, consumer innovators do not innovate for commercial aspirations, although they may later choose to share their innovations for free, found a start-up, or collaborate with existing firms (de Jong et al. 2015; von Hippel et al. 2011; 2012). Specifically, study 2 investigates how individual-level drivers (i.e., the work environment of consumer innovators) fosters HHS innovation.

Second, innovations may be differentiated with regard to their *type*, i.e., whether the innovation is a new or significantly improved product (good or service), process, method, or procedure (Damanpur 1991; De Dreu 2006; Johannessen/Olsen/Lumpkin 2001; Kline/Rosenberg 2010). Particularly for organizations, internal innovations related to more efficient and effective processes, methods, and procedures have become increasingly valuable in the battle to gain and maintain competitive advantages and survive in the face of constant change (Pisano 1997; Vivero 2002; Wong/Lee/Foo 2008). Accordingly, study 1, with its focus on producer-led innovation, assesses innovation at a global level by investigating the impact of leadership on all four innovation types.[1] By way of contrast, study 2 assesses HHS innovation among consumer innovators. Hence, the analysis adopts a differentiated perspective that focusses exclusively on products (goods and services).

Third, innovations vary with regard to their *outcome*. Traditionally, novelty and use value/utility of an innovation are distinguished (Amabile/Barsade/Mueller/Staw 2005; Poetz/Schreier 2012; Stock/Oliveira/von Hippel 2015). Regarding the former, research on new product development differentiates between incremental and radical innovations, although the two are increasingly viewed as opposite ends of a single continuum than oppositional categories (Subramaniam/Youndt 2005; Szymanski/Kroff/Troy 2007). Regarding the latter, two different per-

[1]The global assessment of organizations' propensity to innovate is also referred to as *organizational innovativeness* (OI) (Lumpkin/Dess 1996; Stock 2011; Subramanian/Nilakanta 1996). Researchers of OI restrict the term *innovation* to refer to the outcomes of the innovation process (Garcia/Calatone 2002; Ruvio/Shoham/Vigoda-Gadot/Schwabsky 2013). Hence, study 1, which assesses organizational units' ability to innovate with regard to products, processes, methods, and procedures adopts the terminology of organizational unit innovativeness.

spectives are assessed in the literature depending on rater characteristics. If self-ratings by innovators are collected, personal use value is commonly assessed; if external, third-party raters are employed, general use value is commonly assessed (de Jong et al. 2018; Stock et al. 2015). Similarly, literature distinguishes between different innovation referents in an attempt to further specify newness of the innovation. For example, an innovation may be new to a customer but already known to the industry, or it may be entirely new to the innovating firm itself (Garcia/Calatone 2002; Zhou/Yim/Tse 2005). Finally, recent studies comparing innovations of users to those of employees have started to include feasibility (i.e., the ease of production or potential for successfully turning an idea into a realizable product) as a fourth outcome dimension (Magnusson 2009; Poetz/Schreier 2012). In sum, with respect to innovation outcome, study 2 of the thesis measures novelty (adopting the continuum view), general use value, and feasibility to investigate the impact of consumer innovators' work environment on the outcomes of HHS innovation efforts.

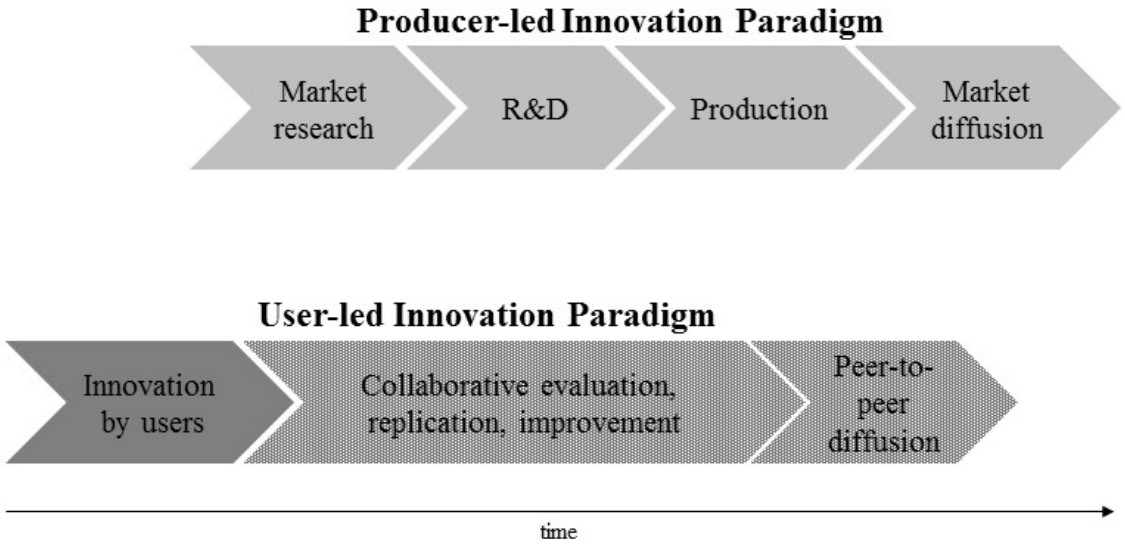
Building on the distinction between producer- and user-led innovation, in the fourth dimension, this thesis differentiates between two major innovation *targets*. Primarily, (producer-led) innovations are developed for external use, i.e., for the diffusion to customers. These customers can either be end consumers (i.e., end users, who consume the innovation) or B2B customers (i.e., other organizations who buy, use and/or modify the innovation) (Stock 2006; Stock/Zacharias 2013). Alternatively, innovations may also be developed for internal use, i.e., for personal or organizational inhouse use (von Hippel 2005). If they are developed for inhouse use, targets may include teams, business units or the organization as a whole. With study 1 set in the producer innovation sphere and study 2 set in the user innovation sphere, the thesis covers both target dimensions. To elaborate these two spheres in more detail, an overview of the producer- and the user-led innovation paradigms follows next.

2.1.2 The Two Innovation Paradigms

Traditional innovation literature builds upon the Schumpetarian view of producers as sources for change and initiators of innovation, emphasizing "it is […] the producer who as a rule initiates economic change, and consumers are educated by him if necessary" (Schumpeter 1934, p. 65). Contesting this view, a wealth of research over the past three decades has shown that users too are a major source of innovation and that, on aggregate, users invest sums comparable to producers into the development of their innovations (Gambardella et al. 2017; Raasch/von Hippel 2012; von Hippel et al. 2012). To reflect this significant addition to the standard economic view, the traditional producer-led innovation paradigm has been complemented by von Hippel and colleagues through the introduction of a user-led innovation paradigm (Baldwin/von

Hippel 2011; Gambardella et al. 2017). Figure 2-2 depicts the central elements of the two paradigms in schematic linear innovation models (Godin 2006).

Figure 2-2: The Two Innovation Paradigms (based on Raasch/von Hippel 2012)



In the *producer-led innovation paradigm*, innovation is regarded as the domain of producers (i.e., organizations or self-employed entrepreneurs) (Gambardella et al. 2017; von Hippel/de Jong 2010). As depicted by the upper arrow in Figure 2-1, the producer-led innovation process encompasses four stages. In the first stage, producer innovators typically conduct market research to identify use needs of potential customers and assess whether the target group is large enough to merit engagement in innovation activities (Hauser et al. 2006; Raasch/von Hippel 2012). If this is the case, producer innovators engage research and development (R&D) departments (stage 2) for the design of new products and services, which are subsequently sent into production (stage 3) (Bush 1945; Godin 2006; Raasch/von Hippel 2012). Finally, innovations are diffused in the market (stage 4) (Stock 2011; Ulrich/Eppinger 2012; Urban/Hauser 1993).

As a fundamental principle, producer-led innovation is not self-rewarding, meaning producers must generate profits from their innovations through compensated transactions (Baldwin/von Hippel 2011; von Hippel 2017). Therefore, diffusion generally does not occur for free in the producer-led innovation paradigm. Instead, producer innovators typically sell or licence their innovations in order to maximise the benefits of their innovation activities and achieve strategic goals (Schumpeter 1942, Teece 2006; von Hippel/de Jong 2010). Moreover, they take consid-

erable care to protect their innovation designs through intellectual property rights and the imposition of high secrecy standards in R&D processes (Arrow 1962; Cohen/Nelson/Walsh 2000; McMullen 2011; Moser 2005; Teece 2000).

Conversely, the *user-led innovation paradigm* maintains that a significant number, if not the majority of innovations is developed by users (i.e., individual consumers and user firms) (de Jong/von Hippel 2009; Riggs/von Hippel 1994; von Hippel 2005). Extant research shows that user innovations cover a range of fields, including clothing, medical equipment, gardening tools, consumer products, vehicles, software, or sporting equipment (de Jong et al. 2015; Habicht/Oliveira/Shcherbatiuk 2012; Ogawa/Pongtalanert 2011; Stock et al. 2016). Typically, user innovations arise when users experience (personal) needs and strive to satisfy these. Because users have perfect need information and knowledge regarding the context of use as well as their capabilities, they frequently perceive opportunities for innovations before producers do - especially for products with functional novelty (Franke/von Hippel/Schreier 2006; Gambardella et al. 2017; Heiskanen/Lovio 2010; Hienerth/von Hippel/Jensen 2014). As depicted by the lower arrow in Figure 2-2, the user-led innovation paradigm therefore generally starts to the left of the producer-led innovation paradigm and encompasses a maximum of three stages.

Upon experiencing a new need or identifying a gap in products offered on the market, user innovators engage in developing a working prototype (Franke/Reisinger 2003; Stock et al. 2016; von Hippel/de Jong 2010). In contrast to producer innovators, user innovators as ‘consumers’ of their own innovations have no need to conduct market research, or to separately engage in R&D and production. Hence, the three stages all collapse into a single stage of innovation development (stage 1) (Raasch/von Hippel 2012). Depending on whether user innovators choose to share their innovations, other user innovators may become involved and collaboratively develop or improve the innovation (stage 2). Moreover, if user innovators choose to (freely) diffuse their innovation peer-to-peer, other consumers may also benefit (stage 3) (Baldwin/von Hippel 2011; Gambardella et al. 2017). Subsequently, this may trigger further collaboration in stage 2. Critically, stage 2 and 3 are optional in the user-led innovation process, because user innovators immediately draw benefits from the development of their innovation (Stock et al. 2015).

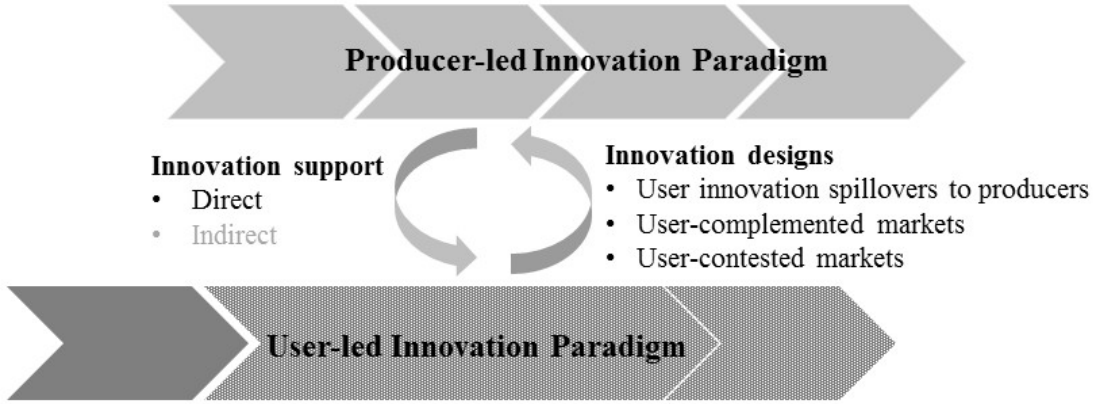
As a result of those immediate benefits, diffusion of user innovations to others (stage 3) poses a considerable challenge. Although roughly 80% of user innovators indicate a willingness to freely reveal innovations, diffusion rates remain low and only about one out of five innovations is successfully adopted by other end consumers (de Jong 2016; de Jong et al. 2015; von Hippel et al. 2012). This is all the more relevant, as extant research stresses that a considerable number of innovations would be of value to other consumers or even organizations as potential B2B

customers (von Hippel 2017; von Hippel et al. 2012). Accordingly, there is ongoing research into mechanism capable of increasing diffusion. In connection with this, successful interactions between the producer-led and user-led innovation paradigm have been identified as a critical lever (Gambardella et al. 2017). Consequently, potentials for interactions between the two paradigms are next discussed.

2.1.3 Interactions Between the Two Innovation Paradigms

Interactions between the producer-led and the user-led innovation paradigms can take two general directions: (1) user innovators may initiate interactions with producers (represented by upward error in Figure 2-3) or (2) producers may initiatate interactions with user innovators (represented by downward error in Figure 2-3). Gambardella et al. (2017) refer to these two directions as *innovation designs* and *innovation support*, respectively, and distinguish four pure interaction types.

Figure 2-3: Interactions Between the Two Innovation Paradigms (adapted from Gambardella/Raasch/von Hippel 2017)



One way for interactions based on innovation designs to arise is through *user innovation spillovers to producers.* In this case, user innovators choose to share their innovations with producers, either for free or based on commercial transactions (de Jong et al. 2015). As users have perfect need-knowledge and are often ahead of market trends when developing a solution to meet their needs, producers can profit greatly from adopting user innovations as a basis for new products or services (von Hippel 2017). For example, several studies on user development of sporting equipment, ranging from mountain-biking and white-water kajaking to kitesurfing, show that user innovations, particularly those of lead users, frequently build the basis for successful commercial products by producers (Franke et al. 2006; Hienerth et al. 2014; Lüthje et

al. 2005; von Hippel 2005). Moreover, studies also show that adopting user designs can lower producers' development costs and that these designs often have longer product life cycles, generate higher sales volumes and offer greater gross margins than producer-developed products (Jeppesen/Frederiksen 2006; Lettl et al. 2006; Lilien/Morrison/Searly/Sonnack/von Hippel 2002; Nishikawa et al. 2013).

Alternatively, interactions based on innovation designs may result in *user-complemented markets*. In this case, user innovators develop and freely diffuse innovations peer-to-peer that complement existing products or services of incumbent markets. These complements may consist either of separate units or of direct modifications to producer products and services (Gambardella et al. 2017). As von Hippel (2017) emphasizes, complements help producers "focus on selling commercially viable products" (p. 9). In addition, producers' innovations may also become more valuable and attractive for other end consumers through user developed complements. For example, in extreme sports, such as kayaking and kitesurfing, it is common for athletes to develop and share new techniques to use equipment (Franke/Shah 2003; Franke et al. 2006; Hienerth 2006). These techniques are considered vital complements to the equipment offered by producers and may even be the reason why some end consumers buy the equipment in the first place (Hienerth et al. 2014; von Hippel 2017).

Finally, interactions based on innovation designs may also lead to *user-contested markets*, where innovations by users (partially) substitute innovations by producers. In this interaction type, commercial producer and freely diffused user products and services exist side by side and customers must decide which option to choose. As studies show, in both instances costs occur, either directly from paying for the product or indirectly. In open source projects, for example, transition barriers for freely diffused user software include adoption costs, the need to have the capabilities to use the software, as well as accepting that solutions may not fully address needs (Franke/von Hippel 2003; Raasch/von Hippel 2012). These indirect costs may hamper customers' willingness to choose the (seemingly) free user-developed option.

By way of contrast, in *producer support for user innovation*, producers offer support to user innovators in order to systematically point these towards areas for innovation that are of commercial interest to producers or to augment the number of user innovations in general. Typically, supporting activities include sponsoring deals, user toolkits, or design competitions (Franke/Piller 2004; Füller et al. 2011; von Hippel/Katz 2002; West/Lakhani 2008). Moreover, producers can decide to assign some of their own employees to work with innovating users and user communities, or share valuable information that allows user innovators to replicate or improve producers' innovations (Henkel 2008; Schweisfurth/Raasch 2015). Although this runs the risk that user innovators may self-provision products and services originally offered by a

producer, the process of supporting user innovators is also likely to provide producers with innovation designs that spill-over into the development of new or enhancement of existing producer products (von Hippel 2017).

In sum, a critical evaluation of the interactions between producer- and user-led innovation paradigms uncovers heterogeneous results with regard to different interaction types. Concerning innovation design, user-complemented markets and user-contested markets are least likely to foster sustained interactions as they generate single-sided benefits for either producers (i.e., benefits from product enhancements via complementary user products in complemented markets) or society in general (i.e., benefits from alternative product offerings in contested markets). In contrast, user-innovation spillovers to producers provide most immediate benefits to producers, while user innovators may benefit from transaction rewards, and societies from the professional diffusion of the user innovations. Nonetheless, for effectively increasing development and diffusion of user innovations on a general level, a more equally balanced type of interaction appears desirable.

Against this backdrop, producer support for user innovation offers the most promising approach to pursue, because it shows capable of ensuring benefits for all sides (see above). Yet, studies on producers' support, so far, have predominantly focused on producers' direct support, i.e., instances where producers intentionally decide to interact with user innovators by providing sponsorship, toolkits, or assistance (Franke/Piller 2004; Henkel 2008; Schweisfurth/Raasch 2015; West/Lakhani 2008). Alternatively, producer and user innovation spheres may also collide unintentionally, thus offering opportunities for indirect support. For example, studies of user innovators' demographics show that the majority of user, and especially consumer, innovators holds employment (Lüthje et al. 2005; Shah 2005; Stock et al. 2015). Given the relevance of innovation for today's organizations, user innovators may hence gain central insights for the development of their innovations as a side effect of their daily work. In order to add to contribution 2 and shed more light on interactions and the potential for cross-fertilization between the two paradigms, the thesis thus focusses on the underresearched field of producer support for user innovation, specifically illuminating an indirect form.

Indirect forms of support, in which producer innovators may engage without bound resource investments, may also be relevant in light of increasing resource shortages and the resulting importance to economize resources in general, and in the innovation context (He/Wong 2004; Tarique/Schuler 2010; Vaiman et al. 2012). Hence, the two empirical studies on innovation drivers (Chapter 3 and 4) that build the basis for discussing the potential for interactions between the two paradigms are embedded in two resource-based frameworks. These frameworks are elaborated in the following section.

2.2 Resource-based Theories

Innovation endeavors require assets, i.e., resources that aid accomplishment (Amabile et al. 1996; Amit/Schoemaker 1993). Already Drucker acknowledged their pivotal importance for innovation, stating, "[Innovation] is the means by which the entrepreneur either creates new wealth-producing resources or endows existing resources with enhanced potential for creating wealth" (1985, p. 67). Hence, resources are central to innovation. Generally, resources-based theories distinguish two categories, i.e., *tangible* resources (e.g., technical equipment, financial assets, physical assets) and *intangible* resources (e.g., knowledge, skills, organizational culture) (Hmielseski/Carr/Baron 2015; Hobfoll 2011; Howard-Grenville/Metzger/Meyer 2013; McKelvie/Davidsson 2009). As intangible resources are often more difficult to obtain, they are generally considered more valuable (Teece/Pisano/Shuen 1997; Zorn/Norman/Butler/Bhussar 2017).

Given the central role of resources for innovation, the two empirical studies of this thesis both build on resource-based theories. Analogous to their two foci on producer- and user-led innovation, the studies cover two complementary perspectives of resource-based theories: an organizational-level perspective (Section 2.2.1) and an individual-level perspective (Section 2.2.2). In the following sections, resource theories of each perspective are outlined, before the thesis' two central theories, ambidexterity theory and conservation of resources (COR) theory, are presented and critically evaluated in more depth.

2.2.1 Resource-based Theories from an Organizational-level Perspective

2.2.1.1 General Overview

Among organizational-level perspectives on resources, the *resource-based view*[2] (RBV) provides a rich and powerful theoretical framework for the study of how organizations employ resources to derive sustainable competitive advantages (Barney 1986; Barney/Ketchen/Wright 2011; Eisenhardt/Martin 2000; Teece et al. 1997; Wernerfelt 1984). Having its origins in Penrose's (1959) theory of the growth of firms, the RBV adopts a long-term strategic perspective and regards organizations as bundles of resources (DeSarbo/Di Benedetto/Jedidi/Song 2006;

[2] Originally referred to as *resource-based view* (RBV), more recent conceptualizations also employ the terminology *resource-based theory* in order to reflect its evolutional development (Barney et al. 2011; Kozlenkova/Samaha/Palmatier 2014). As the thesis is mainly concerned with the underlying foundations of the RBV as a basis for the emergence of ambidexterity theory (Study 1) and does not discuss intricacies of RBV's theoretical developments, the terminology "resource-based view" is employed.

Eisenhardt/Martin 2000). Critically, the RBV argues (1) that differences in resource bundles exist, i.e., resources are heterogenous, and (2) that resources are (close to) impossible to transfer, i.e., resources are immobile (Barney 1991; Peteraf 1993).

Within the RBV, resources are conceptualized as "those specific physical (e.g., specialized equipment, geographical location), human (e.g., expertise in chemistry), and organizational (e.g., superior sales force) assets that can be used to implement value-creating strategies" (Eisenhardt/Martin 2000, p. 1106f.). Moreover, it is argued that resources can support the achievement of a sustainable competitive advantage, if they possess *VRIN* attributes (Barney 1991; Teece 2014):

- *Valuable*: resources must support organizations in increasing their productivity. Hence, resources are valuable if "they enable a firm to conceive of or implement strategies that improve its efficiency and effectiveness" (Barney 1991, p. 106).
- *Rare*: resources must be scarce and not/infrequently shared by competitors. According to Barney (1991), resources are rare if "the number of firms that possess a particular valuable resource […] is less than the number of firms needed to generate perfect competition dynamics" (p. 107).
- *Imperfectly imitable*: resources must not or should only be partially copiable, implying that organizations that "do not possess these resources cannot obtain them" (Barney 1991, p. 107).
- *Non-substitutable*: resources must not be easily replaced by other, equally valuable but frequent and imitable resources. Accordingly, Barney (1991) demands that "there must be no strategically equivalent valuable resources that are themselves either not rare or imitable" (p. 111).

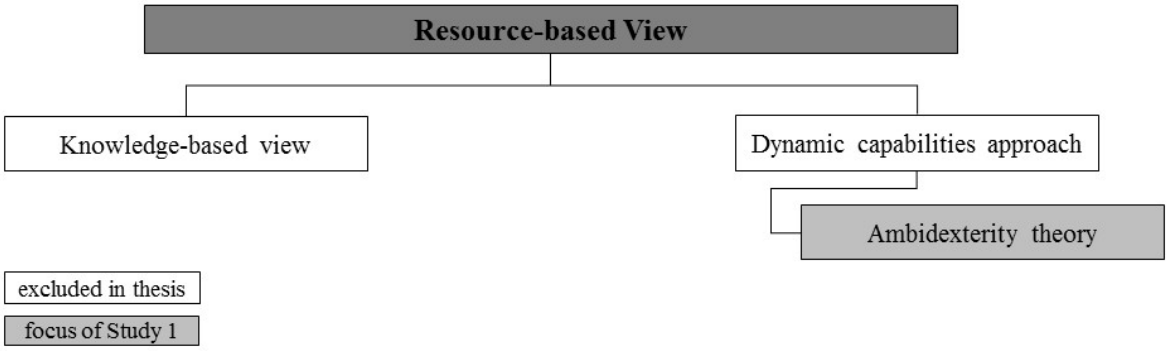
Over the last three decades, the RBV has contributed significantly to scholars' understanding of organizations and has evolved to become a leading theory in management research. This is also reflected in its extensive application to a variety of fields, ranging from strategic management (Alexy/West/Klapper/Reitzig 2018; Garbuio/King/Lovallo 2011, Kunc/Morecroft 2010), to economics (Combs/Ketchen 1999; Conner/Prahalad 1996; Lockett/Thompson 2001), marketing (Palmatier/Dant/Grewal 2007; Srivastava/Fahey/Christensen 2001), or entrepreneurship (Alvarez/Busenitz 2001; Ireland/Hitt/Sirmon 2003). More recently, the RBV, and particularly its spin-off perspectives presented below, has also been applied to innovation research (Kleinschmidt/Di Bretani/Salomo 2007; Stock et al. 2013b; Teece 2007). Yet, irrespective of its broad application, the RBV has been subject to considerable criticism (Armstrong/Shimizu 2007; Kraaijenbrin/Spender/Groen 2010; Priem/Butler 2001). Kraaijenbrin et al. (2010) group these criticsms into eight categories and conclude that "the RBV's core message can withstand five

of these critiques quite well, especially when the RBV's variables, boundaries, and applicability are more clearly specified. However, three threaten the RBV's status as a core theory" (p. 350). These three are:

First, the RBV has been criticized for arguing that VRIN attributes of resources, i.e., being valuable, rare, imperfectly imitable, and non-substitutable, are sufficient and necessary for achieving a sustained competitive advantage. Contrary to this view, empirical studies have offered next to no support for the sufficiency of these attributes (Armstrong/Shimizu 2007; Foss/Knudsen 2003; Newbert 2007). Second, the RBV has been reproached for its use of near tautological definitions that prevent the testing of core statements (Lockett/Thompson/Morgenstern 2009; Priem/Butler 2001). In particular, it has been argued that the definition of resources is too indeterminate, because resources and outcomes are both defined in identical terms. Third, and relatedly, the definition of resources itself has been criticized to be unworkable (i.e., it fails to differentiate between resources as inputs and capabilities to utilize the inputs) (Kraaijenbrink et al. 2010; Priem/Butler 2001). As a result, from a RBV perspective, everything related to an organization's strategy can be considered a resource.

In order to address these shortcomings, a number of spin-off perspectives have been developed (Acedo/Barroso/Galan 2006; Barney et al. 2011; Kraaijenbrink et al. 2010). Among these, the *knowledge-based view* (Grant 1996a) and the *dynamic capabilities approach* (Teece et al. 1997) have emerged as dominant frameworks. They are presented in Figure 2-4 below and briefly outlined to aid the categorization of ambidexterity theory.

Figure 2-4: Resource-based Theories from an Organizational-level Perspective



Against the backdrop of highly dynamic and competitive markets, the knowledge-based view advocates knowledge as the most strategically significant resource for organizations (Barney et al. 2011; Grant 1996a; 1996b). Accordingly, it is paramount for organizations to gain superior

access to knowledge and integrate the knowledge of their employees (Grant 1996a; Hult/Ketchen/Slater 2004). This knowledge may be embedded within individual employees and departments, but also in the organizations' culture, its routines or directive systems (Grant 1996b). As organizations' capability to integrate and recombine knowledge is also at the heart of innovation activities, the knowledge-based view has been repeatedly employed as a theoretical foundation by innovation research (Caner/Tyler 2015; Shu/Page/Gao/Jiang 2012).

Similar to the knowledge-based view, the dynamic capabilities approach is concerned with intangible resources, but differs in its emphasis on capabilities as central element to achieve superior, long-term performance (Teece 2007; 2014; Teece et al. 1997). Dynamic capabilities encompass strategies, processes, routines, or activity patterns that are employed to respond to environmental change by uniquely altering an organization's resource configuration. Specifically, Eisenhardt/Martin (2000) define dynamic capabilities as "the antecedent organizational and strategic routines by which managers alter their resource base - acquire and shed resources, integrate them together, and recombine them - to generate new value-creating strategies" (p.1107). Hence, by building on and equally shaping VRIN resources, i.e., resources that are valuable, rare, imperfectly imitable, and non-substitutable, dynamic capabilities critically determine organizations' ability to adapt to change and, thus, succeed in innovation (Kor/Mesko 2013; O'Reilly/Tushman 2008; Teece 2014).

2.2.1.2 Ambidexterity Theory

Ambidexterity theory shares the dynamic capabilities approach's view that dynamic capabilities constitute the foundation for organizations' success in adapting to change and achieving long-term organizational performance (O'Reilly/Tushman 2008). Specifically, ambidexterity theory argues that the ability to simultaneously "configure and reconfigure organizational resources to capture existing as well as new opportunities" (O'Reilly/Tushman 2008, p. 189) lies at the heart of sustainable competitive advantage (Helfat/Raubitschek 2000; Holmqvist 2004). In particular, being ambidextrous encompasses pursuing two divergent, but complementary goals and consists of a subset of dynamic capabilities that build on and shape VRIN resources, i.e., resources that are valuable, rare, imperfectly imitable, and non-substitutable (Gibson/Birkinshaw 2004; Jansen/Tempelaar/van den Bosch/Volberda 2009a; O'Reilly/Tushman 2013; Teece 2014).

Drawing on March's (1991) distinction between *exploration* and *exploitation*[3], in management research ambidexterity describes an organization's ability "to both efficiently exploit its existing competencies (via 'exploitation') and foster … innovativeness (via 'exploration')" (Patel/Messersmith/Lepak 2013, p. 1420). Exploration is concerned with discovery, the pursuit of new knowledge, and variety – thus, explorative behaviors relate to being innovative and adaptive to change. Conversely, exploitation is concerned with control, efficiency and certainty – thus, exploitative behaviors relate to being aligned and highly productive (Jansen et al. 2009a; Lavie/Stettner/Tushman 2010; Raisch/Birkinshaw 2008). As a result of this dichotomy, the challenge of balancing exploration and exploitation within a single organization is inherent to ambidexterity. Yet, both strategies battle for internal resources. Therefore, organizations generally favor one strategy over the other (Benner/Tushman 2003; Levinthal/March 1993).

In particular, established organizations typically favor an emphasis of exploitation, as exploiting established product ranges is considered more reliable in guaranteeing profits (Lavie et al. 2010; Sarkees/Hulland 2009). However, by single-sidedly emphasizing exploitation, organizations are in danger of falling into a 'competency trap' that prohibits further innovation (O'Reilly/Tushman 2008). In contrast, focusing on explorative behaviors drastically increases uncertainty regarding profits and may also endanger the existence of established products and departments (O'Reilly/Tushman 2008; Sarkees/Hulland 2009). Organizations that one-sidedly emphasize exploration are thus in danger of succumbing to a 'failure trap' that lures organizations into constantly alternating their focus, thus inhibiting exploitation of existing competencies (March 2003; Siggelkow/Rivkin 2005). Nonetheless, organizations that strive to simultaneously pursue exploration and exploitation do not necessarily fare better. Specifically, strategic management research shows that organizations which aim to pursue two (opposing) strategies in equal measures may become mediocre or suffer from inertia (Ebben/Johnson 2005; Ghemawat/Costa 1993; Porter 1980).

Accordingly, a significant amount of research within ambidexterity theory is dedicated to resolving the seeming paradox of balancing the theory's two pivotal behaviors of exploration and exploitation, and determine how organizations can achieve a state in which the benefits of both strategies can be reaped (Adler et al. 2009; Raisch/Birkinshaw/Probst/Tushman 2009). From this research, three dominant approaches have emerged (O'Reilly/Tushman 2013):

[3] At a finer-grained level, ambidexterity theory also differentiates between the capabilities of sensing, seizing and reconfiguring (O'Reilly/Tushman 2008; Teece 2006). However, as this differentiation is irrelevant for the application of ambidexterity theory in study 1, this distinction is not further elaborated.

Proponents of the *sequential ambidexterity approach* argue that ambidexterity is a question of shifting organizations' structures over time (Duncan 1976; O'Reilly/Tushman 2013). According to this view, organizations should alternate their strategy in a sequence of explorative and exploitative cycles (Laplume/Dass 2012; Lavie et al. 2010; Siggelkow/Levinthal 2003). Yet, in the face of rapid change, sequential approaches to ambidexterity have been criticized as too protracted to effectively cope with changing environments (Tushman/O'Reilly 1996). Therefore, proponents of the *structural ambidexterity approach* suggest that organizations should simultaneously pursue exploration and exploitation by creating autonomous subunits, respectively dedicated to one of the two strategies. To succeed, these separate subunits must be integrated by overarching values and a shared strategic vision (Benner/Tushman 2003; Hill/Birkinshaw 2012; Raisch et al. 2009). Alternatively, proponents of the *contextual ambidexterity approach* emphasize the importance of individuals for achieving ambidexterity (Gibson/Birkinshaw 2004). Accordingly, proponents of this view conceptualize ambidexterity as a behavioral capacity and propose that organizations should create a supportive context through processes and systems that allow individuals to allocate their time to explorative and exploitative behaviors (Brunner/Staats/Tushman/Upton 2009; Gibson/Birkinshaw 2004).

While originally developed as self-contained propositions to resolve the ambidexterity paradox, studies within each approach have shown all three approaches to be viable (Gibson/Birkinshaw 2004; He/Wong 2004; Jansen et al. 2009a; Siggelkow/Levinthal 2003). Moreover, recent research has shown that organizations even switch between the approaches to successfully realize ambidexterity (Geerts/Blindenbach-Driessen/Gemmel 2010; Jansen/Andriopoulos/Tushman 2013; O'Reilly/Tushman 2013). In all three approaches, senior management occupies a central position, as it is, in effect, leadership that determines organizations' strategy (sequential approach), the design of subunits (structural approach), and the creation of an ambidexterity-fostering work context (contextual approach). Accordingly, a number of recent studies (Carmeli/Halevi 2009; Havermans/Den Hartog/Keegan/Uhl-Bien 2015; Jansen/George/van den Bosch/Volberda 2008; Lubatkin/Simsek/Ling/Veiga 2006; Nemanich/Vera 2009; Rosing et al. 2011) concluded that ambidexterity is "at heart, a leadership issue" (O'Reilly/Tushman 2013, p. 328). As a consequence, the focus of ambidexterity research is shifting from a comparison of different approaches to an investigation of the role of leadership in resolving the trade-off between exploration and exploitation. Building on this insight, study 1 (Chapter 3) contributes to precisely this gap by introducing a leadership approach that simultaneously addresses explorative and exploitative business unit outcomes.

In sum, a critical evaluation of ambidexterity theory reveals considerable contributions as well as a number of shortcomings. First and foremost, ambidexterity theory provides a valuable framework for a holistic assessment of organizational performance. Moreover, by stressing the

importance of exploration and exploitation strategies, the theory expands the dynamic capabilities approach and specifies two central capabilities. Finally, ambidexterity theory imposes a long-term perspective by drawing researchers' and practitioners' attention to the requirements of promoting efficiency *and* innovation for sustained organizational success. This becomes particularly important in light of organizations' aim to cope with today's constantly changing and dynamic markets by equally reaping benefits and generating novel products. Here, ambidexterity theory powerfully elucidates the dangers that one-sided resource allocations may entail.

However, ambidexterity theory continues to suffer from a number of limitations. A central point of criticism is that, after almost two decades of research, the notion of balance still remains unclear (Lavie et al. 2010). This issue relates, both, to the approaches of how to best achieve a balance, as well as to its optimal composition (i.e., equal measures vs. ratios of exploration and exploitation). Relatedly, discrepancies in the conceptualizations of exploration and exploitation, either as a continuum or discrete strategies, continue to exist (Gupta/Smith/Shalley 2006; Lavie et al. 2010; Raisch et al. 2009). This conceptual issue also extends to the definition of ambidexterity itself, as scholars alter in their conceptualizations between a narrow focus (i.e., ambidexterity only refers to the simultaneous balance of exploration and exploitation) and a broad focus (i.e., ambidexterity refers to the balance of exploration and exploitation in general) (Gibson/Birkinshaw 2004; Jansen et al 2009a; Lavie et al 2010; O'Reilly/Tushman 2013). Finally, another criticism relates to the variation in operationalizations of ambidexterity (i.e., single outcome variable (sum, absolute difference, or product of exploration and exploitation) vs. two separate variables) that exacerbates comparison of results and causes performance implications to remain vague (Auh/Menguc 2005; He/Wong 2004; Jansen et al. 2009a; Nemanich/Vera 2009; Patel et al. 2013).

In light of these considerations, study 1 (Chapter 3) adopts central assumptions of ambidexterity theory to develop a framework for the investigation of how leadership (i.e., dual innovation leadership) as a central innovation driver fosters sustained organizational unit performance in the producer-led innovation paradigm. First, the study builds on ambidexterity theory's organizational-level perspective and its central assumption of balancing exploration (i.e., innovation) and exploitation outcomes (i.e., efficiency) to justify the analysis of organizational unit innovativeness and constraint adherence. Second, the study addresses O'Reilly/Tushman's (2013) call for more research into the role of leadership in driving ambidexterity. Specifically, study 1 theoretically develops and empirically investigates a leadership approach capable of driving ambidextrous outcomes. Accordingly, with dual innovation leadership, study 1 advances ambidexterity research by specifying leader behaviors in the innovation context that resolve the tension between exploration and exploitation outcomes (Lukoschek et al. 2018). Finally, re-

garding the theory's limitations, the study follows the dominant view of conceptualizing exploration and exploitation as discrete elements and, accordingly, assesses the impact of dual innovation leadership on innovation and efficiency separately but simultaneously. In sum, the study thus contributes to refocusing ambidexterity research on its origins for further investigations of its drivers. Table 2-2 summarizes central elements of ambidexterity theory and its main contributions to this thesis.

Table 2-2: Summary of Ambidexterity Theory

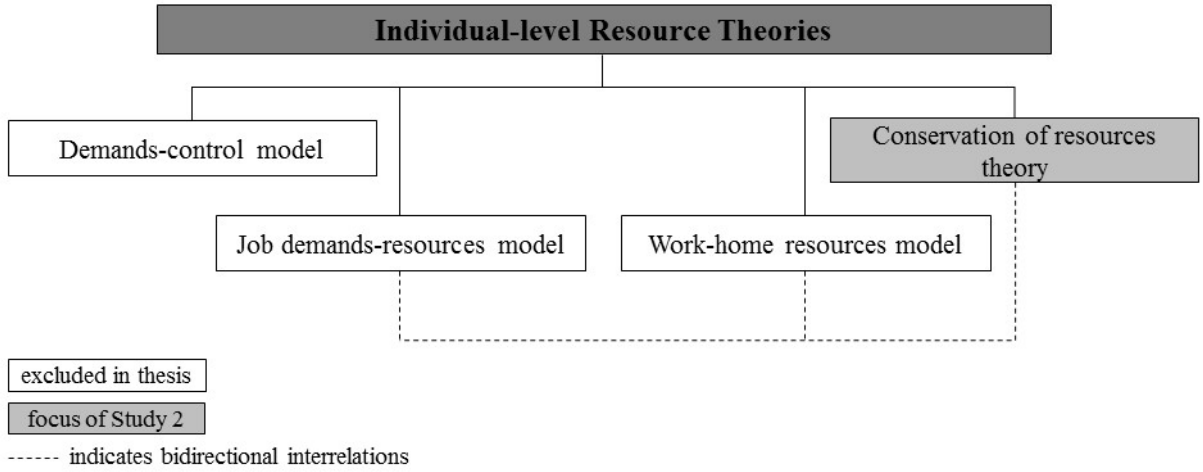
Ambidexterity Theory	
Central sources	Gibson/Birkinshaw 2004; O'Reilly/Tushman 2008; Tushman/O'Reilly 1996
Level of application	Organizational-level
Basic assumptions	- Ambidexterity is a dynamic capability. - Ambidexterity consists of exploiting existing and exploring new strategies. - Ambidexterity builds on and shapes resources with VRIN attributes, which, in turn, are critical to generate competitive advantages.
Core message	Organizations need to be ambidextrous in order to achieve superior, long-term organizational performance.
Central contribution to thesis	- Leadership occupies a central role in driving ambidexterity. - Innovation and efficiency must be balanced for sustained performance, i.e., innovation cannot be successfully achieved if efficiency is neglected.

2.2.2 Resource-based Theories from an Individual-level Perspective

2.2.2.1 General Overview

The origins of individual-level perspectives on resources can be traced back to occupational psychology and organizational behavior literature dedicated to the phenomena of work stress and mental strain. Here, Karasek's (1979) *demands-control model* (also known as job strain model) has formed the basis for many of today's leading theories on how individuals employ resources (Bakker/Demerouti 2017; Demerouti/Bakker/Nachreiner/Schaufeli 2001). Specifically, the demands-control model is concerned with how adverse job characteristics influence personal well-being. It postulates that the "demands of a work situation and the range of decision-making freedom" (Karasek 1979, p. 287) jointly determine the level of psychological strain experienced (Totterdell/Wood/Wall 2006). In extension of this model, the *job demands-resources model* (JD-R) (Demerouti et al. 2001), the *work-home resources model* (W-HR) (ten Brummelhuis/Bakker 2012), and *conservation of resources* (COR) *theory* (Hobfoll 1989; 2001) take a more general view on individuals' resources and their exchange processes with the environment. Figure 2-5 provides an overview of relevant individual-level resource theories and their interrelations.

Figure 2-5: Resource-based Theories from an Individual-level Perspective



The JD-R model[4] was developed to predict employee behavior and organizational outcomes (Demerouti et al. 2001). Specifically, JD-R is a dominant and well-researched model that aims to provide a framework for the effects of work demands and resources on individual well-being (Xantholpoulou/Bakker/Demerouti/Schaufeli 2007). For this purpose, the model distinguishes between job resources, which support individuals in succeeding at work and addressing job demands, and job demands, which draw energy from individuals, thus weakening performance and potentially health (Bakker/Demerouti 2007; 2017). Moreover, the model proposes that the motivational aspect of job resources and the health-threatening aspect of job demands are independent of one another. Hence, job resources have a buffering effect on demand-related outcomes.

Consistent with COR theory, the JD-R model places a strong emphasis on the availability and role of resources, stressing "job resources are instrumental in that they arm employees with the means it takes to cope with job demands" (Bakker/Demerouti 2018, p. 2). In addition, the model highlights that the external environment must supply individuals with resources in order to ensure job demands are met (Demerouti et al. 2001). Applying JD-R reasoning to the innovation context, innovation, as a complex and highly risky endeavor (Janssen/van Yperen 2004; Kanter

[4] More recently, scholars refer to the JD-R model as a theory in order to reflect its development from a basic model into a complex theoretical framework with several propositions (Bakker/Demerouti 2017). As this overview focusses on JD-R's basic assumptions that have been presented under the terminology of 'model', the thesis retains the 'model' terminology.

1988), may be viewed as a type of job demand. In the logic of the JD-R model, individuals thus resort to their resources provided by their external environment to deal with the challenges arising from innovation.

In contrast, the W-HR model was developed to explain individuals' bidirectional resource exchanges between the work and home domain (ten Brummelhuis/Bakker 2012). Building on role theory (Pleck 1977) and COR theory (Hobfoll 1989; 2001), the W-HR model provides an insightful framework for studying how resources from one domain may relate to outcomes in the other domain. More specifically, the model distinguishes between negative resource processes (i.e., conflict, where resource depletion in one domain hampers the generation of outcomes in the other) and positive resource processes (i.e., enrichment, where resource accumulation in one domain increases performance in the other) (Du/Derks/Bakker 2018; ten Brummelhuis/Bakker 2012). As a result of its rather recent development, however, the W-HR model is empirically less well researched than its more established counterparts.

Central to the W-HR model is the notion that individuals occupy dual roles. These roles may drain or contribute resources. Accordingly, W-HR reasoning departs from traditional views that focus one-sidedly on conflicts arising from dual roles (Eby/Casper/Lockwood/Bordeaux/Brinley 2005). Instead, the model explicitly stresses the beneficial effects of dual roles, which can lead to "an increase in skill and fulfillment levels that facilitate performance in both roles" (ten Brummelhuis/Bakker 2012, p. 545). Applied to the innovation context, the W-HR model highlights the potential of distinct domains in contributing to innovation outcomes. Specifically, the model supports the notion that resources acquired as a result of a role in one domain (e.g., knowledge on innovation processes acquired as employee at work), may generate synergies, thus enhancing performance in the other domain (e.g., engagement in innovation activities as innovator at home) (Russo 2015).

In sum, the JD-R and the W-HR model both contribute, on a more abstract level[5], to the underlying theoretical notions of study 2 (Chapter 4). In particular, the tenets of innovation as 'resource demand process' and of the (external) environment as' resource supplier' can be traced back to JD-R literature. In contrast, the tenets of 'dual roles' and 'interlinked domains' between which resources may be bidirectionally transferred relate to ideas elaborated in W-HR research. Nonetheless, both models strongly build on COR theory when specifying the application of

[5] Due to limitations of space, the theoretical foundations in study 2 (Chapter 4) are restricted to a focus on COR theory and innovation literature. Thus, contributions of the JD-R model and the W-HR model are not explicitly elaborated.

resources in the work context (represented by doted lines in Figure 2-5). For example, ideas relating to the fundamental importance of resources or to gain and loss spirals originate in COR theory (Bakker/Demerouti 2007; ten Brummelhuis/Bakker 2012; van Woerkom/Bakker/Nishii 2016). Consequently, this thesis adopts COR theory, as a broader and more widely acknowledged theory, as its dominant framework in study 2 (Chapter 4).

2.2.2.2 Conservation of Resources Theory

COR theory is a resource-based theory that seeks to explain how individuals economize their resources to attain personal goals and prevent stress (Hobfoll 2001; Zellars/Perrewé/Hochwater/Anderson 2006). Highlighting resources as key components, COR theory argues that "we are all captive to our resources, their availability, and the extent to which they are shared and stable" (Hobfoll 2001, p. 340). The central tenet of COR theory therefore predicts that individuals "strive to retain, protect, and build resources" (Hobfoll 1989, p. 513). Accordingly, resource loss, threat of loss, and failure to gain resources after a resource investment cause individuals mental strain.

Although COR theory was originally developed by Hobfoll (1989; 2001; 2002) as an alternative to Lazarus/Folkman's (1984) coping-appraisal theory on stress, the theory has been extensively applied to a variety of phenomena in industrial psychology and organizational behavior literature, including burnout, personal well-being, job-satisfaction, or performance (Babakus/Yavas/Ashill 2009; Fritz/Sonnentag 2005; Innstrand/Langballe/Espnes/Falkum/Aasland 2008; Ng/Feldman 2012; Whitman/Halbesleben/Holmes 2014). More recently, researchers have also begun to apply COR theory to studies on innovation (Kiazad/Seibert/Kraimer 2014; Montani/Dagenais-Desmarais/Giorgi/Grégoire 2018; Stock 2015).

COR theory establishes the primacy of resource conservation and acquisition, arguing that resources are, by themselves, valuable, but may differ in value for different individuals (Halbesleben/Neveu/Paustein-Underdahl/Westman 2014). Specifically, the theory defines resources as "objects, personal characteristics, conditions, or energies that are valued in their own right, or that are valued because they act as conduit to the achievement or protection of valued resources" (Hobfoll 2001, p. 339). Based on this definition, four resource categories are distinguished:

- *Object resources* encompass material or symbolic objects that are either valuable to the individual or that draw value from their price or scarcity (Hobfoll 1989). Examples include personal transportation, housing, clothes, or tools (Hobfoll 2001).
- *Personal characteristics* refer to resources that are capable of reducing stress and mental strain and help the individual adopt a positive perspective on life. They encompass personal traits, skills, mastery orientation, or positive sense of self (Hobfoll 1989).

- *Condition resources* comprise resources that arise as a result of a valued context. Depending on the extent to which the context is positively perceived, marriage, seniority, role as a leader, or job tenure may fall under this category (Hobfoll 1989; 2001).
- *Energy resources* comprise resources that aid the acquisition of new resources. Accordingly, their value lies in their supportive potential. Examples include knowledge/information, money, or time for leisure and work (Hobfoll 1989; 2001).

Moreover, COR theory builds on six basic assumptions, comprising two principles and four corollaries, that provide the theory's theoretical foundation (Hobfoll 1989; 2001; Halbesleben et al. 2014). According to the first principle, individuals experience resource loss more prominently than resource gain. While this implies that resource gains and losses are not equally balanced, it also stresses that a greater amount of resources must be gained in order to balance a loss (Halbesleben et al. 2014). Building on the importance of gains, the second principle states that individuals must invest resources to protect against loss, recover, or gain resources. Hobfoll (2002) describes this phenomenon of resource investments resulting in new resources as 'resource caravans', specifying that one type of resource may enhance other resources in a chain-like process. If resources are thus accumulated, an ongoing cycle of resource gain develops. Alternatively, if stress arises and resources are lost, an ongoing cycle of depletion evolves. The subsequent corollaries 1 to 3 specify these gain and loss spirals (ten Brummelhuis/Bakker 2012).

Specifically, in corollary 1, Hobfoll (2001) states that individuals with greater/fewer resources are less/more susceptible to resource loss, which allows them to gain/prevents them from gaining more resources. Halbesleben et al. (2014) summarize this assumption by pointing out, "those with a pool of resources to draw from have greater opportunity to invest resources" (p. 1336). From this it follows that initial resource loss begets future loss (corollary 2) and that initial resource gain begets future gains (corollary 3). Thus, individuals who are equipped with resources may benefit twice: first, by owning the resources and, second, by employing the resources to protect against stress and future loss. In particular, this implies that resources are transferable and may be taken from one domain to substitute, buffer or grow missing resources in another. Finally, Hobfoll contends that individuals who lack resources conserve the few resources they have and become less likely to invest those resources (corollary 4). As COR theory's application within the user-led innovation paradigm is elaborated in study 2 (Chapter 4), the section refrains from discussing further details of resource application to innovation endevaors in this section.

In sum, a critical appraisal of COR theory highlights valuable contributions as well as some aspects that are subject to criticism. Above all, COR theory is a stress and motivational theory

that employs an integrative resource perspective on environmental and internal processes (Hobfoll 2001). Emphasizing the centrality of resources for human behavior, COR theory provides a broadly applicable framework for the study of how individuals economize their resources. Moreover, in stressing the primacy of resource loss and investments (principles 1 and 2), the theory offers a theoretical basis for explaining why individuals acquire and protect their resources. This becomes particularly important in light of political and/or organizational initiatives that seek to direct resource investments within their population or their workforce. Here, COR theory may help set incentives to increase productivity, engagement, or innovation, as elaborated for the case of user-led innovation and subsequent interactions between innovation paradigms in sections 2.1.2 and 2.1.3. Finally, with the notion of gain cycles, the theory shines a light on a largely neglected area of research and overcomes previous tendencies to focus one-sidedly on loss spirals (Hobfoll 2001; 2011). Positive resource gain processes are vital for understanding resource transfers, for example, between the work-home domain, and receive increasing attention as a result of the blurring boundaries of today's digital era (Hakanen/Perhoniemi/Toppinen-Tanner 2008; Hobfoll 2011). Moreover, they are also central to innovation endeavors (Chapter 4).

Nonetheless, COR theory suffers from limitations, especially with regard to its core concept. Specifically, the definition of resources as "things that [people] value" (Hobfoll 2001, p. 341) has been criticized of being too broad. As several researchers have pointed out, according to this definition almost everything may be regarded as a resource (Gorgievski/Halbesleben/Bakker 2011; Thompson/Cooper 2001). Moreover, the terminology has been accused of being imprecise as it inherently assumes that resources produce positive outcomes. As studies in the field of work-home interactions show, this is not necessarily the case, because building resources in one domain may lead to conflicts in the other (Beehr/Bowling/Bennet 2010; Halbesleben et al. 2014). Relatedly, researchers have criticized that the delineated resource processes of COR theory are insufficiently understood and require further elaboration. Particularly with regard to resource acquisition, evidence to support Hobfoll's (1989; 2001) notion of a strategic process is still missing. While this impedes an accurate assertion to which extent strategy and chance are involved in resource acquisition, it also raises doubts about COR theory's central assumption that individuals intentionally decide over resource investments (Halbesleben et al. 2014).

Bearing these considerations in mind, study 2 (Chapter 4) adopts central assumptions of COR theory to develop a framework for the investigation of how consumer innovators' work environment as a central innovation driver fosters the outcome of innovation efforts in the user-led innovation paradigm. First, study 2 adopts COR theory's individual-level perspective on resources and transfers COR theory from stress to innovation research, in particular research on

consumer innovation. Specifically, study 2 investigates how (employed) consumer innovators employ job-related resources when developing HHS innovations during their leisure time. Second, the study focusses on positive resource processes, in particular, on COR theory's second principle of resource investment and its specifications in corollaries 1 and 3 (see Section 4.2.1 for details). Accordingly, the study contributes to research investigating resource transfers at the individual level and provides requested evidence for positive gain processes (Hobfoll 2011; Hakanen et al. 2008). In particular, study 2 corroborates the notion that the accumulation of resources at work may lead to spillovers[6], resulting in the generation of new resources at home (i.e., the HHS innovation). Finally, regarding COR theory's limitations, study 2 resolves the issue of resource ambiguity by restricting its focus to intangible job-related resources, i.e., knowledge, energy, and inspiration. Table 2-3 summarizes central elements of COR theory and its main contributions to this thesis.

Table 2-3: Summary of Conservation of Resources Theory

COR Theory	
Central sources	Hobfoll 1998; 2001; Halbesleben/Neveau/Paustian-Underdahl/Westman 2014
Level of application	Individual-level
Basic assumptions	- Resource loss outweighs resource gain. - As resource loss causes mental strain, individuals strive to prevent resource loss. - The investment of resources results in resource gain.
Core message	Individuals strive to retain, protect and build resources in order to prevent loss and attain personal goals.
Central contribution to thesis	- Resources are central to innovation endeavors. - Resources are transferable. - Consumer innovators strive to acquire and build resources in different domains. - Consumer innovators must invest resources to gain new resources, i.e., HHS innovations.

2.3 Literature Review of Innovation Drivers

As a consequence of the strategic and economic importance of innovation for organizations and societies, there is a long tradition of studies in the management sciences dedicated to uncovering

[6] Also see footnote 5. Due to limitations of space, the origins of the 'dual role' notion in the W-HR model (ten Brummelhuis/Bakker 2012) are not elaborated in detail in study 2 (Chapter 4). Instead, the study builds on spillover effects - a phenomenon already established in (user) innovation research (Davis/Davis/Hoisl 2013; Schweisfurth 2017; Schweisfurth/Raasch 2015).

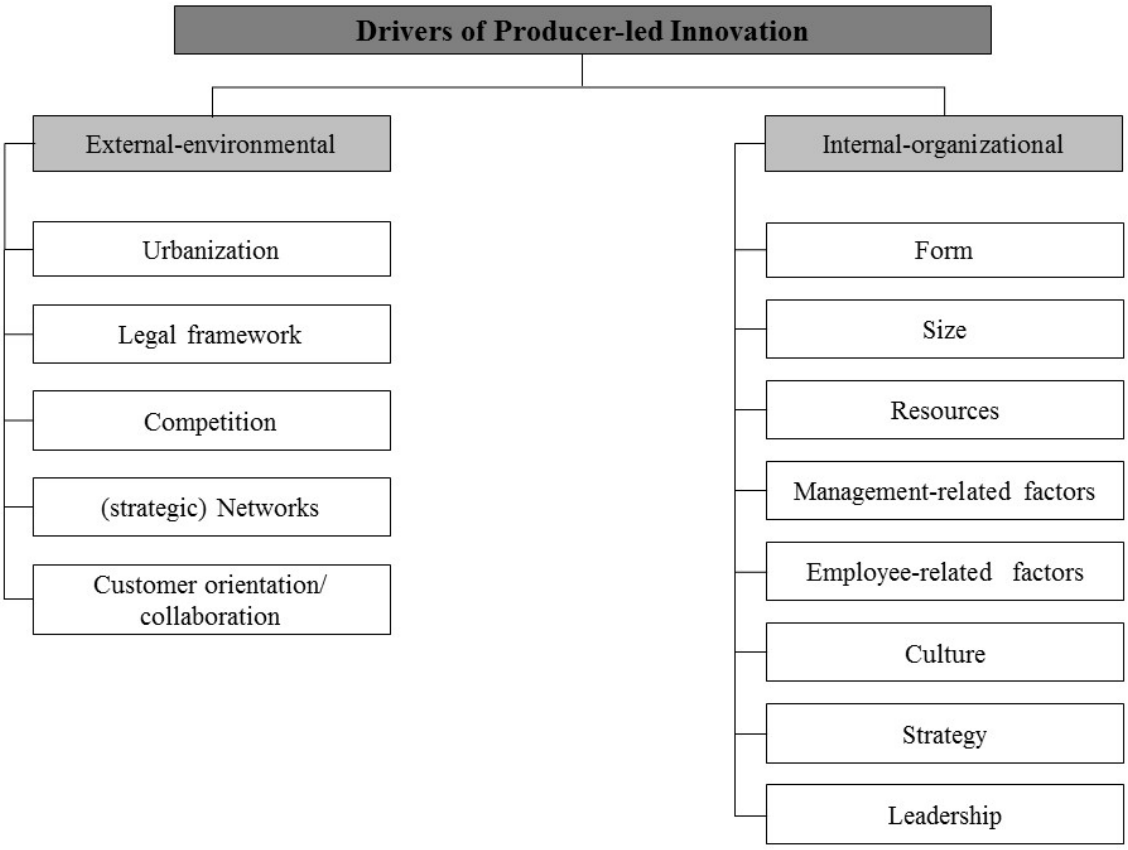
central innovation drivers (Anderson et al. 2014; Damanpour 1991; Hauser et al. 2006; Mumford 2000). Building on previous work that categorizes innovation research of the last 30 to 40 years into distinct levels of analysis (e.g., organizational, team, individual, and multilevel) (Anderson et al. 2014; Denti/Hemlin 2012), the following section distinguishes between an organizational- and an individual-level perspective to systematically and comprehensively review literature on innovation drivers within the producer-led (Section 2.3.1) and the user-led innovation paradigm (Section 2.3.2). In each section, a structured overview of general innovation drivers is provided and central drivers of each paradigm are highlighted. Next, empirical studies on two central drivers investigated in study 1 and study 2, i.e., leadership and the work environment, are systematically analyzed in more depth with regard to their effect on innovation. Specifically, key findings of preceding studies are compiled, limitations discussed, and pathways for scientific investigations *beyond the obvious* elucidated.

2.3.1 Drivers of Producer-led Innovation

2.3.1.1 General Overview

Within the producer-led innovation paradigm, innovation drivers at the organizational level have been extensively studied in multiple studies from a variety of perspectives, including marketing, strategic/operations/technology management, economics, psychology, or organizational behavior research (Elenkov/Judge/Wright 2005; Hauser et al. 2006; Hirst/van Dick/van Knippenberg 2009a; Moser 2005). This wealth of research has given rise to a number of metaanalytic papers that have systematically compiled the most reliable and extensively studied innovation drivers (Anderson et al. 2014; Damanpour 1991; Hauser et al. 2006; Mumford 2000). Building on these reviews, the thesis introduces two central categories of innovation drivers, *external-environmental* (also referred to as contextual) and *internal-organizational drivers*. The two categories, together with examples of respective innovation drivers in the producer-led innovation paradigm, are depicted in Figure 2-6 below.

Figure 2-6: Organizational-level Innovation Drivers of Producer-led Innovation



External-environmental drivers of innovation encompass boundary conditions provided by the context in which organizations operate or relate to their interactions with the environment. Among the former, *urbanization* and *legal frameworks*, in particular the granting of patent rights and successful patent protection, have been argued to drive organizational innovation (Damanpour/Schneider 2006; Goes/Park 1997; Hauser et al. 2006). In a similar vein, *competition* within a market or an industry sector has been shown to positively affect innovation (Damanpour 2010; Fuentelsaz/Gomez/Polo 2003; Utterback 1974). Finally, a number of studies has investigated the impact of organizations' exchanges in networks with other market and industry players. Alternatively, studies have also analyzed organizations' collaborations with customers in customer initiatives or co-development projects. Both fields find positive effects for organizations' engagement in *networks* and *customer orientation/collaboration* on organizational innovation (Dhanarag/Parkhe 2006; Operti/Carnabuci 2014; Ordanini/Parasuraman 2011; Priem/Li/Carr 2012; Sáez/Marco/Arribas 2002; Stock/Zacharias 2011). Yet, notwithstanding the positive impact of external-environmental drivers, organizations can only influence and mold these innovation drivers to a certain extent.

By way of contrast, internal-organizational drivers encompass organizations' internal characteristics that develop within an organization and may be shaped by organizational policies and management decisions. Regarding organizational *form*, for example, studies have shown that organizations with flatter hierarchies and decentralized, informal structures are more innovative than organizations with high levels of formalization (Cohendet/Simon 2007; Jung/Wu/Chow 2008). Related to the question of form, research has also investigated the effects of organizational *size* on innovation, generating mixed results. While some studies support the notion that smaller organizations, typically also less formal, drive organizations' ability to innovate (Chandy/Tellis 2000; Mitchell/Singh 1993), others show that larger companies are more successful as a result of economies of scale and access to more resources (Ali 1994; Camison-Zornoza/Lapiedra-Alcami/Segarra-Cipres/Boronat-Navarro 2004; Damanpour 2010). Not surprisingly, availability of *resources* itself has been argued to be a critical driver of creative endeavors and innovation (Amabile et al. 1996; Greve 2003; Mumford 2000). Other drivers that have been found to positively affect innovation encompass *management-related factors*, for example, employee trainings, flexible working hours, or performance-based payment, and *employee-related factors*, for example, age, tenure, or social ties (Damanpour/Schneider 2006; Liu/Chen/Yao 2011; Martínez-Sánchez/Vela-Jiménez/Pérez-Pérerz/De-Luis-Carnicer 2011; Mumford 2000; Perry-Smith 2006; Tierney/Farmer 2002). By far the most attention, however, has been dedicated to research on the effects of *culture* (Büschgens et al. 2013; Martins/Terblanche 2003; Stock/Six/Zacharias 2013a; Tian/Deng/Zhang/Salmador 2018), *strategy* (Hauser et al. 2006; He/Wong 2004; Stock/Zacharias 2011), and *leadership* (see Section 2.3.1.2 for detailed elaboration) in driving organizational innovation.

Among this triad, leadership occupies a unique position. Like the other two, leadership has been regarded as a unique, intangible organizational resource that may arguably exhibit VRIN attributes (i.e., be valuable, rare, imperfectly imitable, and non-substitutable) from a resource-based perspective (Barney 1991; Khatri 2000; Teece 2014). Unlike the other two, however, leadership is a determinant and predecessor of culture and strategy: "leaders influence the culture and environment by focusing on different ways of thinking, as well as ways of […] taking action" (Gilley/Dixon/Gilley 2008, p. 156). Hence, leadership is regarded as one, if not the, critical predictor of innovation (Mumford et al. 2002; Rosing et al. 2011). Yet, irrespective of the considerable extent of leadership research, studies of different leadership approaches continue to produce heterogeneous results. In order to advance research in this central field, the next section provides a systematic overview of the current state of leadership research, highlighting limitations and elucidating remedies for future studies.

2.3.1.2 Leadership as Central Driver of Producer-led Innovation

Leaders occupy a central position when it comes to organizational innovation. With their leadership styles, leaders set goals, influence, and direct innovation-related behaviors of individual employees, teams, business units, and entire organizations (Denti/Hemlin 2012; Kesting et al. 2015; Mumford et al. 2002). Moreover, by deciding how, when, and where resources are invested, leaders determine which innovation projects are launched, which are implemented, or which are finally abandoned (Somech 2006; Stoker/Looise/Fisscher/de Jong 2001). Reflecting this width of decision-making, leadership studies have been targeted to different levels of analysis (e.g., from individual to organizational), different innovation types (e.g., radical vs. incremental, explorative vs. exploitative), as well as different stages of the innovation process (e.g., from idea generation/creativity to idea implementation) (Hughes/Lee/Tian/Newman/Legood 2018; Kesting et al. 2015; Rosing et al. 2011). In order to generate a comprehensive overview that elucidates the relation between well-acknowledged, universal leadership approaches and innovation, this review thus follows extant literature in adopting a broad perspective (Denti/Hemlin 2012; Rosing et al. 2011). Hence, the impact of different universal leadership approaches on innovation in general, irrespective of level of analysis, type, or stage within the innovation process, is examined. Whereever critical, however, limitations of the studies with regard to their application to innovation are highlighted. The most well-known and extensively researched leadership approaches are summarized with regard to their impact on innovation in Table 2-4.

Table 2-4: Overview of Universal Leadership Approaches and their Impact on Innovation

Leadership approach	Effect	Central sources
Transactional leadership	+	Jansen/Vera/Crossan 2009b; Keller 1992
	-/n.s.	Jansen/Vera/Crossan 2009b; Moss/Ritossa 2007
Transformational leadership	+	Boerner/Eisenbeiss/Griesser 2007; García-Morales/Lloréns-Montes/Verdú-Jover 2008; Gumusluoglu/Ilsev 2009; Shin/Zhou 2003; 2007
	-/n.s.	Eisenbeiss/van Knippenberg/Boerner 2008; Hirst/van Dick/van Knippenberg 2009a; Jaussi/Dionne 2003; Jung/Wu/Chow 2008; Osborn/Marion 2009
Strategic leadership	+	Elenkov/Judge/Wright 2005; Makri/Scandura 2010
Participative leadership	+	Nijstad/de Dreu 2002; Somech 2006
	inconcl.	Stoker/Looise/Fisscher/de Jong 2001
LMX theory	+	Basu/Green 1997; Janssen/van Yperen 2004; Scott/Bruce 1994
	inconcl.	Clegg/Unsworth/Epitropaki/Parker 2002
Empowering leadership	+	Harris/Li/Boswell/Zhang/Xie 2014; Naqshbandi/Tabche/Choudhary 2018; Zhang/Bartol 2010
Innovation-tailored leadership approaches	Ambidextrous ls (Zacher/Robinson/Rosing 2016; Zacher/Rosing 2015) Innovation ls (Carmeli/Gelbard/Gefen 2010) Innovation-oriented ls (Stock/Totzauer/Zacharias 2013b)	

Notes: +: significant positive relationship; -: significant negative relationship; n.s.: non-significant relationship; inconl.: inconclusive (significant positive as well as n.s. relationships found within a single study).

Conceptualized by Burns (1979) and, subsequently, elaborated by Bass (1990), *transactional* and *transformational leadership* have been extensively assessed in the context of innovation projects and the management of innovation processes (Kesting et al. 2015). Transactional leadership relies on exchange-based relationships that focus on clarification of goals, rewards for goal achievement, and selected intervention if necessary (Bass 1990; Eisenbach/Watson/Pillai 1999). Although transactional leadership does not promote experimentation per se, it addresses basic needs of employees and provides sturcture (Daft 2001). In line with this, positive effects of transactional leadership on exploitative innovation have been suggested and empirically corroborated (Jansen/Vera/Crossan 2009b; Keller 1992). Equally, however, studies have revealed nonsignificant or negative relationships between transactional leadership and (explorative) innovation (Jansen et al. 2009b; Moss/Ritossa 2007).

In contrast, transformational leadership is concerned with motivating employees and encouraging them to challenge the status quo by leaders exerting idealized influence, inspiration, intellectual stimulation, and individualized consideration (Bass 1990; Keller 2006). As a result, a

considerable number of studies has provided evidence for the positive effects of transformational leadership on (individual/team) creativity, team innovation, and organizational innovation (Boerner/Eisenbeiss/Griesser 2007; García-Morales/Lloréns-Montes/Verdú-Jover 2008; Gumusluoglu/Ilsev 2009; Shin/Zhou 2003; 2007). Nonetheless, studies also find no or even negative effects for creative performance, team, as well as organizational innovation (Eisenbeiss/van Knippenberg/Boerner 2008; Hirst et al. 2009a; Jaussi/Dionne 2003; Jung et al. 2008; Osborn/Marion 2009). It has therefore been argued that transformational leadership may be more suited to stimulate ideas and creativity, while transactional leadership may be more appropriate to structure idea implementation (Kesting et al. 2015; Rosing et al. 2011)[7].

A different approach is adopted by *strategic leadership* research that focusses on leader behaviors of decision-makers in fostering innovation (Finkelstein/Hambrick 1996). Specifically, strategic leadership encompasses envisioning and anticipating change, thinking strategically, as well as ensuring flexibility at the organizational level (Ireland/Hitt 1999). As a result, strategic leadership adopts a top management perspective and is mainly limited to the study of CEOs, who are argued to occupy the central role in fostering and realizing innovation (Elenkov/Manev 2005). Only few empirical studies, however, have been conducted that empirically corroborate the pivotal role of CEOs' strategic leadership. A study by Elenkov et al. (2005), for example, finds evidence for strategic leadership's positive effect on product-market and administrative innovations. In another case, strategic leadership is refined by a differentiation into two dimensions, i.e., operational and creative leadership (Makri/Scandura 2010). While both are found to foster organizational innovation quantity, only creative leadership is found to foster organizational innovation quality (Makri/Scandura 2010). Nonetheless, empirical evidence for stretagic leadership's ability as a driver is scarce and responsibility as well as execution for innovation projects generally lies at the unit, not CEO, level (Holthausen/Larcker/Sloan 1995; Jansen et al. 2006). Therefore, it remains questionable whether strategic leadership is capable of providing a generalistic and reliable approach to foster innovation.

In contrast to strategic leadership's focus on the CEO level, *participative leadership* and *LMX* (leader-member exchange) *theory* constitute two approaches that are geared to the individual or team level and revolve around flexibility and interactions with employees. In participative leadership, employees are encouraged to partake in decision making processes and express their

[7] Moreover, the relationship between transactional/transformational leadership approaches and innovation has also been shown to be contingent on moderating variables. For reasons of space, however, these contingencies are not further elaborated. For a detailed overview, please refer to Denti/Hemlin (2012) and Rosing et al. (2011).

opinions (Somech 2006). Not surprisingly, studies thus find a positive effect of participative leadership on creative idea generation and team innovation (Nijstad/de Dreu 2002; Somech 2006). Moreover, similar to transformational leadership that also encourages employees' openness and experimentation, participative leadership has been argued to be more suited to the ideation stages than the implementation stages of the innovation process (Stoker et al. 2001). On the other hand, LMX theory focuses on dyadic relationships between leaders and employees, constituting that leader behaviors vary between employees and depend on the quality of dyadic relations (Graen/Uhl-Bien 1995). According to LMX theory, employees will be more willing to take risks, and thus pursue innovation activities, if they have their leader's trust (i.e., engage in a high quality relationship) (Rosing et al. 2011). In support of this view, research has found a positive relation between LMX and innovative behavior as well as innovative job performance (Basu/Green 1997; Janssen/van Yperen 2004; Scott/Bruce 1994). Yet, comparable to participative leadership, the objection has been raised that LMX may not be an effective enabler of innovation in all stages. Specifically, in a finer-grained study of different innovation stages, support for LMX's positive effect on innovation could only be replicated for the stage of idea implementation, but not idea generation (Clegg/Unsworth/Epitropaki/Parker 2002).

Finally, *empowering leadership* deviates most from the universal, leader-centric approaches of Table 2-4, as the approach adopts a follower-centric perspective. Specifically, empowering leadership is concerned with enabling employees to lead themselves by supporting the development of self-management and self-leadership skills, for example, opportunity thinking, teamwork, or participative goal setting (Ahearne/Mathieu/Rapp 2005; Amundsen/Martinsen 2014; Manz/Sims 1987; Pearce/Sims/Cox/Ball/Schnell/Smith 2003). This ability to lead oneself, hence the feeling of self-efficacy, control, and personal purpose, has been argued to be central for the development of innovative capabilities (Arnold/Arad/Rhoades/Drasgow 2000; Carmeli/Schaubroeck/Tischler 2011; Spreitzer 1995; Yun/Cox/Sims 2006). In support of this view, first studies in the innovation context have found empowering leadership to predict employee creativity and affect innovation efforts (Harris/Li/Boswell/Zhang/Xie 2014; Naqshbandi/Tabche/Choudhary 2018; Zhang/Bartol 2010). However, the studies primarily focus on the individual level of analysis and are, so far, insufficient to reliably predict the impact of empowering leadership on organizational innovation at more general levels.

In sum, the contribution of the surveyed universal leadership approaches is twofold. First, the approaches are well acknowledged and thus provide a reliable guiding framework for the investigation of leadership as a driver of organizational innovation. Second, empirical studies exist in all approaches that corroborate evidence for the pivotal role of leadership in driving innovation. Yet, a critical evaluation of Table 2-4 also points to a number of shortcomings. As

elaborated above, the empirical studies between, but also within, different leadership approaches differ considerably with regard to their level of analysis. While many investigate the effects of leadership at the individual or team level, only few explicitly analyze outcomes at higher levels, particularly the levels between top management and work team (Rosing et al. 2011). This criticism pertains particularly to strategic leadership, LMX theory and empowering leadership. Second, the universal leadership approaches appear ill-suited to drive innovation throughout the entire innovation process (Anderson et al. 2014). As a closer analysis of the results reveals, many of the approaches foster one stage in the innovation process (e.g., idea generation or implementation) but fail to foster both equally. Accordingly, transactional, transformational, participative leadership, as well as LMX theory have been criticized for their unidimensional applicability. As a result, no single best leadership approach for driving innovation can be identified. In line with this observation, metaanlytic studies of leadership continue to call for conceptually more differentiated leadership behaviors specifically geared to the needs of the innovation process, as well as more nuanced study designs (Denti/Hemlin 2012; Hughes et al. 2018; Kesting et al. 2015; Rosing et al. 2011).

This has given rise to contemporary *innovation-tailored leadership approaches* that aim to address the unique requirements of the innovation process, for example, ambidextrous leadership, innovation leadership, or innovation-oriented leadership. While first empirical studies provide evidence for the positive effects of these approaches on innovation or innovative performance (Carmeli/Gelbard/Gefen 2010; Stock et al. 2013b; Zacher/Robinson/Rosing 2016; Zacher/Rosing 2015), major research gaps continue to exist. Specifically, with regard to their level of analysis innovation-tailored leadership approaches, like their universal counterparts, continue to overlook organizational units as the main drivers of innovation. It therefore appears likely that more research on these approaches will uncover similarly ambiguous results when they are applied from top management or team level to the unit level. Moreover, contemporary as well as universal leadership approaches both critically fall short when it comes to sustained organizational performance. As elaborated in section 2.2.1.2 above, ambidexterity theory posits that sustained success requires a balance between innovating and operating efficiently (Gibson/Birkinshaw 2004; Jansen et al. 2009a; O'Reilly/Tushman 2008). Hence, a single-sided focus of leadership research on innovation outcomes fails to acknowledge that innovation also drains organizations of critical resources they may subsequently lack when current innovation projects exceed planned requirements or new projects are initiated (Sarkees/Hulland 2009; Zhou/Gao/Zhao 2017). The success of these leadership approaches will undoubtedly be shortlived. Thus, reliable new leadership approaches for innovation should target efficiency-related outcome variables in addition to organizational innovation. Building on these insights, study 1 (Chapter 3) extends leadership research beyond its elaborated confines by building on

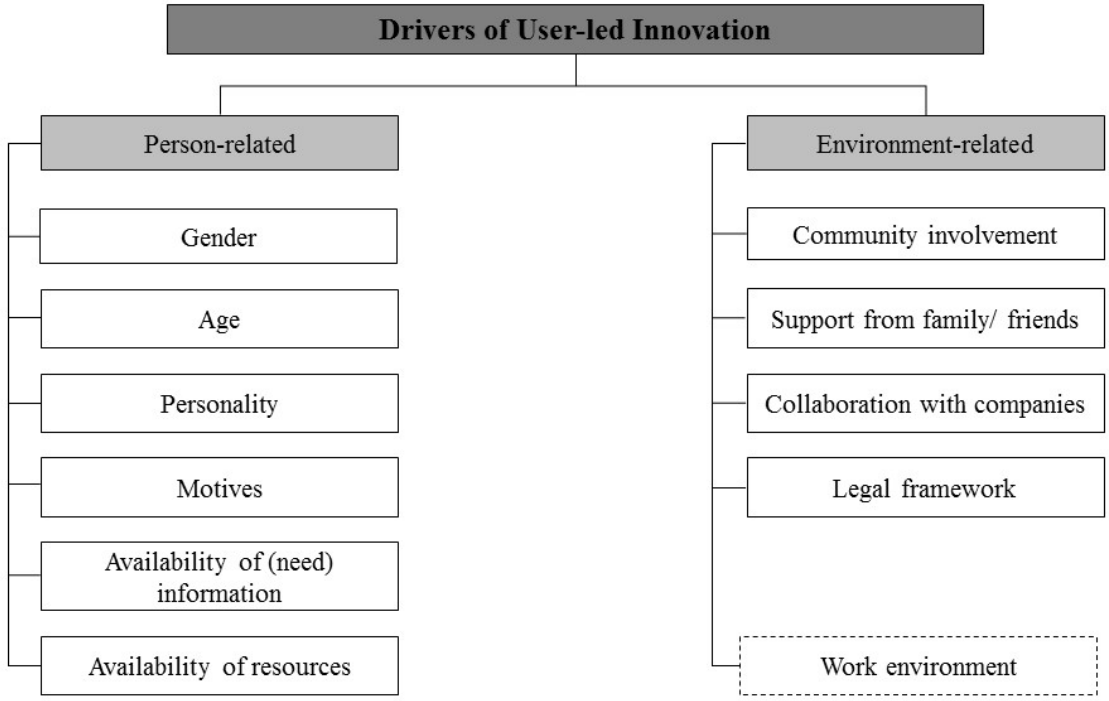
ambidexterity theory (Section 2.2.1.2) and introducing a new leadership approach geared to drive sustained innovation at the level of organizational units. This is done with the aid of a *cross-dimensional perspective* that complements the assessment of innovation with an efficiency dimension.

2.3.2 Drivers of User-led Innovation

2.3.2.1 General Overview

In contrast to the producer-led innovation paradigm, drivers of the user-led innovation paradigm have been less extensively and systematically studied. Certainly, one reason for this shortcoming lies in the comparative newness of the research field (Section 2.1). Another reason for the lack of systematic analyses, however, is related to the number of different perspectives applied to why users innovate. Specifically, Bogers et al. (2010) highlight that various explanations (e.g., a knowledge-, costs-, information stickiness-, or benefits-perspective) have been explored in different studies and with different types of user innovators (e.g., user-, lead user-, or consumer innovators). Hence, research struggles to determine a coherent theoretical perspective that is capable of consolidating and comparing extant findings. As a consequence, this thesis builds on research in producer-led innovation and its distinction between internal-organizational and external-environmental innovation drivers (Section 2.3.1.1) to systematically structure the literature on individual-level drivers of user-led innovation. As depicted in Figure 2-7, the thesis differentiates *person-related*, internal and *environment-related*, external drivers, and focusses on the most frequently discussed and empirically investigated drivers of the user-led innovation paradigm. Thus, drivers of user-led innovation are compiled irrespective of their compatibility regarding adopted perspectives or applicability to different types of user innovators.

Figure 2-7: Individual-level Innovation Drivers of User-led Innovation



Person-related drivers of innovation encompass characteristics internal to the innovating user. For example, empirical studies have found that successful user-led innovation is significantly associated with user innovators' *gender* and *age*[8], as the phenomenon is frequently observed among middle-aged men (Davis et al. 2013; de Jong 2013; Faullant/Schwarz/Krajger/ Breitenecker 2012; von Hippel 2017; von Hippel et al. 2011). In addition, *personality characteristics* and *user motives* have been shown to determine the extent to which users engage in innovation activities. With regard to the former, Stock et al. (2016) provide empirical evidence in a study of the 'Big Five' that openness to experience, introversion, and conscientiousness contribute to user innovators' success in different stages of the innovation process. With regard to the latter, research has identified a number of intrinsic and extrinsic motives that successfully enhance user-led innovation, for example, hedonic, utilitarian, altruistic, reputational, and social motives, as well as output-, learning- or need-related motives (Franke/Schreier 2010; Füller

[8] Evidence for the positive impact of age on user-led innovation comes especially from empirical studies on leisure time invention, which constitute a special field of research located at the boundary between producer-/employee- and user-led innovation (Davis et al. 2013; 2014).

2006; Hienerth et al. 2014; Jeppesen/Frederiksen 2006; Lakhani/Wolf 2005; Raasch/von Hippel 2013; Stock et al. 2015). Related to the notion of need-related motives, *availability of (need) information* has also been highlighted as a critical driver of user-led innovation. Specifically, research in this field shows that the possession of sticky/tacit knowledge about (personal) use needs, which is difficult or even impossible to transfer to producers, spurs users' engagement in innovation activities (Franke 2002; Lüthje et al. 2005; Ogawa 1998; von Hippel 1994). Finally, research also argues that *availability of personal resources*, for example, spare time, equipment, or financial assets for prototyping, is an important determinant of the extent to which users engage in innovation activities (Lettl et al. 2006; Prügl/Schreier 2006; von Hippel 2005). Although, this driver has not been explicitely studied, extensive empirical support for the importance of resource availability is provided by resource-based views of innovation (Section 2.2)

Nonetheless, person-related drivers constitute only one side of the coin. As user innovators regularly develop innovations with the aid of their social environment, environment-related drivers occupy a central position when it comes to enhancing users' engagement in innovation activities (Shah/Tripsas 2007). For example, research in a number of fields, including medical equipment, sports, open-source software, or leisure-related activities, shows that user innovators are frequently involved in *communities* (Bogers et al. 2010; von Hippel 2017; von Krogh/Haeflinger/Spaeth/Wallin 2012). These communities enable user innovators to encounter like-minded individuals, exchange knowledge, or learn about previous user innovations (Franke/Shah 2003; Hienerth et al. 2014; Raasch/Herstatt/Lock 2008). Moreover, communities may provide specific innovation support by actively testing prototypes, giving feedback, or making suggestions for improvements (Baldwin/Hienerth/von Hippel 2006; de Jong et al. 2018; Shah/Tripsas 2007). Alternatively, this input may also be provided by *family members and friends* (Franke/Shah 2003; Lüthje et al. 2005; Pongtanalert/Ogawa 2015; von Hippel 2017). Finally, the impact of organizational and political initiatives on users' engagement in innovation activities has also been discussed. In particular, studies on user *collaboration with companies*, (e.g., in contests, via toolkits, or active collaborations between companies' employees and user innovators/communities) substantiate evidence for collaborations' positive effect on user-led innovation (Henkel 2008; Lakhani 2016; Prügl/Schrier 2006; Schweisfurth/Raasch 2015). Similarly, *legal frameworks*, capable of ensuring intellectual property protection while granting room for experimentation, have been argued to encourage user-led innovation (Harhoff/Henkel/von Hippel 2003; Samuelson 2016; Strandburg 2008; Torrance 2016).

In sum, a closer analysis of the studied drivers reveals that, in addition to person-related factors, particularly knowledge/input gained in interactions with communities, family members, friends, or companies, is a critical determinant of user-led innovation. Against this backdrop, it

is all the more surprising that a central domain for knowledge accumulation, i.e., user innovators' *work environment*, has been largely omitted by user innovation research thus far. In order to illuminate the importance of the work domain for user innovators and bridge the gap to study 2 (Chapter 4), the thesis next provides a systematic overview of individual-level innovation drivers in user innovators' work environment.

2.3.2.2 The Work Environment as Central Driver of User-led Innovation

While research on producer-led innovation has extensively studied various facets of the work environment (Section 2.3.1), research on user-led innovation has predominantly limited itself to the social environment of user innovators or their interactions with companies during their leisure time. Yet, the majority of user, and especially consumer, innovators are employees for the most part of their day (Lüthje et al. 2005; Shah 2005). Hence, in their jobs, they are likely to encounter requirements that stimulate creativity, if not demand engagement in innovation activities. In turn, insights gained from these requirements may provide user innovators with knowledge that can inspire and even support them in the development of their innovations at home (Shah/Tripsas 2007; Shane 2000). Hence, Table 2-5 summarizes central factors pertaining to employees' work that drive innovation at the individual level. Moreover, given the centrality of leadership in fostering innovation in organizations (Section 2.3.1.2), i.e., employees' work environment, the overview is restricted to selected job conditions that are primarily influenced by leadership (Mumford 2000; Piccolo/Colquitt 2006; Purvanova/Bono/Dzieweczynski 2006; Shalley/Gilson 2004). Finally, with regard to the level of analysis, the overview encompasses outcome variables related to the creativity stage, the implementation stage, or innovation in general, as all are relevant to individuals' innovation efforts when engaging in user-led innovation activities.

Table 2-5: Overview of Work-related Drivers Applicable to User-led Innovation

Selected drivers	Central sources
Job demands	de Jong/Kemp 2003; Janssen 2000
Job complexity	Oldham/Cummings 1996; Park/Zhou/Choi 2018; Shalley/Gilson/Blum 2009; Tierney/Farmer 2002
Job feedback	Christensen-Salem/Kinicki/Zhang/Walumbwa 2018; Coelho/Augusto 2010; de Stobbeleir/Ashford/Buyens 2011
Job autonomy	de Jong/Kemp 2003; de Spiegelaere/van Gyes/de Witte/Niesen/van Hootegem 2014; Ramamoorthy/Flood/Slattery/Sardessai 2005
Job obligation to innovate	Gilson/Shalley 2004; Ramamoorthy/Flood/Slattery/Sardessai 2005; Yuan/Woodman 2010
Work underload	Gasper/Middlewood 2014*; Mann/Cadman 2014*; Stock 2015**

Notes: *: general studies on boredom not restricted to employee creativity/innovation. **: study on relation of employee boreout and innovative behavior.

Job demands are defined as "psychological stressors, such as requirements of working fast and hard, having much work to do within little time, or a heavy workload" (Janssen 2000, p. 289). Accordingly, job demands relate to requirements of the work that place stress on employees by taxing employees with the solving of complex tasks (Janssen 2000). High job demands have therefore been argued to increase psychological arousal, which in turn triggers coping processes, such as creative thought (Bunce/West 1994; Edwards/Cooper 1990). Consistent with this view, empirical studies have substantiated evidence for a positive effect of high/challenging job demands on innovative behavior (de Jong/Kemp 2003; Janssen 2000).

Relatedly, *job complexity* is defined as the extent to which a job is "characterized by high levels of autonomy, skill variety, identity, significance, and feedback" (Oldham/Cummings 1996, p. 610). As a result of the multifacetedness in demands, job complexity has been argued to increase employees' motivation and creativity (Deci/Connell/Ryan 1989). In support of this notion, research has found job complexity to be positively related to creativity and innovative behavior (Oldham/Cummings 1996; Park/Zhou/Choi 2018; Tierney/Farmer 2002), as well as indirectly to creative performance (Shalley/Gilson/Blum 2009).

Among the five dimensions of job complexity, two dimensions, i.e., *feedback* and *autonomy*, have also been investigated with regard to their separate effects on innovation/creativity. Building on a long research tradition, job feedback is commonly defined as "the degree to which carrying out the work activities required by the job results in the employee obtaining direct and clear information about the effectiveness of his or her performance" (Hackman/Oldham 1975, p. 162). Empirircal studies show that job feedback is directly (Coelho/Augusto 2010, de Stobbeleir/Ashford/Buyens 2011), as well as indirectly (Christensen-Salem/Kinicki/Zhang/Walumbwa 2018) related to creative behavior, and hence a determinant of innovation. In a similar vein, research on job autonomy, defined as the extent to which employees are free to engage in 'trial and error' and carry out tasks without excessive input from supervisors (Basu/Green 1997), has found a positive relation to innovative behavior (de Jong/Kemp 2003; de Spiegelaere/van Gyes/de Witte/Niesen/van Hootegem 2014; Ramamoorthy/Flood/Slattery/Sardessai 2005).

In addition, research has also focused on employees' *job obligations to innovate*, captured, for example, by job required creativity or innovativeness as a job requirement. Job obligations to innovate subsume creative demands of the job and can be defined as the extent to which employees are expected and required to engage in creative/innovative behaviors during their time at work (Gilson/Shalley 2004; Yuan/Woodman 2010). In particular, research in this field has

substantiated evidence that job obligations to innovate drive innovative behavior directly (Ramanoothy et al. 2005) and indirectly (Yuan/Woodman 2010), and are a predictor of creative performance (Gilson/Shalley 2004).

Most interestingly, this positive effect has also been found for the opposite case, i.e., *work underload*. Work underload refers to a situation in which individuals are faced with inadequate or insufficient stimulation from their tasks that may lead to feelings of boredom, a crisis of meaning, or a crisis of growth (Cummings/Gao/Thornburg 2016; Fisher 1998; Stock 2016). Accordingly, work underload describes a "psychological state of low work-related arousal" (Stock 2015, p. 574). For example, research on boredom by Gasper/Middlewood (2014) and Mann/Cadman (2014) finds positive effects for boredom on individuals' creativity and creative thought. These insights are complemented in a seminal study of the work context by Stock (2015), who sheds light on the effects of boreout on employees' innovative behavior. Specifically, Stock (2015) shows that crisis of growth and crisis of meaning both hamper innovative behavior, whereas job boredom does not. The author explains this finding by suggesting that boredom may entail positive effects and, in particular, foster the generation of new ideas.

Among the examined work-related drivers, job obligations to innovate are, evidently, most likely to expose user innovators to innovation-relevant knowledge and methods for innovating. Nonetheless, recent research on work underload also highlights an unexpected positive potential of boredom to provide user innovators with spare (mental) resources at work that may stimulate creative thought and innovative behavior (see Chapter 4 for a detailed discussion). Accordingly, the two factors provide a promising starting point to fill shortcomings of user innovation research and uncover the potential of user innovators' work environment in driving user-led innovation. Study 2 (Chapter 4) therefore addresses the research gap by building on COR theory's notion of resource transferability (Section 2.2.2.2) and extending user innovation research beyond its primary focus on users' home domain to users' work domain. Specifically, the study adopts a *cross-domain perspective* and empirically investigates the effects of high (job innovativeness) and low (job boredom) job requirements on the outcome of HHS innovation efforts of consumer innovators.

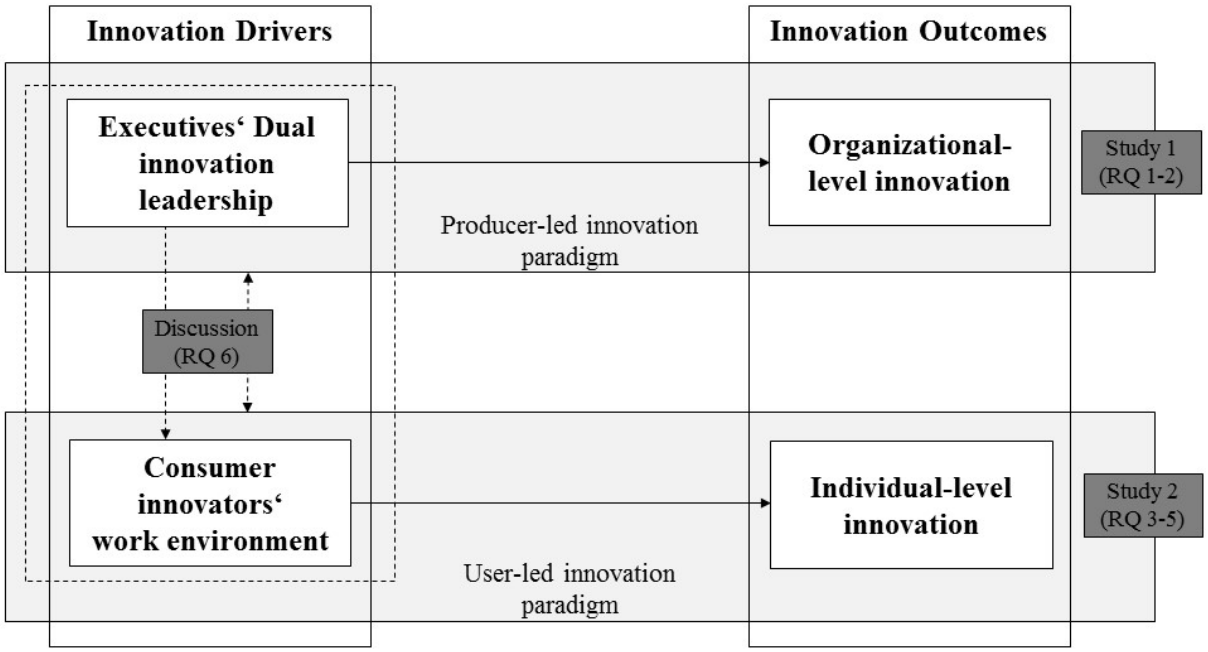
2.4 Central Research Questions and Overview of the Studies

On a superordinate level, the literature reviews highlight that innovation drivers in both research streams have received and continue to receive growing attention. While this has resulted in a number of valuable findings on innovation drivers, the reviews also demonstrate that research in both fields is highly heterogeneous, with a broad variation in perspectives, levels of analysis, and innovator types that aggravate comparability and compatibility of study results. In short,

the literature review on organizational-level drivers of innovation uncovered a variety of environmental and organizational drivers, but places special emphasis on strategy, culture and, particularly, leadership. At a higher level, studies on individual leadership approaches support the notion of leadership as a driver of producer-led innovation. Yet, on closer consideration, results of universal leadership approaches remain ambiguous, thus fueling the search for an adequate and reliable leadership approach to innovation. Similarly, the literature review on individual-level drivers found a considerable number of studies on person-related and environment-related drivers that foster user-led innovation. As the systematic analysis, however, revealed, major and equally critical gaps in research pertain to user innovators' work environment, which, after all, occupies a significant amount of (employed) user innovators' time. A deeper, theoretically and empirically grounded understanding of central drivers in the two innovation paradigms is thus required to investigate interdependencies, and, eventually, shed light on the potential for cross-fertilization between them.

As elaborated in section 1.2, the overarching goal of this thesis is to provide more nuanced insights into central drivers of the producer- and user-led innovation paradigms and uncover potential linkages between the two. Accordingly, the thesis seeks to make two contributions. First, the thesis expands previous research (leadership as a driver) and contributes to a new research field (work environment as a driver) by specifying and empirically investigating two central drivers of the paradigms (Contribution 1). Second, the thesis contributes to research on interactions between the two paradigms by exemplarily illuminating how leadership may encourage cross-fertilization (Contribution 2). Reflecting the differentiation into two paradigms, the thesis builds on two empirical studies that separately focus on one paradigm, and extends previous research by going *beyond the obvious* with the aid of three perspectives and six research questions. Figure 2-8 summarizes the thesis' overarching conceptual framework.

Figure 2-8: Overarching Conceptual Framework



RQ 1	Does executives' dual innovation leadership increase organizational unit innovativeness and efficiency?	Contr. 1
RQ 2	Are executives' goal orientations drivers of dual innovation leadership?	
RQ 3	How do high (i.e., job innovativeness) and low (i.e., job boredom) job requirements contribute to the acquisition of job-related resources that are relevant to the development of HHS innovations?	
RQ 4	How does organizational tenure affect the strength of the relationship between job requirements and job-related resources?	
RQ 5	How do job-related resources affect the outcomes of HHS innovation efforts?	
RQ 6	(How) Can the two innovation paradigms cross-fertilize one another?	Contr. 2

In detail, study 1 (Chapter 3) is located in the producer innovation sphere and introduces dual innovation leadership as a new leadership approach. Drawing on structural equation modeling (SEM) (Múthen/Múthen 2015), study 1 addresses two research questions (RQ1 and 2) that investigate the impact of dual innovation leadership on sustained organizational performance, captured via the two dimensions of innovation and efficiency:

(1) Does executives' dual innovation leadership increase organizational unit innovativeness and efficiency?
(2) Are executives' goal orientations drivers of dual innovation leadership?

To answer these research questions, study 1 integrates literature on leadership and innovation, goal orientations, and ambidexterity theory, and builds on two data sets. First, the newly developed scales of dual innovation leadership are confirmed in a validation study with 171 executives. Next, hypotheses are tested with data from 194 executives collected at two points in time. Based on the results, the study empirically supports the importance of new and more differentiated leadership approaches for successfully realizing sustainable innovation in organizations. By integrating innovation with efficiency outcomes, study 1 adopts a *cross-dimensional perspective*. Hence, the study contributes to a more nuanced theoretical foundation and empirical understanding of leadership as a driver of organizational-level innovation and proposes valuable guidelines for managers on how to handle the ambidextrous demands of innovation and efficiency for sustained organizational success.

Study 2 (Chapter 4) is primarily located in the user innovation sphere, but integrates the producer innovation sphere through its focus on employed consumer innovators. Specifically, the study explores how the work environment, as an individual-level driver of innovation, affects the development of consumer innovators' HHS innovations in the home domain. Identical to study 1, study 2 draws on SEM (Múthen/Múthen 2015) in order to shed light on three research questions (RQ3, 4, and 5):

(3) How do high (i.e., job innovativeness) and low (i.e., job boredom) job requirements contribute to the acquisition of job-related resources that are relevant to the development of HHS innovations?
(4) How does organizational tenure affect the strength of the relationship between job requirements and job-related resources?
(5) How do job-related resources affect the outcomes of HHS innovation efforts?

To answer these research questions, study 2 builds on COR theory and literature from user innovation research, and analyzes data from a sample of 147 employed consumer innovators as well as three independent raters. Findings of SEM analyses provide empirical evidence for the

positive effect of job requirements on consumer innovators' acquisition of job-related resources and their subsequent contributions to outcomes of HHS innovation efforts. By shedding light on this largely unexplored area in user innovation research, the study adds to a comprehensive perspective on user-led innovation. Specifically, the study adopts a *cross-domain perspective* that contributes to a more nuanced understanding of resource transfers between consumer innovators' work and home domain. By doing so, the study also points towards the potential of interactions between innovation efforts in the user and the producer innovation sphere (indicated by dashed downward pointing arrow in Figure 2-7). Hence, study 2 generates important implications for policy makers that aim to jointly enhance successful producer- and user-led innovation.

Finally, the question of paradigm interactions, and cross-fertilization in particular, is further elaborated in the overarching implications presented in chapter 5. Expanding the findings of study 2, the chapter integrates theoretical insights on interactions from section 2.1.3 and from the literature reviews of section 2.3 in order to address the fifth research question (RQ5):

(6) (How) Can the two innovation paradigms cross-fertilize one another?

With its overarching implications, the thesis contributes to research on interactions between the two paradigms and highlights the potential of indirect producer support for user-led innovation (Section 2.1.3). In particular, the thesis exemplarily discusses how leadership targeted to innovation (study 1) can encourage cross-fertilization by shaping consumer innovators' work environment (study 2) (indicated by dashed bidirectional arrow in Figure 2-7). With this *integrative perspective* on the findings of study 1 and study 2, the thesis generates comprehensive, yet differentiated insights into producer- and user-led innovation, shedding light on resource-efficient interactions and illuminating unexplored avenues for future research. In the following, the underlying motivations, theoretical foundations, as well as empirical results and implications of each study are presented (Chapter 3 and 4), before the overarching discussion of implications provides an integrative perspective on the two paradigms (Chapter 5).

3 Study 1 – Dual Innovation Leadership: How Executives Foster Sustainable Organizational Unit Performance

3.1 Introduction[9]

In modern economies, innovation, encompassing the intentional introduction and application of novel ideas (West/Farr 1990), is a cornerstone of organizational success (Dunne/Aaron/McDowell/Urban/Geho 2016; Hauser et al. 2006). Organizational units, i.e., business units, departments, or functional divisions with profit-and-loss responsibility (Tsai 2001), often shoulder the responsibility for innovation projects and resource allocation decisions (e.g., Holthausen et al. 1995; Jansen et al. 2006). Consequently, organizational units play a key role in organizational innovation, raising organizations' and research's attention to drivers of those units' performance. Previous research shows that leadership exerts decisive influences on individual behaviors related to creativity and innovation (Kesting et al. 2015). Leadership is therefore considered critical for successful innovation. Even as it identifies leadership as a key driver of innovation success, most research in this area limits its scope to innovativeness as the focal outcome (for a meta-analysis, Rosing et al. 2011). This bears the risk of ignoring efficiency and undercutting the foundations of ambidexterity theory.

Ambidexterity theory stresses the importance of pursuing divergent but complementary goals in order to achieve sustained organizational performance (Gibson/Birkinshaw 2004; O'Reilly/Tushman 2008). Specifically, the theory focusses on combining explorative elements, such as being innovative, and exploitative elements,such as being aligned and efficient (Jansen et al. 2009a; Raisch/Birkinshaw 2008). If organizations focus unidimensionally on innovation and

[9] This chapter is based on the joint paper by Lukoschek et al. (2018) "Leading to Sustainable Organizational Unit Performance: Antecedents and Outcomes of Executives' Dual Innovation Leadership" that has been published in Journal of Business Research, Volume 91, 266-276, 0148-2963, ©. https://doi.org/10.1016/j.jbusres.2018.07.003.

do not take efficiency into account, they become prone to taking excessive risks, operating wasteful, and failing to extract profits. Hence, they eventually endanger their long-term economic survival (Sarkees/Hulland 2009). As a result, leader behaviors aimed at driving innovation at the organizational unit level also need to promote the units' efficiency. In line with this notion, recent studies highlight that organizational efficiency complements investigations of innovation (e.g., Abdul 2015; Ahluwalia/Mahto/Walsh 2017; Yang 2012; Zhou et al. 2017). Hence, our study seeks to determine whether leader behaviors geared to fostering organizational unit innovativeness are also able to increase the unit's efficiency.

Innovation comprises the two stages of idea generation and idea implementation (Anderson et al. 2014; Birdi et al. 2016). Successful innovation requires organizational units to engage in both of these complementary albeit distinct activities. To foster innovation at the organizational unit level, executives accordingly must engage in two leader behaviors. Each of these leader behaviors is designed to drive one of the focal elements (Rosing et al. 2011). Analogously, we introduce *dual innovation leadership*, which includes two leader behaviors aimed at driving ideation and realization of novel ideas in general. To conceptualize these behaviors, we seize on Rosing et al.'s (2011) concept of opening and closing leader behavior. Morever, we specify the concept to fit the core elements of innovation. Therefore, we propose two distinct leader behaviors: *Fostering idea generation* refers to the extent to which executives encourage the creation and development of novel ideas in their organizational unit. It is a leader behavior that aims to increase follower variance by creating a supportive work environment and giving subordinates room for the development of their ideas. *Fostering idea realization* refers to the extent to which executives support the implementation of novel ideas in organizational units. It seeks to reduce follower variance by providing structures and resources for successful implementation.

With dual innovation leadership as the focal construct, we seek to answer two main research questions. First, leader behaviors geared to drive innovation could increase innovativeness at the expense of efficiency, hence forfeiting sustained organizational success (Sarkees/Hulland 2009). As a consequence, we simultaneously investigate two outcomes which reflect the challenge inherent to ambidexterity: (1) *organizational unit innovativeness*, that is the extent to which organizational units generate and implement new methods, procedures, products, or services (De Dreu 2006) and (2) *organizational unit constraint adherence*, that is the degree to which organizational units keep to their budgets and meet expectations (Lovelace/Shapiro/Weingart 2001), reflecting their efficiency. By applying this global definition of innovativeness, we aim to account for the constantly increasing pressure organizations face to

continuously innovate, products and services offered to customers as well as methods and procedures applied within these organizations, in order to remain competitive (e.g., Dunne et al. 2016; Magadley/Birdi 2012). As a result, not only units with close proximity to the market and responsible for the development of new products or services, but organizational units in general are under the pressure to continuously innovate and improve and should be studied. By simultaneously investigating two outcomes at the organizational unit level, we take this fact into consideration and address the research question: *Does executives' dual innovation leadership, i.e., fostering idea generation and fostering idea realization, increase organizational unit innovativeness and efficiency?*

Second, extant research documents the impact of leaders' characteristics on how they lead (Bass/Bass 2008; Pastor/Mayo 2008). But studies of leadership constructs tailored to foster creativity or innovation (e.g., Makri/Scandura 2010; Carmeli et al. 2010; Stock et al. 2013b) do not investigate antecedents. We therefore investigate how *goal orientations* might drive executives' engagement in dual innovation leadership by drawing on research into their role in fostering innovation-related behaviors (e.g., Alexander/van Knippenberg 2014; Janssen/van Yperen 2004). So far, research has linked employees' goal orientation to innovative behavior and creativity (e.g., Gong/Kim/Lee/Zhu 2013). Similarly, goal orientation of executives might affect their motivation to engage in leader behaviors that foster innovation-related behaviors. Our second question thus asks, *Are executives' goal orientations drivers of dual innovation leadership, i.e., of fostering idea generation and fostering idea realization?*

We conduct two empirical studies to answer the two research questions. First, we confirm newly developed scales that measure dual innovation leadership in a validation study with 171 executives. In our main study, we then test our empirical model with data that was collected at two points in time from 194 executives heading organizational units with profit-and-loss responsibility.

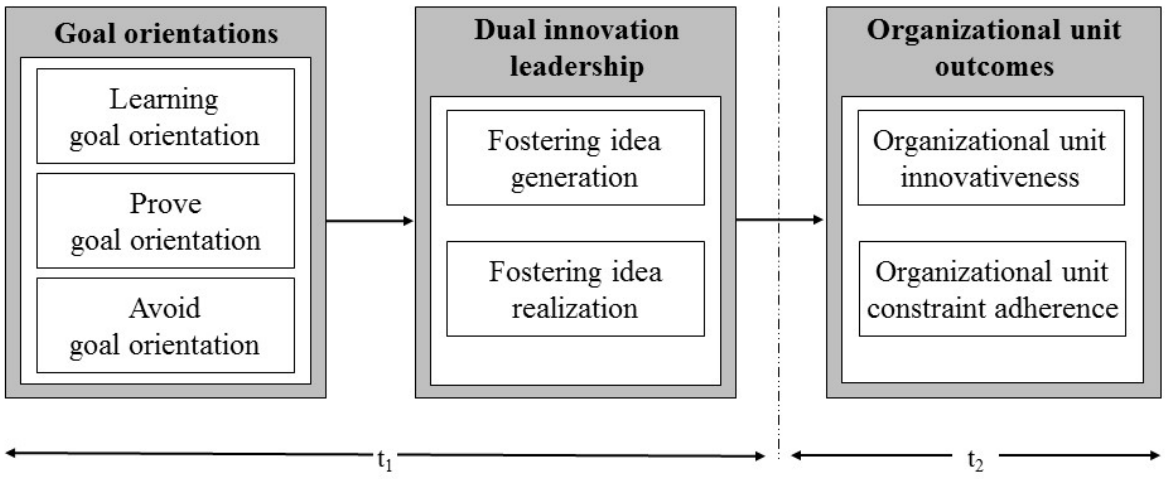
Our two studies make several contributions. First, previous research highlights the need to refine leadership constructs in innovation contexts, because existing constructs cannot sufficiently address the dual challenge inherent in leading for innovation (e.g., Kesting et al. 2015; Rosing et al. 2011). We respond to these calls by introducing two new leader behaviors and empirically investigating them in two studies. The two leader behaviors provide insights into how executives can encourage core elements of successful innovation. Second, by simultaneously investigating how executives' dual innovation leadership influences organizational unit innovativeness and efficiency, the main study advances our understanding of leader behaviors capable of promoting ambidextrous organizational outcomes. Third, we study goal orientations of executives as individual-level antecedents of their dual innovation leadership. By doing so,

we identify characteristics that distinguish executives capable of engaging in leader behaviors that address the demands of leading for innovation and efficiency. Therefore, our results not only expand research on leadership in the innovation context, but also generate practical insights to companies regarding the recruitment of executives.

3.2 Theoretical Framework

Our research draws on literature pertaining to goal orientations, leadership and innovation, and ambidexterity theory. Analogous to our two research questions, the literature review covers two main topics. First, we investigate the role of leadership in driving innovation. This leads to our dual innovation leadership construct and hypotheses about its impact on organizational unit outcomes. Second, we investigate the role of goal orientations in driving innovative behavior. This leads to hypotheses about antecedents of dual innovation leadership. Figure 3-1 depicts the conceptual framework of the following subchapters.

Figure 3-1: Study Framework (Lukoschek et al. 2018)



3.2.1 Leadership's Role in Driving Innovation

Previous research cites various universal leadership behaviors, detailing their ability to drive innovation at organizational, team, and individual levels (for reviews, Denti/Hemlin 2012; Kesting et al. 2015; Rosing et al. 2011). But most meta-analytic correlations of universal leadership constructs and innovation are small to moderate in size (Rosing et al. 2011). As a result, a single best leadership construct capable of successfully fostering innovation has not been

identified to date. This suggests a need to refine our ideas of what characterizes successful leadership in innovation contexts.

Recent publications have therefore begun to introduce leader behaviors that are explicitly tailored to the unique challenges of innovation: For example, Carmeli et al. (2010) study innovation leadership that assesses in how far leaders foster trust, encourage individual initiatives, clarify responsibilities, and provide feedback, among others. They find a positive effect of innovation leadership on performance, mediated by the company's adaptability. Alternatively, Makri/Scandura (2010) introduce creative leadership, which is concerned with developing human and social capital, and investing in internal knowledge development. They find that creative leadership interacts with operational leadership to foster innovation quality and quantity. Finally, Stock et al. (2013) introduce innovation-oriented leadership, which is defined as the extent to which executives encourage subordinates' innovation orientation. The authors note a positive impact of innovation-oriented leadership on companies' product program innovativeness.

In sum, the three studies substantiate the relevance of leader behaviors specifically tailored to foster innovation. Yet they also share two limitations. First, the leadership concepts investigated do not fully map the duality of innovation because they do not differentiate between leader behaviors geared toward driving idea generation versus idea implementation, i.e., the two focal elements of innovation (Rosing et al. 2011). Second, the studies examine leadership and innovation at top management (i.e., CEO) and organizational levels, even though responsibility for innovation and related resource allocations often accrues to the unit level (e.g., Holthausen et al. 1995; Jansen et al. 2006). In order to bridge these research gaps, we (1) introduce executives' dual innovation leadership, which consists of two leader behaviors that can foster idea generation and idea realization, and (2) investigate its impact on complementary organizational unit level outcomes.

3.2.2 Complementary Organizational Unit Outcomes of Dual Innovation Leadership

The construct of *dual innovation leadership* is tailored to an analysis at the organizational unit level. With this focal construct, we introduce two sets of leader behaviors that seek to drive the two core elements of innovation: idea generation and idea implementation (Anderson et al. 2014; Birdi et al. 2016). Thereby, we specify the concept of opening leader behaviors (i.e., increasing variance in followers' behavior) and closing leader behaviors (i.e., reducing variance in followers' behavior) (Rosing et al. 2011) in an innovation context.

Idea generation focusses on "the production of novel and useful ideas in any domain" (Janssen 2000, p. 288). It involves being creative, open to new things, and eager to learn and explore

(Hirst/van Knippenberg/Zhou 2009b; Miron-Spektor/Beenen 2015). The corresponding leader behavior we introduce is *fostering idea generation*, which describes executives' efforts to allow variance in the thinking and behavior of subordinates when they develop new ideas.

Idea implementation focusses on "producing a prototype or model of the innovation that can be experienced and ultimately applied" (Janssen 2000, p. 288). It is related to the successful application of ideas (Birdi et al. 2016). Idea implementation comprises a structured task that encompasses evaluating solutions, convincing stakeholders to provide support, and systematization (e.g., Baer 2012; Janssen 2001; Janssen/van Yperen 2004). The corresponding leader behavior is *fostering idea realization*, which describes executives' efforts to reduce variance in the thinking and behavior of subordinates when they realize new ideas.

Ambidexterity theory, however, asserts that a onesided focus on driving innovativeness is shortsighted. Instead, the theory stresses that sustained organizational performance requires successfully balancing the divergent but complementary demands of innovation and efficiency (O'Reilly/Tushman 2013; Patel et al. 2013). Accordingly, we argue that leadership that aims to foster innovation needs to simultaneously ensure efficiency in order to sustain organizational success. Hence, we investigate organizational unit innovativeness *and* efficiency as two potential outcomes of dual innovation leadership.

First, executives who engage in dual innovation leadership should increase innovativeness by enhancing ideation and implementation of novel ideas in their unit (Anderson et al. 2014; Magadley/Birdi 2012). In particular, executives engaging in fostering idea generation create supportive working conditions, take supportive actions, and provide encouragement. Thereby they supply their organizational unit with physical and psychological resources to create and develop new ideas for new methods, procedures, products, and services (Janssen 2001; Zhou/George 2001). Prior studies agree that such activities prompt individual creativity among subordinates, which increases the likelihood of idea generation in the unit (e.g., Birdi et al. 2016; Zhou/George 2001). In a similar vein, executives who engage in fostering idea realization drive their units' implementation performance by providing the guidance and resources needed for expedient, systematic endeavors to implement new methods, procedures, products, or services. These actions should encourage subordinates' implementation activities and help ensure that new ideas result "in actual, tangible … products, services, processes, or other aspects of organizational functioning" (Birdi et al. 2016, p. 20). Thus:

> *H1: (a) Fostering idea generation and (b) fostering idea realization relate positively to organizational unit innovativeness.*

Second, organizational unit performance is also dependent on the unit's ability to operate efficiently (Sarkees/Hulland 2009). Executives who encourage innovation must therefore keep efficiency requirements in view to ensure that units adhere to constraints and meet performance expectations. We argue that dual innovation leadership, beyond its positive impact on innovativeness, should also contribute to organizational unit efficiency, as reflected in the unit's constraint adherence (Lovelace et al. 2001). When executives foster idea generation and idea realization, they not only help increase the extent to which their units generate and implement new methods, procedures, products, or services (i.e., innovativeness). In addition, they also drive enhancements to existing methods, processes and procedures that result in "improved ways of working" (Anderson et al. 2014, p. 1298) and, hence, enhanced constraint adherence. Fostering idea generation increases subordinates' variance by providing them with encouragement and latitude to question established modes of practice, to speak up, and develop ideas for improved and more efficient ways of working (Janssen 2001; Jansen et al. 2009b). Fostering idea realization, on the other hand, reduces subordinates' variance by securing access to adequate amounts of resources as well as by demanding systematic, target-oriented ways of working. Thereby, fostering idea realization not only supports subordinates in effectively implementing ideas for more efficient and improved ways of working, which should generate tangible efficiency gains. In addition, fostering idea realization also encourages subordinates to work more purposefully and systematically in general. In sum, this should add to the unit's ability to keep to budgets and stick to timelines, as reflected in increased organizational unit constraint adherence. Thus:

> *H2: (a) Fostering idea generation and (b) fostering idea realization relate positively to organizational unit constraint adherence.*

3.2.3 Executives' Goal Orientations as Antecedents of Dual Innovation Leadership

Extant literature shows that leaders' individual characteristics, such as demographics, skills, and personality, shape their leadership styles and behaviors (e.g., Bass/Bass 2008; Bruno/Lay 2008; Pastor/Mayo 2008). A potentially relevant but understudied antecedent of leadership in innovation and ambidexterity contexts are leaders' motivational orientations, specifically their goal orientations. These are likely to influence their behavior (Humphreys/Revelle 1984; McClelland 1987), including which goals leaders decide to pursue, which strategies they use to reach these goals, or how they react to obstacles (Hendricks/Payne 2007; Marques-Quinteiro/Curral 2012). Executives generally have more leeway in their decision-making and priority setting than employees at lower levels of an organization's hierarchy, so executives' goal orientations may be particularly relevant for explaining goals and actions. Moreover, extensive

studies suggest that goal orientations are drivers of behaviors related to creativity and innovation (e.g., Gong et al. 2013; Hirst et al. 2009b). Therefore, goal orientations might be particularly relevant to explaining executives' engagement in dual innovation leadership.

In particular, three goal orientations can be distinguished: (1) learning, reflecting a drive "to develop competence by acquiring new skills and mastering new situations" (VandeWalle 1997, p. 997); (2) prove, reflecting a desire to gain favorable judgments and prove competence; and (3) avoid, stemming from a desire to avoid negative judgments and disproving competence (VandeWalle 1997). While a learning goal orientation thus fosters people's eagerness to acquire knowledge and learn new skills, eliciting an intrinsic motivation to engage in challenging tasks (Hirst et al. 2009b; VandeWalle 1997), prove and avoid goal orientations derive from the desire to receive rewards (prove) or avoid criticism (avoid), such that they are extrinsically motivated (Hirst et al. 200b9; Miron-Spektor/Beenen 2015).

Prior research argues that different goal orientations coexist within people and may trigger distinct behaviors (Janssen/van Yperen 2004). Specifically, research has shown that different goal orientations may drive behaviors related to transformational or transactional leadership (e.g., Pastor/Mayo 2008). Moreover, from research at the individual and team level we know that goal orientations can foster innovative behaviors.

For example, studies hypothesize and find that learning goal orientation enhances creativity, innovative job performance, and innovative behavior (e.g., Hirst et al. 2009b; Janssen/van Yperen 2004; Montani/Odoardi/Battistelli 2014). In contrast, with regard to prove goal orientation, researchers have suggested conflicting hypotheses: Janssen/van Yperen (2004) suggest that prove goal orientation negatively affects innovative job performance because prove goal oriented individuals focus on successful task achievement, thus relying more strongly on rehearsed and automated task strategies that have previously led to results. According to these authors, engaging in innovation activities will thus be an endeavor considered too unpredictable and risky for prove goal oriented individuals. Alternatively, Lee/Yang (2015) argue that prove goal orientation fosters creativity as a result of individuals' high motivation to achieve goals. They maintain that prove goal oriented individuals who anticipate to attain their goals and gain praise by generating ideas will engage in innovation. In contradiction to the proposition by Janssen/van Yperen (2004), empirical studies either find positive (Gong et al. 2013) or non-significant (Janssen/van Yperen 2004; Lee/Yang 2015) relationships. Finally, with regard to avoid goal orientation, the hypothesized negative relationships with creativity have either been found to be non-significant (Hirst et al. 2009b) or affirmed (e.g., Gong et al. 2013). Despite this ample evidence for goal orientations affecting innovative behaviors, to the best of our

knowledge, goal orientations' effect on leader behaviors in the innovation context has not been studied to date.

Building on preceding research on the consequences of individuals' goal orientation and the notion that different goal orientations trigger distinct behaviors (Janssen/van Yperen 2004), we argue that goal orientations of executives differentially affect their engagement in dual innovation leadership. Based on this observation, we develop three hypotheses:

First, *learning goal orientation* is characterized by a preference for demanding and complex tasks that provide opportunities to develop personal skills and competencies (Dragoni/Kuenzi 2012). Complex innovation activities, including idea generation and implementation, require the elaboration of existing knowledge and deep processing activities (Hirst et al. 2009b; Janssen/van Yperen 2004). Therefore, executives' learning goal orientation should encourage them to cherish the novelty and learning potential inherent to innovation activities. In other words, executives with a high learning goal orientation may be more inclined to engage in dual innovation leadership and foster ideation and implementation in their organizational units.

> *H3: Executives' learning goal orientation relates positively to (a) fostering idea generation and (b) fostering idea realization.*

Second, high *prove goal orientation* motivates people to demonstrate their abilities, outperform others, and gain praise (Janssen/van Yperen 2004). The goal of being a top performer is not tied to any specific task though (Lee/Yang 2015). As a result, executives with high prove goal orientation are likely to engage in any behavior that meets expectations. Building on this notion, previous research offers two lines of argumentation: On the one hand, prove goal orientation may encourage individuals to stick to strategies and routines that have previously been successful, as these behaviors are deemed (a) likely to result in successful task completion and (b) less uncertain and risky than experimenting with ideation and implementation of novel ideas (e.g., Janssen/van Yperen 2004). In contradiction to this reasoning, prove goal orientation has also been proposed to encourage engagement in innovation activities based on the observation that successful innovations lead to highly visible and much credited results (e.g., Lee/Yang 2015). Consequently, fostering idea generation and idea realization can be deemed to lead to precisely the acknowledgement and praise sought by prove goal oriented individuals (e.g., Gong et al. 2013). In particular, given that organizations face high pressure to continuously innovate products, services, methods, and procedures in order to remain competitive and ensure economic survival (e.g., Dunne et al. 2016; Hauser et al. 2006), prove goal oriented executives heading organizational units are expected to feel motivated to prove their units' potential for innovation. Therefore, in order to align with their companies' goals, executives with high prove goal orientation will engage in behaviors that foster innovation (Hirst et al. 2009b). In other words, these

executives should be more prone to display leader behaviors that foster the generation and implementation of novel ideas in their organizational units.

> *H4: Executives' prove goal orientation relates positively to (a) fostering idea generation and (b) fostering idea realization.*

Finally, an *avoid goal orientation* leads people to try to suppress poor performance in order to avoid negative judgments (Gong et al. 2013; VandeWalle 1997). Accordingly, avoid goal oriented individuals eschew tasks that feature high levels of uncertainty, due to the high risk of failure. Creative activities, e.g., ideation, are typically vague, uncertain, and prone to error (e.g., Hirst et al. 2009b). As a result, executives with a high avoid goal orientation likely refrain from fostering idea generation. In contrast, engaging in a highly structured, result-oriented task, e.g., fostering idea realization, should reduce perceived uncertainty and risk. Thus, these executives are expected to foster idea implementation activities in their organizational units.

> *H5: Executives' avoid goal orientation relates (a) negatively to fostering idea generation but (b) positively to fostering idea realization.*

3.3 Validation Study

3.3.1 Data Collection and Sample

In order to validate the measures for dual innovation leadership on the executive level, we approached executives participating in an open-enrollment executive education program at an international business school and invited them to complete a questionnaire in class. Our sample consists of 171 executives from various industries. In particular, executives headed organizational units with profit-and-loss responsibility and held positions at the C-level (i.e., chief executive-positions) or no more than two hierarchical levels lower. The average age of executives was 41.39 years (SD = 4.73), average organizational tenure was 9.02 years (SD = 5.88), and male participants made up 79.1% of the sample (for further sample details, see Table 3-1).

3.3.2 Study Measures

We built on literature pertaining to individuals' innovative behavior (Janssen 2001; Zhou/ George 2001) and developed items to capture the extent to which executives foster idea generation and realization in the organizational unit they lead in order to measure dual innovation leadership. After discussing the items with experts from innovation research and experienced executives, we included three items for each facet of dual innovation leadership (see Table 3-2

for items and measurement scales). With our focus on executives, with their scant time resources (Cooper/Payne 1988), we decided explicitly to constrain the number of items to three.

3.3.3 Study Results

The two measures of dual innovation leadership exhibited satisfactory psychometric characteristics (fostering idea generation: M = 5.87, SD = 0.75, Cronbach's alpha = 0.86, average variance extracted [AVE] = 0.73, composite reliability [CR] = 0.84; fostering idea realization: M = 5.69, SD = 0.71, Cronbach's alpha = 0.86, AVE = 0.67, CR = 0.86) (Bagozzi/Yi 1988; Fornell/Larcker 1981; Nunnally 1978). Our exploratory factor analysis confirmed the dimensionality of the scales by yielding a two-factor solution. All construct items loaded on their appropriate factor, with primary loadings exceeding .77 and cross-loadings lower than .29. Both factors of dual innovation leadership had Eigenvalues greater than 1 and together accounted for 72.17% of the variance. Finally, a confirmatory factor analysis that included both facets of dual innovation leadership, also resulted in a satisfactory model fit ($\chi 2/df = 1.71$; standardized root mean residual [SRMR] = 0.030; root mean square error of approximation [RMSEA] = 0.065; confirmatory fit index [CFI] = 0.990; Tucker-Lewis index [TLI] = 0.981).

3.4 Main Study

3.4.1 Data Collection and Sample

To test our model, data from executives was collected at two points in time. Identical to our validation study, participants of the main study took part in an open-enrollment executive education program at an international business school. Again, all participants were heads of organizational units with profit-and-loss responsibility. At t1, we invited 236 executives to assess goal orientations and leader behavior. We received 194 fully completed questionnaires, achieving a response rate of 82.2%. About half a year later, we obtained data on the two dependent variables, i.e., organizational unit innovativeness and constraint adherence, by returning to the same executives of the t1 data collection. At t2, we received 121 completed questionnaires, achieving a response rate of 62.4%.

In the t1 and the t2 sample, participants represented companies of different sizes, sales volumes, and various industries (e.g., manufacturing, professional services, IT, construction, retail and fast-moving consumer goods, and engineering). All participants held positions at the C-level or no more than two hierarchical levels lower, with the majority (t1: 37.2%; t2: 41.2%) being responsible for organizational units of a size of 31 to 100 employees. At t1, average organizational tenure of participants was 9.58 years (SD = 5.57), their average age was 40.47 (SD =

6.26), and 75.8% of the participants were men. Comparably, at t2, average organizational tenure was 9.37 years (SD = 5.36), average age was 40.43 years (SD = 6.28), and 77.5% of the participants were men. Table 3-1 provides detailed information on the sociodemographic characteristics of the two samples.

Table 3-1: Sample Characteristics (Lukoschek et al. 2018)

	Validation Sample	**t_1 Sample**	**t_2 Sample**
Gender	20.9% female 79.1% male	24.2% female 75.8% male	22.5% female 77.5% male
Age	41.39 years (SD = 4.73)	40.47 years (SD = 6.26)	40.43 years (SD = 6.28)
Organizational tenure	9.02 years (SD = 5.88)	9.58 years (SD = 5.57)	9.37 years (SD = 5.36)
Organizational unit size (number of employees)	Not assessed.	< 11 8.7% 11-30 20.2% 31-100 37.2% 101-250 17.5% 251-1,000 12.6% >1,000 3.8%	< 11 8.8% 11-30 15.8% 31-100 41.2% 101-250 20.2% 251-1,000 10.5% >1,000 3.5%
Company size (number of employees)	<100 22.8% 100-500 35.7% 501-1,000 10.5% 1,001-2,500 9.4% 2,501-5,000 7.6% 5,001-10,000 2.4% 10,001-20,000 5.8% 20,001-50,000 2.9% 50,001-100,000 0.6% > 100,000 2.3%	10-49 5.7% 50-99 20.3% 100-500 27.1% 501-1,000 12.0% 1,001-2,500 13.5% 2,501-5,000 8.9% 5,001-10,000 4.2% 10,001-20,000 4.2% 20,001-50,000 3.1% 50,001-100,000 1.0% > 100,000 0.0%	10-49 7.0% 50-99 20.2% 100-500 25.4% 501-1,000 10.5% 1,001-2,500 15.8% 2,501-5,000 8.8% 5,001-10,000 4.4% 10,001-20,000 4.4% 20,001-50,000 2.6% 50,001-100,000 0.9% > 100,000 0.0%
Company sales volume (annual sales in million US dollar)	Not assessed.	< 5 3.7% 5-10 6.3% 11-15 10.1% 16-25 9.5% 26-50 14.4% 51-100 10.6% 101-200 9.5% 201-500 14.8% 501-1000 6.3% >1000 14.8%	< 5 2.6% 5-10 5.1% 11-15 12.0% 16-25 9.4% 26-50 14.5% 51-100 10.3% 101-200 10.3% 201-500 14.5% 501-1000 8.5% >1000 12.8%
Industry sector	Manufacturing 13.1% Professional services 22.5% IT 10.1% Construction 8.8% Retail + Fast-moving consumer goods 10.5% Engineering 8.8% Other 26.2%	Manufacturing 18.4% Professional services 16.2% IT 15.4% Construction 13.2% Retail + Fast-moving consumer goods 8.1% Engineering 7.4% Other 21.3%	Manufacturing 15.8% Professional services 14.5% IT 14.5% Construction 13.2% Retail + Fast-moving consumer goods 6.6% Engineering 10.4% Other 25.0%

3.4.2 Study Measures

Focal constructs of the main study were measured with multiple items and seven-point Likert scales. The scales, together with the respective answer formats, are listed in Table 3-2.

Table 3-2: Scale Items for Construct Measures (Lukoschek et al. 2018)

1. Goal orientations

Learning goal orientation[a] (VandeWalle 1997)
I am willing to select a challenging work assignment that I can learn a lot from.
I often look for opportunities to develop new skills and knowledge.
I enjoy challenging and difficult tasks at work where I'll learn new skills.
For me, development of my work ability is important enough to take risks.
I prefer to work in situations that require a high level of ability and talent.

Prove goal orientation[a] (VandeWalle 1997)
I am concerned with showing that I can perform better than my co-workers.
I try to figure out what it takes to prove my ability to others at work.
I enjoy it when others at work are aware of how well I am doing.
I prefer to work on projects where I can prove my ability to others.

Avoid goal orientation[a] (VandeWalle 1997)
I would avoid taking on a new task if there was a chance that I would appear rather incompetent to others.
Avoiding a show of low ability is more important to me than learning a new skill.
I am concerned about taking on a task at work if my performance would reveal that I had low ability.
I prefer to avoid situations at work where I might perform poorly.

2. Dual innovation leadership

Fostering idea generation[b] (based on Janssen 2001; Zhou/George 2001)
Regarding the development of new ideas in your organizational unit:
- how characteristic is it for you to take actions supporting the development of new ideas?
- how characteristic is it for you to encourage the creation of new ideas for improvements?
- how characteristic is it for you to create working conditions that support the generation of new ideas?

Fostering idea realization[b] (based on Janssen 2001; Zhou/George 2001)
With regard to the realization of innovative ideas in your organizational unit:
- how characteristic is it for you to secure the resources needed to implement new ideas?
- how characteristic is it for you to prompt activities that ensure the implementation of new ideas?
- how characteristic is it for you to make sure that new ideas are introduced into the work environment in a systematic way?

3. Organizational unit outcomes

Organizational unit innovativeness[b] (De Dreu 2006)
Our organizational unit often implements new ideas to improve the quality of our processes, products and/or services.
Our organizational unit gives strong consideration to new and alternative methods and procedures for doing our work.
Our organizational unit often produces new products, services, methods, or procedures.

Organizational unit constraint adherence[c] (Lovelace et al. 2001)
Compared to other organizational units in your company, how would you rate your unit's progress regarding:
- your initial expectations.
- its cost performance.
- its adherence to budgets.

4. Control variables

Organizational tenure
For how many years have you been working for your current company?

Area of responsibility[d]
I have the profit and loss responsibility for the following unit(s).

Technological turbulence[a] (Jaworski/Kohli 1993)
The technology in our industry is changing rapidly.
A large number of new product ideas have been made possible through technological breakthroughs in our industry.

Market dynamism[a] (Jaworski/Kohli 1993)
In our kind of business, customers' product preferences change quite a bit over time.
Our customers tend to look for new products and services all the time.

Competitive intensity[a] (Jaworski/Kohli 1993)
Competition in our industry is cutthroat.
Anything that one competitor can offer, others can match readily.
One hears of a new competitive move almost every day.

Organizational unit size[e]
How many employees work in your unit?

Company size[f]
How many employees work in the company?

Notes: Letters indicate the scale format, with (a) 1 = Strongly disagree, 7 = Strongly agree; (b) 1 = Not at all characteristic, 7 = Very characteristic; (c) 1 = Much lower than average, 7 = Much higher than average; (d) 1 = General Management; 2 = Other Area; (e) 1 = < 11; 2 = 11 - 30; 3 = 31 - 100; 4 = 101 - 250; 5 = 251 - 1000; 6 = > 1000 employees; and (f) 1 = < 100; 2 = 100 - 500; 3 = 501 - 1,000; 4 = 1,001 - 2,500; 5 = 2,501 - 5,000; 6 = 5,001 - 10,000; 7 = 10,001 - 20,000; 8= 20,0001 - 50,000; 9 = 50,001 - 100,000; 10 > 100,000 employees.

Goal orientations. To measure goal orientations of executives, VandeWalle's (1997) thirteen-item scale was applied, including five items for learning goal orientation, four items for prove goal orientation, and four items for avoid goal orientation.

Dual innovation leadership. See 3.3.2 above.

Organizational unit outcomes. Organizational unit innovativeness was measured using three items from De Dreu (2006). We altered these items to refer to organizational unit instead of team. Organizational unit constraint adherence was measured with three items from Lovelace et al. (2001).

Controls. With regard to dual innovation leadership, we control for four variables: executives' organizational tenure, executives' area of responsibility, organizational unit size (measured as the number of employees attached to the unit), and company size (measured as total number of employees in the company). Each control variable was measured with a single item. With regard to organizational unit outcomes, we control for three variables that tend to influence innovation and performance (e.g., Kraft/Bausch 2016): technological turbulence (i.e., the rate of

technological change in the industry), market dynamism (i.e., the rate of change in the composition of customers and their preferences), and competitive intensity (i.e., the assessment of competitors' behaviors and their ability to differentiate). These three variables were measured with shortened versions of Jaworski/Kohli's (1993) scales. In particular, we used three items for competitive intensity and two items each for technological turbulence and market dynamism. Moreover, we control, again, for organizational unit and company size.

Psychometric properties. Table 3-3 presents the descriptive statistics, bivariate correlation coefficients, and psychometric properties of the study's constructs. The reliabilities of the latent constructs are acceptable, with Cronbach's alphas that exceed 0.70 (Nunnally 1978). All constructs exhibit CR and AVE values above the recommended thresholds of 0.70 and 0.50. (Bagozzi/Yi 1988). In order to confirm discriminant validity, we compared the square roots of the AVE for any two constructs against their interscale correlations (Fornell/Larcker 1981). Moreover, we reduced the probability of common method bias (Podsakoff/MacKenzie/Lee/Podsakoff 2003) by (1) collecting data at two points in time and (2) conducting Harman's single-factor test that found no evidence that a single general factor accounted for the majority of variance.

Table 3-3: Descriptive Statistics and Correlation Matrix of Constructs (Lukoschek et al. 2018)

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Learning GO	**0.80**													
2	Prove GO	0.15*	**0.83**												
3	Avoid GO	-0.15*	0.27**	**0.81**											
4	Fostering idea gen.	0.31**	0.03	-0.01	**0.78**										
5	Fostering idea real.	0.27**	0.09	0.15*	0.43**	**0.78**									
6	OU innovativeness	0.37**	0.09	0.01	0.49**	0.36**	**0.87**								
7	OU constraint adh.	0.07	0.17	0.20*	0.40**	0.43**	0.51**	**0.78**							
8	Org. tenure	-0.10	-0.17*	0.09	-0.04	-0.08	-0.08	0.09	**n/a**						
9	Area of resp. [a]	0.07	0.12	0.16*	0.02	0.07	0.10	0.19*	0.09	**n/a**					
10	Technological turb.	0.21**	0.01	0.15*	0.16*	0.20**	0.30**	0.21*	-0.06	-0.03	**0.74**				
11	Market dynamism	0.23**	0.10	0.22**	0.04	0.11	0.03	0.11	-0.07	-0.01	0.60**	**0.78**			
12	Competitive intensity	0.12	0.02	0.16*	0.09	0.07	0.04	0.00	-0.03	-0.05	0.27**	0.38**	**0.80**		
13	Org. unit size[a]	-0.05	-0.13	-0.09	-0.00	0.06	0.04	-0.05	0.23**	-0.11	0.04	0.01	0.14	**n/a**	
14	Company size[a]	0.00	0.09	0.04	0.18*	0.10	0.11	0.33**	0.18*	0.08	0.16*	0.03	0.19*	0.36**	**n/a**
	Mean	5,96	5,37	3,74	5,90	5,80	5,40	4,90	9,58	-	4,14	4,48	5,28	3,13	3,03
	SD	0,81	1,10	1,37	0,73	0,75	0,97	1,05	5,57	-	1,54	1,50	1,28	1,72	2,00
	Cronbach's alpha	0.90	0.89	0.88	0.77	0.82	0.90	0.79	-	-	0.75	0.78	0.78	-	-
	CR	0.90	0.90	0.88	0.76	0.82	0.90	0.83	-	-	0.76	0.78	0.79	-	-
	AVE	63.93	68.31	65.26	61.57	60.49	75.27	61.33	-	-	60.81	63.90	55.16	-	-

Notes: Diagonal elements in bold represent square roots of the AVE for constructs measured with multiple items.
[a] Categorical variable; answering scale format provided in Table 3-2. GO = goal orientation; OU = organizational unit; Org. = organizational.
* $p < 0.05$. ** $p < 0.01$.

3.4.3 Study Results

To test our hypothesized relationships, we employed SEM with full information maximum likelihood (FIML) parameter estimation in MPLUS 7.2 (Muthén/Muthén 2015). Because FIML uses all data available for each case to estimate the model, without imputing values for missing data (e.g., Enders 2006; Enders/Peugh 2004), we opted to use it rather than listwise case deletion, which instead would exclude any case with missing values, even if only one item were missing. Compared with other procedures for dealing with missing values, FIML also has proven superior, in that it yields more efficient, unbiased parameters as opposed to successive ad hoc techniques (Enders 2001; Newman 2014; Olinsky/Chen/Harlow 2003).

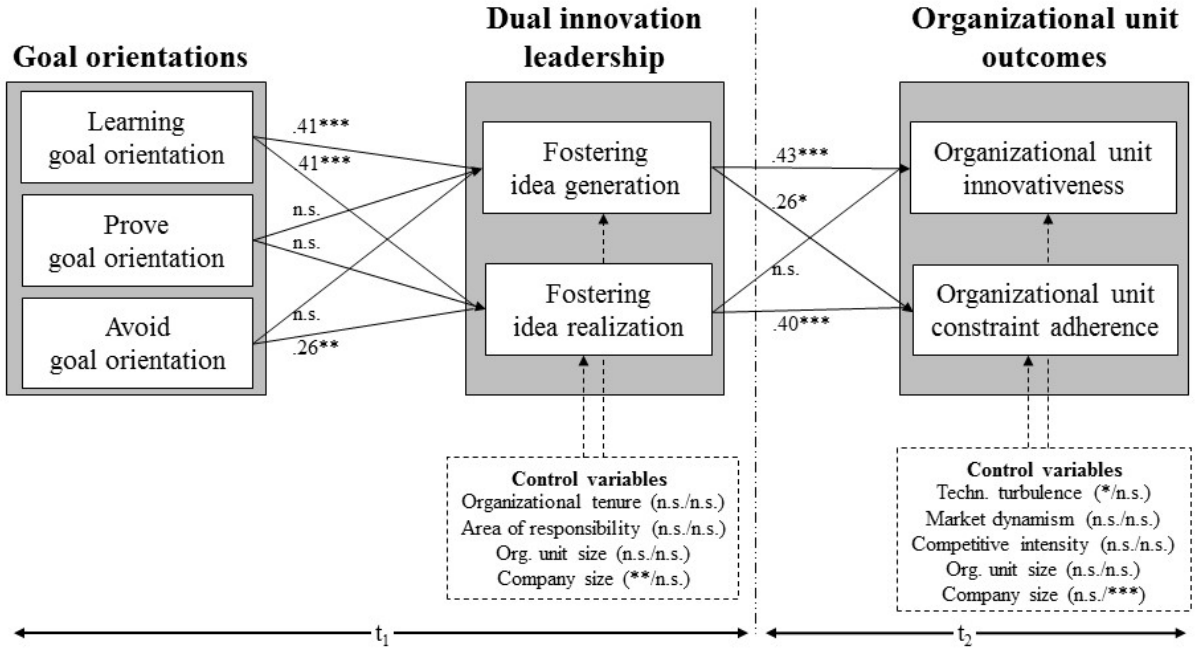
The SEM results indicate satisfactory global fit ($\chi 2/df = 1.38$; RMSEA = 0.045; SRMR = 0.069; CFI = 0.929; TLI = 0.919). Our resulting standardized path coefficients are depicted in Figure 3-2. With regard to our hypotheses for organizational unit outcomes, we find partial support for H1. In line with H1a, fostering idea generation (ß = 0.43, $p < 0.001$), but not fostering idea realization (ß = 0.15, n.s.), relates positively to organizational unit innovativeness. In support of H2a and H2b, fostering idea generation (H2a: ß = 0.26, $p < 0.05$) and fostering idea realization (H2b: ß = 0.40, $p < 0.001$) both exhibit positive relationships with organizational unit constraint adherence.

With regard to our hypotheses on antecedents, we find positive links from learning goal orientation to fostering idea generation (ß = 0.41, $p < 0.001$) and to fostering idea realization (ß = 0.41, $p < 0.001$), supporting H3a and H3b. In contrast, we must reject H4a and H4b because prove goal orientation is unrelated to fostering idea generation (ß = -0.10, n.s.) and fostering idea realization (ß = -0.05, n.s.). Avoid goal orientation, on the other hand, is unrelated to fostering idea generation (ß = 0.09, n.s.) but positively related to fostering idea realization (ß = 0.26, $p < 0.01$), supporting H5b but not H5a.

Finally, with regard to our control variables, we find no effects for organizational tenure on fostering idea generation (ß = -0.06, n.s.) and fostering idea realization (ß = -0.12, n.s.). Also area of responsibility (ß = -0.02, n.s.; ß = 0.04, n.s.) and organizational unit size (ß = -0.07, n.s.; ß = 0.12, n.s.) are unrelated to the two facets of dual innovation leadership. In contrast, we find a positive link from company size to fostering idea generation (ß = 0.25, $p < 0.01$), but not to fostering idea realization (ß = 0.09, n.s.). Regarding our outcome variables, technological turbulence is positively related to organizational unit innovativeness (ß = 0.51, $p < 0.05$), but remains unrelated to organizational unit constraint adherence (ß = -0.15, n.s.). Market dynamism (ß = -0.41, n.s.; ß = 0.26, n.s.), competitive intensity (ß = 0.06, n.s.; ß = -0.13, n.s.), and organizational unit size (ß = 0.06, n.s.; ß = -0.17, n.s.) are all unrelated to organizational unit innovativeness and organizational unit constraint adherence, respectively. Finally, we find company

size is unrelated to organizational unit innovativeness (ß = 0.01, n.s.), but positively related to organizational unit constraint adherence (ß = 0.36, p < 0.001).

Figure 3-2: Structural Equation Modeling Results (Lukoschek et al. 2018)



Notes. n = 194 executives. x^2/df= 1.38; RMSEA = 0.045; CFI = 0.929; TLI = 0.919.
*p<.05. **p<.01. ***p<.001.

3.5 Discussion

Innovation scholars generally agree that leadership is a key determinant of employee behaviors related to innovation and thus of innovation success (e.g., Kesting et al. 2015; Rosing et al. 2011). Yet as ambidexterity theory demonstrates, ensuring sustainable organizational performance requires executives to display leader behaviors that contribute simultaneously to innovativeness and efficiency. By integrating research on the leadership–innovation link and ambidexterity theory, the present study introduces dual innovation leadership, which comprises two leader behaviors that are tailored to the core elements of innovation, and examines its impact on the ambidextrous outcomes of organizational unit innovativeness and efficiency.

3.5.1 Theoretical Implications

From a scientific perspective, this study contributes to research on how leadership drives innovation and efficiency in four main ways. First, this study focusses on executives heading organizational units. By empirically investigating outcomes at this level, we strive to bridge the research gap that has arisen because most research into the innovation-leadership relation examines top executives and firm-level outcomes, as suggested by upper echelons theory (e.g., Sariol/Abebe 2017), or team leaders and team-level outcomes (e.g., Zacher/Rosing 2015). Moreover, our unit-level approach also contributes to ambidexterity research. This research stream notes conceptually how executives' leadership of organizational units can produce organizational ambidexterity (e.g., Gibson/Birkinshaw 2004) but lacks empirical investigations. Accordingly, our quantitative study contributes to answering O'Reilly/Tushman's (2013) call for empirical evidence of how leadership might foster ambidextrous outcomes by shedding light on the effect of dual innovation leadership on organizational unit innovativeness and efficiency.

Second, with dual innovation leadership, we introduce and empirically investigate a leadership construct geared to tackling the dual challenges of generation and implementation executives face when driving innovation. In particular, the results of our validation study indicate that fostering idea generation and fostering idea realization are two conceptually distinct leader behaviors. Future research may now consider applying these validated scales to gain more fine-grained understanding of how executives might enhance different aspects of subordinates' innovative behavior, as discussed by Janssen (2000), or else to investigate which of the two dual innovation leader behaviors increases the quality, quantity, or speed of innovation.

Third, prior research on leadership and innovation focusses almost exclusively on innovativeness as key outcome (Rosing et al. 2011). Yet, the pursuit of innovativeness alone cannot produce a sustained competitive advantage. Instead, ambidexterity theory stresses that innovation and efficiency are both necessary for organizations' overall performance (Sarkees/Hulland 2009). Acknowledging these insights, we test the impact of executives' dual innovation leadership on organizational unit innovativeness and constraint adherence. Our results show that both dimensions foster organizational unit constraint adherence: Executives who display dual innovation leadership increase their unit's ability to stick to its budget and meet performance expectations. However, contrary to our prediction, organizational unit innovativeness is solely affected by fostering idea generation. This result indicates that leadership geared to foster the creation and development of novel ideas enhances the extent to which organizational units innovate methods, procedures, products, or services. In contrast, leadership aimed at fostering the realization of novel ideas is unrelated to organizational unit innovativeness. This counterintuitive finding may be a result of the global conception of innovativeness which we applied in this

study. This global conception captures all types of innovations, i.e., product and service innovations targeting the market as well as innovations regarding methods and procedures for use within the organization. While all units of an organization might contribute to the generation of novel ideas, the responsibility for a given idea's implementation might be restricted to specific organizational units, depending on what kind of product, service, method, or procedure the idea relates to. Moreover, depending on the type and scale of an innovation, an organizational unit might depend on other units for successful implementation. Therefore, across various organizational units, executives' engagement in fostering idea realization might have limited impact on their unit's innovativeness. In addition, executives might labor under a pro-innovation bias when assessing their unit's innovativeness. That is, when executives assess innovativeness, they might unilaterally focus on creative aspects, i.e., whether their organizational unit has come up with many and particularly novel ideas, but forget to consider the successful implementation of these ideas (Magadley/Birdi 2012; Rogers 2010).

Fourth, to the best of our knowledge, this study is the first to examine antecedents of leadership constructs that have been specifically geared toward driving innovation. Distinguishing efforts to foster idea generation from those to foster idea realization provides more differentiated insights into the relations among executives' goal orientations and their engagement in dual innovation leadership. As our results show, a learning goal orientation facilitates both facets of dual innovation leadership. That is, learning goal oriented executives appear to enjoy the complexity and learning potential of innovation activities. A prove goal orientation is unrelated to either facet, a result that is similar to previous research finding prove goal orientation to be unrelated to innovative behaviors (Janssen/van Yperen 2004; Lee/Yang 2015). A possible explanation for the non-significant relationship could be that prove goal orientation triggers two opposite mechanisms capable of cancelling each other out. On the one hand, executives face pressure to engage in innovation activities in order to contribute to companies' goals of gaining and maintaining competitive advantages and ensuring economic survival. Thus, executives high in prove goal orientation engage in dual innovation leadership to prove their competence. Simultaneously, prove goal oriented executives may consider engaging in fostering idea generation and realization too risky against the backdrop of adopting familiar strategies that have previously been successful (e.g., Janssen/van Yperen 2004), leading them to "drop out" of dual innovation leadership when established approaches promise equal success. Together, these opposing mechanisms might explain the non-significant effect of prove goal orientation on dual innovation leadership. To shed more light on these mechanisms, we strongly encourage future research to test the stability of our finding in companies which vary in their degrees of incentivizing innovation. Finally, avoid goal orientation relates solely to fostering idea realization, in line with our hypothesis that idea implementation might be perceived as more structured and

less prone to errors, thus decreasing the risk that avoid goal oriented executives will be subject to negative judgments. In sum, these findings underscore the relevance of executives' goal orientations for predicting leadership aimed at driving innovation.

3.5.2 Managerial Implications

Against the backdrop of dynamic and rapidly changing markets, innovation has been a top strategic priority for executives for over a decade (BCG 2015). With organizational units assuming a key role in organizational innovation, leadership behavior of executives heading those units is crucial for increasing organizational unit innovativeness. Yet as ambidexterity theory reveals, executives also must be able to maintain efficiency in their organizational units (Carmeli/Halevi 2009; O'Reilly/Tushman 2011). By investigating organizational unit innovativeness and constraint adherence simultaneously, our study affirms that companies require executives who can engage in dual innovation leadership to enhance organizational unit performance regarding both key outcomes. That is, executives need to foster idea generation by encouraging openness to new ideas and creativity among subordinates, as well as foster idea realization by supporting subordinates with structuration and resources to implement their new ideas. To qualify executives heading organizational units for successfully employing these two types of leader behaviors, companies may provide coaching and training aimed at imparting techniques to stimulate experimentation and creativity, as well as strategies to systematically and efficiently plan and direct the implementation of novel ideas.

In addition, executives' personal characteristics, and specifically their goal orientations, influence the extent to which they display dual innovation leadership. In this sense, companies may consider selecting leadership candidates on basis of their goal orientations. In particular, candidates with a strong learning goal orientation should be inclined to foster idea generation, thus contributing to their unit's innovativeness and constraint adherence. In contrast, candidates who exhibit a combination of a strong learning goal and avoid goal orientation tend to foster idea realization, thus contributing to organizational unit constraint adherence. As different goal orientations coexist in each person (Janssen/van Yperen 2004), companies might search for candidates that score high in all of these goal orientations. Alternatively, companies could also establish two-headed leadership by selecting two executives who complement each other in their characteristics and thus in their qualifications for dual innovation leadership.

3.5.3 Study Limitations and Avenues for Future Research

The present study reveals the performance implications of executives' dual innovation leadership, but we did not examine which mechanisms mediate the relationships between dual innovation leadership and unit-level outcomes. Future research may therefore decide to identify the variables through which the two facets of dual innovation leadership impact different outcomes, such as subordinates' innovative behavior (Janssen 2000; 2001), motivation to engage in innovation activities (Liu/Jiang/Shalley/Keem/Zhou 2016; Shin/Zhou 2003; Tse/Chiu 2014), or the organizational unit's innovation climate (Hülsheger/Anderson/Salgado 2009). In addition, further research could examine other individual-level antecedents, such as executives' behavioral complexity (Lawrence/Lenk/Quinn 2009), emotional intelligence (Zhou/George 2003), creative self-efficacy (Tierney/Farmer 2002), or scores on the Big Five personality traits (Bono/Judge 2004) to extend our study's focus on executives' goal orientations.

Second, organizational unit innovativeness was measured based on a global definition of innovation. This definition included innovations related to products and services as well as innovations related to methods and procedures (Anderson/West 1998; De Dreu 2006). By doing so, our study was able to investigate antecedents of innovativeness across all types of organizational units. However, more differentiated insights into the effects of dual innovation leadership may be desirable. Hence, future research should employ a more fine-grained conception of innovativeness that distinguishes market-related product/service innovations from innovations regarding methods or procedures. By employing multi-dimensional conceptions of innovativeness as discussed, for example, by Damanpour (2014) or Hervas-Oliver/Sempere-Ripoll (2015), future research could provide valuable insights into whether, and how, dual innovation leadership's effect on organizational unit innovativeness varies when type of innovation is considered.

Third, all study participants were taking part in an executive education program. Sampling in the context of this educational program allowed us access to executives with various occupational backgrounds and from a number of companies, increasing the generalizability of the study's results. Nevertheless, as all study participants were currently involved in professional education, their learning goal orientations might exhibit a relatively high mean and low variance. Thus, we highly encourage further research to validate our research model with executives recruited in other contexts.

Fourth, this study relies on executives' assessments of all model variables. To mitigate the probability of common method bias that may have resulted from this single key informant design, we followed procedural remedies suggested by Podsakoff et al. (2003). Specifically, we (1) separated measurement of outcome variables and the other model variables temporally, (2)

used different response formats, (3) protected participants' anonymity, and (4) reduced participants' evaluation apprehension. In addition to these remedies, future research should include other data sources, for example, (internal or external) customers' assessments of innovativeness, along with objective data to measure constraint adherence.

Finally, in line with previous research indicating that company size affects leadership and organizational unit outcomes (e.g., Anderson et al. 2014; Bass/Bass 2008; Hauser et al. 2006), we controlled for the impact of company size on dual innovation leadership and organizational unit outcomes. We find that company size is positively related to fostering idea generation and organizational unit constraint adherence, but not fostering idea realization and organizational unit innovativeness. To dig deeper into these findings and the underlying mechanisms, future research could employ sampling and analytic strategies that allow for comparatively studying antecedents and outcomes of dual innovation leadership in small, medium, and large companies. Such a comparative approach would also complement recent research in the field of innovation, adding to investigations of the peculiarities of small- or medium-sized companies (e.g., Ahluwalia et al. 2017; Dunne et al. 2016).

4 Study 2 – Drivers of Consumer Innovation: How Job-Related Resources Spill Over into Household-Sector Innovations

4.1 Introduction[10]

An electrically operated scarecrow, a Twitter-linked scale that encourages users to lose weight, and a machine for applying wallpaper to diagonal walls vary in their areas of applications but have a key feature in common. They are all consumer products that have been developed or modified by individual consumers during unpaid discretionary time at private costs for their own benefit, i.e., they are HHS innovations (Gault 2018; von Hippel et al. 2012). Consumers freely engage in innovation to develop products, processes, techniques, or services that can meet their personal needs, whether for their hobbies, medical needs, software demands, or home design preferences (de Jong et al. 2015; Habicht et al. 2012; Oliveira/von Hippel 2011; von Hippel 2017). These HHS innovations fill gaps that are uneconomical or impossible for commercial producers to address (Gambardella et al. 2016), and they have substantial value for society (von Hippel 2005). Yet only about 1.5% to 7.0% of countries' populations successfully engage in HHS innovation (Bengtsson 2015; de Jong 2016; Kim 2015). The prospects are even bleaker with regard to diffusion; with only one of every five innovations ever becoming available to other consumers (de Jong et al. 2015; von Hippel et al. 2012). Considering the benefits that HHS innovations generate, from policy and academic perspectives, these failure rates demand further investigation of contextual factors accompanying HHS innovation.

In particular, innovation is a resource-intense endeavor, so to engage in it, innovators need assets, i.e., resources that facilitate accomplishment (Amabile et al. 1996; Amit/Schoemaker 1993). Some research on consumer innovators cites individual-level or leisure time–related antecedents as resources for HHS innovations, such as consumers' personality characteristics and traits, personal use experience, hobbies related to the innovation, or involvement in (online) communities (e.g., Franke et al. 2006; Lüthje et al. 2005; Ogawa/Pongtanalert 2013; Schreier/Prügl 2008; Stock et al. 2016). Previous studies also hint at the importance of users'

[10] This chapter is based on a joint working paper (Lukoschek/Stock 2019).

professions (Lüthje et al. 2005; Shah/Tripsas 2007). However, job-related antecedents have not been examined previously, despite their likely relevance in HHS innovation settings.

Specifically, at an abstract level, moods, skills, values, and behaviors often spill over between work and family domains (Edwards/Rothbard 2000). Resources acquired by employees through their jobs thus may benefit them beyond work and enrich their home domain (or vice versa) (Hakanen/Peeters/Perhoniemi 2011). At a more specific level, research on employee innovation suggests that they often obtain key resources from domains other than the ones in which they develop the innovation. For example, employees engaged in leisure time invention frequently gain insights from this activity, which then provide crucial impetuses for their work-related innovations (Davis et al. 2013). Finally, employees acquire knowledge about product usage for their companies from other domains, such that embedded lead users (i.e., employees who are lead users of their employing firm's products or services (Schweisfurth/Raasch 2015)), gather knowledge while at home that contributes to the development of innovations at work (Schweisfurth 2017; Schweisfurth/Raasch 2015). Resources thus are transferrable from one domain to another, even in innovation contexts, and we see no reason a similar transfer would not hold true for HHS innovations, such that consumer innovators might benefit from resources acquired in their work domain for developing their HHS innovations at home.

Leveraging COR theory, we explore the link between consumer innovators' work domain and their development of HHS innovations. According to COR theory, people strive to acquire, protect, and grow resources to attain things that are of central value to them (Hobfoll 1989, 2011). Therefore, consumer innovators developing HHS innovations likely start by accumulating resources that will encourage the realization of their innovation. In this context, *job requirements* constitute conditions encountered at work that could facilitate innovativeness and/or give innovators the freedom to build job-related resources for innovation activities at home. To explore the influence of such job requirements, we consider two, representing high and low levels.

That is, as a high-level job requirement, *job innovativeness* reflects whether innovative behaviors are explicitly specified and required by the employee's job description (Yuan/Woodman 2010). To meet such requirements, employees would need to suggest, develop, and test new ideas, which should give these potential consumer innovators a more holistic view of innovation processes. Such required exposures to innovation activities at work may increase the job-related resources available to develop HHS innovations at home.

In contrast, as a low-level job requirement, *job boredom* also might provide space to build resources to support innovation activities at home (Drory 1982; Fisher 1998). Job boredom reflects the extent to which an employee experiences a transient, affective state of low arousal

and dissatisfaction, attributed to a lack of stimulation at work (Fisher 1993; Mikulas/Vodanovich 1993). Albeit controversial, low levels of arousal due to boredom could enable recovery experiences and encourage people to search for distraction, such that recent research argues that boredom can foster creative thought and innovation activities (e.g., Cummings et al. 2016; Gasper/Middlewood 2014; Mann/Cadman 2014). With this foundation, our first research question asks:

(1) How do high (i.e., job innovativeness) and low (i.e., job boredom) job requirements contribute to the acquisition of job-related resources that are relevant to the development of HHS innovations?

Extant literature also highlights the importance of repeated exposures to sources of stimulation, to get people to react and engage in responsive activities (Davis et al. 2013; Elpidorou 2014). Repeated exposures to job requirements may increase consumer innovators' ability to acquire job-related resources, and employees who have been with the company for longer likely have experienced more such exposures. Therefore, we introduce organizational tenure as a contingency variable and ask:

(2) How does organizational tenure affect the strength of the relationship between job requirements and job-related resources?

Finally, COR theory predicts that people invest their resources if doing so helps them gain new resources (e.g., Halbesleben et al. 2014; Hobfoll 2001). Thus, we expect job-related resources to spill over into the generation and enhancement of HHS innovations. According to research that assesses innovation outcomes holistically, consumers' or users' ideas generally score high on novelty and usefulness (e.g., Kristensson/Gustafsson/Archer 2004; Poetz/Schreier 2012), but their feasibility tends to be lower than the levels achieved by employees in their proposed ideas (e.g., Kristensson et al. 2004; Magnusson 2009). Because consumer innovators occupy a dual role, as users and employees, their HHS innovations, however, might score high on all three dimensions. Accordingly, we assess the *outcome of* consumer innovators' *efforts* in terms of HHS innovation novelty, general use value, and technical feasibility, with the following research question:

(3) How do job-related resources affect the outcomes of HHS innovation efforts?

To answer these three research questions, we draw on a sample of 147 work-inspired consumer innovators and ask three independent raters to evaluate the outcomes of their HHS innovation efforts. Our empirical analyses in turn make several contributions. First, research on boredom extensively highlights its detrimental effects on employee productivity and well-being (Loukidou/Loan-Clarke/Daniels 2009; O'Hanlon 1981). Only recently have a few attempts sought to

reconsider its potential role as a stimulus for creativity and change (Carroll/Parker/Inkson 2010; Elpidorou 2014). Such a view implies that sometimes "less is more", and experiencing low job requirements (i.e., boredom) contributes to the acquisition of job-related resources. To substantiate this claim, we empirically test how job boredom could foster the acquisition of job-related resources. Moreover, we shed light on the intricate mechanisms of this link, by taking temporal dimensions into account and including organizational tenure as a moderating variable.

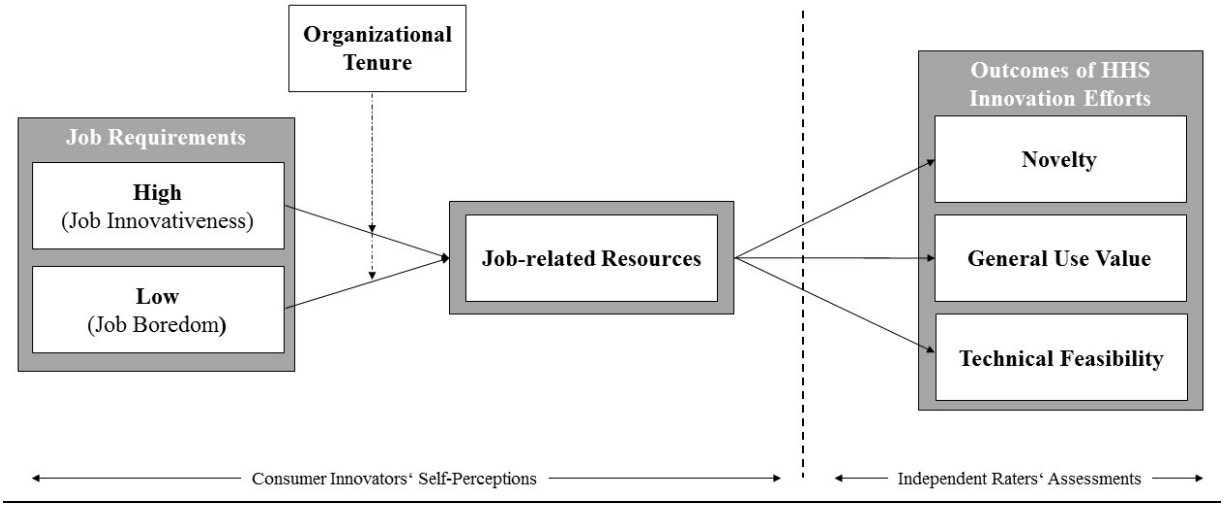
Second, our study complements research on innovation spillovers from home and leisure domains to work, by considering the opposite spillover direction (e.g., Davis/Hoisl/Davis 2014; Schweisfurth/Raasch 2015). We describe and analyze resource transfers of job-related resources to HHS innovations, reflecting a spillover effect from the work domain to innovation activities conducted at home. Our research thus expands current knowledge on consumer innovation by elucidating the role of job-related antecedents for the development of HHS innovations.

Third, comparisons of producer (i.e., employee) and user innovations suggest the latter are technically less mature (e.g., Kristensson et al. 2004; Magnusson 2009). Overcoming this shortcoming could be beneficial to societies though, because technically more advanced consumer innovations might diffuse more readily to first adopters (de Jong et al. 2018; Rogers 2010). This study proposes a potentially promising option, by demonstrating how job-related resources enhance the outcome of HHS innovation efforts, in terms of novelty, general use value, and technical feasibility. Accordingly, we note that consumer innovators' work environment is an important contextual factor that policymakers should address when developing policies to increase the number of successful HHS innovations. In this sense, our findings have notable implications for both research and policy.

4.2 Theory and Hypotheses

The framework of our study (Figure 4-1) is based on predictions of COR theory. In this section, we first elaborate its implementation in the innovation context. Next, we derive hypotheses on how high (i.e., job innovativeness) and low (i.e., job boredom) job requirements contribute to job-related resources and explore the role of organizational tenure as potential moderator. We conclude with hypotheses on how job-related resources spill over into the development of HHS innovations.

Figure 4-1: Sudy Framework



4.2.1 COR Theory in Innovation Contexts

As a resource-oriented framework of how people build, lose, and maintain resources (Hobfoll 1989; 2001; 2011), COR theory defines resources as "objects, personal characteristics, conditions, or energies that are valued in their own right, or that are valued because they act as conduit to the achievement or protection of valued resources" (Hobfoll 2001, p. 339). COR theory has been well established in organizational research, especially for studies of challenging work conditions, stress, and resource losses (e.g., Fritz/Sonnentag 2006; Halbesleben et al. 2014; Zellars et al. 2006). More recently, it has been applied to innovation literature, particularly research on employees' innovative work behavior (Kiazad et al. 2014; Stock 2015) because innovation endeavors require resources. That is, people lose resources through their innovation efforts but gain resources from successful innovation completion. Thus, COR theory contributes to understanding of individual innovation efforts by making predictions about how innovators likely economize their available resources.

As a motivational approach, COR theory also builds on the premise that people strive to attain personal goals and acquire things that are of central value to them (Hobfoll 2001; Zellars et al. 2006), which requires that they invest their existing resources (Hobfoll/Schumm 2002). If they start with greater resources, they may be better able to secure and increase their resources (e.g., Hakanen et al. 2008; Halbesleben et al. 2014; Hobfoll 2001). In an innovation context, Hakanen et al. (2008) provide initial insights into such cumulative resource gains related to work-unit

innovativeness. We adopt this notion and apply it to HHS innovations, by postulating that consumer innovators initiate a resource gain process.

First, consumer innovators likely seek to acquire and build job-related resources that may benefit their private innovation efforts. More favorable or resource-conductive job requirements therefore should contribute to the acquisition of resources that are relevant to HHS innovation. Second, they should invest resources in activities that generate value for them (de Jong et al. 2015), whether hedonic (e.g., learning something new, having fun) or utilitarian (e.g., solving a personal problem) (Stock et al. 2015). Consistent with COR theory, these investments should result in the attainment of new resources, in the form of the HHS innovation.

By studying *job-related resources*, we focus on intangible forms, such as knowledge, energy, and inspiration, that work-inspired consumer innovators may gain from their work environment. These resources could arise from different bases (Halbesleben/Wheeler 2008), so we investigate two job requirements positioned at opposite ends of the intensity spectrum of requirements: job innovativeness and job boredom.

4.2.2 The Importance of Consumer Innovators' Work Environment

4.2.2.1 Job Innovativeness

Since being introduced by Yuan/Woodman (2010), innovativeness as a job requirement has been studied in various contexts, including leader–employee interactions and job designs (e.g., Kurz/Hüsig/Dowling 2018; Qin/Wang/Zhao/Qian/Chen 2016). It reflects the extent to which engaging in innovative behaviors represents an explicit job demand. By integrating literature pertaining to user innovation and COR theory, we propose that job innovativeness contributes to job-related resources for developing HHS innovations through two mechanisms, namely, intellectual and emotional stimulation.

First, if their jobs require innovation activities, the consumer innovators may derive intellectual stimulation from learning basic know-how (e.g., techniques for ideation, prototyping, testing). As suggested by COR theory, we propose that such work-inspired consumer innovators use these insights to build knowledge and draw inspiration for their HHS innovations. This is because user innovators prefer to use local knowledge, i.e., knowledge that is already in their possession, to avoid or reduce the costs of obtaining or transferring it (Lüthje et al. 2005; von Hippel 1994). For example, studies on user innovators in mountain biking (Lüthje et al. 2005) or on lead users (Schweisfurth 2017) show that innovators draw on relevant knowledge acquired in one domain and directly apply it to their domain of innovation. Furthermore, when

innovativeness is required by the job, it may function as a source of knowledge abstraction and inspiration, because work-inspired consumer innovators can engage in analogical thinking or knowledge recombination, two reliable strategies for enhancing creativity and innovation success (e.g., Dane 2010; Franke/Poetz/Schreier 2014; Schweisfurth 2017). Thus, innovativeness required by the job, through intellectual stimulation, may increase consumer innovators' job-related resources.

Second, consumer innovators may be emotionally stimulated by job innovativeness. People tend to act in congruence with their socially defined positions and fulfill the expectations associated with their roles (e.g., Solomon/Surprenant/Czepiel/Gutman 1985). Consumer innovators whose jobs require them to be innovative thus may regard innovation activities as appropriate behavior and associate positive emotions with them (e.g., feelings of success, recognition, contentment) (Yuan/Woodman 2010). Fulfilling role expectations also builds confidence (Solomon et al. 1985; Yuan/Woodman 2010). As positive feelings of endorsement and confidence can energize people (e.g., Estrada/Isen/Young 1994; Rich/Lepine/Crawford 2010; Wright/Cropanzano 2004), we propose that positive feelings elicited by job innovativeness supply consumer innovators with personal energy that enhances their job-related resources.

H1a: Job innovativeness positively affects the acquisition of job-related resources.

4.2.2.2 Job Boredom

Job boredom is characterized by an underuse of capacities, due to monotony or routinization, often resulting in disengagement from work (Harju/Hakanen 2016; Loukidou et al. 2009). Bored people find it difficult to generate interest in and concentrate on their tasks, because they experience a conflict between insufficient stimulation from their work and a desire to be stimulated (Cummings et al. 2016; Fisher 1998). Reflecting this conflict, we note two opposing views on the effects of boredom in prior literature. On the one hand, job boredom could prompt withdrawal and reduced activation levels, and empirical evidence indicates detrimental effects on performance, job satisfaction, and energy (e.g., Drory 1982; Kass/Vodanovich/Callender 2001). On the other hand, boredom could support recovery and act as a catalyst to action, by triggering searches for remedy or new stimuli (Elpidorou 2014; Fisher 1993; O'Hanlon 1981).

Building on this latter perspective, recent studies offer corroborating empirical evidence that boredom can foster creativity (e.g., Gasper/Middlewood 2014; Mann/Cadman 2014). To test this claim, we focus on job boredom's positive effects and draw on COR theory to argue that it may contribute to consumer innovators' job-related resources for developing HHS innovations through two mechanisms: recovery and distraction.

First, when experiencing job boredom, consumer innovators may disengage from their work. Doing so reduces experienced strain, because their cognitive capacities are no longer taxed and can return to pre-demand levels, in turn, enabling recovery experiences (Sonnentag 2001; Sonnentag/Zijlstra 2006). Recovery experiences "describe the process by which depleted resources are replenished and restored" (Halbesleben/Wheeler/Paustian-Underdahl 2013, p.493). They are crucial to overcome resource drain and build new resources. In line with this observation, job boredom may produce a reenergizing state and energy source (Carroll et al. 2010; Jervis/Spicer/Manson 2003). Therefore, we propose that job boredom, by supporting recovery experiences, contributes to consumer innovators' job-related resources.

Second, job boredom may trigger an urge to escape the current dissatisfying situation and drive consumer innovators to find distraction in alternative forms of stimulation (Cummings et al. 2016). Job boredom arising from monotony and routinization expands mental space, because boring tasks do not require extensive cognitive resources (e.g., Ohly/Sonnentag/Pluntke 2006; Stock 2015). Employees might use this mental space to acquire new knowledge or engage in ideation processes. Accordingly, extant research stresses that bored people who cannot physically escape their tasks tend to shift their unoccupied mental attention to engage in mind-wandering, daydreaming, or task-unrelated thought (Cummings et al. 2016; Eastwood/Frischen/Fenske/Smilek 2012). Such thought processes support internal reexamination and reevaluation considerations that allow for the exploration of new ideas and generation of creative thought, which should be inspiring (e.g., Baird/Smallwood/Mrazek/Kam/Franklin/Schooler 2012; Mann/Cadman 2014; McMillan/Kaufman/Singer 2013; Mooneyham/Schooler 2013; Smallwood/Schooler 2014). Analogously, we expect consumer innovators who experience boredom at work to use their unoccupied mental capacities, such that their job boredom, by driving distraction, contributes to consumer innovators' job-related resources.

H1b: Job boredom positively affects the acquisition of job-related resources.

4.2.3 Moderating Role of Organizational Tenure

Innovation literature emphasizes the importance of repeated exposures (Davis et al. 2013; Lüthje et al. 2005). Acknowledging these insights, we examine organizational tenure as contingency variable. Tenure accordingly provides a good proxy of the level of experience, knowledge, and expertise available to employees (e.g., Carmeli/Meitar/Weisberg 2006; Yuan/Woodman 2010). We argue that after longer exposures to job innovativeness, with its resulting intellectual and emotional stimulation, innovativeness required by the job increases consumer innovators' opportunities to acquire job-related resources. Accordingly,

H2a: Organizational tenure strengthens the positive relationship between job innovativeness and job-related resources.

Conversely, repeated exposures to boredom, such as brought about by longer tenures, increase people's boredom proneness (Elpidorou 2014; Kass et al. 2001). Given the desire to avoid such dissatisfying situations, higher levels of job boredom likely fuel people's efforts to find relief through disengagement or alternative stimulation (Cummings et al. 2016; Sonnentag 2001). Accordingly, we expect consumer innovators with longer organizational tenures to possess more advanced strategies to cope with boredom and to reap more benefits from engaging in recovery experiences or diverting their attention to knowledge acquisition and ideation. Thus, with longer exposures to job boredom, the effect on consumer innovators' acquisition of job-related resources should grow stronger. Specifically,

H2b: Organizational tenure strengthens the positive relationship between job boredom and job-related resources.

4.2.4 Spillover Effects on Outcomes of HHS Innovation Efforts

According to COR theory's second principle (Hobfoll 2001), consumer innovators invest their acquired resources to gain new resources. Hence, we expect them to transfer their job-related resources from work to the development of their HHS innovations in the home domain. To investigate these potential spillover effects, we seek to analyze innovation outcomes holistically (Magnusson 2009) and examine the outcome of consumer innovators' HHS innovation efforts across three dimensions frequently assessed in user innovation research: novelty, utility, and feasibility (Poetz/Schreier 2012; Stock et al. 2015). Thus, we capture the outcome of HHS innovation efforts by the extent to which a prototyped idea is novel, generally useful, and feasible.

Users develop their innovations to satisfy personal needs and/or the needs of their close social networks (Gambardella et al. 2016) that have remained unmet or insufficiently met by commercial solutions. These innovations often feature a high degree of newness (Magnusson 2009; Poetz/Schreier 2012). Following COR theory, we therefore argue that consumer innovators invest job-related resources to develop HHS innovations that provide new and unique solutions previously not available to them. We capture this dimension with novelty, defined as the extent to which the HHS innovation is new and unique (Franke et al. 2014).

H3a: Job-related resources positively affect the novelty of HHS innovations.

Moreover, users typically possess perfect access to need-related information, so they can develop solutions uniquely tailored to their personal needs or those of their immediate networks (e.g., Lüthje et al. 2005; Schweisfurth/Raasch 2015). By filling these unmet needs, the resulting innovations feature high levels of use value. Analogously, we expect consumer innovators to invest their job-related resources into the development of HHS innovations with high use value. We refer to this second dimension as general use value, defined as the extent to which the innovation has the potential to generate value for a broader set of consumers (de Jong et al. 2015).

H3b: Job-related resources positively affect the general use value of HHS innovations.

Finally, innovations must be technically feasible. Corporate innovators and their employees typically possess extensive technical knowledge and competencies, such that their innovations turn out to be more realizable and producible (e.g., Preißner/Raasch/Schweisfurth 2017; von Hippel 2017). In contrast, users often lack technical knowledge (Lüthje et al. 2005), so they often fail in efforts to prototype their ideas or propose solutions that are technically immature (e.g., Kristensson et al. 2004; Magnusson 2009). In this context though, employed consumer innovators occupy a unique position. Similar to internal lead users, who have access to technical knowledge due to their positions within companies (Schweisfurth 2017), employed consumer innovators may acquire useful technical knowledge during their time at work and then apply this knowledge to the development of their own innovations. Thus, HHS innovations developed by employed consumer innovators should be technically viable. We capture this third dimension as technical feasibility, defined as the extent to which the innovation is technically advanced. In summary, we anticipate a third positive spillover effect from consumer innovators' work to home domain:

H3c: Job-related resources positively affect the technical feasibility of HHS innovations.

4.3 Research Methods

4.3.1 Participants and Data Collection

This empirical study combines two data sources. First, we collected data from employed German consumer innovators of HHS innovations. As previous surveys have shown, the number of consumer innovators in a population is low, and identifying them remains a challenge (de Jong 2016). Therefore, we took a two-tiered, systematic approach to identify HHS innovations that have completed the development process and are in use, such that they exist as a prototype,

similar to Stock et al. (2016) and de Jong et al. (2018). Specifically, we tasked graduate students enrolled in a seminar on innovation and marketing management to identify potential consumer innovators' email addresses by searching the Internet for consumer innovations discussed or depicted online, as well as reaching out to personal acquaintances who had themselves developed or knew of people in their networks who had developed a HHS innovation. Following a prescreening, we identified 193 valid email addresses of innovators whom we invited to participate in our survey.

To validate the prescreening results, interviewers provided examples of HHS innovations to participants, both verbally and with pictures (Meuter/Ostrom/Roundtree/Bitner 2000). Then, using established procedures (Stock et al. 2016; von Hippel et al. 2012), interviewers asked the participants if they had developed or modified a consumer product during their leisure time that was new to them and solved a problem that they or their close social ties had experienced. If so, the participants were asked to describe their innovation.

Next, participants were invited to fill out a questionnaire and provide depictions and detailed descriptions, to support an evaluation of their innovations. After removing dropouts and incomplete questionnaires, the sample consisted of 147 cases (response rate = 76.2%). To ensure the remaining innovations are exclusively HHS innovations, developed by employed consumer innovators, we excluded any cases in which (1) a company or the employer of the consumer innovator was involved in the development of the innovation, (2) the innovation was not primarily designed to address personal needs or those of close family/friends, or (3) participants had not been employed while they developed their innovation. These exclusion criteria reduced the sample to a final set of 116 HHS innovations.

Comparable to previous studies of consumer innovators (e.g., de Jong 2016; von Hippel et al. 2011), 51% of the innovators in our sample held a university degree; the rest held a high school/college (18%) or lower than high school (31%) degree. Eighty-six percent of the innovators were men, and the average age was 45.9 years (SD = 13.6 years), with an average organizational tenure of 23.4 years (SD = 14.5 years). Participants worked in various industry sectors, including consulting (2.6%), electrical industry (7.8%), engineering/construction (16.4%), health (3.4%), insurance (1.7%), IT/software development (12.9%), and the public sector (19%). On average, participants worked in companies of 101 to 500 employees.

Second, to control for potential biases, we hired three independent graduate student raters, who were not involved in the research but were familiar with the field of innovation management, as suggested by prior literature (e.g., Amabile 1982; Schweisfurth 2017). Their ages ranged from 21 to 25 years. These raters evaluated the 116 HHS innovations on the basis of the de-

scriptions and depictions provided by the innovators. The innovations are comparable to inventions described in previous studies and cover a range of fields, including education, childcare, gardening, household, technical equipment, software, clothing, and animal care (see Table 4-1 for examples) (de Jong, 2016; Ogawa/Pongtalanert 2011; von Hippel et al. 2012).

Table 4-1: Examples of HHS Innovations

Category	Example
Animal care	Diapers for incontinent male dogs. The diapers are reusable as they have panty liners inside that can be easily removed.
Building	Wallpaper-machine for ceilings/diagonal walls. The machine contains wallpaper with glue, a wallpaper-roller, and a brush. It can be operated with two people and efficiently puts wallpaper on ceilings and diagonal walls.
Childcare	Car bed for children. The bed is easy to assemble and can be placed on the front passenger seat of a Mercedes Viano to allow the child to sleep or rest.
Clothing	Freely attachable multipack. The multipack can be attached to purses, bags and backpacks to easily increase available storage space for transport. When not in use, it can be folded into a small parcel and stowed away in a bag.
Gardening	Electrically operated scarecrow. The electric scarecrow uses a windshield motor and can be placed in trees to protect vegetables, fruits and crops from birds.
Household	Container for reusing laundry water. The container is attached to the washing machine and collects reuseable laundry water for use in the next machine of laundry. It helps save water and money.
Maintenance	Automatic woodchopper for firewood. The machine cuts wood into pieces of 50cm lengths that fit precisely into the fireplace.
Software	Twittering scale that automatically posts the weight of the user to friends on Twitter. The scale uses bluetooth, text messaging, WiFi and other software to communicate with the dieter's friends in order to motivate him/her to lose weight.

4.3.2 Measures

The focal constructs are measured with validated and previously used multi-item scales, where possible. Table 4-2 lists all the scales, together with the answer formats. Following established translation procedures (Stock et al. 2016), two researchers not involved in the study translated the English-language constructs into German. For validation, a third, independent researcher back-translated the items. These researchers discussed any differences in translations and adjusted the items accordingly.

Table 4-2: Scale Items for Construct Measures

1. Job requirements
To what extent do the following statements apply to the job you owned at the time of development of the solution?

Job innovativeness[a] (Yuan/Woodmann 2010)
It was part of the job to seek for new technologies and techniques.
In this job, it was common to bring new ideas to the company.
In this job, I had to be innovative to meet my needs.
In this job, I had to test new approaches to problems.
In this job, it was one of my professional duties to suggest new ideas.

Job boredom[a] (based on Drory 1982)
In this job, I was bored.
In this job, most of the time I did nothing.
In this job, I had the feeling that nothing happens.

2. Organizational tenure
For how many years have you been employed in this company?

3. Job-related resources[a] (self-developed)
In this job, I could receive a lot of energy to develop the solution.
In this job, I was inspired to develop the solution.
In this job, I was able to build knowledge in order to develop the solution.

4. Outcomes of HHS innovation efforts
Novelty[b] (based on Franke et al. 2014; Miron-Spektor/Beenen 2015)
The user innovation is novel.
The user innovation is unique compared to other product solutions available on the market.

General use value[cde] (de Jong et al. 2015)
This user innovation would be of value to other people. [c]
I think this user innovation can become a valuable commercial product. [d]
The user innovation enables other people to do something they could not do before. [e]

Technical feasibility[f] (Schweisfurth 2017)
Using your own subjective definition of technical goodness, please assess the degree to which the user innovation is good technically?

Notes: Letters indicate the scale format, with (a) 1 = Strongly disagree, 7 = Fully agree; (b) 1 = Low, 5 = High; (c) 1 = To none, 5 = To (nearly) all; (d) 1 = Not, 5 = To a substantial market; (e) 1 = Not at all, 5 = Absolutely; (f) 1 = Very low, 5 = Very high.

The measures related to consumer innovators sought to capture aspects of work during participants' innovation development processes, so they specifically refer to aspects of the job at the time of the innovation development. In particular, we assessed job requirements with two constructs and seven-point Likert scales.

First, to measure high job requirements, we applied Yuan/Woodman's (2010) five-item scale of innovativeness as a job requirement to assess *job innovativeness*. For standardization, we rephrased the reverse-coded item positively, such as "In this job, I had to be innovative to meet

my needs." Second, to measure low job requirements, we assessed *job boredom* by complementing items from Drory's (1982) boredom scale with an item that captures an experienced inability to engage in activity (Eastwood et al. 2012; Harju/Hakanen 2016). We measured *organizational tenure* in years with a single item (Carmeli et al. 2006; Stock 2015; Yuan/Woodman 2010). Finally, we drew on innovation literature and COR theory to measure *job-related resources* with a three-item scale of the extent to which consumer innovators gain knowledge, energy, and inspiration from their work that supports the development of their HHS innovation. The scale exhibited satisfactory psychometric characteristics (M = 3.32; SD = 1.73; Cronbach's alpha = 0.78; AVE = 0.58; CR = 0.80.

Next, we assessed the *outcomes of HHS innovation efforts* with three constructs. For consistency, all these items relied on five-point Likert scales and were rephrased to refer to "the user innovation," to ensure assessments of HHS innovations. *Novelty* was measured based on two-dimensional conceptualizations applied in the literature (e.g., Franke et al. 2014; Miron-Spektor/Beenen 2015). *General use value* was measured with three items adapted from a scale by de Jong et al. (2015). *Technical feasibility* of the innovation was inspired by Amabile's (1982) consensual assessment technique. Similar to Schweisfurth (2017), we asked the raters to judge technical feasibility on basis of their own experience.

To mitigate potential rating biases (Podsakoff et al. 2003), reflecting consumer innovators' tendency to evaluate the outcome of their innovation efforts more favorably than they deserve (Lüthje et al. 2005), we asked three independent raters to assess the HHS innovations. Next, we computed equally weighted averages by calculating the mean across all raters to obtain a single score for each item (e.g., Magnusson 2009; Poetz/Schreier 2012; Schweisfurth 2017). To support this data aggregation, we checked interrater reliability by computing two-way mixed average measure interconstruct correlation (ICC) values (McGraw/Wong, 1996). These ICCs indicate good absolute agreement, with average scores of 0.71 for novelty, 0.70 for general use value, and 0.60 for technical feasibility (Cicchetti 1994).

Finally, we included control variables that may exert effects on job-related resources and innovation outcomes. In particular and in line with extant literature, we control for *educational degree* (i.e., highest degree earned by the innovator) and *company size* (i.e., total number of employees in the organization) (Stock/Zacharias 2011; von Hippel et al. 2011). Studies show that technical know-how correlates strongly with successful innovation activities (e.g., Davis et al. 2014; Lüthje et al. 2005; von Hippel et al. 2012), so we also control for *industry sector*, as a proxy that captures the extent to which innovators encounter cutting-edge technologies at work. Moreover, in line with extant literature, we control for *gender*, *invested time in development* (in days), and *innovation support* (de Jong 2016; Stock et al. 2016).

Table 4-3 contains the psychometric properties of all constructs, including descriptive statistics and bivariate correlation coefficients. The latent constructs are sufficiently reliable, with Cronbach's alphas, CR, and AVE values that exceed the recommended thresholds of 0.70 (Nunnally 1978), 0.70, and 0.50, respectively (Bagozzi/Yi 1988). The correlation coefficients do not exceed 0.60, alleviating concerns of multicollinearity. Moreover, the comparison of the square roots of the AVE for any two constructs against their interscale correlations confirmed discriminant validity (Fornell/Larcker 1981). Finally, to reduce the probability of common method bias (Podsakoff et al. 2003), we collected the data from two different sources and also conducted Harman's single-factor test, which showed no evidence that a single general factor accounted for the majority of variance.

Table 4-3: Descriptive Statistics and Correlation Matrix of Constructs

Variables	**M**	**SD**	**Cronb. alpha**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1. Job innovativeness	4.26	1.91	0.93	**0.85**						
2. Job boredom	2.07	1.34	0.86	-0.27**	**0.83**					
3. Job-related resources	3.32	1.73	0.78	0.36**	-0.04	**0.76**				
4. Novelty	2.86	0.92	0.94	0.10	0.07	0.16	**0.95**			
5. General use value	2.68	0.66	0.90	0.07	-0.03	0.18	0.27**	**0.88**		
6. Technical feasibility	3.38	0.80	-	0.04	0.16	0.25**	0.44**	0.45**	**n/a**	
7. Organizational tenure	23.5	14.6	-	0.02	-0.07	0.19*	0.08	0.15	0.07	**n/a**
CR				0.93	0.87	0.80	0.94	0.91	-	-
AVE				73.04	69.71	57.72	89.42	76.83	-	-

Notes: Diagonal elements in bold represent the square roots of the average variance extracted for constructs measured with multiple items.
*$p < 0.05$; **$p < 0.01$.

4.3.3 Results

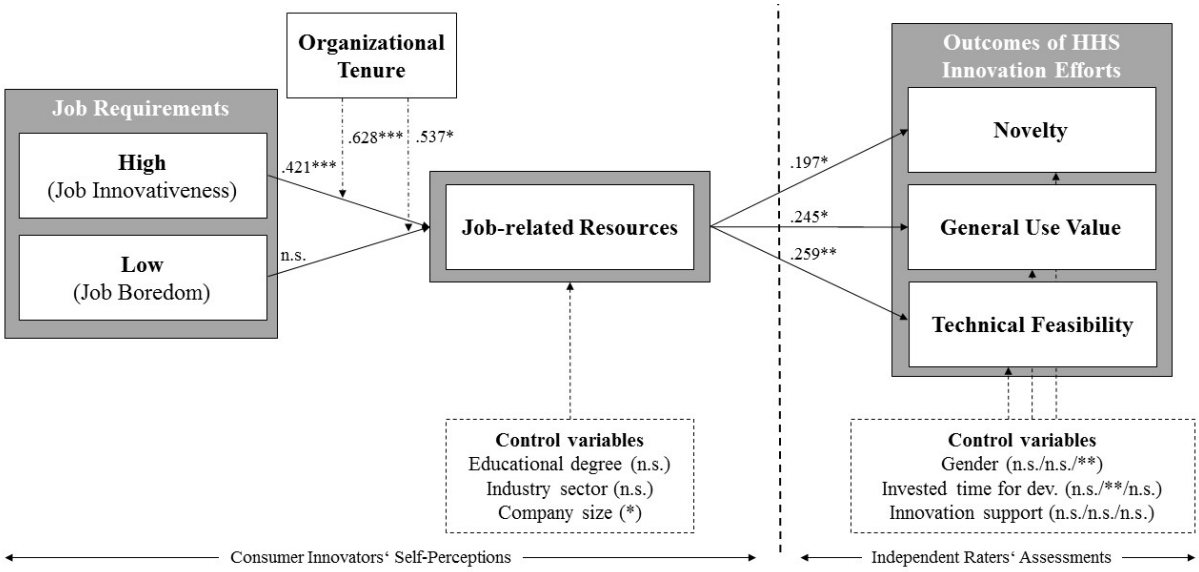
We applied SEM with latent interactions in MPLUS (Muthén/Muthén 2015) to assess the hypothesized relationships. This superior procedure builds on casewise interactions that avoid information loss and exploit the variance available in the data (Marsch/Wen/Hau 2006). As a more advanced form of hierarchical moderated regression analysis, SEM with latent interactions proceeds in stepwise fashion (Aiken/West 1991; Irwin/McClelland 2001). A basic model includes the effects of the independent variables, the moderating variable, and the control variables. Then subsequent models assess the latent interactions of the moderating variable and independent variables, so that the main and interaction effects are separately assessed.

The SEM results for the basic model indicate satisfactory global fit ($\chi 2/df = 1.29$; RMSEA = 0.050; SRMR = 0.064; CFI = 0.952; TLI = 0.944). (Figure 4-2 contains the standardized path coefficients.) We find partial support for the proposed effect of job requirements on job-related resources. In support of H1a, job innovativeness positively affects job-related resources (ß = 0.42, $p < 0.001$). However, we find no effect of job boredom (ß = 0.08, n.s.) and must reject H1b. As suggested by H3, job-related resources enhance the outcomes of HHS innovation efforts, such that they positively affect novelty (H3a ß = 0.20, $p < 0.05$), general use value (H3b ß = 0.25, $p < 0.05$), and technical feasibility (H3c ß = 0.26, $p < 0.01$).

Among the control variables, we find no effects of educational degree (ß = -0.14, n.s.) or industry sector (ß = 0.13, n.s.) on job-related resources. In contrast, company size relates negatively to job-related resources (ß = -0.20, $p < 0.05$). Gender is unrelated to novelty (ß = 0.06, n.s.) or general use value (ß = 0.13, n.s.) but positively related to technical feasibility (ß = 0.28, $p < 0.01$). The time invested in innovation development is unrelated to novelty (ß = 0.17, n.s.) and technical feasibility (ß = 0.12, n.s.) but positively related to general use value (ß = 0.24, $p < 0.01$). Finally, innovation support is unrelated to all three constructs (novelty ß = 0.05, n.s.; general use value ß = -0.01, n.s.; technical feasibility ß = 0.12, n.s.).

To test the hypothesized moderated effects, we employed a stepwise approach with separate analyses for each interaction term, in which we included latent interactions between the moderator and the respective independent variables. We mean-centered all indicators before multiplying their values (e.g., Algina/Moulder 2001; Marsh et al. 2006). Consistent with H2a, we find a positive moderating effect of organizational tenure on the link between job innovativeness and job-related resources, according to the significant interaction term (ß = 0.63, $p < 0.001$). Similarly, in accordance with H2b, organizational tenure has a positive moderating effect on the link between job boredom and job-related resources, with a significant interaction term (ß = 0.54, $p < 0.05$).

Figure 4-2: Structural Equation Modeling Results



Notes: *p<.05. **p<.01. ***p<.001.

4.4 Discussion

The benefits that consumer innovators create for their environment are well researched, yet considerably less is known about the benefits they gain from their environment. To the best of our knowledge, this study is the first to specifically investigate how the work environment of consumer innovators contributes to HHS innovation. Building on COR theory, we generate three important findings.

First, in acknowledging that resources arise from different bases (Halbesleben/Wheeler 2008), we identify job innovativeness (high) and job boredom (low) as two job requirements that might contribute to consumer innovators' job-related resources. In line with our predictions, innovativeness required by the job fostered the acquisition of job-related resources, corroborating the view that innovation activities at work enhance consumer innovators' knowledge, energy, and inspiration resources, through intellectual and emotional stimulation (Lüthje et al. 2005; Yuan/Woodman 2010). Moreover, consistent with existing predictions, we find that this positive relationship remains stable even when we include organizational tenure as a moderating variable (Carmeli et al. 2006; Dane 2010; Yuan/Woodman 2010).

Contrary to our expectations though, job boredom only contributes to consumer innovators' acquisition of job-related resources when we add organizational tenure as a moderating variable. The lack of relationship may reflect two causes. On the one hand, a long-standing debate

addresses whether the frequency of experienced boredom or perceptions of time determine its effects (e.g., Cummings et al. 2016; Eastwood et al. 2012; Elpidorou 2014). Specifically, boredom might depend on repeated exposures that attain threshold levels, before it elicits reactions (Fisher 1993; O'Hanlon 1981). The consumer innovators in our sample might have engaged in recovery experiences and distraction strategies only after substantially longer exposures to job boredom.

Alternatively, two opposing mechanisms could be canceling each other out. That is, we focused on job boredom's positive effects on job-related resources, but boredom also can have clearly destructive consequences, particularly related to its ability to drain people of energy and disrupt their thought processes (e.g., Cummings et al. 2016; Eastwood et al. 2012; Stock 2015). The positive mechanisms that we hypothesize, related to resource acquisition, and the negative mechanisms related to resource depletion could initially neutralize each other, but in the long run, people will strive to acquire, protect and grow their resources (Hobfoll 2001; 2011). Therefore, they adjust their behaviors to circumvent resource losses and recover from resource depletion (e.g., Halbesleben et al. 2014; Kiazad et al. 2014). Repeated exposures to boredom, which may arise through longer organizational tenure, eventually could spark consumer innovators' desire to protect and recover their resources, such that they evoke the observed positive effect for the acquisition of job-related resources.

Second, our findings extend previous research on the outcomes of consumer innovation by specifying how job-related resources enhance HHS innovations. With regard to novelty and general use value, these findings are in line with user innovation literature (e.g., Poetz/Schreier 2012; Stock et al. 2015). They support the prediction that consumer innovators invest resources to fill market gaps and satisfy their needs with novel, useful innovations. Moreover, job-related resources may enhance the technical feasibility of HHS innovations. This finding is particularly noteworthy in light of previous studies that point to the shortcomings of user innovations, in terms of their producibility and technical realization (e.g., Kristensson et al. 2004; Magnusson 2009). The results thus provide valuable insights into the benefits of consumer innovators' dual role, as users and employees, for the successful completion of HHS innovation activities.

Third, at a more abstract level, the findings support and expand knowledge about transferring intangible resources across domains in general, and the innovation context in particular (e.g., Davis et al. 2013; Hakanen et al. 2011; Schweisfurth/Raasch 2015). Specifically, we observe a positive spillover of job-related resources acquired by consumer innovators to HHS innovations developed at home. Our findings contribute to literature on spillover effects by anchoring the phenomenon in the innovation context and exemplifying its mechanisms for HHS innovation

efforts (e.g., Edwards/Rothbard 2000). The findings also offer a better understanding of cumulative resource gain processes, extending previous research on innovative employees to include consumer innovators (e.g., Hakanen et al. 2008; Hobfoll 2011).

4.4.1 Implications for Policymaking

With the recent addition of HHS innovation to the Oslo Manual (OECD/Eurostat 2018), the value of consumer innovation has not only been economically recognized at a global level but also brought to the spotlight of policymakers' attention as never before (Gault 2018). Yet, the potential benefits of HHS innovations for societies and social welfare, and the currently insufficient numbers of innovation and diffusion successes, demand more immediate action (e.g., de Jong et al. 2015; Gambardella et al. 2016; von Hippel 2017). Our study supports this endeavor by offering a comprehensive perspective on consumer innovation efforts, which policymakers can use to formulate targeted policies to increase the quality, number, and diffusion of HHS innovations.

In particular, our findings encourage an integrative view of producer/employee and consumer innovation, because these spheres are linked through intricate mechanisms. Specifically, the spillover effects that we observe for employed consumer innovators indicate that traditional corporate innovations can foster HHS innovation as a by-product. This insight represents a departure from the sometimes observed "black-or-white" views that imply HHS innovation advances only at the cost of producer innovation (or vice versa). Instead, our results suggest that policymakers can adjust corporate innovation incentives in ways that also might enhance HHS innovation.

As an indirect form of interference, policymakers could incentivize managers to support consumer innovators within their ranks. We identify job innovativeness and job boredom as two job requirements that contribute to the acquisition of job-related resources that can support the development of HHS innovations. Accordingly, with regard to high job requirements, policymakers might honor or reward companies that employ special job-rotation and training programs that enable employees to experiment with a broad range of innovation activities, such that they learn a variety of innovation techniques. Such innovation-related training would generate direct benefits for the companies, by producing better skilled employees; they also are likely to increase the number of (potential) consumer innovators who benefit from job-related resources for the development of their innovations at home.

Policymakers also might educate managers about the benefits of occasional periods of reduced activity or rest. As our results indicate, sometimes "less is more"; low job requirements that

lead to some experienced boredom may have beneficial effects, by enabling employees to recover energy, draw inspiration, and build knowledge. Rather than diminishing productivity, limited periods of recovery and distraction may enhance well-being and creativity, which in turn can sustain employee performance and even contribute to consumer innovators' acquisition of job-related resources. Policymakers might encourage companies to grant experienced employees specifically allocated lengths of spare time to prompt more consumer innovation activities in the long run. These initiatives could be designed similar to the health and innovation initiatives already adopted by companies (e.g., BMW, Google, Yahoo, Alliance, HP) (Colombo/Piva/Rossi-Lamastra 2013; Schweisfurth/Raasch 2015).

Finally, user innovations tend to possess high levels of novelty and use value but lack technical quality (Kristensson et al. 2004; Magnusson 2009). Our results highlight that the technical feasibility of HHS innovations does not necessarily represent a limitation, if consumer innovators have sufficient exposure to relevant knowledge. This point is important for two main reasons. First, technical feasibility is central to the successful implementation of innovation endeavors (Lüthje et al. 2005; von Hippel 2017).

Second, adequate technical realization of the innovation is an important criterion for successful, broad diffusion, because end consumers prefer easy-to-handle, well-advanced products (Arts/Frambach/Bijmolt 2011; Rogers 2010). Thus, policymakers aiming to increase HHS innovation should complement their indirect support measures with initiatives that help consumer innovators increase the technical feasibility of their inventions. Such initiatives could encompass technical training, support centers, or community platforms that help innovators resolve technical problems and enhance their technical skills.

4.4.2 Implications and Avenues for Further Research

The conclusions drawn from this study are subject to limitations and also suggest opportunities for further research. A key concern relates to the selection of antecedents. As a first-of-type study, we opted to study two job requirements frequently encountered by employees that also have been related to innovation activities in previous literature, so that we could cover a wide range of work environments. To this end, we focused on job innovativeness and job boredom as high and low job requirements. As indicated by the significant negative correlation between the two constructs, consumer innovators are unlikely to be exposed simultaneously to substantial innovativeness and boredom. Therefore, continued research could expand on these findings by investigating each element individually and including other related conditions relevant to job-related resources, such as job complexity, autonomy, or boreout (e.g., Amabile et al. 1996; Shalley et al. 2009; Stock 2015).

Relatedly, additional research could delineate the underlying mechanisms of the effects of innovativeness required by the job and job boredom. Regarding the former, we propose that intellectual and emotional stimulation contribute to job innovativeness's success in generating job-related resources. It remains unclear if both contribute equally. Regarding the latter, this study advances previous work on boredom by providing empirical evidence of its positive effects and employing more sophisticated statistical techniques (Loukidou et al. 2009). However, the contradictory findings from previous research and the lack of a positive relationship between job boredom and job-related resources in the absence of organizational tenure indicate more complex underlying mechanisms.

To determine when boredom is harmful and when it is beneficial, further research might consider non-linear effects. Our preliminary test for non-linear effects of job requirements on job-related resources generated no results, which we anticipate may occur because the proposed opposing mechanisms related to resource acquisition and depletion cancel out each other. Hence, we call for further research that differentially assesses the non-linear effects of job boredom's positive (e.g., creativity, energy gain) and negative (e.g., energy depletion, inattention) mechanisms.

Yet the lack of non-linear effects also could result from our high-level measurement of job-related resources that this first-of-type study adopted. With confirmation that consumer innovators' job-related resources are transferable, research may now seek a more differentiated view on selected resources to provide a more profound understanding of the effects of antecedents on resources (e.g., job boredom), as well as each individual resource's relation to outcomes of HHS innovation efforts (e.g., Kristensson et al. 2004; Magnusson 2009; Poetz/Schreier 2012).

Finally, a promising avenue for research relates to technical feasibility. Our study shows that consumer innovators can benefit from their dual roles as employees and users and achieve good technical feasibility. Yet the restriction of our sample to employed consumer innovators means that we cannot compare the level of technical feasibility achieved by other types of user or consumer innovators. To dig deeper into the effect of the work domain, researchers should create mixed consumer innovator samples (e.g., de Jong et al. 2018, Schweisfurth 2017). Such a comparative approach would help quantify the benefits of the work environment and eventually sharpen understanding of critical drivers of successful HHS innovation.

5 Overarching Implications

Globalization, rapid technological change, and advances in ICTs coupled with heterogeneous consumer needs have turned innovation from an exclusive province of producers into a societal phenomenon encompassing established manufacturing firms and entrepreneurs, just as open collaboration communities and single innovating end users (Bogers et al. 2010; Harhoff/Lakhani 2016; von Hippel 2005). In order to successfully and economically navigate this multilayered sphere of producer- and user-led innovation, management and policy makers have voiced the need for a more profound and differentiated understanding of the two innovation paradigms, especially of central drivers and their interrelations. Against this background, this thesis set out to shed new light on unsatisfactorily researched and unexplored areas in producer- and user-led innovation in order to make *two central contributions* with the aid of three perspectives that extend previous research *beyond the obvious*:

(1) Identification of central drivers of the producer- and user-led innovation paradigms.

(2) Elucidation of interactions, especially the potential for cross-fertilization, between the producer- and user-led innovation paradigms.

First, based on comprehensive literature reviews of drivers of producer- (Section 2.3.1) and user-led innovation (Section 2.3.2), the thesis identified *leadership* and user innovators' *work environment* as central drivers of the two innovation paradigms. In turn, these drivers were conceptually developed and empirically examined in the thesis' two studies.

Specifically, with regard to central drivers of producer-led innovation, study 1 extends previous, unidimensional conceptualizations of innovation-tailored leadership approaches by adopting a *cross-dimensional perspective* on leadership. This perspective merges organizations' need for innovation with the need for economizing resources by adhering to constraints (O'Reilly/Tushman 2013; Sarkees/Hulland 2009). Consequently, the key contribution of study 1 lies in theoretically introducing dual innovation leadership and empirically substantiating evidence that executives, who engage in fostering idea generation and fostering idea realization, ensure sustainable organizational performance of their units. With dual innovation leadership, study 1

advances previous insights on leadership by introducing a leadership approach that a) is tailored to organizational units as main drivers of innovation, b) individually addresses central stages of the innovation process (idea generation and idea realization), and c) adopts a sustainable perspective capable of generating a competitive advantage (Gibson/Birkinshaw 2004; Hughes et al. 2018; Jansen et al. 2006; Rosing et al. 2011).

Conversely, with regard to central drivers of user-led innovation, study 2 illuminates a largely unexplored area by adopting a *cross-domain perspective*. This perspective merges user innovators' traditionally investigated home domain with their work domain. Consequently, the key contribution of study 2 lies in integrating research on employee and user innovation and applying COR theory's notion of resource transferability to empirically corroborate consumer innovators' work environment, i.e., high and low job requirements that enhance job-related resources, as a driver of HHS innovation (Hakanen et al. 2008; Hobfoll 1998; 2001). In sum, study 2 complements knowledge on person-related drivers with insights into environment-related drivers that a) constitute a central part of consumer innovators' life and b) are shapeable by management and policy makers aiming to foster user-led innovation and interactions between the two paradigms (Lüthje et al. 2005; Mumford 2000; Shah 2005; Shalley/Gilson 2004).

Second, the thesis generated a more profound understanding of interactions between the two innovation paradigms, especially of indirect producer support for user innovation (Section 2.1.3), and highlights the paradigms' potential for cross-fertilization with the aid of an *integrative perspective* elaborated below.

By identifying the work environment as a central driver of user-led innovation, study 2 gives rise to the notion that producer innovators may (indirectly) support consumer innovators' acquisition of HHS innovation-relevant resources as a side-effect of specifying job requirements (i.e., high vs. low requirements). In particular, the study empirically substantiates the notion that job innovativeness and job boredom experienced by consumer innovators' in their work domain (i.e., producer innovation sphere) contribute to the outcome of HHS innovation efforts in their home domain (i.e., user innovation sphere). As these job requirements constitute job conditions that producer innovators develop for the realization of their own goals (i.e., without the intent of creating benefits for user innovators), job requirements do not place additional strain on producers' resources, as other (direct) forms of producer support for user innovation typically do (Franke/Piller 2004; Füller et al. 2011; von Hippel/Katz 2002; West/Lakhani 2008). In sum, the thesis' focus on consumer innovators' work environment extends previous knowledge on interactions between the two innovation paradigms by a) shedding light on the

underresearched area of producer support for user-led innovation and b) identifying a sustainable, resource-protecting alternative to direct support initiatives of producers (Gambardella et al. 2017; von Hippel 2017).

Moreover, the centrality of job requirements in generating and enhancing resources for user-led innovation also gives rise to the notion of cross-fertilization between the two innovation paradigms. In particular, employees' work environment is primarily determined and shaped by leaders, who allocate tasks to their employees, decide on levels of task difficulty, repetition, or autonomy, set timelines, and provide resources in order to realize their organizations' strategic goals and ensure its long-term survival (Mumford 2000; Piccolo/Colquitt 2006; Purvanova et al. 2006; Shalley/Gilson 2004). Leaders also decide whether and which employees engage in innovation activities or are, conversely, relieved of demanding tasks – hence, leaders influence the levels of job innovativeness and job boredom that employees face (Study 2). In addition, leaders who engage in dual innovation leadership actively guide employees to engage in idea generation and idea realization, thus fostering employees' ideation, learning, and implementation skills (Study 1). Thereby, leaders may provide employees with a profound understanding of innovation processes and innovation-relevant knowledge. Integrating insights from previous studies on leisure time invention (Davis et al. 2013), embedded lead users (Schweisfurth 2017; Schweisfurth/Raasch 2015), and research on consumer innovators' work environment (Study 2), this thesis thus argues that leadership is a key enabler of cross-fertilization between the two innovation paradigms.

First, with regard to user-led innovation, study 2 demonstrates that consumer innovators benefit from the acquisition of job-related knowledge, inspiration, and energy drawn from job requirements by transferring and applying these resources to the development of their HHS innovations. This implies that having leaders who design employees' work environment by setting relevant requirements, such as high requirements fostering stimulation and, at least occasionally, low requirements enabling recovery (Study 2), will positively affect user-led innovation. With regard to high job requirements, this effect should be particularly strong if leaders engage in dual innovation leadership (Study 1). Specifically, by fostering employees' engagement in innovation activities, dual innovation leaders increase consumer innovators' intellectual and emotional stimulation at work (Study 2), and thus the possibility to acquire job-related resources for the development of their HHS innovations. In short, leaders are key to generating work conditions that enhance user-led innovation.

Second, with regard to producer-led innovation, the centrality of leadership in driving innovation is well-documented (see Section 2.3.1.2 for details). Advancing these insights, study 1

demonstrates that leaders who engage in dual innovation leadership successfully and sustainably drive their organizational units' innovativeness. However, leisure time invention- and lead user research also provide evidence that employees draw on insights from their home domain and transfer knowledge to their work domain when developing innovations at work (Davis et al. 2013; Schweisfurth 2017; Schweisfurth/Raasch 2015). This prediction is supported by COR theory's notion of positive resource gain cycles according to which resource gains in one domain (e.g., engagement in innovation activities in the home domain) positively affect resource investments and subsequent gains in other domains (e.g., development of innovations in the work domain) (Hakanen et al. 2008; Hobfoll 2011). Accordingly, it is likely that consumer innovators transfer knowledge and insights gained from the development of their innovations at home to innovation activities they pursue as employees at work. This should be especially the case if leaders encourage employees to contribute ideas, as for example dual innovation leaders do by fostering idea generation (Janssen 2001; Zhou/George 2001), and integrate user innovators' knowledge into producer-led innovation activities. Hence, leaders shaping employees' work environment and engaging in dual innovation leadership can contribute to producer-led innovation via two mechansims. First, leaders directly drive innovation through fostering employees' engagement in producer innovation projects. Second, leaders may contribute indirectly to innovation through stimulating the return transfer and application of (employed) user innovators' knowledge to innovation projects in the work domain.

Taken together, leaders' ability to drive producer-led and foster user-led innovation constitutes a promising case of cross-fertilization between the two innovation paradigms. Accordingly, the overarching findings of this thesis entail significant implications for future research as well as management and policy makers.

5.1 Contributions and Future Avenues for Research

Overall, this thesis contributes to research on producer- and user-led innovation in several important ways. Congruent with the thesis' research goals, its *first theoretical/conceptual contribution* lies in advancing research on drivers of the two innovation paradigms, particularly with regard to leadership and user innovators' work environment. To this end, the thesis theoretically developed and empirically verified the conception that reliable and sustainable leadership approaches for innovation must address central stages of the innovation process, focus on organizational units as drivers of innovation, and include efficiency dimensions. Evidently, the thesis' exploratory study of dual innovation leadership could benefit greatly from future research adopting the suggested cross-dimensional perspective and exploring dual innovation leadership's applicability in a variety of settings. Specifically, future studies should consolidate dual

innovation leadership's success in fostering different innovation types, for example, by comparing its impact on tangible product vs. intangible service innovations, or internal-organizational vs. external consumer-targeted innovations. Alternatively, future studies may also contribute to more differentiated insights by assessing its applicability to different industries, small/medium vs. large organizations, or organizations from different countries.

Moreover, the thesis introduced a cross-domain perspective and merged research on employee innovation with research on user innovation to develop a conceptual framework for the study of consumer innovators. Building on this framework, the thesis empirically substantiated the importance of user innovators' job requirements as a source for acquiring job-related resources for HHS innovations. Accordingly, future research should strive to expand the cross-domain perspective by comprehensively and systematically assessing user innovators' work environment. With regard to work-related factors, for example, the thesis' literature review (Section 2.3.2.2) identified several other work-related drivers that may be applicable to user-led innovation. Here, a promising area for further investigations lies in singling out those drivers that are capable of fostering cross-fertilization between the two innovation spheres.

The thesis' *second theoretical/conceptual contribution* lies in expanding previous research on interactions between the producer- and user-led innovation paradigms by encouraging an integrative perspective on the two innovation spheres. Previous work by Gambardella et al. (2017) and Raasch/von Hippel (2012) has identified two directions, innovation designs and innovation support (Section 2.1.3), by which producer and user innovation spheres may interact. However, research on the latter direction has been scare, with only few empirical studies focusing on direct forms of producer support for user innovation (e.g., Franke/Piller 2004; Füller et al. 2011; von Hippel/Katz 2002; West/Lakhani 2008). By investigating user innovators' work environment, study 2 expands and complements this work with insights on indirect support mechanisms. However, the study did not assess how much resources producers, e.g., leaders of the consumer innovators' organization, invest to generate the work environment that eventually enables consumer innovators to acquire job-related resources. Relatedly, the study did not assess the benefits that producers gain by investing resources into designing this work environment. Consequently, more research is needed to address these questions and expand knowledge on additional areas for indirect support by producers as well as its effect on their resources.

In addition, further research into the intricate interaction mechanisms will also contribute to exploring cross-fertilization effects between the two paradigms. Building on the combined insights of study 1 and study 2, as well as resource-based theories, this thesis discussed the potential of (dual innovation) leadership in enabling cross-fertilization between the two paradigms. To this end, benefits for producers as well as consumer innovators were illustrated. Yet,

irrespective of their profound theoretical foundation from study 1 and 2, the proposed benefits require empirical support. Accordingly, future research may advance knowledge on (dual innovation) leadership as a driver of cross-fertilization by designing empirical studies that simultaneously investigate its effects on (1) employee performance, (2) employed consumer innovators' job-related resources, and (3) the return transfers of knowledge and ideas from consumer innovators to the work domain, as well as their subsequent impact on organizational performance.

Last but not least, empirical research exploring cross-fertilization effects may also benefit from a deeper and consistent theoretical grounding. As an interdisciplinary field that spans research on producer/employee-, user-, and open innovation, as well as psychological studies on creativity and innovation, research on cross-fertilization faces the challenge of defining a common framework, agreeing on methodological standards, and unifying its varied terminology. Hence, if research is to progress in the long run, diverting attention to these theoretical advancements will prove inevitable to ensure comparability of results and the integration of insights on producer- and user-led innovation.

Finally, the thesis' *methodological contributions* from employing SEM analyses with time-lagged and multisource data (see Chapter 3 and 4 for details) also shine a light on future avenues worthwhile to pursue. Specifically, future research may consider complementing the employed SEM methodology with longitudinal and/or objective data. For example, in order to expand research on dual innovation leadership, the temporally delayed measure of executives' assessment of their units' performance could be complemented by additional, objective data sources. These objective measures could contribute to more holistic performance implications by assessing if and how dual innovation leadership affects performance in other units through spillover effects, and how leaders engaging in dual innovation leadership affect organizations' overall performance. Alternatively, future research may also consider combining data sources from executives and their employees via multilevel modeling in order to measure the effects of dual innovation leadership on employees' innovative behavior and their individual performance (Raudenbush/Bryk 2002; Tabachnick/Fidell 2014).

Conversely, with regard to methodological advancements to research on user innovators' work environment, it may be worthwhile to address shortcomings of the cross-sectional research design of study 2 by conducting longitudinal surveys (Bono/McNamara 2011; Lindell/Whitney 2001; Rindfleisch/Malter/Ganesan/Moorman 2008). While study 2 strived to alleviate the limitations of SEM analyses regarding causality implications with the use of two data sources (i.e., consumer innovators and independent raters), longitudinal research designs could further support the validation of the causal effects between job requirements and the acquisition of job-

related resources, as well as the effects between job-related resources and the outcomes of HHS innovation efforts.

5.2 Contributions for Management and Policy Makers

In addition to generating theoretical/conceptual and methodological implications for research, this thesis offers several *content-related contributions* to management and policy makers. Over the past decades, globalization, highly dynamic market environments, and technological advancements have continuously increased the importance of innovation for organizations and societies, and given rise to user innovators as significant contributors of innovations (Baldwin/von Hippel 2011; Gambardella et al. 2017). Simultaneously, potential and actual resource shortages (Berchicci 2013; Köhler et al. 2012; Vaiman et al. 2012) have resulted in the need for managers and policy makers to economize resources and focus their initiatives aiming to increase organizational and national innovativeness on the most central innovation drivers.

In this setting, the thesis identified leadership and the work environment as central drivers of producer- and user-led innovation. As both drivers result in innovation outcomes by stimulating and fostering innovation behaviors among individuals, at a higher level, the thesis' findings align with previous conceptions of innovation as a primarily human-driven endeavor that places individuals, i.e., leaders, employees, and users, at the core of innovation activities (Amabile et al. 1996; Mumford 2000). Importantly, this view is also consistent with resource-based theories. Specifically, with regard to organizational innovation, Khatri emphasizes that "it is hard to duplicate competitive advantage gained through better management of people" (2000, p. 337). Expanding this view to innovators in general, policy makers may echo that it is hard to duplicate competitive advantages gained through better people, i.e. innovating citizens in general. Accordingly, the implications for management and policy makers focus primarily on suggestions for human-centered initiatives.

For management, the thesis derives three key contributions. First, with regard to leadership, the thesis advises organizations to "*separate the wheat from the chaff*". Previous research demonstrates that leadership is central to innovation (Denti/Hemlin 2012; Mumford et al. 2002; Rosing et al. 2011). In other words, to ensure that organizations' strategic goals are met, competitive advantages are realized, and long-term survival is secured, organizations must have accomplished leaders for innovation at their disposal. Nonetheless, identifying successful leaders for innovation has posed considerable challenges to management in the past and resulted in several promising but few reliably successful leadership approaches (Section 2.3.1.2). To overcome the limitations of previous approaches, the findings of the thesis urge organizations to focus on

executives' of their organizational units. Specifically, organizations should school their executives in fostering innovation throughout the different stages of the innovation process and in complementing their focus on innovation with efficiency measures. In connection with this, study 1 suggested organizations may implement dual innovation leadership as a leadership approach specifically tailored to the multifaceted demands of organizational innovation. These dual innovation leaders may also be the key to unlock the largely unexplored potential of cross-fertilization between the two innovation paradigms.

Regarding the reaping of cross-fertilization benefits, the second implication for management is to "*overcome mental barriers*" of their employees, and particularly their leaders. Innovation is a complex phenomenon that comprises multiple facets and, as elaborated in this thesis, two central innovation paradigms. To successfully manage the current paradigm shift, organizations should thus educate their leaders and support them in developing an integrative perspective that considers the phenomenon of innovation holistically. To this end, leaders must relinquish their old views of the work domain as exclusive province of innovation and begin to acknowledge that employees may be workers for some time of their day, but, irrespective of their jobs, may also be innovators in their private life with the potential to significantly contribute to producer innovation activities. Consequently, organizations are well advised to initiate developmental programs for their leaders that help them in identifying, schooling, and fostering (employed) consumer innovators in dedicated projects. Far from being 'just' social projects, projects supporting consumer innovators of the workforce can be a means for organizations to reap benefits from cross-fertilization for themselves, when supported employees return innovation-relevant knowledge from their home domain to innovation projects at work.

Thirdly, to successfully introduce new leadership approaches to innovation and sustain an integrative perspective on innovation, supportive organizational structures are essential in the long run. Accordingly, as a third implication, organizations are advised to "*break out of set structures*" by developing new, interconnected organizational forms that amplify human-centered initiatives. For example, organizations may consider placing stronger emphasis on interconnectedness among employees and external stakeholders by developing decentral network structures (Malone 2004). Indeed, new approaches that allocate more decision power to individual units and enable collaboration with more and various external stakeholders (e.g., including user innovators) are becoming increasingly important in the pursuit to strengthen organizational innovativeness (Lavie et al. 2010; Tushman/O'Reilly 1996).

With regard to policy makers, the thesis analogously derives three key contributions. First, policy makers are advised to "*invest in common ground*" in order to enhance innovation from a national-level perspective. Specifically, policy makers should identify and foster interrelated

innovation drivers that bridge the producer and user innovation sphere. To this end, policy makers may incentivize producer innovators to readjust employees' work environment. As the thesis highlighted, adjustments to the work environment, especially with regard to increasing job innovativeness or (occasionally) lowering work requirements, contributed to job-related resources of consumer innovators and benefitted their HHS innovation efforts in terms of increasing innovativeness and technical realization success. Eventually, as more consumer innovators succeed in developing novel and appealing innovations, national innovation levels increase and the overall number of diffused consumer innovations is likely to rise (de Jong et al. 2018; Rogers 2010). In turn, this will contribute to societal progress and increase standards of living (Gambardella et al. 2017; Henkel/von Hippel 2004). Alternatively, policy makers may consider enhancing access to knowledge and special trainings for consumer innovators, as individuals' tend to transfer their resources from one domain to another. Accordingly, through directly supporting consumer innovators, policy makers can also raise producer-led innovation levels in the long run by providing organizations with better educated and potentially more inspired employees, who invest their externally acquired resources to succeed in the tasks they encounter in their workplace.

The second implication for policy makers is to "*call a spade a spade*". Specifically, the thesis advises policy makers to raise public awareness about the phenomenon of user-led innovation and its interrelation with the producer-led innovation paradigm. Encouraging this open discourse on innovation is important to demonstrate the possibilities and potentials of innovation to citizens, and to inspire other innovators to join the user/consumer innovation community. Moreover, policy makers should complement these dialogs with publications of objective data on user innovation activities. To this end, they may consider investing in longitudinal surveys that holistically monitor and compare the success of producer- and user-led innovation over time. For example, the recent adjustment of the Oslo Manual (OECD/Eurostat 2018) to assess user-led innovation poses a very promising first step in this undertaking. In addition to the informative value of such surveys, systematically measuring user-led innovation also enables policy makers to develop more comprehensive and differentiated innovation policies and monitor their success (Gault 2018). Eventually, this will help identify the most central measures and ensure that economic and social objectives are effectively and efficiently reached.

Finally, this thesis highly encourages policy makers to "*build bridges*" between the two innovation paradigms by ensuring an active and regular exchange between producer and user innovators. Today, first attempts to bring the two innovation spheres together can be observed in event formats, like 'start-up' days or 'young entrepreneur' events, offered by a variety of stakeholders, including individual companies, universities, or (non-profit) organizations and unions.

Nonetheless, innovation as a societal phenomenon would greatly benefit from nationally coordinated, public initiatives that holistically assess and pair innovators from all industries and social classes. To this end, policy makers could build innovation data bases that provide a systematic overview of the varied innovation projects in the two spheres and enable innovators from both sides to identify partners for potential inter-paradigm collaboration projects.

In summary, this thesis underlines the importance of exploring paths *beyond the obvious* when seeking to identify central innovation drivers and deliberating potentials for interaction between the two innovation spheres. Accordingly, the thesis concludes by encouraging management and policy makers to adopt an integrative perspective to successfully navigate and negotiate between the producer- and user-led innovation paradigms in the future.

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