INDIFFERENCE, RESISTANCE AND REJECTION IN CONSUMER ADOPTION PROCESSES

AN EMPIRICAL ANALYSIS OF DETERMINANTS, CONSEQUENCES AND NEURAL CORRELATES

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LIST OF ABBREVIATIONS

AVE	Average variance extracted
AIR	Active Innovation Resistance
BOLD	Blood oxygenation level dependent
CR	Composite reliability
et al.	Et alii/ et aliae/ et alia
FWE	Family-wise error
FWHM	Full width at half maximum
GLM	General Linear Model
MNI	Montreal Neurological Institute
ms.	milliseconds
n	Sample size
n. s.	Not significant
PIR	Passive Innovation Resistance
PLS	Partial Least Squares
p-value	Probability of obtaining test statistics
Q^2	Stone-Geisser statistic for predictive validity

R^2	Squared Multiple Correlation
R&D	Research and Development
RT	Reaction time
SD	Standard Deviation
SEM	Structural Equation Modeling
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
TIR	Transactional Innovation Resistance
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
VIF	Variance Inflation Factor
UTAUT2	Unified Theory of Acceptance and Use of Technology Model 2
VIF	Variance inflation factor
β	Standardized beta-coefficient

1 Introduction and Relevance

Consumers expect companies to provide them with innovative offerings. However, held expectations are rising higher and higher in today's fast-moving, technology-driven society. Nowadays, consumers impatiently seek out the latest and most advanced technology, and meeting these expectations rewards innovative companies with a desirable market position. This is evidenced by the Forbes annual report "World's Most Innovative Companies,"[1] where ServiceNow, Inc.—a US-based Cloud Computing Provider—scored first place while holding 48.85% market share in their industry[2]. Similarly, other, more prominent, companies—such as Amazon.com, Inc. (scoring 5th) and Facebook Inc. (scoring 10th)—also dominate their industry by continually providing innovative solutions for their customers. Companies of comparable size and market share (e.g., General Motors and PLR IP Holdings, LLC – producer of the Polaroid camera) that have failed to provide their consumers with innovative solutions slowly lost market shares before they eventually went bankrupt.

Staying innovative is an expensive endeavor. Companies are required to repeatedly identify, develop, and launch new products and services. Hence, staying innovative requires companies to invest in research and development (R&D) activities. For instance, Amazon spent $22.6 billion in 2017[3] for research and development (called "Technology and content" in the annual report), making it the company with the world's highest R&D spending. However, the R&D costs concomitant with the effort to stay innovative are

[1] https://www.forbes.com/innovative-companies/#46ded3b11d65, 09th Sept. 18, 01:40 pm

[2] https://www.datanyze.com/market-share/itsm/servicenow-market-share , 09th Sept. 18, 01:45 pm

[3] http://phx.corporate-ir.net/phoenix.zhtml?c=97664&p=irol-reportsannual, 09th Sept. 18, 02:40 pm

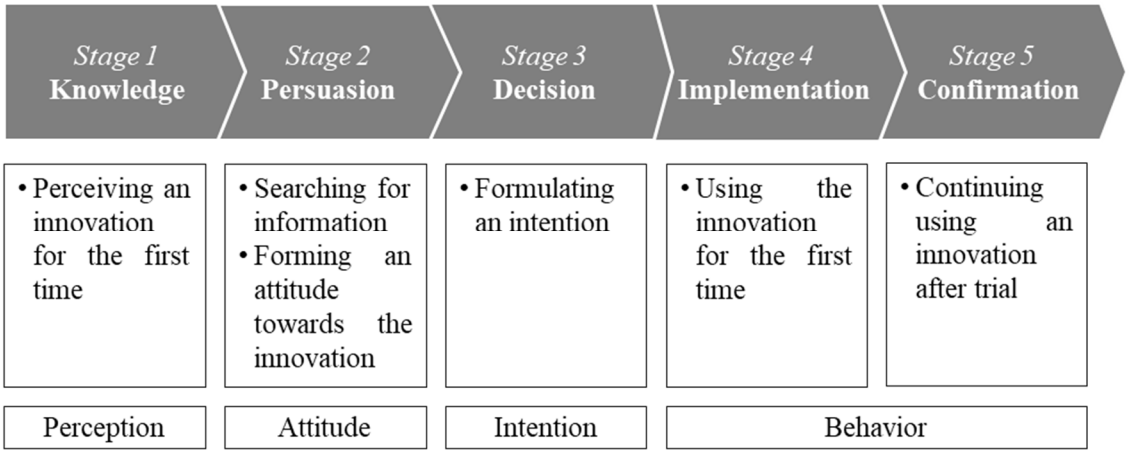
only the beginning of a vicious cycle. The downside of enormous and steady investments in R&D is that companies are then in desperate need to commercialize their new products successfully. Revenues from new product sales are not only economically desirable but also essential to maintain the overall operation of the company, as well as to finance future R&D activities (Gourville, 2006).

In reality, however, an alarming proportion of new product innovations are rejected by consumers, producing a failure to generate revenue and inhibiting the ultimate goal of market introduction and diffusion. In fact, depending on the product category and source, product failure rates range between 50 and 90% (Castellion & Markham, 2013). These high failure rates endanger the company's future revenues, its competitive position, and its capabilities for continuing operation. To sum up, following the path of consumer expectations to provide innovative product or service offerings can give companies the opportunity to dominate the market, but the effort can also cause them to lose market position.

The literature on innovation adoption provides managers with theoretical guidance. At its core, innovation adoption theory, first proposed by Rogers in 1962, describes a "[...] process through which an individual (or other decision-making unit) passes from gaining initial knowledge of an innovation, to forming an attitude toward the innovation, to making a decision to adopt or reject, to implementation of the new idea and confirmation of this decision" (Rogers, 2003, p. 168). He views the process as a string of five distinct stages: the knowledge stage, the persuasion stage, the decision stage, the implementation stage, and, finally, the confirmation stage (Rogers, 2003, pp. 169) (figure 1). In the knowledge phase, a consumer becomes aware of an innovation by being exposed to it for the first time (Kaplan, 1999). In the persuasion stage, individuals then begin to develop

an attitude towards the innovation by actively seeking out and assessing innovation-related information (Rogers, 2003, p. 169). In the decision stage, the individual continues the information, while also considering alternatives. The decision phase ends with an intentional outcome of either adopting or rejecting the innovation in the future (Rogers, 2003, pp. 177). In the implementation stage, the intentional motivation transfers into actual behavior, leading to the initial adoption or rejection of the innovation. In the final stage, the confirmation stage, consumers evaluate their accumulated usage experiences and decide either to continue, stop, or reverse their behavior (Rogers, 2003).

Figure 1: Rogers' innovation decision process



The time an individual needs to pass from the initial knowledge stage to the final confirmation stage is referred to as the innovation-decision period. The amount of time this takes is influenced by the individual's assessment of the focal innovation characteristics and how those are compliant with predefined expectations (Talke & Heidenreich, 2014). In particular, Rogers (2003) argues that 49 to 87% of the individual's progress along the Innovation decision process is explained by five attributes of innovation. (I) *Relative advantage* is the degree to which an innovation is perceived as better than the

current product or alternative in use. (II) *Compatibility* is the degree to which an innovation is perceived as consistent with existing values and practices. (III) *Complexity* is the degree to which an innovation is difficult to understand or use. (IV) *Trialability* is the degree to which an innovation is available to the individual for initial trial and experimentation. (V) *Observability* is the degree to which the innovation is observable for an individual within his social environment.

Surprisingly, the conceptualization of the Rogers processual model assumes that consumers are generally open to novel offerings and thus would eventually pass from one stage to another. However, as evidenced by more contemporary studies (Claudy, 2011; Kleijnen, Lee, & Wetzels, 2009; Talke & Heidenreich, 2014) and managerial insight (Schneider & Hall, 2011; Simester, 2016), consumers are not necessarily open to innovation. More specifically, consumers might find the changes imposed by an innovation disadvantageous, leading them to resist or reject the innovation (Heidenreich & Spieth, 2013; Oreg, 2003). Therefore, Rogers initial processual model may be based on a false assumption. The discovery and later acknowledgment of this phenomenon within the innovation adoption community —coined pro-change bias— motivated academics to explore the underlying reasons for negative outcomes of the Innovation decision process (Heidenreich & Kraemer, 2015a; Heidenreich & Spieth, 2013; Ram, 1989; Ram & Sheth, 1989; Rogers, 1976; Sheth, 1981).

1.1 Research Potential of the dissertation

Research Potential 1 – "Clouded Insights": The importance of understanding the adoption of innovative offerings has been acknowledged by both academia and practice. Consequently, over the last decades, scientists from multiple disciplines investigated innovation adoption in their respective fields and context, culminating in an enormous number of articles exploring and explaining specific phenomenon related to innovation adoption in their respective academic disciplines. For instance, when searching for the term "innovation adoption"[4] on the Web of Science database, 10,928 articles come forth, listed in 25 academic disciplines, including political sciences (222 articles), environmental studies (600 articles) and engineering industrial (570 articles). Thereafter, the list of disciplines is led by management (2138 articles), business (1610 articles) and economics (1212 articles).

The interest in the topic has come at an undeniable cost: A heterogeneous and fragmented body of literature. As a consequence, researchers and practitioners interested in consumer-specific insights struggle to navigate within the vast number of articles. Practitioners might find it difficult to access, identify and select relevant knowledge. Academics, on the other side, might find it complicated to spot promising research avenues and thus to contribute to our current understanding.

Previous attempts to provide a clear and synthesized picture of the literature are not particularly helpful for academics and practitioners interested in innovation adoption and consumer behavior, as they focus on specific contexts (e.g. agriculture, (Feder & Umali,

[4] Search Term: [TOPIC: (innovation) AND TOPIC: (adoption)]; Web of Science database, 8th Oct 18, 2:15 am

1993)), focus on firm but not on individual level (organization adoption, (O'Neal, Thorelli, & Utterback, 1973)) or are either too broad (e.g. innovation adoption and diffused, (van Oorschot, Hofman, & Halman, 2018)) or too narrow (e.g. emerging countries and smartphone adoption, (Aldhaban, Daim, & Harmon, 2015)). Hence, to navigate within the vast clouded body of literature of innovation adoption and to provide opportunities for fruitful research avenues, a systematic synthesis of relevant literature on the intersection of innovation adoption and consumer behavior is desirable.

Research Potential 2 – "Black and White": Past literature on consumer-related innovation adoption has differentiated between positive (e.g., acceptance and adoption) and negative (e.g., resistance and rejection) outcomes. This "black and white" thinking neglects the possibility of alternative outcomes: Leapfrogging and Postponement. Leapfrogging refers to a consumer's intention to reject the current and to skip ("leapfrog) the following product generation in order to wait for specific product improvement in the third product generation (Herrmann, Sprott, & Schlager, 2015). Postponement describes a consumer's positive attitude toward an innovation, followed by a delay of the purchase to an unspecific point in time. As such, leapfrogging describes a deliberate, while postponement describes an undeliberated, form of consumer resistance (Kleijnen et al., 2009; Talke & Heidenreich, 2014).

Both forms are of particular interest for managers, as they inhibit sales maximization. However, leapfrogging behavior, unlike postponing behavior, mirrors a consumer's determination to simply wait for a foreseeable product improvement (Goldenberg & Oreg, 2007; James, 2009). Hence, managers are able to identify the roots of the consumer's current rejection behavior as well as to elaborate and initiate marketing measures

to counteract it. Postponement, on the other side, reflects an undeliberated form of resistance (Claudy, 2011). Thus, managers are left in the dark on why consumers reject the innovation. Consequently, managers struggle to choose the most effective and efficient marketing measures to address the consumers' reasons for postponement in order to counteract the ongoing rejection behavior.

The literature on postponement is scarce, as the majority of articles focus on positive or negative outcomes of Rogers' innovation decision process. While some articles mention postponement (Reinhardt, Hietschold, & Gurtner, 2015; Szmigin & Foxall, 1998; Talke & Heidenreich, 2014) only a few investigate the phenomenon empirically. For instance, Greenleaf & Lehmann (1995) explored the reasons which lead to a "substantially delayed" of purchase decisions. However, the generalizability of their results is subjected to certain boundaries. First, they focused on instances that potentially led to adoption, while neglecting those that were delayed indefinitely. Second, Greenleaf & Lehmann (1995) investigate delay reasons which are linked to considerably expensive, high-involvement products. Third, the authors only examine graduate business students, which might inhibit delay reasons mentioned by participants of other demographic constellations. Although Greenleaf & Lehmann's (1995) results are bound to certain limitations (high-involvement goods; student sample) and might not explicitly account for postponement (as they neglected indefinite delay), their results indirectly demonstrate how reasons for delay might differ from those for continues rejection. As a result, the examination of differences between consumers' reasoning to reject and/or postpone an innovation remains still untouched.

Research Potential 3 – "Early Stages": The majority of articles that, to some extent, utilize innovation adoption theory examine individuals' intentions (Lee, Park,

Chung, & Blakeney, 2012; Parry, Kawakami, & Kishiya, 2012; Schreier, Fuchs, & Dahl, 2012; Talke & Snelders, 2013) and behaviors (Kuester, Hess, & Herrmann, 2015; Labrecque, Wood, Neal, & Harrington, 2016; Müller-Stewens, Schlager, Häubl, & Herrmann, 2017; Stock & Schulz, 2015). Following Rogers' (2003) initial processual proposal, intentional and behavioral outcomes are, regardless of the general nature (positive or negative), associated with the mid- (e.g., decision stage) and later-stages (implementation and confirmation stage) of the innovation decision process. In contrast, research on outcomes of the early stage (knowledge stage) is sparse. The reasons for that might be twofold. On the one side, consumers struggle to articulate their emotions, perceptions, and attitudes when being confronted with innovation for the first time (Rindova & Petkova 2007). On the other side, researchers face the difficulty of providing measures to quantify and capture a consumer's early-stage impressions with traditional methods, such as questionnaires, interviews or experimental observations (Calantone, Griffith, & Yalcinkaya, 2006; Danneels & Kleinschmidt, 2001; Gatignon & Robertson, 1991). One notable attempt to investigate an early-stage product encounter has been undertaken by Olshavsky & Spreng (1996). They asked their participants to instantly verbalize their thoughts when seeing one of the experimental stimuli (innovative food products). This procedure, also known as the "Think-out-loud" method, aimed to collect immediate responses from consumers while they were assessing and judging novel food products. Yet, it remains questionable to what extent Olshavsky & Spreng (1996) captured the individuals' emotional, perceptual and attitudinal impressions, as their method is based on self-reported feedback, and thus might not depict the multifaceted nature of encountering novel products.

Nevertheless, understanding the valence and variance of the consumer's impression gained during the early stages remains of utmost importance. Previous literature argues

that early-stage impressions substantially affect the individuals at mid- and later-stages, as it influences future information search (Bonner, Ruekert, & Walker 2002; Heidenreich & Kraemer 2015; Kohli, 1999), processing (Branco, Sun, & Villas-Boas, 2016; Rindova & Petkova 2007), and ultimately the outcome (Claudy, Garcia, & O'Driscoll, 2015; Heidenreich & Spieth, 2013; Talke & Heidenreich, 2014). To sum up, studying early-stage perception remains methodologically challenging, as traditional measures are not capable of adequately capturing the valence and variance of the initial moment (Calantone et al., 2006a; Danneels & Kleinschmidt, 2001). At the same time, however, insights into the consumer's early-stage reasoning would reveal novel and fruitful insights for academics and practitioners alike to better understand outcomes of the later stages (Griffin, 1997).

The aforementioned research potentials are taken up by three essays. Essay I (chapter 2 of this dissertation) addresses Research Potential 1: "Clouded Insights". In detail, essay I first uses a systematic literature review to identify key literature at the intersection of marketing and innovation adoption. Building on those findings, a descriptive analysis follows to quantify the resulting body of literature. In a subsequent step, the identified articles are synthesized using a bibliographic analysis. The essay ends by combining the findings of the descriptive analysis with the findings from the bibliographic analysis by proposing several future research avenues.

Essay II (chapter 3) consists of three consecutive steps that all correspond to Research Potential 2: "Black and White". In a first step, using a systematic literature screening, relevant literature on rejection (continuous rejection) and postponement (temporary rejection) has been identified. Next, there is an explorative, qualitative study aimed at identifying reasons not yet described in the literature. The results from the contemporary

literature and the qualitative study suggest that currently available constructs are sufficient to explain continuous rejections but not to explain postponement. To account for this gap, a new construct, coined as *transactional resistance*, has been introduced to complement the existing constructs. Finally, the effectiveness of the construct transactional resistance has been examined using survey data.

Essay III (chapter 4) attempts a novel approach to exploit Research Potential 3: "Early Stages". By using contemporary insights from innovation management, cognitive psychology and neuroscience literature, essay III investigates the individual's neuronal reaction to product innovations. Therefore, from a methodological standpoint, essay III combines behavioral, survey and neuroimaging data derived from a functional magnetic resonance imaging (fMRI) experiment to overcome current methodological challenges in studying consumers' reactions to novel products. Table 1 lists the essays of the dissertation and provides an overview of the key literature and methodologies used to investigate each research question. Table 2 depicts each article's contribution, as well as an overview of the co-author's contribution.

Table 1: Overview dissertation essays, research objectives, applied methods and key literature

Chapter (Essay)	Research objectives	Key Literature	Methods
Chapter 2 (Essay I) *Connecting the Dots – A Bibliographic Analysis of Literature on Roger's Innovation Decision Process in the intersection of Marketing, Innovation Management, and Psychology* Page 15 to 63	– Select, summarize and syntheses literature on innovation adoption – Provide future research avenues	– Rogers (2003) – Van Eck & Waltman (2007) – Van Oorschot, Hofman, & Halman (2018)	– Systematic Lit. Review (Zhang & Banerji, 2017) – Co-Citation Analysis (Van Eck & Waltman, 2007) – Bibliographic Coupling Analysis (Van Eck & Waltman, 2007)
Chapter 3 (Essay II) *To Buy or Not to Buy? Investigating Determinants and Differences of Temporary and Continuous Rejections of Innovations* Page 65 to 107	– Contrast differences in reasoning between continuous and discontinuous rejections	– Talke & Heidenreich (2014) – Greenleaf & Lehmann (1995)	– Systematic Lit. Review (Bartels & Reinders, 2011) – Semi-structured Interviews (Spiggle, 1994) – Survey instrument (with SEM PLS & Multi-Group Analysis) (Hair, 2013)
Chapter 4 (Essay III) *A Sneak Peek into the Brain: Investigating neuronal Reactions to New Products Using Functional Magnetic Resonance Imaging (fMRI)* Page 109 to 147	– Identify neuronal activations of perceiving novel products	– Rindova & Petkova (2007) – Heidenreich & Kraemer (2015a) – Olshavsky & Spreng (1996)	– Reaction Time Analysis (Reimann, Castaño, Zaichkowsky, & Bechara, 2012b) – Neuronal ROI* Analysis (Mathlab SPM12) (Poldrack, 2007) – Meta-Analysis (Yarkoni, Poldrack, Nichols, Van Essen, & Wager, 2011) – SEM PLS (Hair, 2013) – Mediation Analysis (Hayes, 2009)

* ROI = Region of Interest; Analysis of neuronal activation within a specified (brain-)space that follows a stimuli presentation.

Table 2: List of conference contributions and overview co-author contributions

Chapter (Essay)	Conference Contribution*	Co-Author Contributions**	
Chapter 2 (Essay I) *Connecting the Dots – A Bibliographic Analysis of Literature on Roger's Innovation Decision Process in the intersection of Marketing, Innovation Management, and Psychology*	– -	JM	sole authorship
Chapter 3 (Essay II) *To Buy or Not to Buy? Investigating Determinants and Differences of Temporary and Continuous Rejections of Innovations*	– Summer AMA Conference, Atlanta, USA, Aug 2016; – 22nd IPDM Conference, Copenhagen, DK, June 2015; – 31st ANZAM Conference, Melbourne, AUS, Dec 2017.	SH JM	setting up research design; developing story ling; guiding quantitative data analysis; stream lining manuscript gathering data, analysing qualitative and quantitative data; writing first draft of the paper
Chapter 4 (Essay III) *A Sneak Peek into the Brain: Investigating neuronal Reactions to New Products Using Functional Magnetic Resonance Imaging (fMRI)*	– VHB TIE Tagung, Hamburg, GER, Sep 2018; – 25th IPDM Conference, Porto, PRT, June 2018; – NPEC, Zurich, CHE, May 2018; – NPEC Conference, Antwerp, BEL, June 2017; – IIF, Berlin, GER, April 2017;	JM SH MR CK	planning and execution study; analysis behav. & neuro. data analysis; developing paper setting up research design supporting story line development setting up fMRI equipment; guiding SPM12 analysis

*Conferences: *AMA* = American Marketing Association; *IPDM* = International Product Development Management; *ANZAM* = Annual Australian and New Zealand Academy of Management; *VHB TIE Tagung* = Verband der Hochschullehrer für Betriebswirtschaft e.V. Fachtagung der wissenschaftlichen Kommission Technologie, Innovation und Entrepreneurship; *NPEC* = NeuroPsychoEconomics Conference; *IIF* = International Interdisciplinary Forum.

**Contributors, if not stated otherwise, are listed in the order of overall contribution to the essay: *SH* = Sven Heidenreich, Saarland University; *MR*= Martin Reimann, University of Arizona; *CK* = Christoph Krick, Saarland University; *JM* = Jan Andre Millemann, Saarland University.

1.2 Course of the Investigation

The present dissertation consists of five chapters. Chapter 1 provided a general introduction to the topic, highlighted research potentials and introduces the corresponding three essays. Chapter 1 closes with an overview of the dissertation essays showcasing their research objectives, applied methods and key literature (Table 1). Chapter 2 represents essay I, which aims at identifying and synching key literature about Rogers' innovation decision process between the academic disciplines of Marketing, Innovation Management, and Psychology. Methodologically, essay I uses a systematic literature review (Zhang & Banerji, 2017), a descriptive analysis and a bibliographic analysis (co-citation analysis & bibliographic coupling analysis, (van Eck & Waltman, 2007)). Chapter 3 discusses essay II, which investigates how consumers' reasoning to reject an innovation temporarily (postponement) differs from that associated with continuous rejections. Building on the extensive systematic literature review and explorative semi-structured interviews, essay II extends the current knowledge about postponing intentions by introducing and testing the construct of transactional resistance. Chapter 4 contains essay III, which explores consumers' neuronal reaction to product innovations using a functional magnetic resonance imaging. In the course of the investigation, essay III demonstrates how traditional methods can be complemented with methods from other disciplines to overcome previously held research limitations. Chapter 5 summarizes and synthesizes the results, findings and implications of the dissertation.

2 Connecting the Dots – A Bibliometric Analysis of Literature on Rogers' Innovation Decision Process in the intersection of Marketing, Innovation Management, and Psychology[5]

2.1 Introduction

What do we know about consumer innovation adoption? Practitioners might reply that we know only a little. They are under constant pressure to launch the next big innovation. Yet, they have come to the sobering realization that only 3% of new consumer goods exceed $50 million in sales in the first year after launch, the benchmark for highly successful innovations (Schneider & Hall, 2011). Others even witness how 60% of their newly introduced products failed within three years (Anderson, Lin, Simester, & Tucker, 2015). The causes and reasoning underlying the low success rate of innovation might be manifold, but understanding them is of utmost importance for companies as failure of innovation endangers the return on investment, threatens the continuation of innovation supporting activities, and in some severe cases, jeopardizes the maintenance of operation.

Academics, on the other side, might reply that we know a lot about consumer behavior in general and innovation adoption in specific. Since Rogers pioneered the field of innovation adoption in 1962 with his groundbreaking book "diffusion of innovations," a tremendous amount of studies have emerged from his ideas to investigate innovation adoption in various fields including the military, health care, and marketing. While innovation diffusion pertains to a macro perspective on how individuals of a certain social

[5] Author: Jan Andre Millemann

system adopt to innovations over time, innovation adoption relates to a micro perspective on how individual's reason and decide when being confronted with an innovation. In particular, the cornerstone of innovation adoption is the Innovation decision process (originally coined innovation adoption process), which is described as "[...] the process through which an individual (or another decision-making unit) passes from gaining initial knowledge of an innovation to forming an attitude toward the innovation, to making a decision to adopt or reject, to implementation of the new idea and confirmation of this decision" (Rogers, 2003, p. 168). Rogers' influence on the scientific field, as well as the general interest in innovation adoption of fellow academics, is evidenced by 96'541 citations of Rogers' latest book released in 2003 (according to Google scholar citations, 21.06.18).

Yet, although academics revealed great insights into consumer behavior and innovation adoption, practitioners still struggle to launch new offerings successfully. Therefore, the question remains: What do we really know about consumer innovation adoption? Hence, the aim of this paper is to twofold. (I) Present a holistic status quo of the past developments in consumer behavior and innovation adoption in the intersection of marketing, innovation management, and psychology. (II) Utilize the status quo to systematically deduce future research avenues to facilitate further advancements of innovation adoption literature.

I want to achieve the aims by applying a three-step procedure recently suggested by Kovács, van Looy & Cassiman (2015). In particular, I will first systematically identify the relevant literature. Second, I will conduct an extensive descriptive analysis before I perform, in a third step, a bibliographic analysis. The latter is based on a software package, called the VOSviewer (van Eck & Waltman, 2007), which synthesizes the arti-

cles by visualizing similarities based on the articles bibliographic data collected from the metadata databases. In general, bibliographic analysis approaches search for over-laps in citations and other reoccurring patterns among articles. The VOSviewer allows finding such overlaps between authors (called bibliographic coupling) and references (called co-citation analysis) (Ringel & Skiera, 2016; van Eck & Waltman, 2007) to comprehend the innovation adoption literature. The bibliographic coupling reveals similarities among the identified articles references and clusters them accordingly. Thereby, the bibliographic coupling analysis addresses the question: Which authors used the same sources and thus examined a similar topic? The co-citation analysis highlights similarities among the identified articles references and clusters to their references accordingly. The question the co-citation attempts to answer is: What are the theoretical pillars of a certain set of articles?

Similar visualization approaches have previously been utilized to review vast amounts of articles within marketing related fields to identify future challenges for servitization (Zhang & Banerji, 2017), examine theoretical and practical contributions of the outlet to business-to-business and industrial marketing (Valenzuela, Merigó, John-ston, Nicolas, & Jaramillo, 2017) and highlight leading trends of the European Journal of Marketing (Martínez-López, Merigó, Valenzuela-Fernández, & Nicolás, 2018). One recently published article from van Oorschot et al. (2018) demonstrated how a bibliometric review could create meaningful value for innovation research. Similar to my methodological approach, they utilize a bibliographic analysis to summarize findings on innovation adoption. Nevertheless, when looking closer, my theoretical focus, as well as the methodological approach significantly differs from those of van Oorschot et al. (2018) in five points. (1) Time perspective: van Oorschot et al. (2018) only consider articles published within the time span of 2013 to 2016. In contrast, the present article has no fixed time frame. (2) Focus: In their article, van Oorschot et al. (2018) neither set contextual boundaries, nor

do they differentiate between articles related either to innovation diffusion or innovation adoption, leading to a great variety of articles in their analysis. Contrary to van Oorschot et al. (2018) and their intention to present a general picture of the field, I am particularly interested in a narrow picture by focusing on only those findings, which contribute to the advancement of innovation adoption and the advancement of Rogers Innovation decision process within the intersection of marketing, innovation management and psychology. (3) Depth: As stated by van Oorschot et al. (2018), considering 45,932 unique references consequently restricts the possibility to take all conceptual, operational, and methodological aspects of each article into account. For instance, due to the richness and complexity of the dataset, van Oorschot et al. (2018) had to limit their consideration of articles to those that have been cited at least 20 times. (4) Journals: In contrast to my approach, van Oorschot et al. (2018) incorporate a wide variety of scientific journals. As recommended by Saunders, Wong, & Saunders (2012) I only included publications in carefully selected, peer-reviewed journals with a greater than or equal to VHB-JOURQUAL3 “B” rating, as articles published in those journals are considered as the most useful and credential source of literature. (5) From a methodological standpoint, van Oorschot et al. (2018) applied a bibliographic coupling and a co-citation analysis. While I also use both steps, I additionally conduct a descriptive analysis, highlighting conceptual and methodological advancements and shortcomings. Summing up, my article validates and extends the work of van Oorschot et al. (2018) in some instances while still significantly deepening our understanding of innovation adoption in a consumer-related context.

2.2 Methodological Approach

2.2.1 Systematic Literature Review

The paper's primary goal is twofold. First, I am interested in seeing how Rogers and his ideas summarized in the book "Diffusion of Innovations", influenced marketing and new product development over time. As the second step, I am striving to identify past conceptual developments as well as deducing future research avenues from it. To achieve the proposed aims, I conducted a systematic literature review in the intersection of marketing, new product development, and psychology to identify research articles influenced by Rogers' book "Diffusion of Innovations." Zeroing in on this specific book seems particularly appropriate as Rogers - since the first edition of this book - has been widely acknowledged as "the inventor of the [adoption and diffusion] theory" (Kapoor, Dwivedi, & Williams, 2014, p. 74). Consequently, his conceptual thoughts and ideas guide past and inspire contemporary work, which is both, most likely esteemed by the citing of and referring to his publication.

First, I identified relevant journals in the field of marketing, innovation management and psychology. Notably, this step differs from a common bibliographic analysis. Common analyses consider a broad and heterogeneous body of literature and thus need to consider entire databases. However, since the present article is more interested in the most relevant and influential articles in one particular intersection, namely, the consumer centered innovation adoption, a more narrow and goal-directed approach to identify relevant articles had to be applied. As any manual selection of articles might influence the later descriptive or bibliographic analysis and the outcome of the review, past authors have called for great caution. They argue that the outcome of a literature analysis is only

as good as its input (Takey & Carvalho, 2016; Webster & Watson, 2002). Nevertheless, as shown by Zhang & Banerji (2017), a rigorous, transparent and systematic process to identify the most relevant articles addresses prior concerns while also addressing the initial reviews goal. Hence, I adopted Zhang and Banerji's (2017) so-called "improved systematic literature review process" for literature screening and selection. In a first step, I set up a consideration set of journals by collecting all journals' names listed in the VHB-JOURQUAL3 ratings for marketing (MAR), technology and innovation management (TIE) and general business administration (ABWL). Next, I canceled out those journals, which have been listed equal to or less than "C" rating to focus on those journals with a higher standard in publishing articles. Furthermore, I screened the journals' websites to evaluate their scopes. In case the journal's scope did not fit into the present study (e.g. focus on B2B, team or organizational level) I withdrew the journal's name from the final set. For instance, I excluded Organization Studies, which is rated with "A" in general business administration, because its overall scope is solely focused on the organizational context, which clearly does not contribute to my research aim. After the initial screening, 52 journal outlets remained. In the second step, I invited six scholars (33% female; with 3 - 5 years experience) to a short survey in which they were asked to" identify the most relevant journals for consumer-focused innovation adoption literature." Next, I explained the overall research goal before presenting them with the above-mentioned VHB-JOURQUAL3 Journal list. Finally, the scholars were asked to name as many additional Journals not listed in the survey (please view appendix I.2 for the original survey). Then I summarized the replies and included those journals, which have been named at least by two experts. The final set of journals includes the Journal of Consumer Research, Journal of Marketing, Journal of Marketing Research, Journal of Consumer Psychology, Journal of

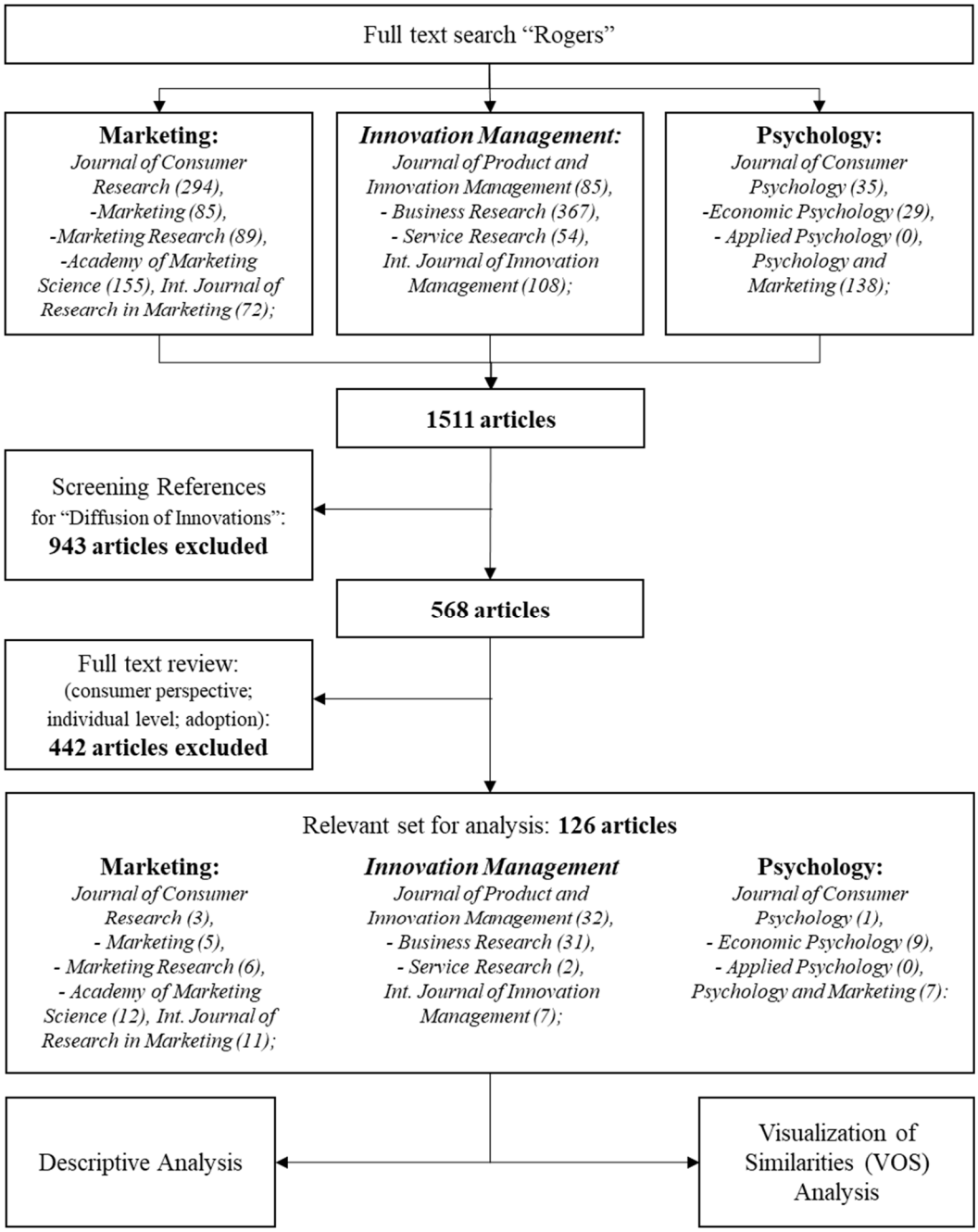
the Academy of Marketing Science, International Journal of Research in Marketing, Journal of Product and Innovation Management, Journal of Service Research, Journal of Business Research, International Journal of Innovation Management, Psychology and Marketing, Journal of Economic Psychology.

Second I screened each journal's database for relevant articles. In particular, due to varying citation regulation among the relevant set of journals, I applied a full-text search for "Rogers". In a subsequent step, I then screened each article for the specific citation of Rogers' book "Diffusion of Innovations". The search took place between May and July 2018. It was noteworthy that in an initial and seemingly more time efficient attempt, when I conducted a full-text search for "Diffusion of Innovations" it yielded fewer results. However, due to differences between the search procedures of each journal's database, some publications citing Rogers "Diffusion of Innovations" have been withheld from the search report. For instance, searching for "Diffusion of Innovations" within the Journal of Marketing (full-text search; field "anywhere in the article") yielded 7 articles. The same search with the term "Rogers" yielded 85 articles, one of which has been authored by Müller-Stewens et al. (2017) with the title "Gamified Information Presentation and Consumer Adoption of Product Innovations". On a closer look, the paper also cited Rogers' book "Diffusion of Innovations" making the paper not only relevant but also necessary for the systematic analysis.

Third, I screened the identified papers' abstracts to determine their overall fit to my research goal. This step was of particular importance, as Rogers' book "Diffusion of Innovations" provided not only the conceptual foundation for studying the micro perspective (adoption) but also for the macro perspective (diffusion). Since I am particularly in-

terested in the micro perspective and innovation adoption, I manually screened each paper's title, abstract, and keywords. Thereby, I excluded all papers that solely focused on the macro perspective, while including those articles, which incorporate both perspectives. In the end, the systematic literature review yielded 126 articles (figure 2) (please see appendix I.1 for the final set of articles).

Figure 2: Overview systematic literature review



2.2.2 Coding for the Descriptive Analysis

As the next step, I manually coded each paper according to the following criteria. All uncertainties were presented to and discussed with fellow researchers until a mutual agreement was met. (For a detailed overview of the coding criteria, please view Tables 3-12).

I. Methodology: *Approach* – Coding the applied methodological approach (e.g., survey, experiment, interview etc.).

II. Process: *Stages of the innovation decision process* – Coding the addressed process stages of the Innovation Decision process (e.g., knowledge stage, persuasion stage, decision stage, etc.);

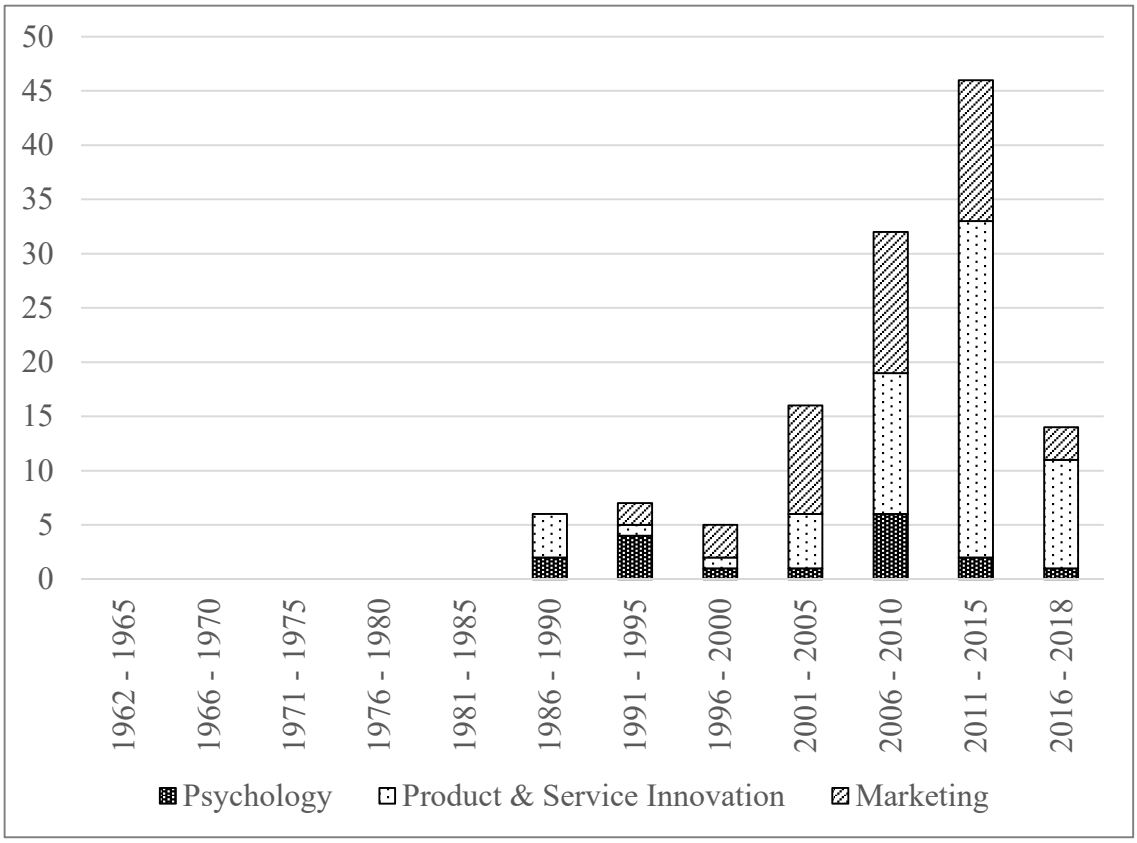
III. Variables: *Nature of dependent variable* – Coding the addressed attitudinal, intentional, or behavioral outcome of the article); *Context of dependent variable* - Coding the general context of the dependent variable (e.g., adoption, rejection, postponement etc.); *Consumer-related variables* – Coding considered consumer related variables to analyze innovation adoption; *Innovation-related independent variables* - Coding considered innovation related variables to analyze innovation adoption; *Processes and interactions* – Coding considered mediating and moderating variables.

IV. Context: *Innovative object under study* – Coding articles, objects under study (e.g., smartphones, apps, computer, etc.); *Degree of innovativeness* – Coding the examined degree of innovativeness (e.g., incremental, moderate, radical)

2.3 Descriptive Analysis and Results

From a historical standpoint, the development of innovation adoption literature reveals that Rogers' ideas, particularly his Innovation decision process had not been appreciated by the academic community until the late 80s. Back then, the innovation decision-making process suddenly gained momentum, which have steadily increased until today. Thereby, the disciplines - psychology and innovation management pioneered while marketing research gained a sudden but constant interest in the topic after the early 2000's. Within the last few years, understanding the individual's decision making when being confronted with innovative offerings seems particularly important for marketing and innovation management scholars, as figure 3 illustrates.

Figure 3: Articles published over time by discipline

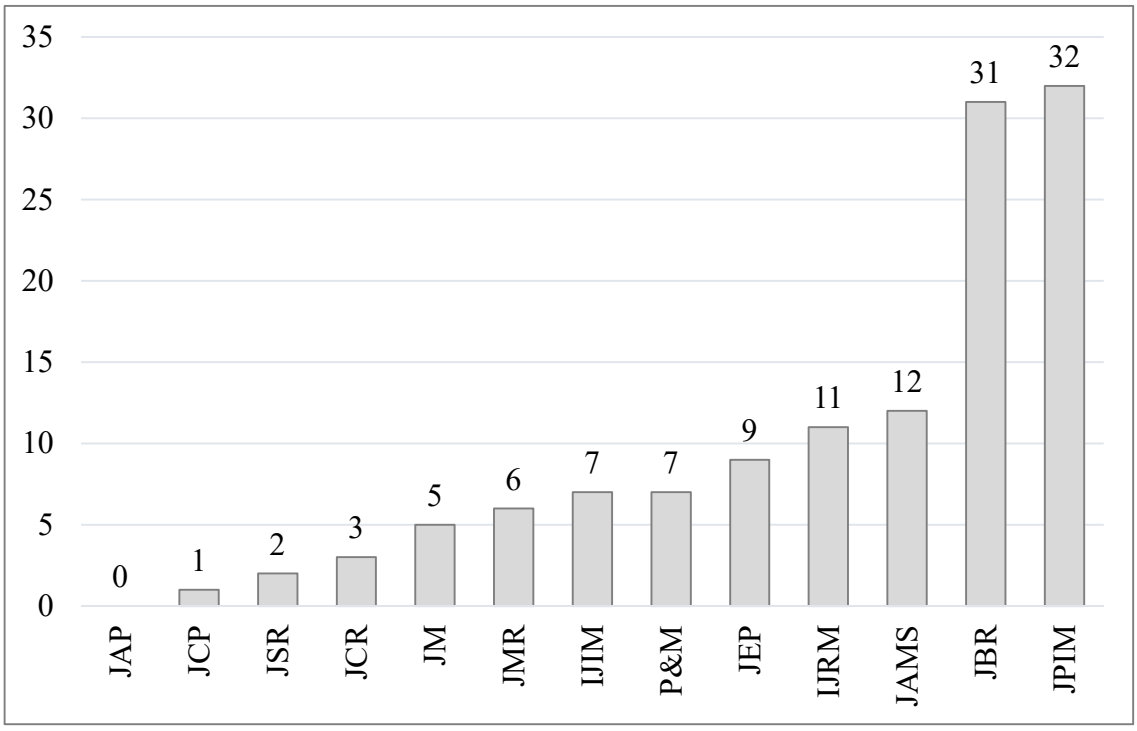


Psychology (Journal of Consumer Psychology, - Economic Psychology, - Applied Psychology, Psychology and Marketing); *Innovation Management* (Journal of Product and Innovation Management, - Business Research, - Service Research, Int. Journal of Innovation Management); *Marketing* (Journal of Consumer Research, - Marketing, - Marketing Research, - the Academy of Marketing Science, Int. Journal of Research in Marketing)

When looking at the outlet, where authors publish their work, a clear tendency towards innovation management related journals like the JBR and JPIM becomes apparent (figure 4). Further, the data reveals that consumer centered Journals such as the JCP and JCR, marginally covered innovation adoption topics in the past. This seems particularly interesting since both journals feature several articles investigating the individual's decision making in various contexts. Nevertheless, contrary to their declared positioning, both

journals seemingly neglected the consumer's perspective on innovation adoption-related topics in the past.

Figure 4: Number of articles per journal



JAP = Journal of Applied Psychology, *JCP* = Journal of Consumer Psychology, *JSR* = Journal of Service Research, *JCR* = Journal of Consumer Research, *JM* = Journal of Marketing, *JMR* = Journal of Marketing Research, *IJIM* = International Journal of Innovation Management, *P&M* = Psychology and Marketing, *JEP* = Journal of Economic Psychology, *IJRM* = Int. Journal of Research in Marketing, *JAMS* = Journal of Academy of Marketing Science, *JBR* = Journal of Business Research, *JPIM* = Journal of Product and Innovation Management;

Table 3: Most cited articles* identified in the systematic literature review

Citations	# Article	Title	Author	Journal	Year	Approach	Stage
3551	53	Why we buy what we buy: A theory of consumption values	Sheth, Newman, and Gross	JBR	1991	concept/ quant	decision
2042	20	Consumer switching costs: A typology, antecedents, and consequences	Burnham, Frels, and Mahajan	JAMS	2003	quant	decision
1765	22	An attitudinal model of technology-based self-service: Moderating effects of consumer traits and situational factors	Dabholkar and Bagozzi	JAMS	2002	quant	decision
1306	76	Choosing Among Alternative Service Delivery Modes: An Investigation of Customer Trial of Self-Service Technologies	Meuter, Bitner, Ostrom, and Brown	JM	2005	quant	decision
1174	17	Decomposition and crossover effects in the theory of planned behavior: A study of consumer adoption intentions	Taylor and Todd	IJRM	2007	quant	decision
787	27	Determinants of online channel use and overall satisfaction with a relational, multichannel service provider	Montoya-Weiss and Grewal	JAMS	2003	quant	confirmation
794	50	Using the technology acceptance model to explain how attitudes determine Internet usage: The role of perceived access barriers and demographics	Porter and Donthu	JBR	2006	quant	confirmation
714	9	Exploratory consumer buying behavior: Conceptualization and measurement	Baumgartner and Steenkamp	IJRM	1996	Quant	general
629	25	An empirical study of innate consumer innovativeness, personal characteristics, and new-product adoption behvaior	Im, Bayus, and Mason	JAMS	2003	Quant	decision
581	85	Entrenched Knowledge Structures and Consumer Response to New Products	Moreau, Lehmann, and Markman	JMR	2001	Qual/Quant	knowledge

* Citation count extracted from Google Scholar on October 29th, 2018

From a methodological standpoint, the identified papers have mainly applied quantitative approaches such as surveys and experimental methods to address their research questions. Qualitative approaches, such as observations, interviews, and focus groups are less represented for past innovation adoption research. Interesting though, since Rogers published his groundbreaking work in 1962, only 11 articles have attempted to advance our understanding of innovation adoption with inductive, qualitative studies. In summary, the evident tendency towards quantitative, deductive studies, leads me to speculate that Rogers' initial conceptual proposal is substantiated until today.

Table 4: Methodological approach

Coding Criteria	**Articles**	∑	**% of final set**
Survey	3, 4, 6, 7, 10, 11, 13, 17, 20, 21, 24, 25, 27, 29, 31, 32, 33, 36, 39, 42, 44, 46, 47, 49, 50, 51, 53, 54, 57, 60, 64, 66, 69, 72, 73, 74, 76, 91, 94, 95, 97, 98, 99, 102, 105, 111, 114, 118, 120, 122, 123, 124, 126	53	42%
Experiment	5, 14, 19, 22, 23, 26, 40, 41, 55, 63, 65, 70, 77, 78, 79, 81, 82, 83, 84, 86, 87, 88, 89, 90, 93, 100, 103, 106, 107, 108, 109, 110, 112, 113, 116, 119	36	29%
Conceptual	9, 30, 34, 37, 67, 68, 101, 115, 125	9	7%
Scale Development	9, 18, 28, 43, 59, 92	6	5%
Observation	12, 104, 117, 121	4	3%
Interview	1, 16, 35, 52, 96	5	4%
Simulation	38, 45, 56, 61	4	3%
Mixed Method	62, 75, 80, 85	4	3%
Focus Group	58, 71	2	2%
Lit. Review	2, 48	2	2%
Meta-Analysis	8	1	1%
Totals		126	100%

Scholars have predominantly addressed research questions in the decision and confirmation stage of the Rogers' innovation decision process. This is in line with the finding on the nature of the dependent variable under study. Since the outcome of the decision stage is intentional in nature and the outcome of the confirmation stage is behavioral in nature, I observed a similar pattern for the investigation of the studies nature of dependent variables. On the other side, scholars apparently neglected the knowledge and implementations stages.

Table 5: Focus within the innovation decision process

Coding Criteria	**Articles**	∑	**%**
3. Stage: Decision	3, 4, 5, 6, 8, 14, 16, 17, 18, 19, 20, 21, 22, 24, 25, 29, 32, 35, 38, 39, 41, 42, 44, 45, 46, 47, 49, 51, 53, 56, 59, 66, 69, 70, 71, 73, 76, 77, 78, 80, 81, 82, 84, 90, 91, 93, 94, 95, 96, 97, 98, 99, 102, 105, 107, 108, 112, 113, 114, 116, 118, 120, 122, 124	61	46%
General	1, 2, 7, 8, 9, 10, 11, 13, 16, 24, 28, 30, 34, 36, 37, 43, 48, 51, 52, 58, 67, 68, 92, 101, 115, 125, 126	27	20%
2. Stage: Persuasion	23, 29, 40, 54, 55, 63, 82, 83, 86, 87, 100, 103, 109, 110, 111, 121	17	13%
4. Stage: Implementation	1, 2, 9, 10, 11, 28, 30, 34, 37, 43, 48, 52, 58, 67, 68, 92, 101, 115, 125, 126	12	9%
1. Stage: Knowledge	62, 65, 79, 82, 83, 85, 89, 104, 106, 117	10	8%
5. Stage: Confirmation	7, 8, 12, 15, 57, 64, 88, 119	5	4%
Totals		132	100%

*Some articles investigate research questions in multiple process stages

Table 6: Nature of dependent variable

Coding Criteria	**Articles**	∑	**%**
Intentional	3, 4, 6, 8, 14, 17, 18, 19, 20, 21, 22, 23, 29, 33, 39, 41, 42, 44, 46, 47, 53, 58, 66, 71, 73, 77, 78, 80, 81, 82, 84, 86, 90, 91, 92, 93, 94, 95, 96, 97, 99, 102, 105, 107, 108, 112, 114, 116, 118, 120, 122, 124	52	44%
Behavioral	1, 5, 7, 8, 9, 11, 12, 13, 15, 24, 25, 26, 27, 31, 32, 35, 36, 40, 46, 49, 50, 51, 52, 57, 58, 60, 64, 69, 70, 72, 74, 75, 76, 77, 79, 80, 82, 88, 90, 91, 98, 113, 119, 123, 126	45	38%
Attitudinal	16, 18, 23, 54, 63, 83, 87, 100, 103, 109, 110, 111, 121	13	11%
Knowledge / Awareness	62, 65, 82, 85, 89, 104, 106, 117	8	7%
Totals		118*	100%

*Some articles, such as conceptual ones, do not centre on one specific stage, and are thus excluded from the count. Others list multiple studies, which might refer to two or more stages.

On looking closer at the context of the dependent variables under study, the data reveals that the majority of studies (49%) investigate innovation adoption. In contrast, only 11% of the articles study innovation rejection. Further, delay decisions of deliberate (leapfrogging) or undeliberated (postponement) nature have found little to no consideration. Similarly, little effort has been devoted to examine consumer opposition to product and service innovations.

Table 7: Context of dependent variable

Coding Criteria	**Articles**	∑	**%**
Adoption	1, 3, 4, 6, 7, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, 32, 35, 39, 40, 44, 46, 50, 51, 52, 53, 57, 58, 66, 69, 70, 73, 77, 78, 80, 81, 82, 84, 86, 88, 90, 91, 94, 95, 96, 97, 98, 100, 102, 105, 108, 112, 113, 114, 116, 118, 119, 120, 122, 123, 124	60	49%
Evaluation	55, 83, 87, 103, 108, 109, 110, 111, 117, 121, 126	11	9%
Rejection	4, 5, 35, 36, 41, 46, 52, 70, 71, 89, 91, 93, 107	13	11%
Continuing & renew	31, 32, 33, 36, 42, 47, 49, 58, 60, 72, 74, 75	12	10%
Knowledge	62, 65, 82, 83, 85, 89, 104, 106, 117	9	7%
Trial	64, 76, 79, 82, 84, 88	6	5%
Resistance	21, 23, 54, 92, 93	5	4%
Upgrade	42, 99	2	2%
Postponement	46, 71	2	2%
Acceptance	63	1	1%
Opposition	71	1	1%
Totals		122	100%

*Some articles, such as conceptual ones, do not centre on any specific dependent variable; others contain multiple dependent variables.

The analysis of the applied consumer-related variables shows that only two out of three articles (82 articles with consumer-related variables / 126 articles) consider such variables in their investigation. This seems particularly interesting, as decision-making is influenced by an individual's prior experiences and personality related predispositions. Of those articles, which did consider consumer-related variables, a majority applied context related constructs such as innate or domain-specific innovativeness as well as prior experience with an object under study. General personality related constructs such

as the big five personality factors or an individual's general cognitive abilities have been rarely considered by scholars.

Table 8: Consumer-related variables

Coding Criteria	**Articles**	∑	**% of final set**
Innovativeness	3, 4, 8, 12, 14, 18, 23, 24, 25, 39, 47, 51, 55, 64, 75, 84, 86, 94, 112, 123, 124, 126	22	17%
Experience / length of ownership	5, 20, 27, 31, 32, 52, 74, 76, 78, 79, 86, 98, 123	13	10%
Knowledge	5, 29, 44, 51, 62, 65, 84, 85, 108, 112, 120	11	9%
Self-efficacy	3, 17, 22, 23, 122, 126	6	5%
Involvement	8, 13, 29, 51, 120	5	4%
Need for interaction	3, 22, 76	3	2%
(Lack) Need for information	6, 8, 107	3	2%
Self-determination	122, 126	2	2%
Status Quo Satisfaction	4, 5, 70	3	2%
Optimism	39, 124	2	2%
Insecurity	39, 124	2	2%
Discomfort	39, 124	2	2%
Novelty seeking	22, 57	2	2%
Cognitive flexibility/style	69, 83	2	2%
Anxiety	22, 76	2	2%
Inclination to resist changes	4, 70	2	2%
Totals		82	65%

*Consumer-related variables mentioned only once are considered as highly context specific. Hence, only those variables are listed, which have been mentioned at least twice within the final set of articles.

The most often-used innovation specific variables are perceived ease of use, perceived usefulness as well as relative advantage, risk, and complexity. This finding seems surprising as Rogers originally postulated that five perceived innovation characteristics namely, relative advantage, complexity, compatibility, observability, and trial-ability are sufficient to capture the innovation's influence on the decision making. As shown by the descriptive analysis, various scholars disregarded Rogers postulation and employed variables that are grounded in the Technology Acceptance Model (Davis, 1985). Davis (1985) originally developed the TAM Model on the basis of the Theory of Reasoned Action (Fishbein & Ajzen, 1975) and its successor, the Theory of Planned Behavior (Ajzen, 1991) to specifically explain computer usage intentions and behaviors in an organizational context.

Table 9: Innovation-related independent variables

Coding Criteria	**Articles**	∑	**% of final set**
Perceived ease of use	4, 6, 22, 33, 36, 39, 40, 47, 50, 60, 79, 86, 87, 88, 90, 91, 93, 96, 97, 105, 114, 119, 120, 124	24	15%
Perceived usefulness	6, 36, 39, 40, 42, 47, 50, 60, 86, 90, 91, 96, 97, 102, 105, 114, 119, 120, 124	19	12%
Relative advantage	4, 8, 10, 13, 17, 19, 29, 33, 39, 44, 76, 79, 85, 93, 95, 109, 110, 112, 118	19	12%
Complexity	4, 8, 10, 13, 16, 17, 19, 20, 29, 44, 63, 76, 93, 95, 109, 110, 112, 118	18	11%
Risk	4, 5, 6, 10, 13, 26, 46, 71, 76, 84, 85, 93, 95, 107, 109, 112	16	10%
Compatibility	8, 10, 17, 33, 44, 47, 76, 79, 91, 95, 110, 112, 118	13	8%
Newness / Originality	12, 29, 63, 81, 102, 118, 119	7	4%
Image / Brand	12, 33, 46, 71, 91, 100, 107	7	4%
Observability / Visibility	4, 8, 13, 33, 76, 91, 110	7	4%
Perceived fun / Enjoyment	22, 36, 119, 122	4	3%

Trialability	4, 8, 76, 91	4	3%
Learning cost / Effort expectancy	31, 49, 103	3	2%
Availability	97, 98, 114	3	2%
Incongruity	82, 83, 84	3	2%
Performance expectancy	23, 31, 49	3	2%
(Monetary) value	5, 46, 47	3	2%
Reliability / Trust	88, 119	2	1%
Tradition	46, 71	2	1%
Switching costs	20, 26	2	1%
Totals		159	100%

*Innovation-related variables mentioned only once are considered as highly context specific. Hence, only those variables are listed, which have been mentioned at least twice within the final set of articles.

Furthermore, when reviewing the number of mediating and moderating considerations, it becomes apparent that both are underrepresented in the final set of articles. In particular, only nine percent considered moderating and eight percent investigated mediating relationships in their conceptualizations. This finding shows that processual and interacting relationships have found only marginal considerations to explain the complex nature of decision-making.

Table 10: Focus on processes and interactions

Coding Criteria	**Articles**	∑	**% of final set**
Moderation	14, 20, 22, 24, 60, 70, 83, 91, 102, 109, 112	11	9%
Mediation	14, 25, 70, 76, 77, 83, 91, 100, 114, 124, 126	11	9%
Totals		17*	13%

*Duplicates (articles containing moderation and mediation) have been counted as one article.

The majority, namely 56%, is dedicated to investigating product (innovation) adoption. More specifically, 34% of the articles focus on the adoption of electronic devices such as smartphones, tablets, and computers. On the contrary, only 24% of the final articles examine the adoption of services. Here, scholars predominantly applied the Innovation decision process to study research questions in the context of e-banking and e-shopping.

Table 11: Research context

Coding Criteria	**Articles**	∑	**% of final set**
Product context		**71**	**56%**
Electronic devices	4, 5, 7, 10, 17, 19, 24, 29, 32, 35, 39, 42, 51, 55, 57, 63, 70, 73, 74, 77, 79, 80, 81, 84, 85, 87, 89, 90, 93, 97, 98, 99, 102, 103, 105, 106, 108, 112, 113, 114, 116, 117, 120	43	34%
Consumer durables	26, 53, 64, 75, 78, 95, 100, 104, 106, 107	10	8%
Cars	21, 81, 85, 94	4	3%
Home appliances	62, 103, 110	3	2%
Food and drinks	12, 69, 83, 104	4	3%
Green technology	6, 21	2	2%
Healthcare	65, 104	2	2%
other	52, 121	2	2%
Apparel	78	1	1%
Services context		**30**	**24%**
E-banking	20, 27, 31, 37, 46, 47, 54, 72, 91	9	7%
E-shopping	33, 40, 49, 66, 88, 123, 126	7	6%
Entertainment	50, 86, 96, 111, 122	5	4%
Applications	3, 60, 76, 119	4	3%
Service plans	23, 36	2	2%
E-trading	124	1	1%
Hotel service	118	1	1%
Healthcare	1	1	1%

Finally, when reviewing the examined levels of innovativeness, the descriptive analysis shows that only 14% of the articles considered specific or varying levels of product or service innovativeness in their conceptualization. Those articles, which considered the level of innovativeness mostly referred to it as a continuum, ranging from incremental (low) to radical (high).

Table 12: Degree of innovativeness

Coding Criteria	**Articles**	∑	**Percentage of final set**
incremental – radical / (...) = only radical	41, 80, 82, (83), 84, (89), 93, (103), 108, 112	10	8%
low - high innovativeness	65, 104, 106	3	2%
low - high technology / (...) = only high technology	(7), 55, 104	3	2%
low - high complexity	63	1	1%
continuous – discontinuous innovation	32	1	1%
Totals		18	14%

2.4 Synthesizing findings with the VOS (Visualization of Similarities) approach

In the final step, I synthesized the articles by visualizing similarities based on the articles that reported metadata collected from the Scopus database. Note that one article (Rijsdijk, Hultink, & Diamantopoulos, 2007) was not available in the Scopus database, nor in the alternative Web of Science database. Consequently, the article is not considered

for the subsequent analysis. From a methodological standpoint, I followed recommendations from Ringel & Skiera (2016) and used a bibliometric software (VOSviewer developed by van Eck & Waltman (2007)) to find bibliometric interrelations among the systematically identified articles.

In general, bibliographic analysis approaches search for overlaps in citations and other reoccurring patterns among articles. The VOSviewer allows the finding of overlaps between authors (called bibliographic coupling) and references (called co-citation analysis) (Ringel & Skiera, 2016; van Eck & Waltman, 2007) to comprehend the innovation adoption literature. The bibliographic coupling reveals similarities among the identified articles references and clusters them accordingly. Thereby the bibliographic coupling analysis addresses the question: Which authors used the same sources and thus examined a similar topic? The co-citation analysis highlights the similarities among the identified articles' references and clusters to their references accordingly. The question the co-citation attempts to answer is: What are the theoretical pillars of a certain set of articles? Hence, although both approaches are similar in their nature, a clear differentiation regarding the final clustering becomes apparent. While the bibliographic analysis only groups the articles previously identified according to their similar referencing patterns, the co-citation analysis focuses on the article's references and groups them according to reoccurring patterns. Additionally, co-citation analysis methodologically counts the occurrence of citations. A circumstance, which is disadvantageous for recent publications, as they might have not yet been referenced by other articles and in consequence, is withheld from the evaluation. That's the reason why co-citation analysis is referred to as a method to reveal theoretical pillars, while the bibliographic analysis is referred to as a method to highlight current research clusters as well as identify future research questions.

Figure 5: Conceptual idea – bibliographic coupling

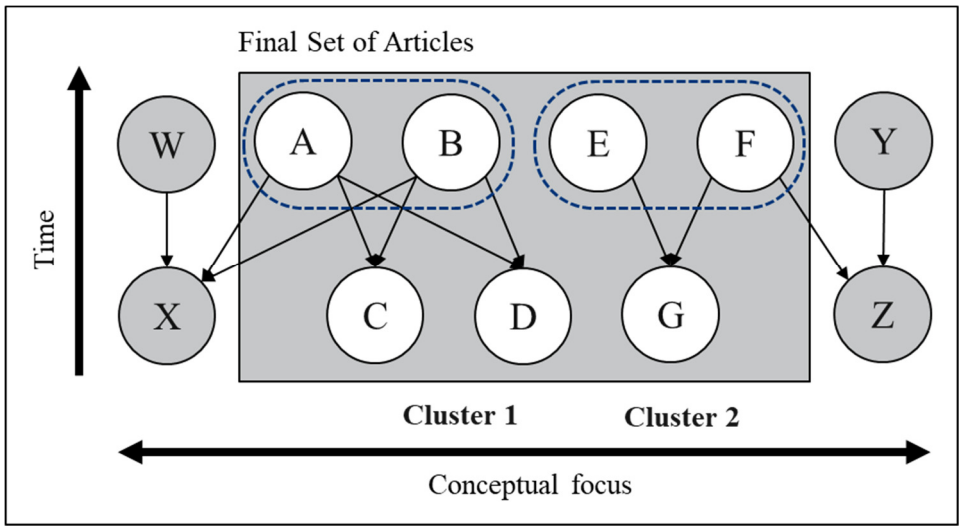
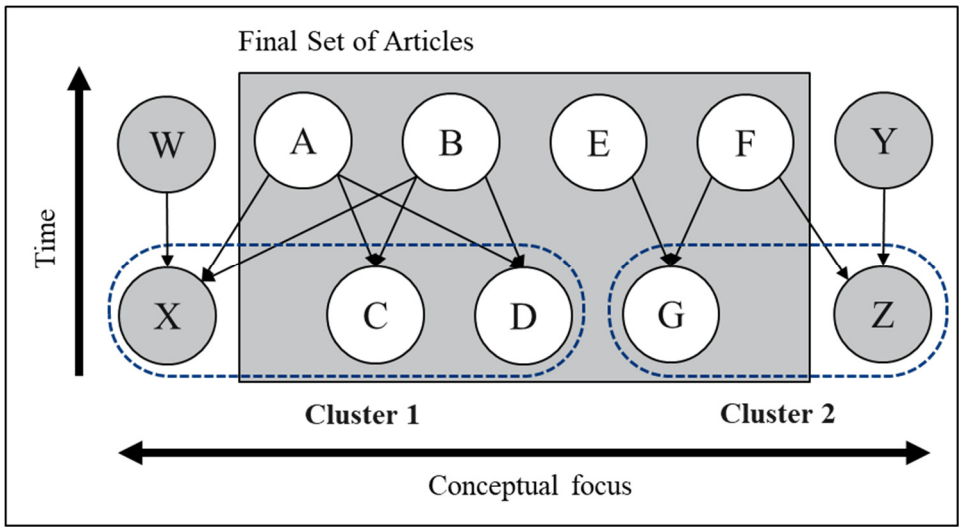


Figure 6: Conceptual idea – co-citation analysis



Figures 5 and 6 illustrate the three different bibliographic analysis methods (adapted from Boyack & Klavans (2010). In general, the grey box encircles the final set of articles derived from the systematic literature review. Thereby, white circles represent identified articles (A-F) while grey circles represent the literature outside the present study's conceptual focus (W-Z). Furthermore, the top row of articles, W, A, B, E, F, Y, represents

recently published articles. On the contrary, articles X, C, D, G, and Z are older articles. The arrows connecting circles indicate the direct citation.

a) Bibliographic coupling: Articles A and B both cite articles C, D, and X. They are based on the same conceptual foundation and thus form the bibliographic cluster 1. Similar, articles E and F share the citation of G. Therefore, they form cluster 2. Article W and Y are outside of the present studies scope and thus are not considered.

b) Co-citation analysis: Articles A and B both cite articles C, D, and X. Hence, articles C, D, and X form the co-citation cluster 1. Similar, articles E and F share the citation of G and Z. Thus, G and Z are grouped as co-citation cluster 2.

Similar visualization approaches have been previously utilized to review vast amounts of articles within the marketing related field to identify challenges for servitization (Zhang & Banerji, 2017), examine theoretical and practical contributions of the outlet to business-to-business and industrial marketing (Valenzuela et al., 2017) and highlight leading trends of the European Journal of Marketing (Martínez-López et al., 2018).

Similar to previous work from (van Oorschot et al., 2018) I followed recommendations from Kovács et al. (2015) and van Eck & Waltman (2007) to conduct a bibliographic analysis consisting of a bibliographic coupling analysis to reveal current and future research trends and a co-citation analysis to uncover commonalities in past conceptual settings. More specifically, I applied the Visualization of Similarities (VOS) software (http://www. vosviewer.com). It identifies, clusters and visualizes thematic clusters based on the article's references (van Eck & Waltman, 2011). From a mathematical standpoint, the VOS software applies optimization and clustering algorithms for visualization (van Eck & Waltman, 2011). (For detailed methodological details, please see Kovács et al.

(2015) and van Eck & Waltman (2007). Distinct from previous bibliographic approaches, which focus only on bibliographic data, I am also conducting an in-depth descriptive analysis, spanning across all identified articles.

Through the analysis, I applied the normalized strength measure setting, which groups articles based on commonalities among their references:

$$S_{ab} = \frac{a \cap b}{\Sigma_a \Sigma_b}$$

where:

S_{ab}: Normalized strength measure

a / b: Citations in article a / Citations in article b

a ∩ b: Depending on the procedure the number of citations articles a and article b both cite (bibliographic coupling) or received (co-citation analysis).

$\sum_{a/b}$: The total number of references in article a or b

The normalized strength measure S_{ab} is calculated for every pair of articles and reflected in the relative distance of two articles in space. Thereby, the VOS Software calculates the normalized strength measure for every pair of articles and visualizes its relative reciprocal strength level by placing the articles apart. For example, if articles a and b share a significant number of references, they will be grouped closely and vice versa. *The size of the letters* as well as the size of the circle showcases the relative importance of an article or name within the map. *Similar coloring* shows articles that are clustered by the algorithm. At the same time, *clusters that are shown close to each other*, are more related and vice versa (van Eck & Waltman, 2007).

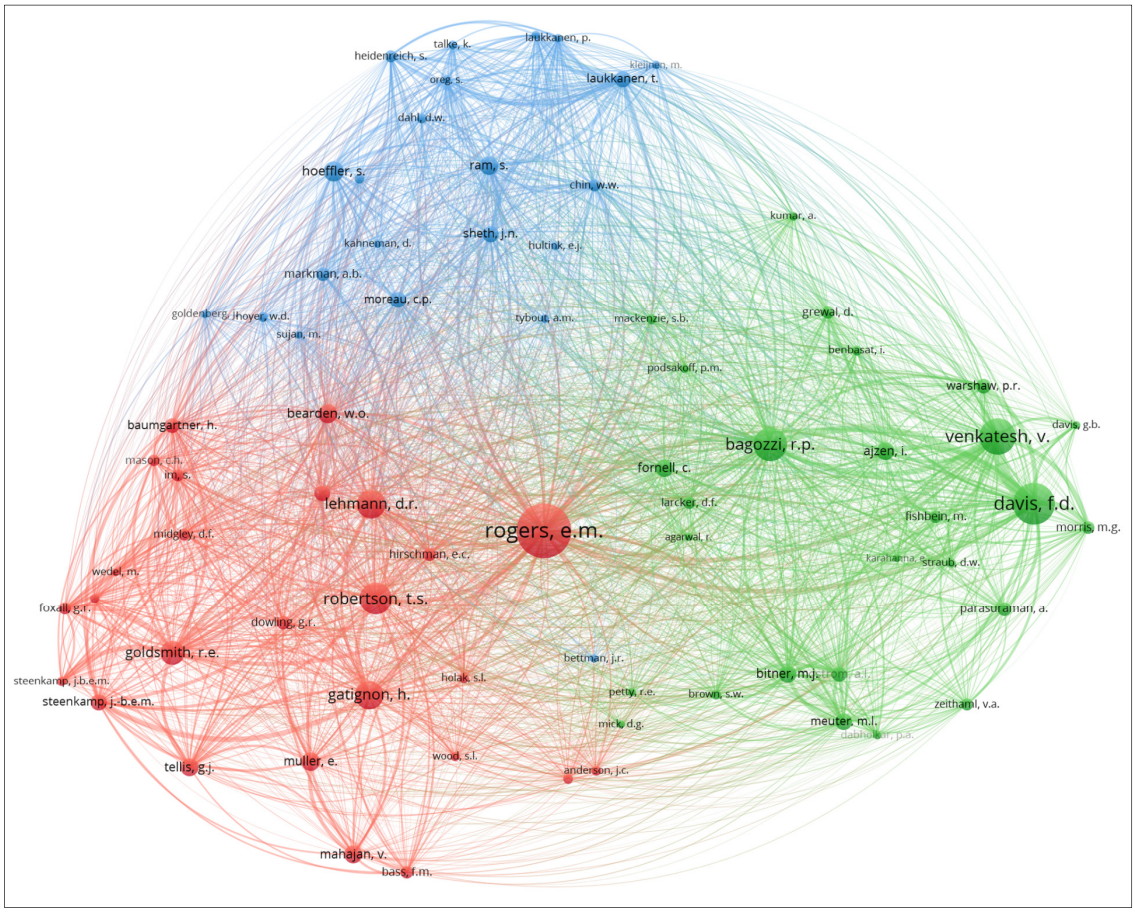
2.5 Results co-citation analysis

The goal of the co-citation analysis is to identify the theoretical pillars of consumer centered innovation adoption by identifying the most influential authors and their theoretical lens of the field. To achieve the goal, I screened the references of the final set of articles for commonalities and recurring patterns. The analysis of the final 126 articles revealed a total of 6936 uniquely cited authors. To ensure an author's relevance to the field, I only included those authors who have been cited at least twenty times (within the final set of articles). This restriction led to a final consideration of 75 authors. I further excluded four authors, manually, who exclusively have been cited for their methodical contribution (Fornell, 39 citations for quality criteria; Chin, 30 Citations for PLS reporting; Larcker, 28 citations for quality criteria; Anderson, 21 citations for SEM method). Finally, following recommendations from van Oorschot et al. (2018), to identify clusters, I applied a Newman & Givan's modularity function (for further details, please see Newman (2006)) with a minimum cluster size of 5 and a clustering resolution of 1 and computed the co-citation analysis. Figure 7 displays the results of the co-citation analysis. The spatial distribution between authors indicates their recurrence in the same citation lists. In other words, the more often two authors are cited together, the closer they are placed. The colors reveal recurring patterns in referencing authors together and thus mark the networks of authors or "school of thoughts". The size of a circle represents the relative importance of an author as measured by the total number of citations listed in the Scopus database.

Figure 7 summarizes the findings of the co-citation analysis. In general, the field of consumer centered innovation adoption is built on three distinct but intervened theoretical pillars formed around Rogers (2003). Based on the outcome of the co-citation analysis, I

identified the general theoretical foundation of each pillar by screening the authors past and previous works for patterns in their conceptual focus. Next, I formulated preliminary names for each pillar and presented them together with figure 7 to a group of three fellow researchers. Each of them is knowledgeable about innovation adoption and the aim of the present study. We discussed the naming until a mutual agreement was reached upon. As a result, the pillars are named: P1 – Technology Acceptance (green), P2 – Innovation Perception and Rejection (blue) and P3 – Innovation Adoption (red). Table 13 lists the three most influential authors of each cluster. The influence of an author is calculated by the VOSviewer and quantified in the normalized citation count of an article.

Figure 7: Results co-citation analysis



The largest pillar, labeled P1 – *Technology Acceptance* (green), groups 24 authors, who investigate the acceptance of new products and services. The prevailing theoretical model used in this cluster is the technology acceptance model. This model has been introduced by Davis (1985), who developed his model based on the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) and the Theory of Planned Behavior (TPB) (Ajzen, 1991). The Technology Acceptance Model (TAM) has been predominantly applied to investigate the acceptance of information technologies in an organizational context. At its core, the TAM includes two key constructs, perceived usefulness and perceived ease of use, both of which are determinants of the attitude towards accepting new technology.

The second largest pillar, named P2 – *Innovation Adoption* (red), summarizes 21 authors, who prevailingly focus on Rogers' initial model on Innovation Adoption. The cluster is led by Rogers, who is widely acknowledged as the founding researcher of the innovation adoption theory and the introduction of the Innovation decision process.

The third pillar coined P3 – *Innovation Perception and Rejection* (blue) lists 18 authors and contains two themes. One, which is led by Lehmann & Hoeffler, addresses the early stage innovation perception. Authors of this theme mainly study the influence an individual's preferences, knowledge and experiences have on an individual's subsequent innovation adoption. Ram leads the other theme that primarily investigates why individuals do not adopt to new products or services. Thereby, they more or less apply Rogers' initial theoretical process ideas on innovation adoption. However, Rogers' theoretical model accounts only for positive outcomes (e.g., pos. attitude, intention, or behavior) while assuming that individuals are inherently willing to adopt an innovation. This assumption, coined "pro-change bias", has been addressed by Sheth, (1981) and Ram (1987) with theoretical concepts and advancements. Sheth pioneered the field with

his proposal of the psychology of innovation resistance. Later, Ram addressed the pro-change bias assumption with his model of innovation resistance. Contemporary authors returned to Rogers' initial processual perspective and proposed modifications. The authors Talke & Heidenreich presented a comprehensive advancement of Rogers' process to account for negative outcomes of the Innovation decision process.

Table 13: List of co-citation clusters (sorted by number of authors/ cluster)

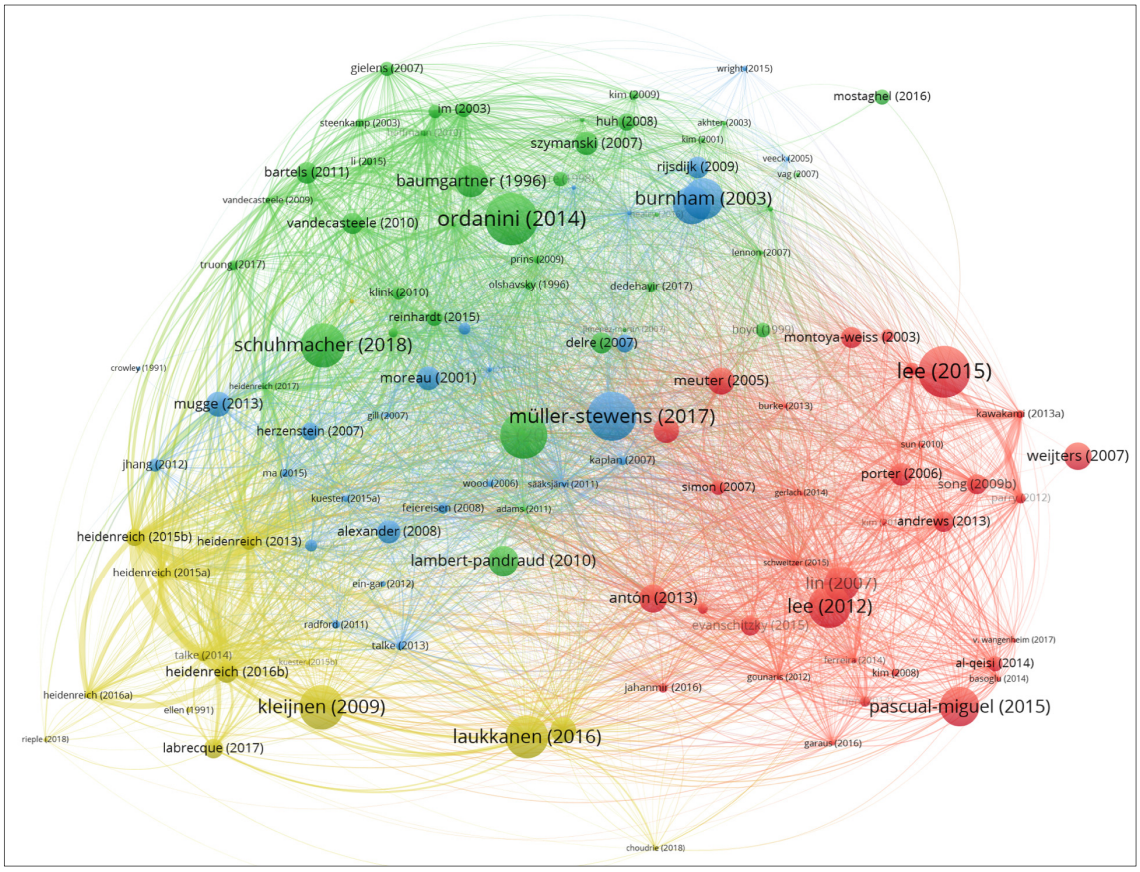
Pillar No.	Cluster	Authors /Cluster	Cit./ Clusters	Av. Cit. weight/ Author; SD	Leading Author	Citation weight L. Author*
P1	Technology Acceptance (green)	27	965	36; 22	Davis, F.D.	102
					Venkatesh, V.	89
					Bagozzi, R.P.	82
P2	Innovation Adoption (red)	26	1085	42; 24	Rogers, E.M.	133
					Robertson, T.S.	80
					Lehmann, D.R	71
P3	Innovation Perception & Rejection (blue)	22	611	28; 9	Hoeffler, S.	50
					Ram, S.	45
					Laukkanen, t.	40

*The citation weight is based on an author's total number of citations of his or her work among the final set of articles. Hence, citation weights are indicative of an author's impact in the field of Innovation adoption. Note: If citation weights are greater then the initially considered set of articles is explained by multiple cited works of an author; Note: Minimum citation count to be considered for the VOS analysis was set to 20.

2.6 Results of the bibliographic coupling

In contrast with the co-citation analysis, which groups' authors mentioned in the identified articles reference lists, the bibliographic coupling analysis groups the articles of the final set based on the commonalities in their references. Applying both methods seems particularly appropriate, as the bibliographic coupling analysis provides a contemporary view on leading articles and topics while the co-citation analysis provides a broader and far-reaching perspective by considering previous authors, within and outside of the original theoretical focus (van Eck, & Waltman (2011). The goal of the bibliographic coupling is to identify current research trends within the field of consumer centered innovation adoption. I applied the same settings as in the co-citation analysis. Figure 8 visualizes the results. The spatial distance between the articles is indicative of the normalized strength measure. The circle size of an article mirrors the article's normalized citation count. The normalized citation count is computed by the number of citations that an item receives and is divided by the average number of citations of all documents published in the same year. The normalization is of particular relevance for the analysis, as it corrects the fact that, in total, older items received more citations in the past than those received by the more recent items. Finally, the colors, as well as the spatial distance, reflect the articles' bibliographical relatedness (van Eck & Waltman, 2011).

Figure 8: Results bibliographic Coupling



Note: This figure shows only four clusters. Articles of cluster five lack bibliometric overlap with the first four clusters. Consequently, the VOSviewer algorithm calculated a broad spatial distribution, which inhibits the displaying of all clusters in one image.

The bibliographic coupling reveals five research clusters. However, as evidenced by the spatial distance between the articles, the clusters are tightly intertwined. To name each cluster, I applied a similar procedure as for naming the clusters in the co-citation analysis. However, this time, I screened every article for theoretical commonalities with other articles of the same cluster. Next, I formulated preliminary cluster names and presented them together with figure 8 to the same group of fellow researchers as for the naming of the co-citation results. We discussed the naming until a mutual agreement was reached upon. The resulting names are: C1 – Innovation Adoption (green), C2 –

Technology Acceptance (red), cluster C3 – Innovation Perception (blue), C4 – Innovation Rejection (yellow), C5 – Consumer Decision Making (not visualized). Table 14 lists the three most influential articles of each cluster. The influence of an article is calculated by the VOSviewer and quantified in the normalized citation count of an article.

The cluster C1 – Innovation Adoption (red) is the largest cluster and lists 40 Articles. Articles within this cluster utilized Rogers' fundamental theory. However, when looking closer, articles of the Innovation Adoption are separable by two distinct research themes.

Theme number one summarizes articles that investigate adopter-specific characteristics such as domain or innate innovativeness and their influence on new product adoption behavior. Bartels & Reinders (2011) provide a systematic review of the literature on consumer innovativeness. The authors show that previous articles in the domain of consumer behavior and marketing have conceptualized and operationalized consumer innovativeness heterogeneously. Building on their summary, the authors propose further steps to explore consumer innovativeness empirically. Huh & Kim (2008) analyze the adoption behavior of consumers when succeeding product generations are available. In particular, using survey data, they examine if early adopting consumers of one generation necessarily are the early adopting consumers of the subsequent generations. Among other findings, the authors show that earlier adopters are not necessarily more innovative than late adopters. However, they show that early adopters use basic functions more frequently than later adopters. Im, Bayus, & Mason (2003) study the link between innate consumer innovativeness, personal characteristics, and new product adoption behavior. Using a household panel, the authors demonstrated that

personal characteristics (age and income) are stronger antecedents of new product ownership than innate consumer innovativeness.

Theme number two addresses the question of how changes of the innovation (or its presentation) affect the consumer's adoption intention or behavior. For instance, Ordanini, Parasuraman & Rubera (2014) presented a holistic framework for new service adoption and test their model using a qualitative comparative analysis to collect data in the hotel industry. They found that new service adoption is fostered by complex trade-off effects and specific combinations of the service innovations attributes. Szymanski, Kroff & Troy (2007) conducted a meta-analysis to shed light on the relationship between innovativeness and new product performance, a proxy for the consumer's adoption behavior. Their findings indicate that innovativeness, on an average, has a moderate effect. However, the authors also found that if certain contextual elements (e.g., meaningfulness) are considered, the effect of innovativeness on new product performance becomes more substantial. Schuhmacher, Kuester & Hultink (2018) investigated how various go-to-market strategies result in consumer adoption intention. For instance, the authors test with an experimental setting how bundles of marketing mix elements (brand, price, message, and distribution intensity) increase the target audience's (consumers of the early or late market) intention to adopt. One of their results underlines the notion that the level of the product of innovativeness and exclusiveness are particularly crucial for consumers of the early market. On the other side, messages limiting the innovations risk are beneficial for consumers of the late market.

The cluster C2 – Technology Acceptance (green) itemizes 33 articles. Although articles of the focal cluster, similar to articles of the Innovation Adoption cluster, examine the antecedence of innovation success, they utilize diverging theoretical rationals.

Contrary to the innovation adoption cluster, which widely builds on Rogers' (2003) fundamental theory, the Technology Acceptance cluster relies to some extent on Davis' (1985) ideas of the Technology Acceptance Model. The Technology Acceptance Model is characterized by its two key constructs, perceived usefulness and perceived ease of use, and their effect on the individual's attitude towards accepting new technology. Lee and Coughlin (2015) provide a comprehensive literature review on the determinants of technology acceptance of older consumers. Lee et al. (2012) developed and tested an integrative model of factors determining consumers' acceptance of IoT technology. Their findings show that perceived usefulness, perceived ease of use, social influence, perceived enjoyment, and perceived behavioral control are the driving factors of individuals' willingness to use IoT technology. Pascual-Miguel, Agudo-Peregrina, & Chaparro-Peláez (2015) investigated the influence gender has on the online purchasing behavior of either digital or non-digital products. Conceptually, the authors utilized and customized the Unified Theory of Acceptance and Use of Technology (UTAUT2) model to formulate their hypothesis. They found that differences between effort expectancy and purchase intention as well as between social influence and purchase intention relate significantly to gender. Finally, Dabholkar & Bagozzi (2002) examine the moderating effects of consumer traits such as novelty seeking, self-efficacy, and the need for interaction on the relationship in an attitudinal model of technology-based self-services. Their results of the experimental design confirm the moderating effect.

The cluster C3 – Innovation Perception (blue) lists 28 articles. As visualized by the VOS tool, Cluster C3 is closely connected with Cluster C1 – Innovation Adoption. On reviewing the articles, the reason for the spatial proximity shimmers through. Both clusters utilize Rogers' ideas and explore the phenomenon of Innovation adoption. Nevertheless, minor differences become apparent. While cluster C1 is related to adopter

and product-specific factors, cluster C3 explores factors related to the consumer's perception of the innovation. A greater differentiator becomes apparent when looking at the stages of Rogers' innovation decision process. Here, cluster C1 contains articles, which address the research questions that are mainly linked to the intermediate or later stages. On the contrary, cluster C3 almost entirely lists articles related to research questions embedded in the early phases of the process. More specifically, cluster C3 can be divided into two themes: comprehension (prior knowledge, new product learning) and visual perception (design, newness). Theme number one relates to comprehension during the early stages (such as knowledge and persuasion stage) in which consumers often hold little to no prior knowledge about an innovation. This discrepancy becomes even more significant for radical innovations. Wood & Lynch (2002) study how prior knowledge relates to the consumers learning about new products. With their experimental approach, they demonstrate that consumers with little prior knowledge, as compared to consumers with high knowledge, learn more about the innovation. Furthermore, they empirically explain this effect by showing how inattention attenuates the high-in-prior-knowledge consumers' motivation to learn more about the new product. Moreau, Lehmann & Markman (2001) investigate the influence that prior knowledge has on the consumer's adoption decision making. Using an experimental setting, the authors show how novices and experts perceive continuous and discontinuous innovations. Thereby, they have found that experts (as relative to novices) report higher comprehension, more net benefits, and therefore higher preferences for continuous innovations. Interestingly, the authors found out that experts report lower comprehension, fewer perceived net benefits, and lower preferences compared for discontinuous innovations. Alexander, Lynch & Wang (2008) link the consumer's perception of innovative product to the temporal construal theory. In four field studies, the authors show how consumers follow through less often with their

intention to purchase a radically new product as compared to their intention to purchase incrementally new products. Most interestingly, the authors show how this effect grows over time and along the Innovation decision process. Theme number two relates to visual perception and pertains to articles which, to some extent, investigate the consumer visual perception of innovativeness and its influence on subsequent evaluations. Mugge & Dahl (2013) empirically test how product design affects the consumer's evaluation of radical and incremental innovations. They found that radical innovations with a high level of design newness led to more negative evaluations than similar innovations with a low level of design. They reason that if radical innovations, which are already incongruent to existing products, are presented in a new design, consumers might find it even more difficult to categorize the perception to access prior knowledge, which results in a less favorable evaluation. Schreier et al. (2012) experimentally investigated consumer perceptions of firms that sell products, which have been designed by consumers. They found out that designs made by consumers increase the consumer's perceptions of a firm, which also leads to a greater intention to purchase and share the company with peers. Most interestingly, the authors also explored boundary conditions of their effects and found, among others, that the consumer's level of familiarity is particularly essential when explaining the consumer's purchase intention. Radford & Bloch (2011), in their research, link the concept of product innovation and visual design. They build their study on the assumption that when consumers perceive an innovation, they evaluate the visual appearance before evaluating the functionality of the product. Thereby, they argue that different levels of product newness provoke different responses. To test their assumption, they conducted two studies in which they examine the consumers' response (emotional, aesthetic, semantic and symbolic) to product newness. Most notably, the authors found that consumers, who first saw products high in visual newness, tend to react with more

emotional and aesthetic responses. On the contrary, when seeing products low in visual newness, consumers showed less emotional and aesthetic responses.

The fourth cluster, C4 – Innovation Rejection (yellow) consolidates 15 articles which focus on negative outcomes of Rogers' innovation decision process. Some authors argue that rejection simply represents the opposite of adoption. Others, however, conclude that rejection is fundamentally different in nature and its determinants (Gatignon & Robertson, 1989; Herbig & Day, 1992; Ram & Sheth, 1989). The need for separate consideration of adoption and rejection as outcomes of the Innovation decision process becomes apparent by the following example: When purchasing (adopting) a new car, a consumer might have searched particularly for an environmentally friendly car. On the contrary, a consumer, who decides not to purchase (rejecting) the same car might not have had made up his mind to search for a car which is environmentally harmful. Laukkanen (2016) focuses on the antecedents of service innovation resistance to explain the consumer's non-adoption behavior. The author shows how adoption barriers (usage, value, risk, tradition, and image) and consumer demographics (gender, age, income) affect the differences between adoption and rejection of mobile banking. The result of the survey indicates that value barrier is the strongest factor for explaining adoption and tradition barrier is the strongest factor for explaining rejection of mobile banking. Kleijnen et al. (2009) introduce a conceptual framework which differentiates between the facets of innovation resistance. In particular, the authors view rejection ("[…] form of resistance [which] implies an active evaluation on the part of the consumer, which results in a strong disinclination to adopt the innovation" (Kleijnen et al., 2009, p. 345), postponement ("[…] consumers find an innovation acceptable in principle, [but] may decide not to adopt it at that point in time, for example, until the circumstances are more suitable. In this case the decision is not final […]" (Kleijnen et al., 2009, p. 345) and

opposition ("[…] consumers may be convinced that the innovation is unsuitable and decide to launch an attack – for example, negative word-of-mouth […]" (Kleijnen et al, 2009, p. 345). Claudy et al. (2015) adress the logical gap between reasons for and against adoption. In detail, the authors deploy the behavioral reasoning theory to test the relative influence of factors for and against the consumer's decision to adopt innovations. Most interestingly, the authors test their model and a second service innovation setting in a product. Their results widely support the notion that antecedents relevant for explaining innovation adoption differ from those relevant for innovation rejection.

The fifth cluster, C5 - Consumer Decision Making (not visualized), lists 12 articles, and it unifies articles that explore the relationship between psychological and cognitive processes and innovative behavior. In this context, Sheth, Newman & Gross (1991) present a conceptual paper, which introduces a theoretical foundation to explain consumer decision making. They postulate that five distinct consumption values (functional, conditional, social, emotional and epistemic) influence decision making. Holak & Lehmann (1990) explore how interaction of Rogers' adoption factors (relative advantage, compatibility, complexity, divisibility and communicability, and perceived risk) affect the consumer's intention to purchase innovative products. Most interestingly, they found that an innovations compatibility ("[…] the degree to which an innovation is consistent with adopters' behavior patterns, life-styles and values" (Holak & Lehmann, 1990, p. 3) and not its relative advantage plays a central role in explaining a consumers adoption intention. Foxall (1994) introduces a comprehensive model called "Behavioral Perspective Model of Purchase and Consumption". Thereby, the author postulates, that a consumer's behavior is primarily determined by the consumer's learning history, the behavior setting, purchase and consumption responses, as well as its reinforcing and punishing consequences.

Table 14: List of bibliographic clusters (sorted by number of authors/ clusters)

Cluster No.	Cluster	∑ Articles*	Cit*². / Clusters; Av. Cit. / Article; SD Cit. / Article	Top three Articles / Cluster	Norm. Cit.*³
C1	Innovation Adoption	40	2009; 50; 62	Ordanini, Parasuraman, & Rubera (2013)	3.56
				Arts, Frambach & Bijmolt (2011)	3.21
				Schuhmacher, Kuester, & Hultink (2018)	3
C2	Technology Acceptance	33	2923; 89; 170	Lee & Coughlin (2015)	4
				Lee, Park, Chung, & Blakeney (2012)	2.9
				Pascual-Miguel, Agudo-Peregrina, & Chaparro-Peláez (2015)	2.7
C3	Innovation Perception	28	2168; 77; 134	Müller-Stewens, Schlager, Häubl & Herrmann (2017)	3.33
				Burnham, Frels & Mahajan (2003)	3.0
				Schreier, Fuchs & Dahl (2012)	2.59
C4	Innovation Rejection	15	415; 28; 40	Kleijnen. Lee, & Wetzels (2009)	3.03
				Laukkanen (2016)	2.93
				Claudy, Garcia, & O'Driscoll (2015)	2.0
C5	Consumer Decision Making	12	1991; 166; 266	Sheth, Newman, & Gross (1991)	2.60
				Holak & Lehmann (1990)	1.07
				Foxall & Bhate (1993)	1.05

* The total number of publications has recently been linked to a cluster's productivity; its total amount for citations to a cluster's influence.

*² Citation count is based on the Scopus database information.

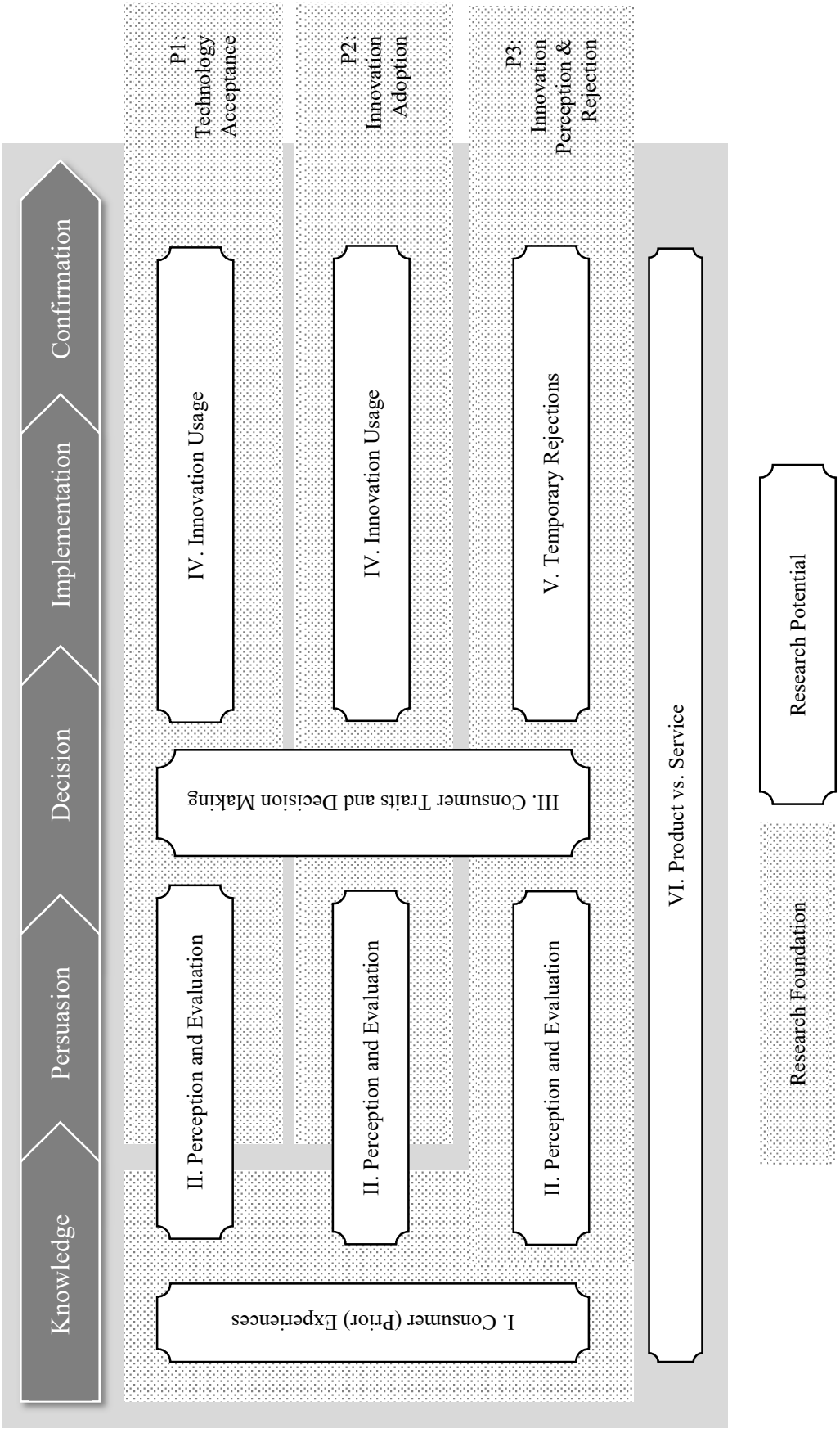
*³ The normalized citation count is computed by the number of citations an item receives, divided by the average number of citations of all documents published in the same year and is represented as the circle size in the VOSviewer output. The normalization is of particular relevance for the analysis, as it corrects for the fact that, in total, older items received more citations in the past than the more recent items. Finally, the colors reflect the article's bibliographical relatedness (van Eck & Waltman, 2011).

2.7 Research Potential

The main goal of the present manuscript is to reveal what we actually know about consumer centered Innovation adoption for academic purpose and practitioners. To achieve the goal, I first systematically screened the past research articles in the field of marketing, innovation management and psychology before conducting an extensive descriptive and bibliometric analysis.

In the following figure 9, research potentials in the field of consumer centered Innovation adoption literature's most recent developments (derived from the bibliometric coupling and descriptive analysis) are mapped on its theoretical foundation (derived from the co-citation analysis).

Figure 9: Research potentials overview



Proposition I – Consumer (Prior) Experiences: *Future research might study the extent to which prior experiences affect the consumer's reasoning, decision-making, and behavior:* Only 11 articles consider, to some extent, the individual's prior knowledge (operationalized as, e.g. "knowledge", "prior experience", "familiarity") as variables in their research. The complex nature of knowledge and its relationship with decision-making is highlighted by Moreau et al. (2001). They experimentally prove how varying knowledge domains (core and supplemental knowledge) influence the consumer's decision making. Although literature from both psychology and marketing have already shown, conceptually and empirically, the influence knowledge has on the individual's decision-making (Gatignon & Robertson, 1991; Sääksjarvi, 2003) it becomes even more critical for marketing of innovative products and services. Innovations are per se inherent of a certain level of novelty. Novelty in this regard evolves from the difference between the consumer's perception and his or her prior knowledge (Rindova & Petkova, 2007). For instance, radical (or discontinuous) innovations evolve from a significant difference between the individual's perception and prior knowledge. The difference then transforms into uncertainty, eventually the perception of risk, which negatively affects both, the consumer's formation of attitudes and intentions (Gregan-Paxton, Hibbard, Brunel, & Azar, 2002; Rogers, 2003). Hence, one promising avenue for future research might be to experimentally test the role that varying levels (high, low) or domains (core, supplementary) of knowledge have in the Innovation adoption process. Another promising approach to expend our current understanding in this domain might be the facilitating of interdisciplinary studies. For instance, literature from cognitive neuroscience has already shown how, and to what extent, general and domain specific-knowledge influences an individual's decision making (Maguire & Frith, 2004; Meyer & Damasio, 2009; Reimann & Bechara, 2010).

Proposition II – Perception and Evaluation: *Future research might explore how, during the early stages, consumers perceive innovative products and services and how their perception subsequently affects their evaluation through the innovation adoption process:* The majority of articles about consumer centered innovation adoption (93%) address research questions related to the consumer's attitudes, intentions, and behaviors. However, perception, defined as a mechanism of making sense of environmental information when becoming aware of stimuli for the first time (Zhang, Liu, & Zhang, 2013), has not been at the focus of the research community. This seems surprising, as perception is the very foundation of subsequent formations of attitudes, intentions, and behaviors (Downs & Mohr 1976; Moore & Benbasat, 1991; Rindova & Petkova, 2007). For instance, during the early stages, individuals begin to develop their attitude towards the new product solely on how they perceive the new product (Lee & Colarelli O'Connor 2003; Talke & Colarelli O'Connor, 2011). Hence, early stage perception affects subsequent information search (Bonner et al., 2002; Heidenreich & Kraemer, 2015; Kohli, 1999), processing (Branco et al., 2016; Rindova & Petkova, 2007), and ultimately the outcome (Claudy et al., 2015; Heidenreich & Spieth, 2013; Talke & Heidenreich, 2014) within Rogers' Innovation adoption process. Admittedly, unlike other expressed consumer feedbacks, perceptions are nebulous and hard to define (Nabih, Bloem, & Poiesz, 1997; Talke & Heidenreich, 2014). This makes the perception of innovative products difficult for consumers to articulate (Rindova & Petkova, 2007), and challenging for researchers to operationalize and measure. In this regard, only Olshavsky & Spreng (1996) explored consumers' perception when perceiving innovative products. Using a think out loud method, the authors collected immediate responses from consumers while perceiving novel products. Yet, it is questioning to what extent Olshavsky & Spreng (1996) observed deliberate perception. One possibility to overcome the challenges of investigating consumers' early

stage perception is the use of methodological advances in the field of cognitive neuroscience. Particularly methodological advancements in neuroimaging techniques, such as the functional magnetic resonance imaging (fMRI), have repeatedly been shown to be a valuable complement to conventional methods for investigating latent constructs. Contemporary applications of the fMRI in marketing have helped to deepen our understanding of latent constructs such as price primacy (Karmarkar, Shiv, & Knutson, 2015), perceived ease of use and usefulness (Dimoka & Davis, 2008), and marketing placebo effects (Plassmann & Weber, 2015). Most notably, Reimann, Castaño, Zaichkowsky, & Bechara (2012b) provide initial evidence that the perception of novel and familiar brands constitutes diverging neurophysiological and behavioral reactions showing that the fMRI methodology can be a vital tool to reveal richer insights into consumers' novelty perception, in general.

Proposition III – Consumer Traits and Decision Making: *Future research might deepen our understanding of the consumer's decision making:* A great majority of articles considered in the bibliographic analysis assume direct relationship between their independent and dependent variables. Only a few look into more complex relationships and incorporate moderating and mediating variables. However, several authors specifically call for further research on influencing (Ferreira, da Rocha, & da Silva, 2014; Y.-K. Lee et al., 2012; Müller-Stewens et al., 2017) and interfering (e.g. Claudy et al., 2015; Li, Zhang, & Wang, 2015; Szymanski et al., 2007) variables on the consumers adoption behavior. Therefore, future studies might explore the role that moderating and mediation individual-specific variables (e.g., consumer traits and emotions), product-specific variables (e.g., perceived level of innovativeness) or context-specific variables (e.g., information presentation) play in the consumer's decision making.

Proposition IV – Innovation Usage: *Future research might investigate innovation adoption from a process perspective by applying longitudinal research designs:* A majority of articles applied a cross-sectional perspective and thus focused on only on one particular time point. Nine articles that consider to some extent varying time points (and dependent variables), but only one article (Lennon, Kim, Johnson, Jolly, Damhorst, & Jasper, 2007) investigated the phenomenon of innovation adoption using a repeated measure design with two waves to predict the online shopping behavior of consumers. The need for supplementary research has also been acknowledged by numerous authors (Al-Qeisi, Dennis, Alamanos, & Jayawardhena, 2014; Anderson & Ortinau, 1988; Heidenreich, Spieth, & Petschnig, 2017; Huh & Kim, 2008; Mukherjee & Hoyer, 2001). The rare occurrence of longitudinal designs appears suppressing. As introduced by Rogers (1962), the very foundation of innovation adoption is its processual sequence of stages that a consumer has to pass from initially, becoming aware of an innovation (knowledge stage), over making a decision (decision Stage) to continuously use an innovation (confirmation stage) (Rogers, 1962). In this context, longitudinal designs are particularly useful to incorporate the development of consumers' perceptions and attitudes as well as to account for their variations along the innovation adoption process (Heidenreich et al., 2017; Yi, Fiedler, & Park, 2006). Therefore, future studies might consider longitudinal designs to investigate how the consumer's evaluation of an innovation changes over time and across the different stages of the adoption process.

Proposition V – Temporary Rejections: *Scholars might consider alternative process outcomes such as temporary rejections:* A majority of the identified articles focus on positive (e.g., acceptance or adoption) or negative (resistance or rejection) process outcomes. The past black and white thinking seems surprising. As demonstrated by previous research, consumers are very likely to spend a considerable amount of time between

recognizing a product and purchasing it for activities such as information gathering and evaluating. In fact, only a fraction of those consumers with an intention to purchase a product follow through within 12 months and thus reject the innovation either continuously or temporarily (Greenleaf & Lehmann, 1995). Temporary rejections can be either of a definite or indefinite nature. The first, definite temporary rejection, is called Leapfrogging (Kleijnen et al., 2009; Talke & Heidenreich, 2014) and is characterized by the consumer's intention to deliberately reject the perceived innovation while having the intention to purchase the follow-up a generation of it. The second, indefinite temporary rejection is called postponement (Laukkanen, 2016; Talke & Heidenreich, 2014) and is defined as the consumer's intention to delay the adoption of the present innovation until circumstances have changed. Surprisingly, although both forms of temporary rejections reflect possible consumer decisions, research cannot provide sufficient empirical evidence to explain neither how determinants of both forms differ from each other nor how the determinants of both forms differ from continuous rejection. Hence, focusing on alternative process outcomes such as temporary rejection might open a new chapter in comprehending the consumer's complex innovation adoption behavior for practitioners and academics.

Proposition VI – Product vs. Service: *Academics should explore differences between the consumer's adoption of product and service innovations:* While a considerable number of articles of the final set focused on services (24%), only 6.2% considered both, product and service innovations in their investigation. However, none of the articles specifically address questions related to the differences between the inherent characteristics of services and products and how those differences influence the consumer's adoption behavior. Surprisingly, numerous articles acknowledge the diverging characteristics of product and services and call for additional research to either replicate their findings in

another contextual setting (Heidenreich & Handrich, 2015b; Lee & Coughlin, 2015; Lennon et al., 2007) or to explore differences between the consumer adoption behavior of services or products (Claudy et al., 2015; Im et al., 2003). The need for additional research becomes further emphasized by the ongoing paradigm shift from product to service demand. In fact, in 2017, services contributed 68.7% to Germany's gross domestic product while production only reached 25.6 %. Hence, to address the ongoing shift from product to service offerings, academics might consider the inherent differences between both offerings. In this regard it might be fruitful to consider the proposition of Zeithaml, Parasuraman & Berry (1985), which differentiates products from services on four distinct characteristics namely: intangibility (services cannot be displayed), inseparability (consumers are involved in production), heterogeneity (service quality varies) and perishability (services cannot be inventoried).

2.8 Conclusion

What do we really know about consumer Innovation adoption? I addressed this question by applying bibliographic analytic procedures to derive a holistic status quo of consumer behavior and Innovation adoption. Building upon the most relevant journals in marketing, innovation management, and psychology, I systematically deduced research potentials to facilitate further advancements of Innovation adoption literature. As compared to previous reviews, which considered entire databases, the present one only considered the systematically selected articles from high-quality journals. The focus on only selected and top-tier journals sets clear search boundaries, limits the possible amount of relevant articles and allows an in-depth analysis of the articles. Nevertheless, as for any review, the results can only reflect the initially self-induced data. Hence, the results of

this bibliographic analysis are limited to the theoretical outlet of each initially considered journal.

3 To Buy or Not to Buy? Investigating Determinants and Differences of Temporary and Continuous Rejections of Innovations[6]

3.1 Introduction

Innovations face a severe risk of failure. In several product categories, failure rates are considered to range around 50 % (Castellion & Markham, 2013; Heidenreich & Kraemer, 2015b). Given the significant investments in new product development (Gielens & Steenkamp, 2007; Gourville, 2006), identifying the causes for innovation failures seems essential to help avoiding future misallocation of resources. Within this respect, prior research has confirmed that most new products fail as consumers reject them either continuously or temporarily (Greenleaf & Lehmann, 1995; Kleijnen et al., 2009; Laukkanen, Sinkkonen, & Laukkanen, 2008).

In the former case, a consumer decides to reject the new product and continues to not purchase it at any later point in time (Talke & Heidenreich, 2014). As a consequence, this consumer will never generate revenue for the company to which this product belongs to. In case a substantial amount of consumers will act in this manner, the new product will fail to reach market success, which in turn might endanger the competitiveness of the corresponding company. In the latter case, a consumer decides to reject a new product at first place, to buy it at a later point in time (postponement) or to wait for a superior, subsequent product generation (leapfrogging; Talke & Heidenreich, 2014). As a consequence, potential revenue is only generated a while after new product launch. However, several studies point out that a certain amount of early adopters of a social system are

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needed for an innovation to get relatively rapid adopted by the remaining members (Allaway, Berkowitz, & D'Souza, 2003; Mahajan, Muller, & Bass, 1990). However, in case a substantial amount of consumers decides to reject an innovation temporarily, this crucial point might never get reached. As a consequence, the new product might turn into market failure before consumers, which temporarily rejected a new product, are finally ready to purchase it. In conclusion, both temporary as well as continuous rejections constitute major causes of new product failures and thus should be addressed by countermeasures of companies. Hence, knowledge on potential barriers in the adoption process that trigger each type of rejection is needed to design appropriate countermeasures for temporary as well as continuous rejection behavior. Based on this knowledge, strategies can be developed to reduce corresponding barriers of both temporary and continuous rejections, thereby minimizing the risk of innovation failures and misallocating resources.

While rejection of innovation, in general, is a phenomenon which has received vast attention both by scientific research and management practice (Ellen, Bearden, & Sharma, 1991; Heidenreich & Kraemer, 2015b; Laukkanen et al. 2008; Ram, 1987; Sheth, 1981), only little research effort has been dedicated to investigate the nature and potential differences in causes leading to temporary rejections (Kleijnen et al., 2009; Talke & Heidenreich, 2014). More specifically, most studies either focused exclusively on determinants that lead consumers to continuously reject an innovation (Heidenreich et al. 2016; Heidenreich & Spieth, 2013; Laukkanen et al., 2008), or did not differentiate between temporary and continuous rejections while examining corresponding determinants for negative outcomes of the adoption process (Claudy et al., 2015; Kleijnen et al., 2009).

Yet, findings on consumer decision making in general point out that the determinants of substantial delay in consumer decision-making significantly differ from those of a final negative outcome (Greenleaf & Lehmann, 1995). Consequently, past conceptual research in the domain of consumers' adoption behavior suggests that temporary and continuous rejections are driven by different determinants (Nabih & Bloem, 1997; Patsiotis, Hughes, & Webber, 2013; Talke & Heidenreich, 2014). To the best knowledge of the authors, however, empirical evidence for the above-made proposition is scarce, as only a handful studies exist yet that examine both temporary as well as continuous rejections and thus shed some light on potential differences. However, these studies and the corresponding findings are restricted in their scope as they are either purely conceptual in nature (Goldenberg & Oreg, 2007; Talke & Heidenreich, 2014), based on qualitative data (Kleijnen et al., 2009) or limited to an empirically quantitative evaluation of differences between adopters and non-adopters rather than on differences between the actual outcomes in the adoption process, namely temporary and continuous rejections (Elbadrawy & Abdel Aziz, 2011; Herrmann et al., 2015; Lian & Yen, 2013). In conclusion, insights on determinants of temporary rejections in general are lacking and the question of whether such determinants differ from those of continuous rejections is still subject to debate.

In summary, this study strives to respond to the above-mentioned research gaps and contribute to adoption theory by (1) systematically identifying the reasons for temporary and continuous rejection within the adoption process as well as (2) shedding light on whether and how temporary rejections and their determinants actually differ from that of continuous ones. Managers of new products are thus provided with insight into the relevance of different adoption barriers for temporary as well as continuous rejections, which

may help them to develop measures to reduce corresponding barriers and enhance the success of new products.

3.2 Temporary and Continuous Rejection – Quo Vadis?

To derive determinants and corresponding theoretical rationales for both rejection types, a systematic literature review following the suggestions of Bartels & Reinders (2010) & Greenhalgh (1997) was conducted. More specifically, the systematic literature review encompassed (1) a database search, (2) expert interviews and (3) a cross reference check.

The database search included the following online resources: ScienceDirect, Emerald Management Xtra and EBSCO. All research articles published prior to September 2017 were considered. The search procedure followed a structured approach to narrow down the relevant literature. First, the keywords, the title, and the abstract information were screened by several search terms. As the focus of this study is on different types of rejection behavior, we included four topic-related search terms (resistance, rejection, postponement and leapfrogging) and connected them with an "OR" condition (resistance OR rejection OR postponement OR leapfrogging). As our focus is on individual behavior (i.e. consumers' adoption behavior) rather than on organisational behavior, we further specified our search string by including two search terms with respect to the research subject (consumer OR customer) and three search terms with respect to the research context (innovation OR new product OR new service). These three different search strings were connected with an "AND" condition to further specify the search outcome. As shown in Table 15, all three databases include a significant amount of articles on the topics resistance, rejection, postponement and leapfrogging. However, when including

our research subject and context specification using an "AND" -condition, a strong structural decline occurs, leading to 257 research articles. Based on an abstract check, 98 articles could be identified as being principally relevant for the final analysis. These 98 articles were subsequently checked on a full article basis for contextual fit leading to 43 relevant articles. Finally, all retained articles were checked for overlaps between the three data bases such that 36 articles could be retained.

Table 15: Methodological procedure of systematic literature review

Process	Science Direct	emer-ald	Ebsco Host	Methodological approach
resistance OR rejection OR postponement OR leapfrogging	239340	5392	24926	Searching within title, keyword and abstract infor-mation
resistance OR rejection OR postponement OR leapfrogging AND consumer OR customer	1078	447	2820	
resistance OR rejection OR postponement OR leapfrogging AND consumer OR customer AND innovation OR new product OR new service	31	32	194	abstract check for con-text fit
narrow set	5	24	69	full article check for context fit
relevant set literature review (single)	2	9	32	
relevant set literature review (combined)		36		check for overlaps
additional analysis literature		+ 24		manual search by cross reference check and expert interviews
extended relevant set		**∑ 60**		

In a second step, the received articles from the database search were presented to experts in the field of innovation resistance to gain feedback on additional research articles that were not yet included in the review by any reason. Finally, in step three, the research articles derived from the procedures in step one and two were used for a cross

reference check to identify further relevant literature. At the end of the systematic literature review process 60 research articles were identified as being relevant for our study (see table 15 for detailed search results or appendix II.4 for information about the articles).

From a conceptual perspective, prior research principally differentiates (1) continuous innovation rejection, if a consumer rejects a new product and also refrains from purchasing the innovation at any later time (Claudy, 2011; Kleijnen, et al., 2009; Talke & Heidenreich, 2014) from (2) temporary innovation rejection, if a consumer rejects a new product at one point in time, but is still open to adopt the innovation in the future (Laukkanen et al., 2008; Talke & Heidenreich, 2014; Weiber & Pohl, 1996). With regard to research activities in both fields, continuous innovation rejection is the more common research area with a total of 59 articles of which 37 exclusively focus on continuous rejection and 9 articles also provide some (mainly theoretical) insights on temporary rejections, while their primary focus is still on continuous rejection behavior. In contrast to that, 9 articles strived to generate insights on both rejection types while only four articles were found that exclusively focused on temporary rejection behavior. This discrepancy becomes even more evident when comparing the number of empirical studies in both research fields. While 40 articles examined continuous rejections empirically, only three articles investigated temporary rejections of innovations empirically. More specifically, most of the empirical studies do not explicitly differentiate between temporary and continuous rejection of innovations. Yet, with respect to rejection behavior in general, the majority of studies indicate a vast agreement on potential determinants for rejection of new products (Claudy et al., 2015; Nabih & Bloem, 1997; Olshavsky, 1980) and services (Laukkanen et al., 2007; Walker, Craig-Lees, Hecker, & Francis, 2002). According to previous empirical findings, past studies differentiate two main reasons in this respect: (1) active innovation resistance as a negative attitude formation driven by

product-specific factors (Claudy et al., 2015; Heidenreich & Spieth, 2013; Laukkanen, Sinkkonen, & Laukkanen, 2007) and (2) passive innovation resistance as predisposition to resist innovations resulting from adopter- and situation-specific factors (Ram, 1987; Szmigin & Foxall, 1998; Talke & Heidenreich, 2014). Active innovation resistance arises (1) if product-specific factors are perceived as dysfunctional or inadequate for a consumer's personal needs and usage expectations and thus lead to functional barriers or (2) if product-specific factors conflict with a consumer's value and belief system and thus psychological barriers arise (Talke & Heidenreich, 2014). Several studies have confirmed that active innovation resistance leads to rejection of new products (Heidenreich & Spieth, 2013; Laukkanen et al., 2007; Wiedmann, Hennigs, Pankalla, Kassubek, & Seegebarth, 2011). Passive innovation resistance arises (1) if adopter-specific factors lead to an inclination to resist changes and thus cognitive passive resistance arises or (2) if situation-specific factors lead to a satisfaction with the status quo and thus situational passive resistance arises (Heidenreich & Kraemer, 2015a, 2015b). Past research has confirmed that passive innovation resistance as consequence of an individual's inclination to resist changes and status quo satisfaction results in a rejection of the innovation (Heidenreich & Handrich, 2014; Heidenreich & Kraemer, 2015a). While there is obviously scientific consensus about the determinants of rejection behavior in general, empirical studies in the area of consumer decision making confirmed that the determinants of substantial delay of a purchase significantly differ from those of a final negative outcome (Greenleaf & Lehmann, 1995).

However, when it comes to a more granulated perspective on innovation rejection behavior, conceptual and empirical findings on the determinants and possible differences of temporary and continuous rejection are scarce. Unfortunately, determinants of rejection behavior are only examined on a more general level without explicitly differentiating

both types of rejection behavior. As consequence, only little is known about possible differences between the determinants of both behaviors. Yet, some conceptual (Gatignon, 1991; Goldenberg & Oreg, 2007; Mittelstaedt, Grossbart, Curtis , & Devere, 1976; Szmigin & Foxall, 1998) and even fewer empirical studies (Greenleaf & Lehmann, 1995; Kleijnen et al., 2009) provide some anecdotal evidence that there might be differences in the determinants of both rejection behaviors. For instance, Kleijnen et al. (2009) came to the conclusion that continuous rejection is based on more societal concerns such as tradition and norms while temporary rejection originates from more basic, practical concerns that might even have not been covered by common determinants of rejection behavior in prior literature. While a closer look at determinants of temporary rejections thus seems useful, the current literature on potential drivers of temporary rejection behavior is rather fragmented, indicating that the concept is still poorly understood. More specifically, some authors see common product- and adopter-specific factors such as perceived risk (Laukkanen et al., 2008), perceived uncertainty, the products complexity (Wood & Moreau, 2006), the lack of trialability (Olshavsky, 1980) or an individual's prior experiences (Hirschman, 1987) as factors that lead to such behavior. Others, however, postulate that in addition to the well-known determinants also some other, external factors might be important in this context. Within this respect, previous studies suggest the lack of time (Ram & Sheth 1989; Szmigin & Foxall 1998), the need for further information (Gatignon & Robertson, 1989) the availability (e.g. supply) of the product (Gatignon, 1991; Herrmann et al., 2015; Wiedmann et al., 2011) as additional driver for a consumer's decision to postpone his/her adoption. However, a comprehensive typology of determinants for temporary rejections is still needed to establish a common ground so that their empirical relevance and possible differences to reasons for continuous rejections can be examined across research objects and research areas. The current article strives to address

this concern by (1) conducting an explorative study to derive a typology of determinants for both temporary and continuous rejections and (2) by empirically validating the derived typology using a large-scale quantitative study.

3.3 Study 1: Explorative Identification of Determinants for Temporary and Continuous Rejections

3.3.1 Methodological Approach

Since both conceptual and empirical evidence on the determinants of temporary rejection behavior is scarce, an explorative approach seems most fitting. More specifically, we decided to conduct semi-structured online interviews as this procedure guarantees both comparability of replies and openness to unexpected responses (Bartels & Reinders, 2011; Reinhardt et al., 2015) such that even unanticipated determinants can be identified. In the beginning of the interview, participants were introduced to a common understanding of the term “innovation”. Subsequently, they were asked to remember an innovative product they noticed during the last six to twelve months but have not bought until today. Further, they had to name and describe the product in detail before describing the reasons for not purchasing the product in the first place. Then the participants’ willingness to purchase the product in the future was measured by a scale from zero to 10 (0-unlikely; 10-likely). In case the participant reported a value ranging between 0 and 4 (5 and 10), the corresponding data set was assigned to continuous (temporary) rejection. Finally, common demographic information (age, gender and current occupation) were requested.

For data generation purpose, students at a major university in Germany solicited participants from their respective social networks using gender and age as quota criteria (Hennig-Thurau, Henning, & Sattler, 2007). A total of 166 consumers participated in study one, of which 66.27% were male. The average age was 32.08 years; ages range from 16 to 58 years. The data analysis followed the procedure for qualitative analysis and interpretation suggested by Spiggle (1994). The interpretation of others' statements is inherently subjective. In order to minimize the possibility of idiosyncratic readings, we thus used a systematic approach for analyzing and interpreting the answers by a group of four experts from the areas of innovation management, marketing and psychology (Spiggle 1994). First, an introductory framework was established and introduced to the group of experts (see appendix II.1), containing detailed descriptions of commonly known reasons for innovation rejection obtained from the systematic literature review and enriched by definitions from Talke & Heidenreich (2014). Second, the qualitative data was reviewed by the group of experts. Doing so, they coded the statements and linked the mentioned reasons to the framework. All information that could not directly get assigned to the provided framework was clustered as “other determinants” (Table 16).

Table 16: Matching to framework of potential determinants

3rd Order Construct	2nd Order Construct	1st Order Construct	# reasons temp. / cont. Rejection / 1st Order Construct		# reasons temp. / cont. Rejection / 2nd Order Construct	
Active Innovation Resistance (AIR)	Functional Barriers	Value Barrier	6	20	29	69
		Complexity Barrier	4	15		
		Trialability Barrier	4	2		
		Compatibility Barrier	2	12		
		Co-dependence Barrier	10	10		
		Visibility Barrier	2	4		
		Communicability Barrier	1	1		
		Amenability Barrier	-	1		
		Realisation Barrier	-	4		
	Psychological Barriers	Norm Barrier	1	3	24	95
		Image Barrier	2	8		
		Usage Barrier	1	11		
		Information Barrier	6	11		
		Personal Risk Barrier	1	16		
		Functional Risk Barrier	5	26		
		Economic Risk Barrier	8	17		
		Social Risk Barrier	-	3		
Passive Innovation Resistance (PIR)	Status Quo Satisfaction	SQS - Innovation	8	14	10	26
		SQS - Product	2	12		
	Inclination to Resist Changes	Routine Seeking	-	4	2	24
		Cognitive Rigidity	2	13		
		Emotional Reaction	-	5		
		Short-Term Focus	-	2		
# mentioned reasons assigned to established framework			65	214		
Total # of reasons mentioned for temp. / cont. Rejection			107	243		
Ratio of assigned reasons to total # reasons mentioned			**60.75%**	**88.07%**		

3.3.2 Analysis and Results

As described above, the data was subdivided in the two scenarios namely: (1) continuous (106 cases | 243 reasons) and (2) temporary rejections (60 cases | 107 reasons). In the case of continuous rejections, the experts were able to link 214 reasons (88.07%) to the framework. Of those reasons 164 (67.49%) were assigned to innovation-specific factors constituting active innovation resistance. More specifically, 69 (28.40%) represent functional barriers whereas 95 (39.09%) are associated with psychological barriers. The most often named innovation-specific reasons for continuous rejections were as follows. (1) Functional risk barrier (26 | 10.70%), for example "Tests show that navigation systems […] suggest unnecessary detours", "I doubt that the control works", "I have my doubts regarding the resilience of the engine". (2) Value barrier (20 | 8.23%), for example "The integrated camera was inefficient", "I can't see the difference between 100Hz and 200Hz", "I can't see a significant difference in resolution". (3) Personal risk barrier (16 | 6.58%) for example "Doubts as to whether using the laser will be harmful or not?", "unclear whether the radiation released by the microwave is harmful or not", "all in all using laser beams must have side effects".

Fifty (20.58%) of the reasons for continuous rejection were linked to adopter- or situation-specific factors constituting passive innovation resistance. While 24 (9.88%) reflect reasons rooted in factors associated with inclination to resist changes, for example "I´ve been using the manual shaver for 20 years now. This will continue for the next 20 years", "I have always been using keyboard and mouse, why should I change to a track ball system?" 26 (10.70%) could be linked to status quo satisfaction for example, „My current smartphone is working just fine", "I am already satisfied with the quality of

DVD's", "A mobile phone meets my requirements, I don't need a smartphone". A remainder of 29 (11.93%) could not get assigned to the framework.

In case of temporary rejection, the experts were able to link 65 reasons (60.75%) to the provided template. In detail, 53 (49.53%) reasons for temporary rejections were seen as innovation-specific factors constituting active innovation resistance. Of those 29 (27.10%) are associated with functional barriers while 24 (22.43%) are representative for psychological barriers. The most often named innovation-specific reasons for temporary rejections were as follows. (1) Co-dependence barrier (10 | 8.41%), for example "Binding to complementary products and services", "The mobile phone is only available when purchased with a plan", "I would need to buy a new TV to use the Blu-ray player". (2) Economic risk barrier (8 | 7.48%), for example, "Cost-benefit ratio", "steep price decline is expected", "It is too expensive for using it only occasionally". (3) Information barrier (6 | 5.61%), "The pros and cons are still unknown", "I still need more information to make the purchase decision", "I haven´t bought it because I am still uncertain about some technical details".

Twelve (11.21%) reasons were allocated to adopter- or situation-specific reasons constituting passive innovation resistance. While 10 (9.35%) reflect reasons rooted in a high status quo satisfaction, only two (1.87%) reason was linked to factors connected with a person's inclination to resist changes.

After the matching of the temporary reasons, 42 (39.25%) remained and thus were labeled as "other determinants". Since such a vast amount of reasons for temporary rejections did not fit to established determinants of rejection behavior, a detailed analysis was performed. Most of the retained answers reflect reasons concerning consumers' lack of

time to deal with the new product (“It might take too much time for me to install it”, “Not enough time”, “Haven´t had time yet”), consumers’ lack of financial resources to purchase the new product (“I am broke”, “I haven’t had enough money”, “My financial situation is uncertain”), the unavailability of the product (“Not available on the market yet”, “Takes too much time to deliver”, “Not available for private households”) or the product price (“Still too expensive”, “Price is definitely too high”, “Relatively unattractive with regard to the price”). After having discussed this pattern, the four expert judges decided to establish a new category of reasons that drive temporary innovation rejection by restricting the consumer in his purchase behavior. Since the unassigned reasons for temporary rejections are neither connected to the new product nor to the adopter, the corresponding category was dubbed external factors and further differentiated in (1) time restrictions, (2) availability restrictions, (3) price restrictions and (4) financial restrictions (Table 17).

Table 17: Outcome Study I after introducing Transactional Innovation Resistance (TIR)

3rd Order Construct	**2nd Order Construct**	**1st Order Construct**	**# reasons temp. / cont. Rejection / 1st Order Construct**	
Transactional Resistance (TIR)	Purchase Constraints	Time Restrictions	4	2
		Availability Restrictions	5	6
	Monetary Constraints	Price Restrictions	23	10
		Financial Restrictions	6	2
# mentioned reasons assigned to TIR			38	20
Total # of assigned reasons for temp./cont. Rejection to the extended framework			103	234
Ratio of assigned reasons for temp./cont. to the extended framework to total # reasons mentioned			96.26%	96.30%

After the extension of the framework by external factors, the experts were able to link 234 (96.30%) and 103 (96.26%) of the continuous/temporary reasons. The remaining reasons that could still not be assigned were either identified as superficial (e.g., Special Christmas calendar - "Selling company became insolvent", Bio fuel - "The purchase is dependent on the seasons") or highly context-specific (e.g. Tanning lotion – "I doubt that the tanning can be reversed", small motor bike – "Has no insurance approval in Germany") and thus not generalizable. As a consequence, the unassigned answers were excluded from further analysis and discussion.

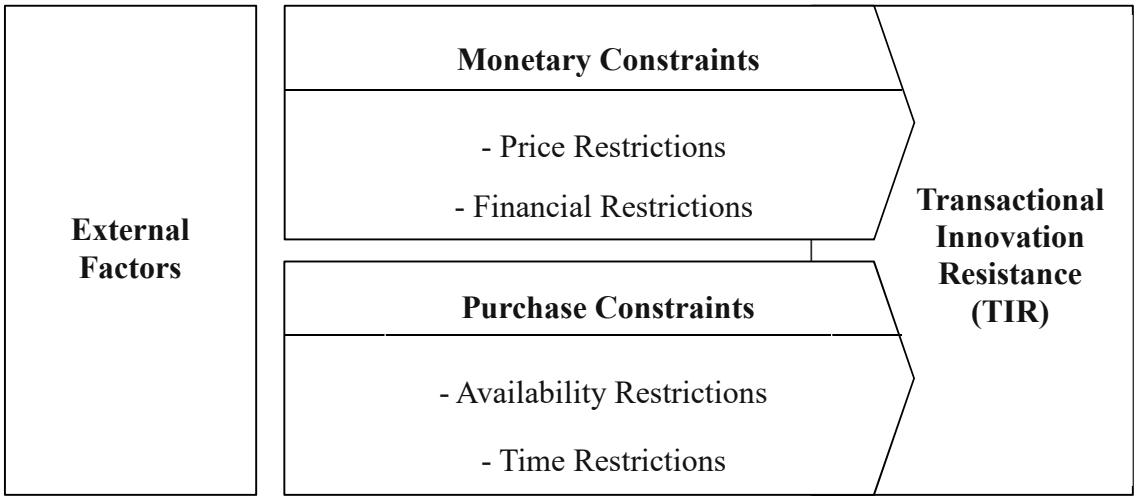
3.3.3 Discussion

The research goal of the first study was to identify determinants of continuous and temporary rejection behavior and to examine whether and how such determinants might differ for both rejection types. Several notable findings could be derived.

First, we found empirical evidence, that adopter-, situation-, and innovation-specific factors that constitute established innovation resistance types, for instance, passive and active innovation resistance, are principally suitable to explain some variance of both temporary and continuous rejection behavior. Thus, our findings are in line with previous research on active (Heidenreich & Spieth 2013; Laukkanen et al. 2009; Wiedmann et al. 2011) and passive innovation resistance (Heidenreich & Handrich, 2014; Heidenreich & Kraemer, 2015b), providing further empirical evidence for the importance of both resistance types as significant inhibitors of new product adoption. However, our results also highlight that determinants of prior innovation resistance research do not account for a significant amount of variance in temporary rejection behavior. Based on this finding,

a modification of the framework was necessary. As an extension to the established framework of innovation-, adopter- and situation-specific factors, external factors such as time, (product) availability, price and financial restrictions turned out to be of utmost importance. Based on these findings, we propose to consider transactional innovation resistance as an additional type of innovation resistance that arises from such external factors. Transactional innovation resistance reflects an individual's perception of external restrictions that might hinder the adoption of a new product. More specifically, monetary constraints in adopting a new product are perceived if the product seems to be overpriced (price restriction) or the current financial reserves of the individual are not sufficient (financial restriction). Similarly, purchase constraints in adopting a new product are perceived if the individual has no time to deal with the new product (time restriction), or the new product is not directly available for purchase (availability restriction) (figure 10).

Figure 10: Sources of Transactional Innovation Resistance (TIR)



Especially within new product adoption contexts, transactional resistance seems to be of utmost importance as innovations are (1) often perceived as being expensive, (2) usually accompanied with a high degree of complexity and (3) ordinarily short on stock. By combining transactional innovation resistance with the established concepts of active and passive innovation resistance (Talke & Heidenreich, 2014), the expert group was capable of identifying additional 20 (8.23%) and 38 (35.51%) reasons to describe continuous and temporary rejection behavior, respectively. Second, in line with findings from Greenleaf & Lehmann (1995) and Kleijnen et al. (2009) - which suggest that temporary rejections origin from circumstances of the purchase situation and continuous rejections origin primarily from product-specific factors - our results also indicate that the determinants leading to either continuous or temporary rejection considerations substantially differ. In our analysis, continuous rejection behavior is almost comprehensively captured by product-specific factors (164 | 67.49%) as well as by adopter- and situation-specific factors (50 | 20.58%). Only 20 (8.23%) of the named reasons were assigned to external factors constituting transactional innovation resistance. Hence our explorative results suggest that especially product-specific factors determine a consumer's decision to continuously reject an innovation. More specifically, reasons that are associated with functional risk and value barrier turned out to be the most important determinants in this respect. These findings are in line with research of Antón, Camarero, & Rodríguez (2013), Sääksjärvi & Morel (2010) as well as Wiedmann et al. (2011) who found that doubtful considerations about the performance and the relative advantage of innovative products primarily drive continuous rejections. On the contrary, in the temporary rejection scenario, only 53 (49.53%) and 12 (11.21%) reasons were linked to product-specific factors and to adopter- or situation-specific factors, respectively. More importantly, almost half of the mentioned reasons to temporarily reject an innovation (38

| 35.51%) were considered as being related to external factors such as purchase constraints and monetary constraints. Evidentially, product-specific factors become less important to explain the motivation behind temporary rejection behavior, while external factors gain importance. These implications are in line with findings from Dunphy & Herbig (1995), Greenleaf & Lehmann (1995) as well as Ramanan & Bhargava (2014) which suggest an important role of monetary or purchase restrictions for a consumers decision to temporarily reject an innovation.

While the explorative findings of study 1 provide first interesting insights into determinants and conceptual differences of temporary and continuous rejection behavior, an empirical and quantitative validation of the derived framework in general and transactional innovation resistance in specific is pending. Consequently, study two strives to (1) quantitatively validate the previously identified factors that lead to passive, active and transactional resistance fostering temporary and continuous rejection behavior and (2) to determine their relative importance for both rejection types.

3.4 Study 2: Empirical Validation of Determinants for Temporary and Continuous Rejections

3.4.1 Conceptual Development

As discussed above, our findings from the explorative study suggest that primarily three types of innovation resistance influence a consumer's decision to either temporarily or continuously reject an innovation: (1) passive innovation resistance, (2) active innovation resistance and (3) transactional innovation resistance. In the following, we provide

theoretical rationales for whether and how these resistance types influence both rejection types.

As shown by the systematic literature review, passive innovation resistance only got recently in the center of attention of adoption research (Claudy et al., 2015; Heidenreich & Handrich, 2014; Labrecque et al., 2016). For instance, Heidenreich & Kraemer (2015a) confirmed that passive innovation resistance represents the major driver of new product rejections across the consumer electronic category. Likewise, findings of Heidenreich et al. (2016) show that both cognitive as well as situational passive resistance lead to the rejection of new products. Furthermore, Oreg (2003) supports the notion that resistance to change and thus cognitive passive resistance affects the timing of the adoption. Similarly, Goldenberg & Oreg (2007) suggest that a consumer's psychological disposition like passive innovation resistance is substantially linked to the point of adoption in time. Hence, passive innovation resistance seems to be an important determinant of consumers' decision to both temporarily or continuously reject a new product. However, empirical evidence on the relative importance of passive innovation resistance for both rejection types is lacking at all. Yet, conceptual considerations might help in this respect. Passive innovation resistance as an individual's predisposition to resist innovation is rather stable over time (Talke & Heidenreich, 2014). Consumers with high passive innovation resistance are thus less open to innovation and principally avoid adjustments to changes entailed to new product adoption (Heidenreich & Handrich, 2014). Hence, such consumers are most likely to reject new products continuously rather rejecting them temporarily with the knowledge that adjustments to the changes are still necessary when adopting the product in the near future. In line with the above-made argumentations, we propose that the effect of passive innovation resistance might be even stronger for continuous innovation rejections compared to temporary ones.

H1: Passive innovation resistance represents an important determinant of both temporary and continuous innovation rejections.

H1a: Passive innovation resistance enhances temporary rejections of innovations.

H1b: Passive innovation resistance enhances continuous rejections of innovations.

H1c: The effect is stronger for continuous rejections compared to temporary rejections.

In comparison to passive innovation resistance, active innovation resistance represents the more often investigated concept (for a review see Heidenreich & Handrich (2014). As a consequence, empirical evidence for the important role of active innovation resistance as determinant of innovation rejection behavior is manifold. For instance, Heidenreich & Spieth (2013) showed that active innovation resistance leads to a strong intention to reject new products. Similarly, the findings of Claudy (2011) provide empirical evidence that active innovation resistance prevents consumers from adopting green innovations. Furthermore, empirical studies also stress the importance of product-specific factors and thus active innovation resistance as triggers to temporarily reject an innovation. For instance, Laukkanen et al. (2009) showed that functional and psychological barriers leading to active innovation resistance affect the timing of adoption of internet banking. Likewise, the findings of Weiber & Pohl (1996) as well as Ram & Sheth (1989) point to risk barriers as one driver of temporary rejections. Others even see the negative experience with the innovation during a trial (trialability barrier; Nabih et al., 1997) or the ability to first observe others using the innovation (observability barrier, Olshavsky & Spreng,

1996) as triggers to postpone the decision to adopt a new product. However, as in case of passive innovation resistance empirical evidence on the relative importance of active innovation resistance concerning both rejection types is lacking. Conceptual considerations might again help in this respect. Active innovation resistance as an individual's negative attitude formation towards a new product evolves from the discrepancy between consumers' perception of certain innovation attributes and their expectations on these attributes (Talke & Heidenreich, 2014). Both the perception of innovation attributes as well as the expectations towards an innovation can change over time. For instance, the perceived complexity of a new product might decline over time, as consumers have tried out the corresponding product. High expectation towards a new product might also decline over time as consumers got aware of negative reviews regarding the product of interest. In both cases, a decision to reject a new product due to active innovation resistance might get reversed, leading to a temporary rejection. Still, a high discrepancy between perceptions and expectations can also be stable over time when no contrary information or experiences are available. In such case, the negative attitude formation will remain, and a continuous rejection will result. In line with the above-made argumentations, we propose that the effect of active innovation resistance does not significantly differ for temporary and continuous innovation rejections.

H2: Active innovation resistance represents an important determinant of both temporary and continuous innovation rejections.

H2a: Active innovation resistance enhances temporary rejections of innovations.

H2b: Active innovation resistance enhances continuous rejections of innovations.

H2c: The effect is similar in its magnitude for continuous rejections and temporary rejections.

Since transactional innovation resistance was introduced as a consequence of the findings of study 1 and thus conceptualized for the first time, neither conceptual nor empirical evidence on whether and how this type of resistance affects temporary or continuous rejections exists so far. However, some anecdotal evidence about the sub-dimensions of transactional innovation resistance leads to the subsequent theoretical rationales. Concerning price restrictions, previous studies have shown that consumers tend to postpone or delay their decision-making when considering expensive products (Dunphy & Herbig, 1995; Greenleaf & Lehmann, 1995). If a consumer, for instance, evaluates the latest cell phone advertisement, he or she might not proceed with adopting after having seen the retail price, even if there is a need for the product. Furthermore, the retail price of innovations is often expected to drop within a given time (Claudy et al., 2015; Ramanan & Bhargava, 2014). Thus, consumers regularly wait until the price has been reduced to re-enter the adoption process. Hence, price restrictions seem to be an important determinant of temporary rejection behavior. Similarly, financial restrictions might also lead to temporary rejections (Dunphy & Herbig, 1995; Kleijnen et al., 2009; Molesworth & Suortfi, 2001). If consumers cannot afford to buy a new product, the innovation gets temporarily rejected until sufficient monetary resources are available (Talke & Heidenreich, 2014). Besides monetary constraints, especially in the context of innovations, consumers are often undecided about whether or not they should allocate more time to the information research (Gatignon & Robertson, 1991). Time restrictions thus often

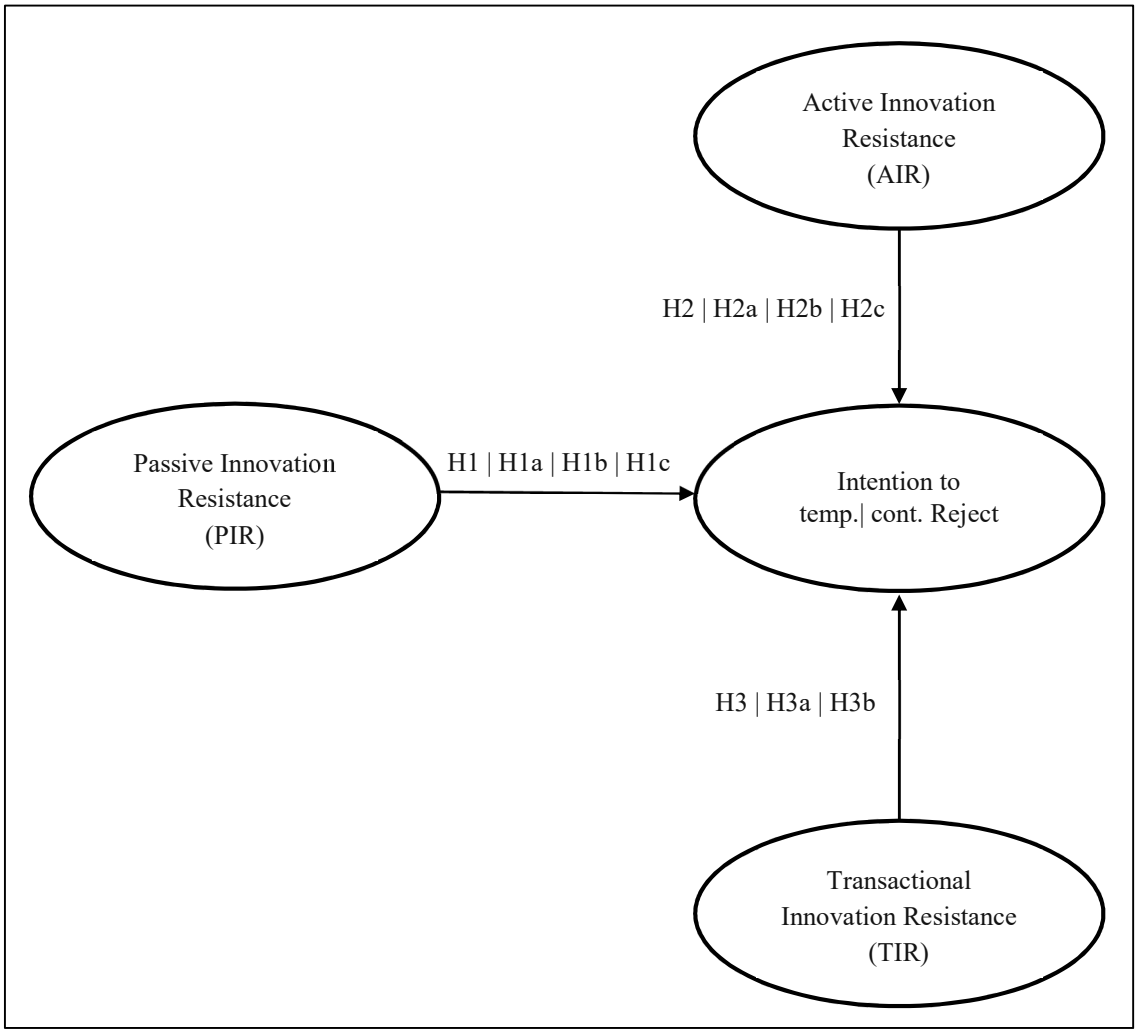
force consumers to temporarily reject the innovative product due to the lack of sufficient time to collect or evaluate new product information (Bagozzi & Lee, 1999; Mittelstaedt et al., 1976; Molesworth & Suortfi, 2001). Similarly, availability restrictions might also prevent consumers from purchasing a new product (Lee, 2013; Olshavsky, 1980; Rogers, 2003). One possible scenario to exemplify the importance of availability restrictions for temporary rejections has been showcased by Rogers (2003). In the US, the marketing of hybrid automobiles preceded the actual availability about six months such that consumers had to postpone their adoption until the innovation is available. As laid out above, both monetary and purchase restrictions leading to transactional resistance are external factors that do not influence the product evaluation itself but rather the timing of adoption. In line with the above-made argumentations, we thus propose that transactional innovation resistance only influences temporary innovation rejections (figure 11).

H3: Transactional innovation resistance represents an important determinant of temporary Innovation rejections.

H3a: Transactional innovation resistance enhances temporary rejections of innovations.

H3b: Transactional innovation resistance does not affect continuous rejections of innovations.

Figure 11: Hypothesis relationship



3.4.2 Data and Measures

To empirically validate our proposed framework of determinants for temporary and continuous rejections and assess possible differences between these rejection types, we developed a self-administered online questionnaire. The design of the survey was based on the methodological procedures that were already implemented in study 1. More specifically, after having established a common understanding of the term "innovation", participants were randomly assigned to a "continuous rejection" and a "temporary rejection"

condition. In the "continuous rejection" condition participants were asked to remember an innovative product they recently encountered but did not buy until today and would definitely not buy in the future. In the "temporary rejection" condition participants were asked to remember an innovative product that they recently encountered and had not bought in the first encounter but would definitely buy in the future. Afterwards, several questions about the corresponding products, the purchase situation, environmental circumstances were asked before the questionnaire concluded with questions regarding the demographic background of the participants.

For the operationalization of our constructs, we only used or adapted established measurement inventories with indicators on a seven-point rating scale. More specifically, we operationalized active innovation resistance as a third-order construct of type two, consisting of functional and psychological barriers as second-order dimensions. To operationalize both second-order dimensions, we used established scales to measure functional (e.g., value barrier) and psychological barriers (e.g., functional risk barrier; appendix II.2 a – appendix II.2 c). Passive innovation resistance was also operationalized as a third-order construct of type two with consumers' inclination to resist changes and status quo satisfaction as second-order dimensions, using the comprehensive measurement inventory of Heidenreich & Handrich (2014). Since our findings from study 1 suggest that transactional innovation resistance consists of four sub-dimensions, we also decided to operationalize it as a hierarchical construct. More specifically, as price and financial restrictions, as well as time and availability restrictions, are distinct but related constructs, transactional resistance was operationalized as a third-order construct of type two, with monetary and purchase constraints as formative second-order dimensions. More specifically, for price restrictions we used items from Adaval & Monroe (2002) and Martins (1995). The items used in case of financial restrictions were adapted from scales used by

Sheldon, Elliot, Kim & Kasser (2001) and Thomson (2006) to measure availability of money. The scale to measure time restrictions was developed based on similar items used in studies from Erdem & Swait (1998, 2004) as well as Suri & Monroe (2003). Finally, availability restrictions were operationalized by using adapted items from a measurement inventory of Sparks & Shepherd (1992) and Vermeir & Verbeke (2008).

The dependent variables of interest were the intention to either continuously or temporarily reject an innovation. In case of temporary rejection, we asked the participants how likely it is, that they might buy the product in the future. Within the continuous rejection condition, we asked the participants how likely it is, that they refrain from purchasing the product in the future. In both cases the answer was measured using a three-item, seven-point, bipolar semantic differential scale anchored by: "very unlikely/very likely", "unimaginable/imaginable" and "impossible/possible" (Kulviwat, Bruner, Kumar, Nasco, & Clark, 2007). Additionally, four control variables (age, income, gender, and education) that are commonly used in innovation resistance research (Claudy et al., 2015; Laukkanen et al., 2008; Lian & Yen, 2013) were included in the study to provide a stronger test for the hypotheses.

For data generation purpose, we recruited participants through an online panel of a German market research institution to ensure a representative sample of the German population. Finally, a total of 817 respondents participated in our online survey. More specifically, 433 respondents were assigned to the "temporary rejection" condition and 384 respondents were allocated to the "continuous rejection" condition. Male participants with an average age of 46 years made up 49.33% of the sample, while female participants with an average age of 42 years accounted for 50.67 % of the participants. With regard to educational background, most participants (54.10 %) hold either a high-school diploma

or a university degree. A substantial part of the remainder (24.60%) reported "vocational training" as their educational category. Finally, 40.64 % of the respondents had an annual income of more than 35,000 Euro, which represents a quite usual distribution for the German population.

3.4.3 Analysis and Results

To empirically validate our research model and corresponding hypotheses, we applied structural equation modeling as this allowed us to test all employed constructs and their relationships simultaneously. In principle, there are two methodological SEM approaches that can be applied: covariance-based SEM and variance-based SEM. For our research model, the use of variance-based SEM seems most reasonable because of two considerations. First, variance-based SEM has great capabilities to deal with highly complex models (Chin, 2010; Hulland, 1999). Second, in contrast to covariance-based SEM, variance-based SEM is able to model hierarchical constructs with formative relationships (Chin, 2010). Both circumstances are given within our research model. Thus, we decided to use variance-based SEM for our empirical examination. More specifically, we used SmartPLS 2.0 (Ringle, Wende, & Will, 2005) to calculate the inner and outer model, employing a path weighting scheme and a mean replacement algorithm for the inside approximation (Chin, 2010). For hypotheses testing, we calculated the standard error of the estimates applying non-parametric bootstrapping procedure with 1000 replications and individual level changes pre-processing. Concerning the modelling of hierarchical constructs, we decided to implement the two-stage approach, since the repeated indicator approach only works well in case of an equal number of indicators at first- and second-order level (Hair, Hult, Ringle, & Sarstedt, 2013; Ringle et al., 2005). As described above, our data collection procedure has led to two separate models with 433 respondents in the

"temporary rejection" condition and 384 respondents in the "continuous rejection" condition. The effect sizes of the path coefficients of both models were compared using the PLS-based multigroup analysis approach (Henseler, Ringle, & Sinkovics, 2009) to assess the relative importance of each determinant for both rejection types.

3.4.4 Measurement Model Results

We followed the evaluation procedure suggested by Hair et al. (2013a). Thus, we began with an evaluation of the measurement model before we assessed the hypotheses at structural model level. Regarding the assessment of the measurement models of reflective constructs, we first checked whether indicator loadings exceed the threshold of .60, which is given for all our constructs (Hair et al., 2013b; Hulland, 1999). In the following steps, we assessed whether composite reliabilities (CR) exceeded 0.70 (Bagozzi & Lee 1999), all average variance extracted (AVE) were greater than .50 (Bagozzi & Yi, 1988) and also exceeded the highest squared correlation with other constructs (Fornell & Larcker, 1981). The data analysis confirmed that the measurement models of all constructs satisfy the above-described quality criteria (appendix II.2 a – appendix II.2 c). With regard to the assessment of the measurement models of formative second-order constructs, we first checked the corresponding weights and their significances. As shown in appendix II.3 a – appendix II.3 c, most second-order weights exceed the critical threshold of .10 and were confirmed to be significant. Finally, we further calculated the variance inflation factor (VIF) to assess the degree of multicollinearity. Previous research postulated that VIFs greater than 10 indicate a problematic level of multicollinearity (Chin, 2010; Ringle et al., 2005). After calculation, the highest value at the measurement model level turned out to be 3.52, indicating that multicollinearity is not a problem. Hence, the measurement model should be suitable for further analysis at structural model level.

3.4.5 Structural Model Results

The estimations fit the data well. More specifically the R^2 for intention to temporarily (.41) and to continuously reject (.34) turned out to be quite high (figure 12). In addition to the confirmed explanatory power, both models also have high predictive power as indicated by high Q^2-values of .38 in case of temporary rejection and .31 in case of continuous rejection (Fornell & Larcker, 1981).

To test our hypotheses, the path coefficients and their corresponding significances were estimated applying a bootstrapping procedure (Chin 2010). With respect to passive innovation resistance, a significant, positive effect could be confirmed for both temporary (β_{temp} = .09, p = .014) and continuous rejections ($\beta_{cont.}$ = .24, p = 001), confirming hypotheses 1a and 1b. Concerning the relative importance of passive innovation resistance for both types of rejection behavior, the strong elevation in the path coefficient of $\beta_{\Delta} = \beta_{temp} - \beta_{cont.}$ = -.15 indicates a higher importance for continuous compared to temporary rejections. To test the significance of the difference between both effects we followed procedures of PLS-based multigroup analysis (Hair et al., 2013a) and applied the modified version of the two independent-samples t-tests suggested by Keil, Tan, Wei, Saarinen, Tuunainen, & Wassenaar (2000). The results confirm that the difference is significant at p = .018, providing empirical support for our hypothesis 1c. In line with hypotheses 2a and 2b, our results confirmed significant positive effects of active innovation resistance on both temporary (β_{temp} = .51, p = .001) and continuous innovation rejections ($\beta_{cont.}$ = .45, p = .001). Furthermore, the application of the two independent-samples t-test suggested by Keil et al. (2000) shows no significance for the difference (β_{Δ} = .06, NS) between the path coefficients of active innovation resistance on temporary and con-

tinuous rejections. Hence, hypothesis 2c is confirmed. With respect to effects of transactional innovation resistance, our results confirmed a significant positive effect on temporary rejections ($\beta_{temp} = .23$, $p = .001$) but contest the significance in case of continuous rejections ($\beta_{cont.} = .04$, NS). Hence, we found empirical support for hypotheses 3a and 3b. Accordingly, results of the two independent-samples t-test suggested by Keil et al. (2000) support the significance of the difference between the path coefficients of transactional innovation resistance for temporary and continuous innovation rejections ($\beta_{\Delta} = .18$, $p = .002$). Figure 12 provides a detailed overview over the structural results.

Finally, in order to determine the effect of each first-order construct on both types of rejection behavior, the path coefficient for each variable was calculated in a separate PLS model, only including the respective first-order construct, the intention to temporarily/continuously reject a new product and all implemented controls (Table 18 a-c). The three most important drivers for temporary rejections were (1) image barrier ($\beta_{temp.} = 0.538$, $p < .01$), (2) norm barrier ($\beta_{temp.} = 0.52$, $p < .01$) and (3) personal risk barrier ($\beta_{temp.} = 0.50$, $p < .01$). For continuous rejections the following three variables were confirmed as the most important ones: (1) norm barrier ($\beta_{cont.} = 0.53$, $p < .01$), (2) compatibility barrier ($\beta_{cont.} = 0.44$, $p < .01$) and (3) economic risk barrier ($\beta_{cont.} = 0.39$, $p < .01$).

Figure 12: Structural model

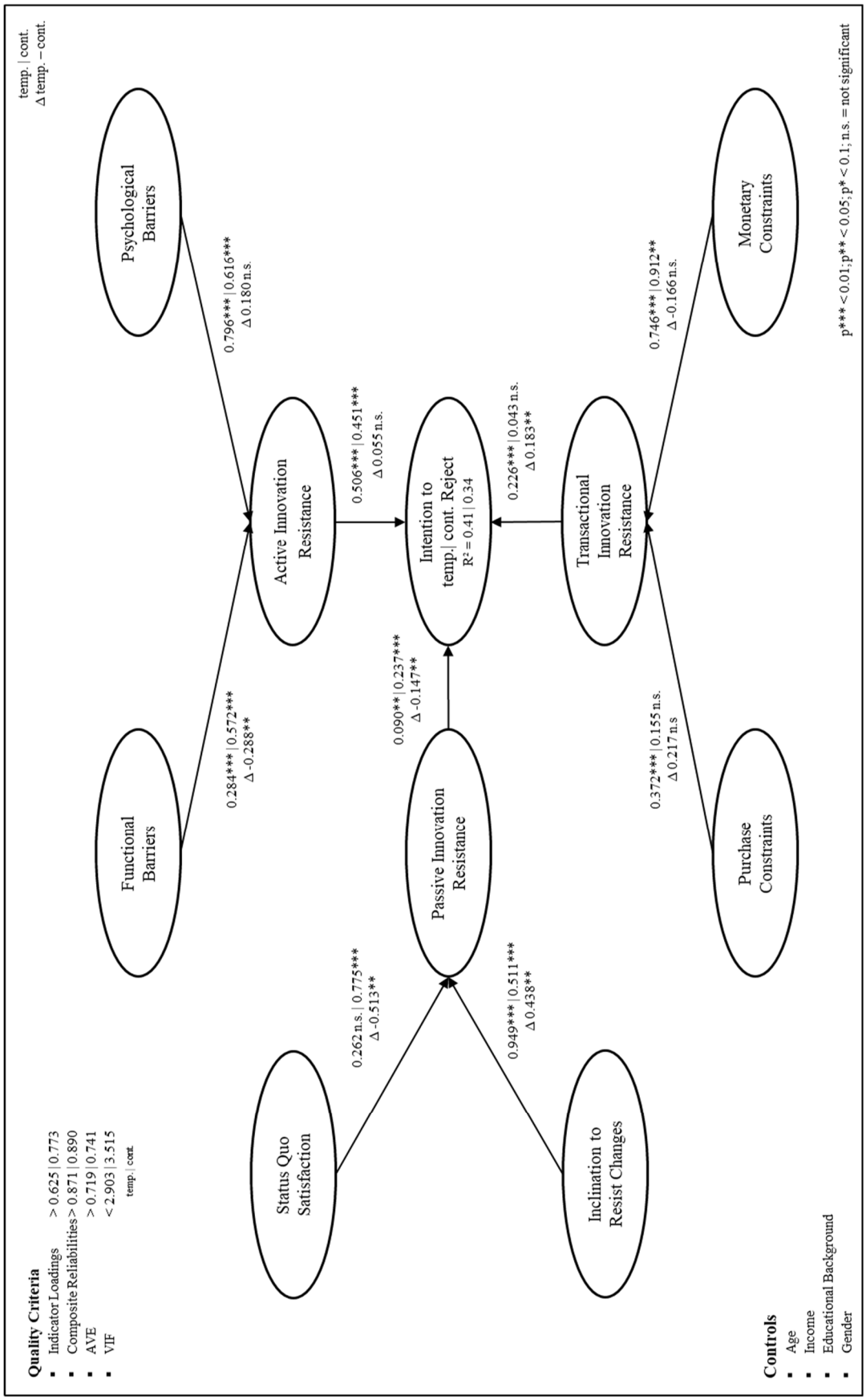


Table 18: Individual effect calculation - First order constructs

Table 18a: Active Innovation Resistance (AIR)

1st Order Construct	t value	Path Coefficient Δ (temp.-cont.)	Path Coefficient temp.	Path Coefficient cont.
Value Barrier	0.546	0.040	0.430***	0.391***
Complexity Barrier	1.661	0.116	0.366***	0.250***
Trialability Barrier	0.725	-0.051	0.222***	0.273***
Compatibility Barrier	1.653	-0.108	0.327***	0.435***
Co-dependence Barrier	2.863	-0.248	-0.032 NS	0.216***
Communicability Barrier	1.690	0.118	0.440***	0.322***
Visibility Barrier	1.084	-0.077	0.156***	0.233***
Amenability Barrier	0.244	0.017	0.319***	0.302***
Realisation Barrier	0.135	-0.101	0.098*	0.199***
Norm Barrier	0.075	-0.005	0.523***	0.528***
Image Barrier	2.318	0.151	0.538***	0.388***
Usage Barrier	0.710	0.039	0.079*	0.040 NS
Information Barrier	3.529	0.259	0.417***	0.158***
Personal Risk Barrier	5.870	0.481	0.500***	0.019 NS
Functional Risk Barrier	3.484	0.242	0.167***	-0.075 NS
Economic Risk Barrier	1.565	-0.116	0.278***	0.393***
Social Risk Barrier	0.763	-0.054	0.202***	0.256***

p*** < 0.01; p** < 0.05; p* < 0.1; NS = not significant

Table 18b: Passive Innovation Resistance (PIR)

1st Order Construct	t value	Path Coefficient Δ (temp.-cont.)	Path Coefficient temp.	Path Coefficient cont.
Routine Seeking	0.396	-0.029	0.222***	0.251***
Cognitive Rigidity	1.701	-0.184	0.084**	0.268***
Emotional Reaction	0.524	-0.039	0.167***	0.206***
Short-Term Focus	0.341	-0.028	0.161***	0.189***
Status Quo Satisfaction - Product	3.769	-0.328	-0.023 NS_	0.305***
Status Quo Satisfaction - Innovation	0.505	-0.328	0.209***	0.245***

p*** < 0.01; p** < 0.05; p* < 0.1; NS = not significant

Table 18c: Transactional Innovation Resistance (TIR)

1st Order Construct	t value	Path Coefficient Δ (temp.-cont.)	Path Coefficient temp.	Path Coefficient cont.
Price Restrictions	1.100	0.075	0.326***	0.251***
Financial Restrictions	3.961	0.281	0.217***	-0.064 NS
Time Restrictions	4.508	0.339	0.295***	-0.044 NS
Availability Restrictions	1.007	-0.084	0.063*	0.147***

p*** < 0.01; p** < 0.05; p* < 0.1; NS = not significant

3.4.6 Discussion

First, the study found support for the hypothesized effects surrounding passive innovation resistance. As postulated in our hypothesis, the contribution of passive innovation resistance to continuous rejections was found to be stronger than in case of temporary rejections. This finding is in line with prior research, highlighting that consumers with high levels of passive innovation resistance principally avoid adjustments to changes entailed to innovation adoption (Heidenreich & Handrich, 2014; Heidenreich et al., 2016). Since a temporary rejection only postpones a potential confrontation with changes entailed to a new product adoption, consumers high on passive innovation resistance rather continuously than temporarily reject an innovation, as they are neither willing to deal with changes entailed by new product adoption in the present nor in the future. When looking at the second-order dimensions of passive innovation resistance, the individual contribution of inclination to resist changes turned out to be greater in case of temporary rejection, while for status quo satisfaction the individual contribution was stronger for continuous rejections. Hence, problems with changes entailed to the adoption that originate from an individual's cognitive style seem to be more relevant for temporary rejections whereas

problems that originate from an individual's preference for the current status quo are more important for continuous rejections.

Second, the results also confirmed the hypotheses proposed for active innovation resistance. As theorized, active innovation resistance represents an important cause for both temporary as well as continuous rejections. This finding provides conclusive empirical evidence that active innovation resistance represents an important driver for both continuous (Heidenreich & Spieth, 2013; Laukkanen et al., 2008) as well as temporary rejections (Kleijnen et al., 2009). However, when looking at the second-order dimension of active innovation resistance, the individual contribution of psychological barriers turned out to be superior to that of functional barriers for temporary rejections, while being equally important in case of continuous rejections. These findings are in line with prior research (Molesworth & Suortfi, 2001; Schilling, 2003; Weiber & Pohl, 1996), suggesting that especially psychosocial barriers are of utmost importance for temporary rejection behavior.

Third, the results confirm the hypothesized effect of transactional innovation resistance on continuous and temporary rejections, with the influence only being significant for temporary rejections. In line with our findings from study one that led to introducing "transactional innovation resistance" as a new construct, practical concerns about the actual acquisition of the innovation seem to be a significant driver of temporary rejection, whereas the same concerns are seemingly not relevant for continuous rejections. More specifically, monetary constraints and thus aspects regarding the perceived pricing of the innovation and the consumer's financial situation are important drivers for temporary rejections. This finding is in line with prior research that highlighted the important role of consumers' financial situation for adoption behavior (Claudy, 2011; Dunphy & Herbig,

1995; Gilly, Celsi, & Schau, 2012). Additionally, also purchase constraints play a significant role for temporary rejections. Our findings thus provide further empirical evidence for the proposition of prior research, that the lack of time (Ram & Sheth, 1989; Szmigin & Foxall, 1998) as well as the availability (e.g. supply) of the product (Gatignon, 1991; Wiedmann et al., 2011; Herrmann et al., 2015) might be important driver of temporary rejections.

3.5 Theoretical Implications

Much work has been carried out on consumers' adoption behavior in general and on factors that influence the decision whether to adopt or to reject an innovation in particular. However, research that explicitly investigates temporary rejections, its determinants and potential differences to continuous rejections is still rare. Consequently, current literature only provides little empirical evidence on whether and how the reasoning behind continuous and temporary rejection differs. The main purpose of the current article was to shed some light on this issue by (1) systematically identifying and (2) empirically validating potential reasons for both temporary and continuous rejections, as well as by (3) providing first empirical evidence on whether and how the reasoning behind temporary and continuous rejection differs. From a theoretical perspective, our research contributes to adoption theory in several ways.

First, based on a systematic literature review, we provide a first-time systematic summary of the past literature on different types of rejection behavior, namely temporary and continuous rejections. Within this respect, the findings from the systematic literature review confirmed that research on temporary rejection is widely neglected (Greenleaf & Lehmann, 1995; Kleijnen et al., 2009; Szmigin & Foxall, 1998), leading to a black-and-

white thinking of either continuous adoption or rejection (Nabih & Bloem, 1997). As a result, nuances between these two extremes are widely ignored in adoption theory, and thus empirical insights on the underlying psychological processes of temporary rejections are almost completely missing. Yet, reality of consumer decision-making seems to be more complex (Greenleaf & Lehmann, 1995) such that several authors highlight the importance of temporary rejections in adoption processes and call for more research on this matter in general and on its determinants in specific (Claudy, 2011; Dunphy & Herbig, 1995; Gatignon, 1991; Herrmann et al., 2015; Wiedmann et al., 2011). Our systematic literature review thus might be used by future studies as starting point to further investigate the nature, determinants, and consequences of temporary innovation rejection behaviour to comprehensively understand this phenomenon.

Second, we provide first empirical evidence on whether established typologies of barriers leading to innovation rejection are suitable to explain both types of innovation rejection, namely temporary as well as continuous rejections. The findings from our qualitative study, indicate that continuous rejection is thoroughly explained by the established concepts of active (Heidenreich & Spieth, 2013; Laukkanen et al., 2009; Ram, 1987) and passive (Claudy et al., 2015; Heidenreich & Handrich, 2014; Labrecque et al., 2016) innovation resistance. However, numerous reasons for temporary rejections mentioned by the respondents could neither be linked to active nor passive innovation resistance and their determinants. Considerations about categorizing the remaining reasons then led to the conceptualization of transactional innovation resistance as new construct in the context of consumers' adoption behavior. Transactional innovation resistance represents an additional type of innovation resistance that arises from external factors, such as price, financial, time or availability restrictions, that might hinder the adoption of a new product at a certain point in time. Previous theoretical and empirical

attempts to propose and validate additional reasons associated with the timing of adoption that might extend established concepts such as passive and active innovation resistance were of heterogeneous nature. Some studies proposed product pricing (Claudy et al., 2015; Dunphy & Herbig, 1995; Greenleaf & Lehmann, 1995), some others consumers' purchasing power (Gilly et al., 2012; Talke & Heidenreich, 2014) and even others product availability (Lee, 2013; Olshavsky, 1980; Rogers 2003) or lack of time (Ram & Sheth, 1989; Szmigin & Foxall, 1998) as determinants of temporary rejections. Due to its conceptualization as hierarchical construct encompassing monetary and purchase constraints as secondary dimensions, transactional innovation resistance synthesizes and unites previous scattered results on potential determinants of temporary rejections in one encompassing construct. This conceptualization and empirical validation of a new construct in the context of consumers' adoption behavior is an important contribution for several reasons. First, introducing transactional innovation resistance represents a first step towards extending the current understanding of what drives consumers to temporarily reject innovations. Second, although the importance of temporary rejections for new product success seems rather obvious, empirical studies are needed that investigate the relevance of corresponding determinants in different contexts and for different consumers. Yet, a good metric that captures additional determinants of temporary rejections besides established constructs, such as active and passive innovation resistance, was still needed. Within this respect, the measurement inventory of transactional innovation resistance might function as common ground that enables empirical investigations into the nature, determinants, and consequences of temporary rejections across research objects and areas. Third, as highlighted in our literature review, adoption theory is prone to a black-and-white thinking of either continuous adoption or rejection. The newly introduced concept of transactional innovation resistance might help in this respect as it provides future

theoretical as well as empirical studies with the possibility to account for nuances in between of these two extremes by explicitly considering reasons that might induce temporary rejections.

As final contribution, our quantitative study delivers first empirical insights on whether and how determinants for temporary and continuous rejection of innovations differ. As theorized in the hypotheses development section, the results from structural equation modelling confirmed significant variations in the effect sizes of passive, active and transactional innovation resistance between continuous and temporary rejections. Concerning the established constructs of passive and active innovation resistance, our findings confirmed that the former is of utmost importance in contexts of continuous rejections but only marginally important in contexts of temporary rejections, whereas the latter represents a significant driver for both rejection types. These findings suggest, that predispositions such as passive innovation resistance, which reflects a rather stable approximation of an individual's cognitive style and preference for the status quo (Heidenreich & Kraemer, 2015a), are most relevant for enduring decision-making. Attitude formations, such as active innovation resistance, which reflects a rather dynamic approximation of functional and psychological barriers induced by the new product (Talke & Heidenreich, 2014), are relevant for both enduring decision-making and postponement of decision-making. Transactional innovation resistance as newly introduced type of innovation resistance conformed with theoretical expectations and was only relevant in contexts of temporary rejections. Expanding the level of detail, findings from the individual effect analyses provide further insights into the relative importance of each constituting factor of the three innovation resistance types for temporary and continuous rejections. Overall, results within this respect show that the most influential first-order constructs for

both temporary and continuous rejections belong to product-specific barriers forming active innovation resistance. More specifically, it seems that new products that (1) evoke unfavourable associations to the brand, manufacturer or country of origin, as well as (2) entail physical risks or could cause harm to one´s property are the primary drivers of temporary rejections, whereas new products that (1) violate group norms, or societal and family values, as well as (2) are not compatible with existent and past products are the primary drivers of continuous rejections. In conclusion, these findings provide further evidence that temporary and continuous rejections are related but distinct construct that are in need of further empirical investigations, to overcome the inherent black-and-white thinking in adoption theory.

3.6 Managerial Implication

Knowledge on factors driving temporary as well as continuous rejections of innovation is crucial for adoption theory but also provides important implications for management practice (Claudy et al., 2014; Talke & Heidenreich, 2014). It is widely acknowledged that the successful introduction of innovations represents one of the most important activities for companies to reach long-term success (Bayus et al., 2003; Gourville, 2006). Within this respect, especially a rapid diffusion of new products in the market represents a guarantor for sufficient return on investments in new product development activities (Heidenreich et al., 2017). However, at a certain amount of accumulated temporary rejections, it is rather unlikely to reach the tipping point at which diffusion catches fire. The findings of our multiple studies provide important insights on how companies can avoid temporary rejections by their customers to reach the critical mass necessary for rapid diffusion in the market. Based on these findings, companies are able to develop and

employ strategies that are tailor-made to overcome the root causes for temporary rejections, namely (1) transactional innovation resistance, (2) active innovation resistance and (3) passive innovation resistance.

In order to overcome transactional innovation resistance, companies should design measures that either help attenuate monetary or purchase constraints that hinder consumers to immediately purchase their new products. With regard to monetary constraints, companies might use direct or indirect measures to overcome potential inhibitors for adoption. A potential direct measure to reduce price restriction would be to provide discounts for early adopters in the initial stage of market introduction (Nejad & Kabadayi, 2016). A potential indirect measure to attenuate high price perceptions would be to employ advertisements that either promote the superiority of the new product or highlight different usage possibilities to increase the potential usage estimation (Nunes, 2000). Both should enhance the perceived price performance ratio and by that reduce perceived price restrictions. Besides these measures targeting price restrictions, companies might also employ attractive funding options, such as financing or leasing options (Dasgupta et al., 2007), to overcome financial restrictions of their customers. With regard to purchase constraints, companies should foremost ensure that their new product is available in sufficient stores and also in adequate numbers. Within this respect, companies should also avoid early announcements of their products that significantly preceded their actual availability at the market (Rogers, 2003). Both should reduce availability restrictions. With regard to countermeasures of time restrictions companies are limited in their application to indirect measures. Possible measures to counteract time restrictions as a result of perceived time pressure could be to provide a store atmosphere that helps customers to forget their everyday worries, or to avoid a crowded store environment by either regulating customer entrance or providing enough store space (Chowdhury et al., 2009).

To overcome active innovation resistance, companies might draw on the rich literature on market instruments to enhance new product evaluation (see Hess, 2009 for a systematic overview) and employ measures that help either reducing the probability for emerging functional or psychological barriers. With respect to one of the most important psychological barrier for temporary rejections, namely image barrier, companies might use bundling of a new product of an unfavourable brand, manufacturer or country of origin with an existing complementary product of a favourable brand, manufacturer or country of origin (Reinders et al., 2010). Likewise, horizontal cooperation with a prominent partner could be also effective within this regard (Garcia et al., 2007). With respect to one of the most important functional barriers for temporary rejections, namely value barrier, companies might induce knowledge in advertisements about the superiority of the new product over existent ones. Inducing knowledge as marketing instrument was shown to reduce consumers' perceived performance uncertainty (Talke & Snelders, 2013; Ziamou & Ratneshwar, 2003), and thus should help to attenuate concerns with regards to a new product's relative advantage.

To overcome passive innovation resistance, companies might use marketing instruments that either help reducing perceived changes entailed to the new product adoption (cognitive passive resistance) or status quo satisfaction with existent products (systematic overview to situational passive resistance; Heidenreich & Kraemer (2015a). With respect to cognitive passive resistance, companies might use mental simulation (Hoeffler, 2003; Zhao et al., 2012) within advertisements to mentally draw a usage situation that highlights the similarity of using the new product to using established products, such that perceived changes get reduced (Talke & Heidenreich, 2014). With respect to situational passive resistance, companies might use benefit comparison (Hess, 2009; Ziamou & Ratneshwar, 2003) in advertisements to highlight the superiority of new product function over those

of existing products, such that consumers' status quo satisfaction gets reduced (Heidenreich & Kraemer, 2015a).

3.7 Limitations and Future Research Directions

While this study has provided some initial insights into the nature and determinants of temporary rejection behavior, the produced findings come along with some limitations that might also offer challenging opportunities for future research.

First, given that our findings are based on participants in one country (Germany), we could not account for possible cultural differences that would might have also affected our results. Yet, the findings of a study by Tansuhaj et al. (1991) suggest that effects of innovation resistance and its determinants might vary with respect to traditionalism, fatalism and religious commitment present in one country. Hence, future research might employ a group comparison approach between diverse countries with different cultural backgrounds to explore the role of cultural variables for the occurrence and determinants of temporary as well as continuous rejections.

Second, our statistical analyses were restricted to cross-sectional data sets. However, recently extended innovation decision models, such as the model by Talke & Heidenreich (2014), highlight the fact that adoption and non-adoption represent a process that happens over time. As such, it would be interesting to examine whether and how the importance of passive, active and transactional innovation resistance for the emergence of temporary rejections varies over time. Therefore, future research might employ longitudinal data set to further investigate this issue.

Third, as an initial assessment of the nature and consequences of temporary rejections, our theoretical and empirical investigation were limited to identifying and validating potential reasons behind this rejection behavior. However, as outlined in our managerial implication section, several strategies seem to be effective as a countermeasure for this detrimental consumer behavior. However, empirical evidence on the effectiveness of marketing instruments and other new product launch tactics to reduce occurrence and severity of temporary rejections is still missing. Similar, to the broad research stream on instruments to enhance new product evaluation (Hess, 2009) or the recent studies testing the effectiveness of marketing instruments to reduce effects of passive innovation resistance on adoption intention (Heidenreich & Kraemer, 2015a), future research might employ consumer experiments to examine the effectiveness of adequate countermeasures for temporary rejections.

4 A Sneak Peek into the Brain: Investigating Neuronal Reactions to New Products Using Functional Magnetic Resonance Imaging (fMRI)[7]

4.1 Introduction

Innovation: "an idea, practice, or object that is perceived as new by an individual or other unit of adoption […]" (Rogers, 2003, p. 292) might be one of the most cited definitions in innovation adoption literature. Over the past 42 years, researchers have presented numerous theoretical and empirical studies, extending our knowledge in various contexts (e.g. products, services, business models (Bitner, Patrício, Fisk, & Gustafsson, 2015; Chesbrough, 2010; Rindova & Petkova, 2007)) and investigating factors influencing the adoption or rejection of innovations (Claudy et al., 2015; Heidenreich, Kraemer, & Handrich 2016; Jhang, Grant, & Campbell, 2012). Ironically, however, researchers supposedly oversaw a crucial link in Rogers' quote – perception (Calantone et al., 2006a; Danneels & Kleinschmidt, 2001; Gatignon & Robertson, 1991); a neurological mechanism of making sense of sensory information (Zhang, Liu, & Zhang, 2013). This seems surprising, as innovation perception, reflected by its underlying cognitive mechanism, is the very foundation of subsequent formations of attitudes, intentions, and behaviors in Rogers' innovation decision process (Downs & Mohr, 1976; Moore & Benbasat, 1991; Rindova & Petkova, 2007).

Understanding the underlying mechanisms of new product perception can be of particular interest for new product development managers. Especially during early stages,

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right before product trail, individuals begin to develop their attitude toward the new product solely on how they perceive it (Lee & Colarelli O'Connor, 2003; Talke & Colarelli O'Connor, 2011). Conclusive evidence suggests that the early stage perception significantly affects future information search (Bonner et al., 2002; Heidenreich & Kraemer, 2015a; Heidenreich & Kraemer, 2015b; Kohli, 1999), processing (Branco et al., 2016; Rindova & Petkova 2007), and ultimately, the outcome (Claudy et al., 2015; Heidenreich & Spieth, 2013; Talke & Heidenreich, 2014) during later stages of the adoption process. Hence, understanding how consumers perceive new products during the early stages of the adoption process will reveal further insights into how consumers make decisions during the subsequent stages (Griffin, 1997).

Unlike attitudes, intentions and behavior, which can be deliberately expressed within a continuum (e.g. low to high), perception of new products is a nebulous and hard to define construct that relies on subliminal cognitive mechanisms (Nabih et al., 1997; Talke & Heidenreich, 2014). Consequently, consumers struggle to articulate their innovation perceptions (Rindova & Petkova; 2007). Similarly, researchers struggle to operationalize and measure innovation perception with traditional methods, such as questionnaires, interviews or experimental observations (Calantone et al., 2006a; Danneels & Kleinschmidt, 2001; Gatignon & Robertson, 1991). Traditional measures ask individuals for thoughtful replies and thus are not suitable to provide insights on preceding subliminal processes. Notably, in a novel attempt to overcome those struggles, Olshavsky & Spreng (1996), explored consumers' thinking when perceiving innovative food products. Using a so-called "think-out-loud" method, they aimed at collecting immediate responses from consumers while assessing and judging novel food products. Yet, the extent to which Olshavsky & Spreng's (1996) evidence reflects subliminal cognitive mechanisms under-

lying innovation perception is questionable since they used consciously recalled information. Until today, analyzing consumer perception remained methodologically challenging.

Recent theoretical and methodological advances in neuroscience research have shown promising applications to dismantle reactive cognitive processes to stimuli. Theoretical advances provided fruitful insight into the relationship between observable physiological reactions and internal neuropsychological ones. Neurophysiological theories, such as the somatic marker theory (Bechara & Damasio, 2005; Damasio, Everitt, & Bishop, 1996; Reimann & Bechara, 2010), provide guidance in analyzing neuroanatomical reactions accompanied by perceptual experiences (Reimann & Bechara, 2010). Methodological advancements in neuroimaging techniques, such as the functional magnetic resonance imaging (fMRI), have repeatedly shown to be a valuable complement to conventional methods to investigate latent constructs. Fundamental to the fMRI methodology are detectable changes in neurophysiological processes as a response to perceiving a stimulus. More specifically, brain areas, which are activated by a perceived stimuli, require relatively more oxygen then deactivated brain areas. The level of change in the blood oxygen level dependent (BOLD) then serves as a neuronal proxy in localizing responding brain reactions in focal areas (Reimann, Schilke, Weber, Neuhaus, & Zaichkowsky, 2011).

Contemporary applications of the fMRI in marketing-related studies have helped to deepen our understanding of latent constructs, such as price primacy (Karmarkar et al., 2015), perceived ease of use and usefulness (Dimoka & Davis, 2008) and marketing placebo effects (Plassmann & Weber, 2015). Most notably, Reimann et al. (2012b) provide initial evidence that the perception of novel and familiar brands constitutes

diverging neurophysiological and behavioral reactions, showing that the fMRI methodology can be a vital tool to reveal richer insights into consumers novelty perception in general.

Ultimately, our goal is to utilize theoretical and methodological advances from neuroscience to overcome previous limitations in exploring the cognitive mechanism that follows consumer perception of innovative products. More specifically, we centered our investigation on a choice-based fMRI experiment where 43 individuals viewed various innovative products. We linked the neurological findings to reaction times, choices and adoption behavior.

With our results, we aim at contributing to marketing and new product development literature on several fronts. First, we strive to contribute to innovation adoption literature by investigating the complex phenomenon of innovation perception using a novel methodological approach. In this way, we hope to reveal underpinning physiological and psychological processes of new product perception to stimulate fruitful discussions within the innovation adoption community. Second, we contribute to calls from Rogers (2003), who asked for a reconsideration of contemporary practices that focus on a limited set of product characteristics (adoption factors) to explain innovation adoption. Third, by acknowledging the multi-dimensionality of perceived product innovativeness, we hope to contribute to the long-lasting discussion among researchers (Garcia & Calantone, 2002; McNally, Cavusgil, & Calantone, 2010; Stock & Zacharias, 2013; Veryzer, 1998) about its conceptualization.

4.2 Conceptualization of Product Innovativeness

Recent publications in marketing and new product development question the widely acknowledged unidimensionality of product innovativeness (e.g., incremental – radical, continuous – discontinuous) and propose a multidimensional perspective (Garcia & Calantone, 2002; Stock & Zacharias, 2013; Szymanski et al., 2007). In detail, contemporary conceptualizations incorporate two dimensions; (I) one of them accounting for the perceived novelty of functional product characteristics and another (II) one for addressing perceived behavioral difficulties when using the innovation. For instance, Stock and Zacharias (2013) propose a multidimensional concept for innovativeness, comprising newness and meaningfulness as distinct dimensions to investigate product level innovativeness in B-to-B relationships. Similar, Calantone, Chan & Cui (2006), link innovativeness to product advantage and customer familiarity. By asking product-line managers to rate how their customers will perceive their product's advantage and familiarity, Calantone et al. (2006b) attempt to determine new product probability. McNally et al. (2010) present product advantage and customer discontinuity as dimensions of the products newness. They ask managers to rate their customers' perceptions of product advantage and customer discontinuity to determine product financial performance. Finally, Szymanski et al. (2007) concluded in their meta-analysis, that a multidimensional perspective consisting of newness and meaningfulness, provides a better indicator for product performance and success than a unidimensional perspective.

Despite underlying similarities in their dimensionality, past conceptualizations significantly differ in their unit of analysis (e.g., Industry, Firm, Product) and reciprocity i.e. Stock et al. (2014) see both dimensions as strongly interrelated. Calantone et al. (2006b) postulates overlaps between product advantage and innovativeness and familiarity and

innovativeness, but not between product advantage and familiarity) and perspective of perception (e.g., manager perceive and rate an innovation vs. manager rate as their customers might perceive their innovation). In particular, the fact that previous studies centered on a management perspective and its opinion on how customers might perceive the product, appears doubtful. In other words, "never ask a barber if you need a haircut" (Warren Buffett). From a more rational angle, managers, as part of the new product development process, acquire relevant knowledge; knowledge that is not available for consumers who first perceive an innovation after product launch. Hence the perception, as defined by the incongruity between sensory-detected information and memories, significantly differs between managers and consumers. The disparity in perception becomes evident as managers seem to systematically overestimate and consumers systematically underestimate the potential of new products; a concept commonly referred to as the pro-change bias (Ram & Sheth, 1989; Rogers, 2003 Talke & Heidenreich, 2014) that leads to commercial failure rates of up to 40% (Barczak, Griffin, & Kahn, 2009; Castellion & Markham, 2013; Lowe & Alpert, 2015). Hence, the fact that our current understanding of consumer innovation perception is mainly built on managers' indirect judgment is a questionable foundation (Danneels & Kleinschmidt, 2001; McNally et al., 2010; Rogers, 1976; Veryzer, 1998).

Building on previous conceptualization and taking their operational and measurement shortcomings into account, we view product innovativeness as a multidimensional construct combining functional and behavioral product innovativeness. Consequently, we define functional innovativeness as the degree of novelty of the innovation characteristics as perceived by the consumer, and we define behavioral innovativeness as the degree to which a consumer perceives physical and mental effort to be necessary for using the innovation. Central for our conceptualization is that we view both dimensions as an integral

component of an overall perception in which functional and behavioral innovation are not necessarily balanced (Stock & Zacharias, 2013), such that consumers might perceive a new product as being prevailingly functional or behaviorally innovative.

4.3 Cognitive Mechanism Underlying Perception of Product Innovativeness

Cognitively, perceived product innovativeness translates into the awareness of incongruity between sensory-detected, product-related information and previous knowledge (Rindova & Petkova, 2007). Knowledge refers to accumulated information that is coded in semantic and episodic memories. Semantic memories are of a declarative nature and comprise a vast variety of our daily information. Semantic memories store information about historical information, scientific facts, mathematical equations and language, also known as the factual knowledge about the world around us (Assaf, Calhoun, Kuzu, Kraut, Rivkin, Hart, & Pearlson, 2006; Binder & Desai, 2011). Individuals acquire declarative memories by learning. For instance, individuals have acquired semantic memories related to previously owned laptops. Those memories might contain numerical information about its CPU processor, its storage size and product weight. Episodic memories, on the other side, are procedural in nature and represent experiences gained from prior behaviors. More specifically, episodic memories consist of coded information which includes situation-specific information (environment and location), actors (objects and individuals), temporal (time (processual)), date (historical)) and Inter- and Intrapersonal information (feelings triggered by actions along the process) (Tulving, 2002; Zhang et al., 2013). Hence, compared to semantic memories, episodic memories not only provide attributable information about the actors, but also store contextual infor-

mation to reconstruct situations comprehensively. Continuing the laptop example, individuals recalling their last experiences when their laptop froze and they realized that their data was gone, mentally re-assemble various contextual experiences to recreate this particular episodic situation. Therefore, individuals are not only enabled to recall the location and time, the surrounding and their initial intention but also, yet attenuated, their feelings and perception similar to those that evolved during the happening.

Incongruity refers to a disparity between sensory information and semantic or episodic memories. Past research has linked perceptual incongruity to perceived product innovativeness. Rindova & Petkova (2007) argue that product newness induces incongruity and associates a high level of newness with great incongruity. Later empirical evidence from Jhang et al. (2012) supports this argument, as the authors show that individuals' level of perceived product innovativeness positively correlates with the degree of estimated incongruity. Simply detecting incongruity leaves individuals with the impression that a new product is different, weird, or incomprehensible (Rindova & Petkova, 2007; Selinger, Dahl, & Moreau, 2006). However, if individuals decide to make sense of the detected incongruity, they actively initiate cognitive mechanisms to assess the level of incongruity and ultimately, the new product's perceived product innovativeness. Cognitive mechanisms are routines to process information efficiently, thereby decreasing cognitive load. In the past, research has differentiated between two types of cognitive strategies: analytical and non-analytical approaches.

Analytical strategies rely on comparative mechanisms to calculate (numerical) disparity between object characteristics and factual knowledge stored in semantic memories. They incorporate heuristic strategies – rational, analytically comparisons – to determine

the level of incongruence between perceived information and semantic memories (Heidenreich & Kraemer, 2015; Ziamou & Ratneshwar, 2003). One particular analytical strategy is a mental comparison. Mental comparison mechanism has been widely acknowledged as underlying cognitive mechanism of consumer's perception. For instance, Wathieu & Bertini (2007) demonstrated that mental comparison mechanisms play a crucial role in determine price differences between new and existing products. Likewise, Ziamou & Ratneshwar (2003) proved that individuals utilized mental comparison heuristics to compare innovative to common product features. Finally, Heidenreich & Kraemer (2015) showed that mental comparison techniques are valuable for overcoming passive innovation resistance in the early stages of the adoption process. Hence, in our case, a consumer who perceives Apple's latest smartphone, the iPhone X, which offers an OLED screen that "rises to the standards of iPhone" with a 1,000,000 to 1 contrast ratio might trigger a cognitive comparison strategy to identify by how much it outperforms its predecessor the iPhone 8 Plus and its 1300:1 contrast ratio. Summing up, consumers who perceive functional innovative product attributes engage in analytical processes such as mental comparison to determine its degree of innovativeness.

Non-analytical strategies are based on contrasting qualitative differences between two entities, such as mental images from expected and previous experiences. One particular non-analytical approach that has repeatedly been applied to studying behavior in the context of marketing and consumer psychology is mental simulation. Central to mental simulation is that consumers begin to mentally project prospective behavioral sequences of using a product in specific scenarios (Dahl & Hoeffler, 2004; Heidenreich & Handrich 2014; Heidenreich & Kraemer, 2015a). Those hypothetical mental pictures assist consumers in anticipating product usage on multiple occasions when physical product trails are not available, or if future benefits, such as efficiency, are not instantly apparent,

as they only would unfold over time and usage (Dahl & Hoeffler, 2004; Feiereisen, Wong, & Broderick, 2008; Heidenreich & Kraemer, 2015a). Once prospective usage has been simulated, individuals contrast their fictive experience with experiences from familiar practices to determine the fit between both (Hess, 2009; Taylor & Schneider, 1989). Recently, Zhao, Hoeffler & Dahl (2009) showed that mental simulations help individuals to anticipate product usage and evaluate new products. Also, Phillips, Olson & Baumgartner (1995) found that product descriptions that ask individuals to imagine actions reduces the individuals' perception of uncertainty with using the product in the future. Feiereisen et al. (2008) demonstrated that imagining situations provides consumers with mental pictures, allowing them to better cope with new product unfamiliarity. Lastly, Heidenreich & Kraemer (2016) provide empirical evidence that mental simulations effectively reduce cognitive passive resistance in early stages of the adoption process. Hence, mental simulation approaches facilitate individuals in coping with unfamiliar consumption situations. Continuing the previous iPhone example, the newly introduced "Face ID" symbolizes such a disruptive unfamiliar consumption pattern. Compared to its predecessor, the "Touch ID", which offered the same functionality (to access the phone with biometric user identification securely), users are now required to face the front sensor instead of touching a finger sensor. To assess the incongruity the behavioral innovation induces, individuals imagine themselves using the product in daily life before contrasting their imaginary experiences with episodic memories. In conclusion, consumers who perceive behavioral innovativeness engage in non-analytical processes, such as mental comparison, to determine its degree of innovativeness.

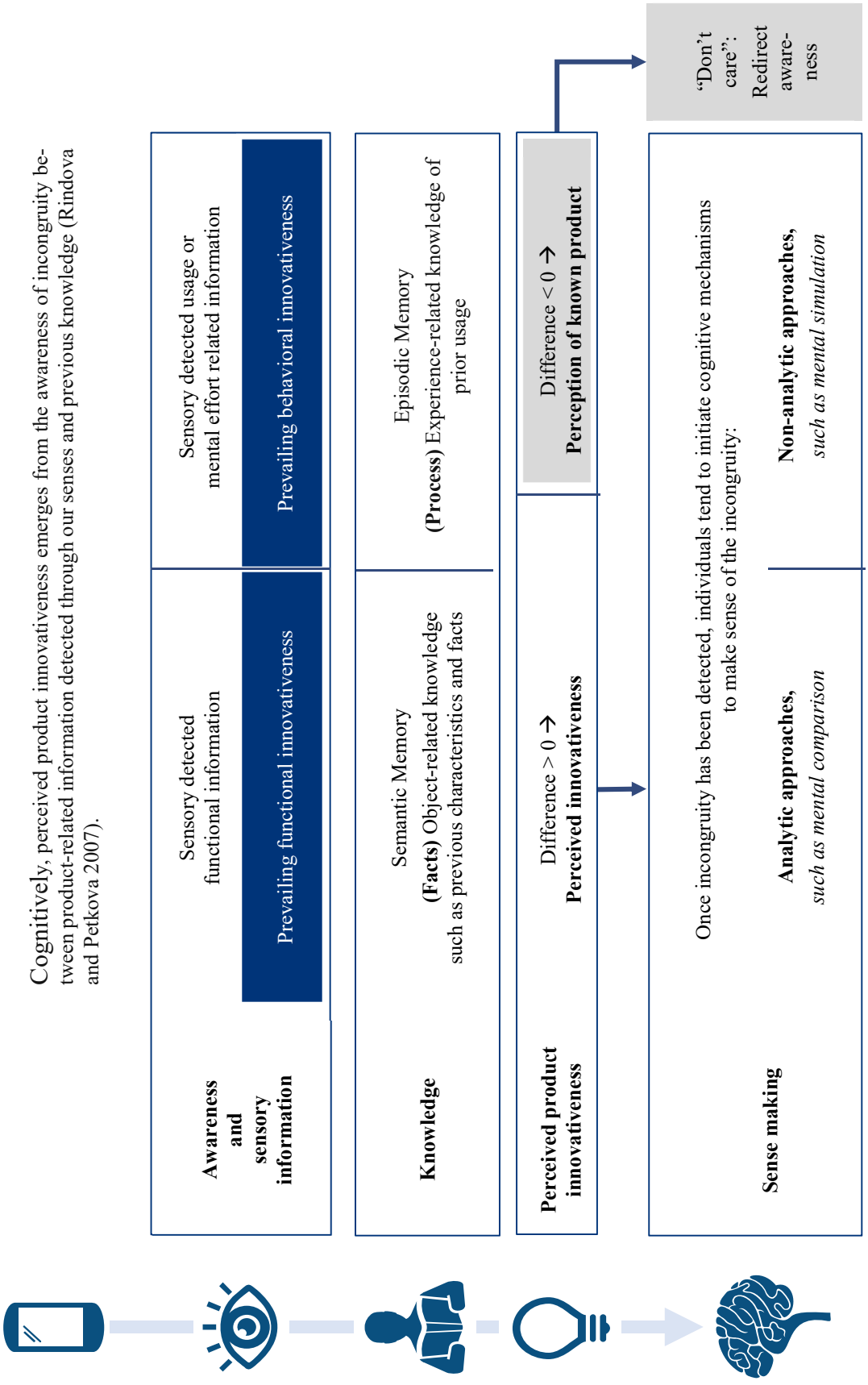
The choice of the cognitive approach is predominantly influenced by (I) single isolated product-inherent characteristics and (II) the order in which they are perceived. (I) As demonstrated by Olshavsky & Spreng (1996), consumers tend to focus on a single

product-inherent characteristic. Specifically, in their think-out-loud experiment, they found that participants repeatedly centered their reasoning around single product attributes, while fading out other characteristics. Olshavsky & Spreng (1996) further observe that participants determined the overall product innovativeness based on the level of the focal characteristic. They explain their finding with the complexity and amount of perceived impressions and the need to process both for evaluation when only limited cognitive resources are available. This is particularly interesting for our study, since we postulate that product innovation comprises two separate, but intertwined, dimensions. Following Olshavsky & Spreng's (1996) logic, attributes either relating to functional or behavioral innovation will receive initial attention and thus determine the course of subsequent cognitive evaluation processes. (II) Furthermore, individuals seem to weight their perception in the order by which they are perceived. In other words, individuals tend to overvalue the first impression and undervalue subsequent ones. Moreau et al. (2001) provide experimental evidence that the order in which product-related information, so-called product cues, are viewed, sets the course for the following evaluation strategies. Participants in their study consecutively viewed two categorizing ads of the same high-tech camera. Yet, the order in which the adds appeared varied between the participants. Although each participant saw both ads, they predominantly formed performance expectation and evaluation strategies corresponding to the first viewed advertisement. They concluded that the initial product cue plays a dominant role in the overall assessment of the innovation, while subsequent cues only marginally affect the overall assessment. Similar evidence is presented by Karmarkar et al. (2015). In their fMRI study, they demonstrated that the sequence of information predominantly influences the purchasing decision-making process. While being scanned, their participants first viewed either the product's

price or an image of the product followed by seeing a combination of both and a purchasing decision. Karmarkar et al. (2015) revealed that their manipulation triggers two different sets of neuronal activities and it leads participants to apply two different decision-making approaches and ultimately to change their purchasing behavior. Relating to our context, initially perceived product dimension significantly influences the overall cognitive approach to assess the level of innovativeness as it attenuates the other dimension.

In summary, depending on the initial sensory information when perceiving a new product, individuals either sense an attributional (functional) or usage-related (behavioral) incongruity. To overcome the incongruity, they engage in cognitive processes such as mental comparison or mental simulation strategies for deriving sense from perceptual information (figure 13).

Figure 13: The cognitive process of perceiving functionally and behaviorally innovative products



4.4 Neuronal Correlates for Processing Functional and Behavioral Innovations

Based on the assumption that the perception of functional and behavioral innovativeness trigger either analytical (mental comparison) or non-analytical (mental simulation) cognitive processes, there is substantial reason to believe that their corresponding neuronal activity discriminates too. Specifically, when looking at the underlying cognitive mechanism that supports each approach, diverging characteristics become apparent. While mental simulation comprises the prompt comparison of declarative information received from semantic memories and visual perception to quantify the perceived incongruity, mental simulation involves recalling and creating procedural experiences in which individuals interact with focal objects. Hence mental comparison and mental simulation diverge in their cognitive and corresponding neuronal involvement in the following dimensions: (1) information, (2) time and (3) processing (figure 14).

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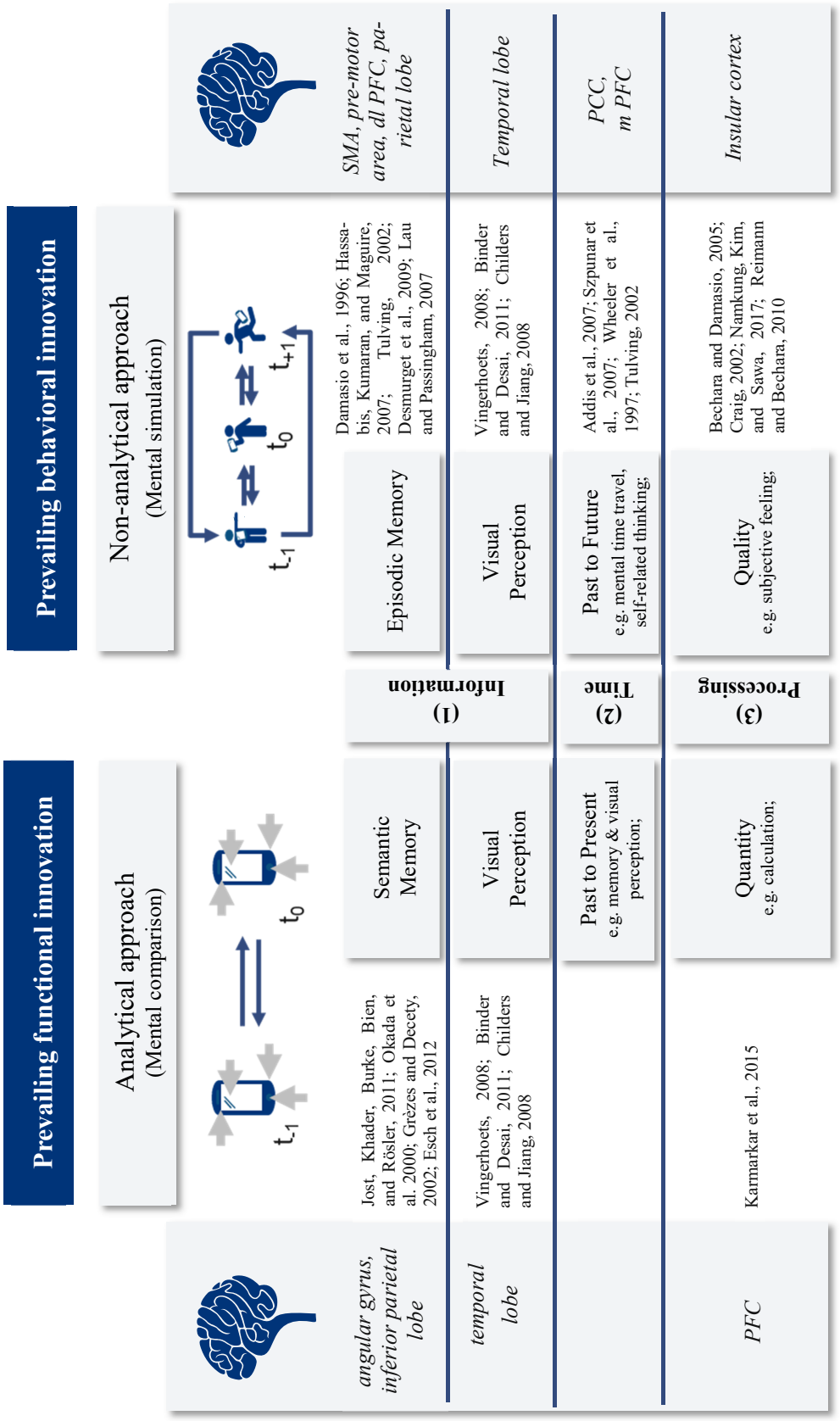
Figure 14: Differences in neuronal activations between perceiving functional and behavioral innovative products



(1) Mental comparison and simulation involve diverging information formats. Mental comparison is based on information from declarative, attribute-based knowledge stored as semantic memories and from (visually) perception. Semantic memories are stored across the parietal areas. Retrieval of object-related characteristics is associated explicitly with activations in the inferior parietal cortex and angular gyrus (Okada et al., 2000). For example, Esch, Möll, Schmitt, Elger, Neuhaus & Weber (2012) found that participants show stronger neuronal activity in the inferior parietal lobe when recalling declarative brand knowledge. Jost, Khader, Burke, Bien & Rösler (2011) identified the angular gyrus (in correspondence with the left inferior gyrus) in an event-related fMRI task to be involved in arithmetic fact retrieval. Lastly, Grèzes & Decety (2002) linked neurophysiological changes in the inferior regions of the parietal lobe to retrieving attributional information when perceiving familiar stimuli. Visual perception is widely linked to activations in the temporal lobe and a neuronal network called ventral stream (also referred to as the "what pathway"); a network responsible for visual object identification and recognition. Particularly, as found by Vingerhoets (2008), individuals activate the inferior temporal lobe during intensive inspection of novel and infrequently used tools. Furthermore, the ventral stream is associated with the recall of semantic memories in a way that individuals view concrete representations of objects in front of the inner eye (Binder & Desai, 2011; Childers & Jiang, 2008). Ganis, Thompson & Kosslyn (2004) for instance, showed in their fMRI experiment that participants, when viewing objects in one condition and imagining similar objects during the other, activate congruent neuronal activities. They reason that the similarities in neuronal patterns are attributional to the similarity between the involved neurological mechanism of actually viewing object characteristics or recalling object-related information in front of the inner eye.

In contrast, mental simulation is based on procedural information from recalled and imagined behavior. Thinking about past and future actions involves a sensory-perceptual network that is inherent to activation of the frontal (here mainly in the Supplementary Motor Area, the Premotor Area and Dorsolateral Prefrontal Cortex) and the parietal lobe (mainly posterior regions) (Damasio et al., 1996; Hassabis, Kumaran, & Maguire, 2007; Tulving, 2002). Particularly, the sensory-perceptual network has shown involvement in perceiving action-inducing stimuli (Desmurget, Reilly, Richard, Szathmari, Mottolese, & Sirigu, 2009; Lau & Passingham, 2007). For instance, evidence from language research fMRI studies demonstrates that processing action-related verbs activates correlates associated with executing and planning corresponding actions (Binder & Desai, 2011; Kiefer & Pulvermüller, 2012). Hauk, Johnsrude & Pulvermüller (2004) showed that reading motor-related words (e.g., kick; pick; lick) actually provoked hemodynamic changes in motor cortex responsible for the distinct body parts (foot; hand; tongue). A similar perception-to-activation link has been found for viewing tools. As summarized by Lewis (2006), his meta analytical findings show that viewing tools, unlike viewing other stimuli, such as living objects (e.g. animals), provoke cognitive mechanisms associated with tool conceptualization and utilization, which are both rooted in sensory-perceptual neuronal activity (Lewis, 2006).

(2) Mental comparison and simulation factor in different temporal perspectives. While both approaches share retrospective information, only mental simulation involves prospective information. Imagining prospective information is a complex and effortful process as it requires input from several cortices (D'Argembeau, Cassol, Phillips, Balteau, Salmon, & van der Linden, 2014; Johnson et al., 1988; McDonough & Gallo, 2010). Hassabis et al. (2007) investigated the differences between imagining and recalling scenarios. They found, among other findings, that imagining future scenarios simultaneously

activates the posterior cingulate cortex and medial areas of the prefrontal cortex. Their finding is in line with contemporary research which considers both regions as "hub" regions for enriching episodic memories with self-referential processes such as self-relevant future thinking (Addis, Wong, & Schacter, 2007; Szpunar et al., 2007) and mental time travel (Wheeler et al., 1997; Tulving, 2002). Additional evidence for distinct brain activation for imagining future actions is provided by Wadsworth & Kana (2011). In their fMRI study, they revealed stronger activation of the SMA, a correlate associated with body movement, during trails for imagining object usage relative to viewing objects. Wadsworth & Kana (2011) reason, that imagining usage actively involves individuals in mentally interacting with the object, while viewing it leads to passively remembering prior usage. Furthermore, Kellenbach, Brett, & Patterson (2003) demonstrate that the Interparietal sulcus (specific region within the parietal lobe) is activated when individuals imagine manipulating an object in space (picking it up and using it). All in all, comprehensive evidence suggests that mentally imagining or simulating product usage triggers sensory-perceptual correlates in the prefrontal, parietal and temporal lobe.

(3) Mental comparison and mental simulation are both triggered by perceived incongruity and share the same objective: making sense of the incongruity. Mental comparison attempts to make sense of the incongruity by quantifying the difference between perceptual information and declarative memories. Cognitive attempts to solve equations has been linked to neuronal activity in the prefrontal cortex. Recent work by Karmarkar et al. (2015) found that the level of activation in the medial prefrontal cortex is related to the type and sequence of given information. More specifically, they show that the strongest activation in the medial prefrontal cortex occurs when individuals view numerical information (e.g., price) compared to visual information (e.g., product image). They presume that higher activation in the prefrontal cortex has been provoked by participant's

cognitive engagement to estimate whether or not the product is worth the advertised price. Hence, mental comparison results in a quantification of incongruity between past and present declarative knowledge. Contrary to mental comparison, mental simulation is based on contrasting prior and imagined experiences. As experiences are accumulated actions in space and time, they are difficult to quantify. Instead, mental simulation contrasts past and current experiences with those anticipated from future scenarios. Therefore, behavioral differences between both experiences become apparent, such as product handling and usage, which results in subjective feelings. Recent advances in cognitive neuroscience view the insula central for subjective feeling states as several authors have linked it to the concept of interoception. Interoception captures the state of "being", which allows individuals to be aware of their physical selves while interacting with their surroundings (Bechara & Damasio, 2005; Craig, 2002; Namkung, Kim, & Sawa, 2017; Reimann & Bechara, 2010). Therefore, awareness refers to the feeling of oneself as a sentient being, as well as to conceiving feelings and emotions from interactions and their consequences (Craig, 2002). Thus, mental simulation derives sense of the incongruity by estimating behavioral differences between past to present behaviors and future behaviors, resulting in subjective feeling states.

Undoubtedly, due to the exploratory nature of our research endeavor, implying neuronal findings based on past evidence is prone to reverse inferencing. However, based on pertinent empirical and observational evidence from prior neuroscience studies, we are assured to propose qualitative (different neuronal activation patterns) difference between perceiving functional and behavioral innovativeness.

P1: The neurological activation patterns of perceiving functional and behavioral innovativeness differ.

P1 a: The neurological activation pattern of perceiving functional innovativeness comprises brain areas associated with cognitive mechanisms for semantic memory retrieval, visual perception and arithmetic comparison.

P1 b: The neurological activation pattern of perceiving behavioral innovativeness comprises brain areas associated with cognitive mechanism for recalling and imagining actions, self-related thinking and subjective feeling.

4.5 Experimental Methods

Participants. Forty-four individuals participated in the main study (50% female; ages ranging from 25 to 67 with a M_{age} of 37.4 years) in exchange for monetary compensation (50€ Amazon voucher) and a copy of their anatomical brain scan. One participant was excluded from the analysis due to excessive head motion. The data collection happened between June and August 2016 in Germany.

Overview Experimental Procedure. After arrival, an instructor welcomed the participants and explained the procedure. Before beginning with the study, we asked the participants for their medical eligibility and prescreened them for fMRI safety issues (no medical implants, metal piercings or medical problems). Following a positive evaluation, the experiment started. First, participants watched standardized video sequences of ten electronic products (4 non-innovative and 6 innovative products; appendix III.8) showing

general product information (30 sec.) and a demonstration of the product's key features (30 sec.) in pseudo-randomized order. Next, we made the participants experience the weight of each product by handing them over for testing. Second, we asked the participants to take a survey, containing validated scales from innovation adoption and consumer psychology. Third, before entering the fMRI scanner, we outlined the fMRI procedure in detail. More specifically, we taught each individual the experimental tasks and provided a similar computer program for practice. Once the participants felt familiarized with the experimental tasks, we acquainted them with the clinical environment and placed them inside a full-body 3.0 Tesla Siemens Magnetom scanner. Subsequently, we handed them two controllers and mounted a 12-channel matrix head coil on top. After checking the auditory communication between the participant laying inside the fMRI scanner and the instructor, the experiment began. At the end of the experiment, individuals were debriefed, offered answers to their questions, thanked and dismissed.

fMRI Task. The experimental fMRI task is operationalized by three extensively pretested blank abstract icons to avoid spurious neuronal activations being provoked by viewing colors, shapes or reading text instructions. The representing icons are: (I) A light bulb icon operationalizing functional innovativeness by triggering the question "From your perspective, which product offers more innovative functionality?". Similar, (II) a clapperboard icon operationalized behavioral innovativeness by inducing the question "From your perspective, which product is more difficult to use?" and (III) a weight icon operationalizing the baseline condition by implying the question "From your perspective, which product is heavier?". (Note: We modeled the baseline condition, similar to the innovative conditions, to be related to the product. However, we intended to use a baseline condition which evokes a basic, simple and thus, effortless, cognitive process (such as

simple numerical weight comparison).) During the scanning, each participant underwent a pseudo-randomized event-related procedure.

Between the trials, participants viewed a blank square for fixation placed in the center of the screen. These inter-trial-intervals (ITI) have been once defined using Gaussian distributed time spans (mean: 5 sec., SD: 1 sec) in respect to best fitting the hemodynamic response dynamics (Amaro & Barker, 2006). After each ITI, one of three experimental task icons (lightbulb, clapperboard, weight icon) appeared in the center of the screen. A half sec. later, two pseudo-randomly selected products appeared on the right and left side of the screen for three sec. To avoid incidental neurological effects by provoking colors and shapes, we manipulated the pictures using a filter to remove color and create clear boundaries of the product images. With the appearance of the products, participants chose one of the products by pressing either the controller in their left or right hand. Their given choice was displayed as feedback on the screen for one second before the visuals vanished and a blank square for fixation appeared during ITI. Each trail showed a pair of experimental stimuli (either one of two non-innovative products or one of six innovative products) to a baseline product (one of two non-innovative baseline products). Every possible combination appeared 24 times per experimental task, leading to a total of 384 trails. With a mean duration of 8 sec (SD 1 sec) per trail, the total time for obtaining functional images summed up to 51.3 min. To provide rest for the subjects, we divided the term into two runs. In-between both runs, we obtained the anatomical images which required the subjects to remain relaxed for 6 minutes in the fMRI scanner (for more information about the fMRI task please view appendix III.5 and appendix III.7).

fMRI Acquisition and Analysis. Images were acquired with a full-body 3.0 Tesla Siemens Magnetom scanner using a 12-channel head coil at (see appendix III.6 for full

description of fMRI scanning parameters). We preprocessed the fMRI data as suggested by Dimoka (2012). Using SPM12 (http://www.fil.ion.ucl.ac.uk/spm) for the analysis, we first corrected the data for slice time artifacts before we realigned and co-registered it to the participant's T1 image. Next, we normalized all functional and anatomical images into a standard stereotaxic space with MNI (Montreal Neurological Institute) coordinates. Finally, we smoothed the fMRI images by convolving them with a Gaussian kernel of 8 x 8 x 8 mm full width at half maximum (FWHM).

Following recommendations from Eklund, Nichols & Knutsson (2016) and Woo, Krishnan & Wager (2014), we used a considerably liberal threshold for the whole-brain results at $p<.05$ (FWE corrected for multiple comparison) to identify significant spatial areas of 10 contiguous voxels (2x2x2 mm brain activation). For the subsequent analysis, we extracted the T-scores of each cluster by forming spheres of 5 mm radius around the peak activation MNI coordinate. The whole-brain analysis was performed using a general linear model (GLM) to analyze the blood oxygenation level dependent (BOLD) response using the experimental tasks as regressors.

Correlations Analysis. We applied PLS-SEM (SmartPLS 2.0) to estimate the correlation between functional and behavioral innovativeness and its neuronal correlates. Compared to commonly used Pearson correlations, PLS-SEM offers the advantage to simultaneously estimate numerous interrelations between a multitude of constructs, to control for measurement errors, and to offer prevailing options to evaluate measurement validity and reliability (Steenkamp & Baumgartner, 2000). The independent variables, perceived functional innovativeness ("The product has unique features"; "The features of the product are innovative"; "The product can be described as revolutionary") and perceived behavioral innovativeness ("To use the product, the consumer has to change

his/her usage behavior"; "The user has to change his/her behavior pattern to use the product"; "The usage of the product requires a certain behavioral adjustment") were measured using a three-item, seven-point scale anchored by "strongly disagree/ strongly agree". The dependent variable, the neuronal correlates, are beta values (coefficient derived from the General Linear Model (GLM) representing the explained variance for a given contrast in a given space) extracted from a 5 mm sphere modeled around each peak activation. Finally, we considered the participant's age, gender and education as control variables. We applied a path weighting scheme to estimate the model parameters. Subsequently, we configured no sign change with mean replacement for the nonparametric bootstrapping procedure with 1000 replications to calculate the model's standard errors. (Chin, 2010).

4.6 Results

Behavioral Response Manipulation Check. We compared the individuals' choices (384 events x 43 participants = 16512 choices) made during the fMRI scanning with the experimental condition. In the functional and behavioral innovativeness condition, individuals choose innovations relatively more often than the baseline products ($Condition_{FI}$ 95% with 4128 [Choices in favor of innovative products] > 196 [Choices in favor of baseline products]; $Condition_{BI}$ 67% with 2770 > 1358). In contrast, in the baseline condition, individuals choose baseline products over innovative products more often ($Condition_{Weight}$ 93% with 275 [Choices in favor of innovative products] < 2853 [Choices in favor of baseline products]).

Next, we calculated the latent variable scores for perceived functional and behavioral innovativeness for the innovative and non-innovative products using SmartPLS 2.0.

Subsequently, we applied an independent-samples t-test which indicated that reported scores for functional and behavioral innovativeness were significantly higher for innovative products ($M_{FI} = 4.65$, $SD_{FI} = 1.83$; $M_{BI} = 4.03$, $SD_{BI} = 1.79$) than for baseline products ($M_{baseline} = 1.18$, $SD_{baseline} = .67$, $t(343) = -17.18$, $p < .001$).

Further, we compared the reaction times (RT) in milliseconds (ms) between the conditions using a PostHoc test with Bonferroni correction to account for multiple comparisons. The RT was measured as the time interval between the appearance of the products and the button press during the choice phase. The results show a statistically significant difference between the conditions ($F(2, 16425) = 443.05$, $p = .0.01$). In particular, the individuals RT were significantly higher in the behavioral condition (M_{BI} = 1744 ms; SD_{BI} = 474 ms, $p > 0.001$) compared to the functional innovation (M_{FI} = 1544 ms; SD_{FI} =410 ms, $p > 0.001$) decision and to the weight condition (M_{weight} = 1526 ms; SD_{weight} =386 ms, $p > 0.001$). In contrast, the RT comparison between the functional innovation condition and the weight condition showed only marginal significant difference ($p > 0.1$). Results from the RT Analysis provide initial evidence for cognitive differences between the conditions. In particular, the results demonstrate a greater difference between the behavioral and the baseline condition compared to the difference between functional innovativeness and the baseline condition. Similarly, the results indicate a substantial difference between the behavioral and functional innovativeness condition (appendix III.1).

Results from Functional Neuroimaging. Anatomic correlates have been labeled according to their peak activation MNI coordinates of the whole-brain analysis using a triangulated process involving SPM Anatomy toolbox (Eickhoff, Stephan, Mohlberg, Grefkes, Fink, Amunts, & Zilles, 2005; Eickhoff et al., 2005), the neurosynth database (Yarkoni, Poldrack, Nichols, van Essen, & Wagner, 2011) and expert discussions. To isolate relevant neuronal correlates for functional and behavioral innovativeness, we used varying regressors in the GLM to contrast between our experimental contrast systematically. We started off contrasting the experimental condition using the innovative products with the baseline condition to reveal main neuronal correlates for behavioral and functional innovativeness. Next, we subtracted the functional from the behavioral condition (and vice versa) while considering only the innovative products to uncover significant differences in their neuronal activity (appendix III.2).

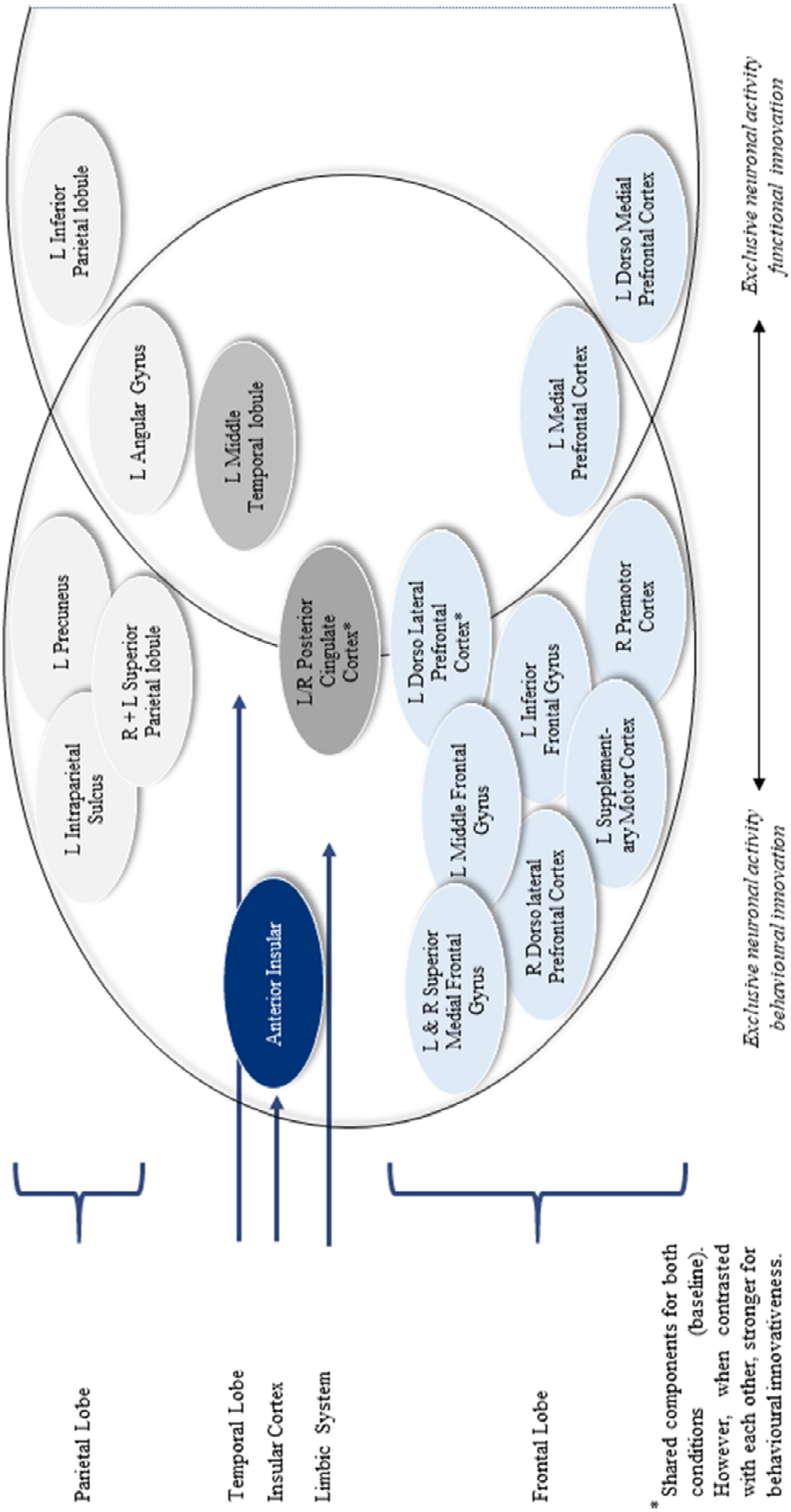
Neuronal Findings for Functional Innovativeness. Results revealed greater activity for functional innovative products compared to the baseline condition for the functional innovativeness condition in the *prefrontal lobe* (L medial prefrontal cortex, $t(42) = 6.21$, $p < 0.001$; L dorsomedial prefrontal cortex, $t(42) = 5.89$, $p < 0.001$; L medial prefrontal cortex, $t(42) = 4.83$, $p < 0.001$) the *parietal lobe* (L inferior parietal lobule, $t(42) = 4.85$, $p < 0.05$; L angular gyrus, $t(42) = 4.80$, $p < 0.001$) as well as in the *temporal lobe* (L middle temporal lobule, $t(42) = 4.85$, $p < 0.05$) and *limbic system* (L posterior cingulate cortex, $t(42) = 4.66$, $p < 0.05$).

Neuronal Findings for Behavioral Innovativeness. The analysis indicated greater neuronal activity between innovative products and the baseline condition for the behavioral innovativeness condition in the *prefrontal lobe* (L supplementary motor cortex, $t(42) = 9.63$, $p < 0.001$; L medial prefrontal cortex, $t(42) = 6.26$, $p < 0.001$; L dorsolateral

prefrontal cortex, $t(42) = 8.32$, $p < 0.001$; R dorsolateral prefrontal cortex, $t(42) = 4.87$, $p < 0.05$; R premotor cortex, $t(42) = 4.74$, $p < 0.01$) the *parietal lobe* (L superior parietal lobule, $t(42) = 8.15$, $p < 0.001$; L angular gyrus, $t(42) = 7.26$, $p < 0.001$; R superior parietal lobule, $t(42) = 5.87$, $p < 0.001$; L precuneus, $t(42) = 5.92$, $p < 0.001$) the *temporal lobe* (L middle temporal lobule, $t(42) = 6.62$, $p < 0.001$) as well as in the *limbic system* (L posterior cingulate cortex, $t(42) = 6.79$, $p < 0.001$) and in the *insular cortex* (R Anterior Insula, $t(42) = 8.08$, $p < 0.001$; L Anterior Insula, $t(42) = 7.88$, $p < 0.001$).

Neuronal Findings for Differences Between Functional and Behavioral Innovativeness. Contrasting BOLD activity between the functional and the behavioral condition when viewing innovative products revealed no significant differences. However, contrasting behavioral and functional innovativeness showed differences in the *prefrontal lobe* (L supplementary motor cortex, $t(42) = 7.06$, $p < 0.001$; L dorsolateral prefrontal cortex, $t(42) = 6.37$, $p < 0.001$; L inferior frontal gyrus, $t(42) = 4.99$, $p < 0.001$) the *parietal lobe* (L intraparietal sulcus, $t(42) = 6.19$, $p < 0.001$; L precuneus, $t(42) = 4.59$, $p < 0.05$) as well as in the *limbic system* (L posterior cingulate cortex, $t(42) = 4.74$, $p < 0.05$) and in the *insular cortex* (L Anterior Insula, $t(42) = 6.08$, $p < 0.001$; R Anterior Insula, $t(42) = 5.98$, $p < 0.001$) (for on simplified overview please see figure 15).

Figure 15: Differences in neuronal activity between the experimental conditions



Results from Correlation Analysis. We applied PLS-SEM to test the correlation between the self-reported measures (perceived functional and behavioral innovativeness) and its corresponding neuronal results (beta coefficients extracted from ROIs). In contrast to common (Pearson) correlations, analysis between survey and fMRI data, we decide to choose PLS-SEM because it allowed us to simultaneous test multiple relationships of one IV and numerous DVs and thus to account for a neuronal network effect. In particular, we examined the path coefficients and their significance levels using SmartPLS 2.0 (Ringle et al., 2005) (to view a summary of the results, please view appendix III.3). Concerning neuronal results of functional innovativeness (vs. baseline) only one of seven path coefficients showed a significant effect (FI → *L Middle Temporal Lobule*, $\beta = 0.149$; $p < .01$). In contrast, in the neuronal activations for behavioral innovativeness (vs. baseline), fourteen out of sixteen path coefficients revealed significant effects. The greatest effects were BI → L Anterior Insula ($\beta = 0.322$; $p < .001$), BI → L Angular Gyrus ($\beta = 0.274$; $p < .001$) and BI → L Superior Parietal Lobule ($\beta = 0.234$; $p < .001$). The direct comparison between functional innovativeness and behavioral innovativeness indicated that all eleven path coefficients for behavioral innovativeness were significant. Again, BI → L Anterior Insula, $\beta = 0.334$ $p < .001$, BI → L Anterior Insula, $\beta = 0.206$ $p < .001$ and BI → L Intraparietal Sulcus, $\beta = 0.246$ $p < .01$ showed the strongest effect sizes.

Results Interpretation Based on Meta-Analyses. The exploratory nature of this research makes it prone to controversially discussed reverse-inferring (Karmarkar & Plassmann, 2017; Poldrack, 2011). In other words, it appears tempting to conclude from neuronal activations to variations in psychological measures. To deal with this temptation, we followed recommendations from Poldrack (2011), who suggested viewing the posterior probability of a region of interest before postulating inferences. One way to receive posterior probability is to conduct a meta-analysis using the neurosynth.org database

(Yarkoni et al., 2011). In particular, we searched for past psychological and physiological associations linked to our peak activation coordinates in the neurosynth.org database (Yarkoni et al., 2011). First, we extracted associated terms and their corresponding *z*-scores (i.e., the likelihood that a term is used in a study given the presence of reported activation) as well as their posterior probability (i.e., the estimated probability of a term being used given the presence of activation) (Yarkoni et al., 2011)). Second, we used the same coordinates to search for related previous studies manually. This time we allowed a spherical radius of 2 mm around the peak activation to identify studies with similar neurological findings (appendix III.4 lists the findings of the meta-analysis)

Based on the meta-analysis results, peak activations for functional innovativeness (functional innovativeness > baseline) have been related to s*emantic memory retrieval* (memory - L angular gyrus, semantic - L temporal lobe, semantic - L medial prefrontal cortex), visual perception (recognition – L inferior parietal lobe) and *higher order processesing* (Coprehension – L dorsomedial prefrontal cortex, thinking – L posterior Cingulate Cortex). Taken together, the peak activations for functional innovativeness cohesively point toward a strong involvement of cognitive mechanisms constituting to mental comparison. In contrast, we identified correlates for behavioral innovativeness (contrast: behavioral innovativeness > baseline; innovative products) which have been linked to *semantic* (memory retrieval – L angualr gyrus, memory – L dorsolateral prefrontal cortex) and *episodic memory retrieval* (memory retrieval – L posterior cingulate cortex, episodic memory - L superior parietal lobule, encoding retrieval – L precuneus), *visio-spatial processing* (spatial – L Premotor Cortex, visual word – L middle temporal lobule, retrieval – L supplementary motor cortex, target detection – R dorolateral prefrontal cortex) and *self reflected processing* (self – R superioir parietal lobule, self referential - L medial prefrontal cortex) as well as *behavioral inhibition* (Stop signal – R Anterior

Insula, response inhibition – L Anterior Insula). Taken together, results from the meta-analysis give reason to speculate that perceiving functional and behavioral innovativeness might, on the one side, activate shared cognitive processes (e.g. retrieving semantic memories) and on the other side, trigger distinct (e.g. behavioral inhibition for behavioral but not for functional innovativeness) cognitive processes.

4.7 Discussion

Our findings confirm the initial preposition that consumers engage in diverging cognitive mechanisms when perceiving products with novel characteristics (functional innovativeness) and products that require physical and mental effort for usage (behavioral innovativeness). The differences are mirrored in diverging neuronal activation patterns. Functional innovativeness triggered a neuronal pattern involving regions of the frontal, parietal and temporal lobe all of which contribute to cognitive mechanisms for semantic memory retrieval, visual perception and arithmetic comparison. Behavioral innovativeness, in contrast, predominantly triggered a neuronal pattern involving regions of the frontal and parietal lobe, as well as the insular cortex, all of which contribute to cognitive mechanism for recalling and imagining actions, self-related thinking and subjective feeling. Hence our results confirm our preposition 1, 1a and 1b. When contrasting behavioral innovativeness against functional innovativeness, several brain areas, including the insular cortex, frontal and parietal lobe survived. More interestingly, when contrasting vice versa, we saw no distinct neuronal correlates for perceiving functional innovativeness. This difference suggests that perceiving behavioral innovativeness evokes greater brain activity. Additionally we observed significantly longer response times during behavioral innovativeness trails compared to the functional innovativeness and baseline condition,

further suggesting that individuals deployed greater neuronal and cognitive effort (Reimann et al., 2012b). Hence, our results confirm preposition 2.

Jointly, these findings suggest that (1) the neuronal activation of both experimental conditions greatly overlap in a way that perceiving behavioral innovations includes similar, yet stronger neurological activation in shared areas and that (2) behavioral innovations triggers additional, distinct brain areas.

(1) Among the shared areas are the parietal and temporal cortex. The parietal and temporal lobe are predominantly involved in neuronal processing of vision and actions. According to the two-streams hypothesis (Chen, Nelson, & Hsu, 2015; Goodale & Milner, 1992), the parietal and temporal cortexes are essential components of the ventral stream; a neuronal network for visual perception and recognition and the dorsal stream; a neuronal network for visually guided behavior and motor imaginary. This network, also including the SMA, is particularly involved in perceiving and imagining object-directed actions (Helbig, Graf, & Kiefer, 2006). Hence, shared brain activation is not necessarily indicative for similar cognitive mechanisms. Instead, the parietal and temporal lobe might serve – as a part of the ventral visual stream – to perceive and identify an object during the functional innovativeness condition, while the same correlate – as part of the dorsal visual stream – might serve to perceive and imagine object-directed action during the perception of behavioral innovativeness. Further evidence from the structural equation model analysis supports this notion. Here we saw switching path coefficient signs between self-reported measures and neuronal activation. More specifically, the analysis showed a positive and significant effect of the self-reported functional innovativeness measure and the neuronal activation drawn from the temporal lobe during the functional innovation condition. More interestingly, we saw a negative and significant effect for the

self-reported behavioral innovativeness on the temporal lobe activation drawn from the same functional condition while we saw a positive and significant effect of the same self-reported measure on the neuronal activation drawn from behavioral innovation condition. Although both experimental conditions provoked overlapping neurological activation, the additional data analysis still confirms our initial assumption that the underlying cognitive mechanisms differ.

(2) Distinct areas for perceiving behavioral innovativeness are the Precuneus, Superior parietal regions (Intraparietal Sulcus), several lateral regions of the prefrontal cortex extending dorsal and activation of the insular cortex. Previous functional imaging studies implicate the precuneus specifically in representational aspects of responding to unfamiliar, novel activity-inducing stimuli. For instance, Precuneus activity has been reported in encoding and retrieval of (imagined) visio-spatial interactions with objects (Hassabis et al., 2007) the automated processing of visio-spatial representation of possible hand-tool interactions upon perception (Vingerhoets, 2008) and novelty perception (Zhang et al., 2013). The intraparietal sulcus has been shown to have a strong association with several cognitive mechanisms necessary for behavioral interaction with objects. For instance, recent neuroimaging studies have related the intraparietal sulcus to the integration of visual-spatial information with experiential knowledge of object use (Mruczek, Von Loga, & Kastner, 2013) coping with atypical tool usage (Wakusawa, Sugiura, Sassa, Jeong, Yomogida, Horie, & Kawashima, 2015) and planning and executing of pantomimic tool usage (Vingerhoets, Vandekerckhove, Honoré, Vandemaele, & Achten, 2011).

Nevertheless, especially the insular cortex seems interesting, as the neuronal activation is not only exclusive to the behavioral innovativeness condition but also showed

by far the highest path coefficients with self-reported measures. Both results are congruent with recent advances in cognitive neuroscience, which view the Anterior Insula central for interoception; a concept capturing the state of "being" which allows individuals to be aware of their physical selves while interacting with their surroundings (Bechara & Damasio, 2005; Craig, 2002; Namkung, et al., 2017; Reimann & Bechara, 2010). Therefore, awareness refers to the feeling of oneself as a sentient being, as well as to conceiving feelings and emotions from actions and their consequences (Craig, 2002). In the context of our study, interoception is particularly interesting, as it is essential for maintaining homeostasis; an inherent physiological mechanism of our visceral system to prevent change and restore the status quo (Bechara & Damasio, 2005; Craig, 2002; Reimann & Bechara, 2010; Reimann, Castaño, Zaichkowsky, & Bechara, 2012a). When somatosensory information indicates a potential threat to homeostasis, the Anterior Insula induces subjective feelings such as pain to motivate corresponding withdrawal behavior to defend changes to homeostasis and to ultimately maintain the status quo.

Similar to the physiological concept of homeostasis, individuals have an inherent psychological tendency to maintain equilibrium (Osgood & Tannenbaum, 1955). Any stimuli that might provoke change to the psychological equilibrium is considered a potential threat and elicits negative reactions. Recently, Heidenreich & Kraemer (2015a) found that the tendency to maintain the psychological status quo inhibits individuals in engaging in further assessment of innovation and ultimately contributes to new product resistance. Additionally, they also found that resistance increases with the perceived level of product innovativeness. Further evidence is provided by Heidenreich & Spieth (2013) who revealed that perceived threats to the psychological equilibrium negatively influence subsequent product evaluation. Nevertheless, contrary to previous findings, which postu-

lated that innovations per se represent a threat to the psychological equilibrium, we exclusively saw activation of the Anterior Insula during the behavioral innovation condition. This suggests that it is mainly behavioral innovations that represent a threat to homeostasis or the psychological equilibrium as individuals anticipate the necessity to learn new behavioral procedures and to change their daily routines and usage patterns. Functional innovativeness, however, did not involve the Anterior Insula. This finding might explain that cognitive processes necessary for perceiving functional innovativeness do not involve the projection of future actions and the anticipation of their consequences for the individual.

Surprisingly, neurological and psychological results suggest a predominant role of the Anterior Insula in perceiving behavioral innovativeness and in motivating defensive behavior to maintain homeostasis. However, contrary to our expectations, we did not find a significant effect of the individual's self-rated behavioral innovativeness and their rejection behavior. The ambiguous findings led to speculation that the activation of the Anterior Insula might be a necessary factor in explaining this link. Previous studies confirm that the Anterior Insula crucially influences motivation to engage in behavior (Craig, 2002; Naqvi & Bechara, 2009; Reimann et al., 2012a; Weller, Levin, Shiv, & Bechara, 2009). Specifically, the Anterior Insula encodes rewarding and punishing values from stimuli perception by evaluating the stimuli-eliciting subjective feeling states. Therefore, rewarding stimuli evoke feelings of pleasure, motivating pro-active behavior, whereas punishing stimuli evoke feelings of pain, resulting in aversive behavior (Namkung et al., 2017). Hence, to further investigate the underlying cognitive mechanism of behavioral innovativeness, one might test the role of the Anterior Insula in perceiving behaviorally innovative products.

In conclusion, we show that consumers perceive functional and behavioral innovativeness with two distinct neuronal activation patterns that are representative for distinct cognitive mechanisms. Therefore, our findings provide unique insights to facilitate a better understanding of mental processes behind new product perception.

4.8 Implications for Theory

Essay III offers three implications. Firstly, evidence from our fMRI experiment demonstrates that the perception of innovativeness dimensions, functional and behavioral innovativeness, leads to distinct neuronal patterns. Building on the assumption that neuronal activities are affiliated with cognitive mechanisms, our results further suggest that functional innovativeness triggers cognitive mechanisms essential for mental comparison strategies, and that behavioral innovativeness initiates cognitive mechanisms constituting mental simulation strategies. Our results extend current belief in innovation literature (Zhao, Hoeffler, & Dahl, 2012) that an increase in product innovativeness translates into a greater cognitive effort. Our results rather suggest that it is not the level of innovativeness per se that demands increasing cognitive effort: instead, depending on the predominant perceptual innovativeness dimension, individuals devote more (mental stimulation) or less (mental comparison) to solving the incongruity. Admittedly, some authors consider design-related components (e.g., visual aesthetics, functionality, and symbolism (Homburg, Schwemmle, & Kuehnl, 2015) as a distinct dimension of innovativeness (Rindova & Petkova, 2007; Verganti, 2008).

Secondly, along with our exploratory analysis, the anterior insula repeatedly showed the most robust activation relative to other brain regions. The activation occurred predominantly during the behavioral innovativeness condition. Additionally, the analysis

identified the anterior insula as being most sensitive to increasing perceived behavioral innovativeness. Hence we decided to investigate further the role of the anterior insula in perceiving behavioral innovativeness and found that its activation is essential in explaining subsequent rejection behavior. Admittedly, we did not find such an effect for perceiving functional innovation. The unique role of the anterior insula in perceiving behavioral innovativeness might be explained by the fact that, unlike when perceiving functional innovativeness, a cognitive mechanism is initiated wherein one views oneself interacting within an imaginary environment and receiving 'as if' emotional feedback from those interactions. This concept, also called interoception, has recently attracted the interest of several scientists as it is responsible for maintaining homeostasis. Sensed changes to homeostasis are contemplated as threats entailing physical, emotional, or cognitive measures to counteract changes and to return to the status quo. Our findings contribute to this stream of literature by offering reasons to believe that anticipating psychological threats, like physical threats, is similarly mirrored in the anterior insula and motivates comparable withdrawal behavior.

Thirdly, we also contribute to the growing literature stream on innovation resistance (Claudy et al., 2015; Gourville, 2005; Heidenreich & Kraemer, 2015a). For instance, Talke & Heidenreich (2014) postulate that individuals, when first perceiving a new product, hold passive resistance to some degree, rooted in adopter- and situation-specific factors. Our neurological findings confirm that situation-specific factors such as the tendency to maintain homeostasis affect later adoption. Our results further demonstrate that this effect only holds for behavioral innovativeness as, unlike functional innovativeness, it induces a threat to homeostasis.

4.9 Implications for Practice

The findings of this study enable managers to anticipate consumers' new product perception. From a new product manager's standpoint, understanding how consumers perceive product innovations is particularly essential for launching those products, as it provides insights into the underlying precursory cognitive mechanisms of adoption or rejection behavior. A successful product launch might in a first step evaluate whether consumers perceive the new product predominantly as being functionally or behaviorally innovative. Depending on the initial perception, consumers initiate cognitive mechanisms to process product-related information. Here, our findings implicate that consumers require relatively more effort to process behaviorally innovative information compared to functionally innovative information. Since cognitive effort represents an incipient mental obstacle prior to rational reasoning, it might affect later product evaluation and ultimately behavioral outcomes. Acknowledging our findings, new product managers might thus target consumers with corresponding information to facilitate cognitive processing and comfort. In a similar vein, providing the right information at the consumers' first encounter with a product might lower the necessary cognitive effort for perceiving it. This informational fit between the consumers' initial cognitive mechanisms and the provided product information might create a state of familiarity and comfort, overall positively affecting subsequent attitudinal, intentional and behavioral consumer response. Here, our results implicate that if consumers focus first on functional characteristics, new product managers might choose to follow a benefit comparison strategy to highlight performance improvements. Conversely, if consumers focus first on behavioral changes necessary for using the product, new product managers might highlight similarities with previous experiences and known usage patterns.

4.10 Limitations and Future Research Avenues

Like any research, this study contains certain limitations which limit the applicability of the findings, but provide fruitful future research areas. First, the novel attempt of using fMRI to investigate an individual's innovation perception most certainly comes with limitations. Compared to other methodological attempts, experimental designs involving imaging devices are bound to their necessary operating infrastructure. This said, our participants were subjected to a clinical environment and its necessary conditions. Nevertheless, future interdisciplinary attempts might consider the application of less restrictive imaging methods. For instance, portable EEGs might allow researchers to conduct experimental studies in field settings. Second, our findings shed light on the consumers' perception of product innovations. However, product innovations are inherently different from service innovations. More specifically, as postulated by Zeithaml, Parasuraman, & Berry (1985), services differ by four distinct characteristics, namely intangibility (services cannot be displayed), inseparability (consumers are involved in the production), heterogeneity (service quality varies) and perishability (services cannot be inventoried). Acknowledging the differences, our results might not be transferable to the field of service research. Thus, future research might investigate further how consumers perceive service-based innovations. Third, given that our findings are based on participants in one country (Germany), we were not able to account for possible cultural differences that may have affected our results. Findings put forward by Tansuhaj et al. (1991) suggest that the effects of innovation resistance and its determinants might vary according to the traditionalism, fatalism, and religious commitment present in a country. Hence, future research might employ a group comparison approach between various countries with different cultural backgrounds to explore the role of cultural variables in the perception of novel products.

5 Concluding remarks

The present dissertation aims at contributing to the field of innovation adoption. More concretely, split into three distinct essays, the dissertation aims at expanding our current knowledge of an individual's path thought Rogers' innovation decision process (Rogers, 2003).

Essay I aimed at identifying and synthesizing key literature about Rogers' innovation decision process from the academic disciplines of marketing, innovation management, and psychology. Methodologically, essay I uses a systematic literature review (Zhang & Banerji, 2017), descriptive analysis, and bibliographic analysis (co-citation analysis and bibliographic coupling analysis) (van Eck & Waltman, 2007).

Essay II investigated the consumers' reasoning to reject an innovation temporarily (postponement) and contrasted the insights with reasoning linked to continuous rejection. Building on the extensive systematic literature review and explorative semi-structured interviews, essay II extended the current knowledge about postponing intentions by introducing and testing the construct of transactional resistance.

Essay III explored the consumer's neuronal reaction to product innovations using functional magnetic resonance imaging. In a novel attempt, essay II demonstrates how traditional methods can be complemented by methods from other disciplines to overcome previously held research limitations. The following Table 19 provides a summary of the essays' key findings as well as their implications for theory and practice.

Table 19: Overview key findings and implications for theory and practice

Chapter (Essay)	Key Finding	Implications for Theory	Implications for Practice
Chapter 2 (Essay I) *Connecting the Dots – A Bibliographic Analysis of Literature on Roger's Innovation Decision Process in the intersection of Marketing, Innovation Management, and Psychology*	→ Growing interest in Innovation Adoption; → The majority of articles consider intentional DVs and thus focus on the decision phase of Rogers Process; → Contemporary Research in Innovation Adoption can be clustered in five research streams;	+ Complements and extends our understanding about consumer-centered innovation adoption (van Oorschot et al., 2018); + Provides a structured picture on the status quo of past and contemporary literature; + Highlights future research potentials;	+ Provides a navigable "map" to efficiently access academic insights from past and contemporary research on innovation adoption;
Chapter 3 (Essay II) *To Buy or Not to Buy? Investigating Determinants and Differences of Temporary and Continuous Rejections of Innovations*	→ Known reasoning to continuously reject innovation does only partially explain temporary rejections; → The overall reasoning for temporary rejection significantly differ from those of continuous rejections;	+ Provides systematic Literature Review; + Introduces the construct "Transactional Resistance" (Claudy et al., 2015; Talke & Heidenreich, 2014); + Demonstrates differences in consumers reasoning between Temp. and Cont. Rejections (Greenleaf & Lehmann, 1995; Kleijnen et al., 2009);	+ Suggests strategies that are tailor-made to overcome the causes for temporary rejections;
Chapter 4 (Essay III) *A Sneak Peek into the Brain: Investigating neuronal Reactions to New Products Using Functional Magnetic Resonance Imaging (fMRI)*	→ Perception of func. and behav. Innovativeness provokes diverging neuronal activations → The diverging neuronal activations are associated with two distinct cognitive approaches; → The perception of behav. Inno requires additional, distinct brain areas;	+ Exemplifies how neuroscientific methods complement traditional data collection methods (Calantone, Griffith, & Yalcinkaya, 2006; Olshavsky & Spreng, 1996); + Highlights (neuronal) distinctiveness of product innovativeness dimensions and isolates specific neural correlates involved in the perception of behavioral innovativeness (Garcia & Calantone, 2002; Stock & Zacharias, 2013); + Intensify the impression that adopter- and situation-specific factors are related to the individual's perception of behavioral innovativeness but not functional innovativeness (Heidenreich & Kraemer, 2015a; Heidenreich & Spieth, 2013);	+ Enables managers to anticipate their consumer's underlying cognitive mechanisms when launching "new to the market" products;

The results of essay I—in particular, the historical analysis of the articles—confirmed a steadily growing influence in innovation adoption related research. Although starting late (Rogers' ideas were not appreciated by the academic community until the late 1980s), use of the innovation-decision process suddenly gained momentum and has steadily increased until today. The disciplines of psychology and innovation management led the way, while marketing research gained sudden, but sustained, interest in the topic after the early 2000s. Within the last few years, understanding the individual's decision-making when being confronted with innovative offerings has been of particular importance for marketing and innovation management scholars.

All in all, the historical analysis highlights the relevance of innovation adoption research. The descriptive analysis provides an overview of contemporary operationalizations used to study an individual's innovation decision process. Accordingly, the majority of articles focus on the decision stage of Rogers' innovation-decision Process. As a consequence, previous authors have predominantly addressed intentional outcomes. The application of VOSviewer for the bibliographic analysis allowed overlaps between authors (called bibliographic coupling) and references (called co-citation analysis) to be found (Ringel & Skiera, 2016; van Eck & Waltman, 2007) to comprehend the innovation adoption literature. The bibliographic coupling revealed similarities among the identified articles' references and clustered them accordingly. As a result, five distinct clusters evolved: Innovation Adoption, Technology Acceptance, Innovation Perception, Innovation Rejection, Consumer Decision Making. The co-citation analysis found similarities among the identified articles' references and clustered the articles accordingly. The roots of contemporary Innovation Adoption research can therefore be traced back to three distinct schools of thought, namely Technology Acceptance, Innovation Adoption, Innovation Perception & Rejection. Yet, essay I considers only top-tier journals and thus sets

clear search boundaries, restricting the number of relevant articles but also allowing an in-depth analysis of the articles. Nevertheless, like any literature review, the results can only reflect the initially self-induced data. Hence, the results of this bibliographic analysis are limited to the theoretical outlet of the journal initially considered. Future research might thus consider a greater number of journal outlets in the analysis. From a managerial perspective, Essay I provides companies with a vital opportunity to leverage existing academic insights for their operational and strategic activities. It gives a systematic and comprehensive access point for relevant and important literature in the field of marketing novel products and services. Both the descriptive and bibliographic analyses could position managers at a good vantage point to identify the nodal studies that focus on their criteria and to derive crucial academic insights on their managerial challenges.

The consolidated findings of essay II strongly suggest that understanding temporary rejection is not only relevant but also necessary to complement our understanding of consumer innovation rejection behavior. Firstly, the systematic literature review emphasizes that research on temporary rejection is widely neglected (Greenleaf & Lehmann, 1995; Kleijnen et al., 2009; Szmigin & Foxall, 1998), leading to black-and-white thinking of either continuous adoption or rejection (Nabih & Bloem, 1997). As a result, nuances between these two extremes are widely ignored in adoption theory, and thus empirical insights on the underlying psychological processes of temporary rejection are almost entirely missing. However, the reality of consumer decision-making seems to be more complex (Greenleaf & Lehmann, 1995), such that several authors highlight the importance of temporary rejection in adoption processes and call for more research on this matter in general and on its determinants specifically (Claudy, 2011; Dunphy & Herbig, 1995; Gatignon, 1991; Herrmann et al., 2015; Wiedmann et al., 2011). Secondly, essay II found that established typologies of barriers leading to innovation rejection are

suitable to explain both types of innovation rejection, namely both temporary and continuous rejection. The findings from our qualitative study indicate that continuous rejection is thoroughly explained by the established concepts of active (Heidenreich & Spieth, 2013; Laukkanen et al., 2009; Ram, 1987) and passive (Claudy et al., 2015; Heidenreich & Handrich, 2015a; Labrecque et al., 2016) innovation resistance. However, numerous reasons for temporary rejection mentioned by the respondents could be linked to neither active nor passive innovation resistance and their determinants. Thirdly, the quantitative study delivered empirical evidence on whether and how determinants for temporary and continuous rejection of innovations differ. As theorized, the results from structural equation modeling confirmed significant variations in the effect sizes of passive, active, and transactional innovation resistance between continuous and temporary rejections. Concerning the established constructs of passive and active innovation resistance, our findings confirmed that the former is of the utmost importance in contexts of continuous rejection but only marginally relevant in contexts of temporary rejection, whereas the latter represents a significant driver for both rejection types.

Finally, essay III utilized methodological advancements from cognitive neuroscience to shed light on hemodynamic differences between its two dimensions, perceived functional and behavioral innovativeness. The initial analysis of participants' reaction times suggested differing levels of cognitive involvement between the experimental conditions. Additional evidence from the fMRI analysis further demonstrated that perception of the innovativeness dimensions—functional and behavioral innovativeness—led to distinct neuronal patterns. Building on the assumption that neuronal activities are affiliated with cognitive mechanisms, our results further suggest that functional innovativeness triggers cognitive mechanisms essential for mental comparison strategies, and that behav-

ioral innovativeness initiates cognitive mechanisms constituting mental simulation strategies. The ensuing Meta-Analysis confirmed the assumption that cognitive mechanisms differ between the experimental conditions. Specifically, we saw that neurological activation patterns following the perception of functional innovativeness are firmly related to cognitive mechanisms related associated with semantic memories, visual perception, and quantification attempts, all of which contribute to mental comparison approaches. On the other hand, we saw that the neurological activation patterns of behavioral innovativeness are associable with episodic memories, mental time travel (projection of future usage), and qualifying attempts, all of which are connected to mental simulation approaches. Lastly, the fMRI experiment revealed distinct neuronal activations. In particular, activation of the anterior region of the insula stood out. Along with our exploratory analysis, the anterior insula repeatedly showed the most robust activation relative to other brain regions. The activation occurred exclusively during the behavioral innovativeness condition. The subsequent PLS-SEM analysis further revealed that the extracted ROI for the anterior insula has the strongest correlation with the participants' self-reported scales.

In sum, the cumulative dissertation consists of three essays, which advance our understanding of how consumers adopt product innovations. Each essay utilizes a different methodological approach to address identified research potentials. More specifically, essay I systematically summarizes the heterogeneous and fragmented body of literature on innovation adoption theory using a bibliometric analysis and proposes several fruitful research avenues. Essays II and III contribute empirical insights to distinct stages of Rogers' innovation decision process. While essay II applies an explorative approach to investigate determinants of temporary rejections occurring during the decision stage, essay III demonstrates how neuroscientific tools (fMRI) are conductive to overcome long hold

methodological limitations of traditional data collection tools to study consumers' new product perception in the knowledge stage.

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APPENDIX

Appendix I Chapter 2 (Essay 1): Connecting the Dots – A Bibliometric Analysis of Literature on Roger's Innovation Decision Process in the intersection of Marketing, Innovation Management, and Psychology

Appendix I.1 Final set of articles (sorted alphabetically according to the journals and first authors last name)

#	Journal	Author	Title	Year
International Journal of Innovation Management				
1	IJIM	Adams, Tranfield, and Denyer	A taxonomy of innovation: Configurations of attributes in healthcare innovations	2011
2	IJIM	Dedehayir, Ortt, Riverola, and Miralles	Innovators and early adopter in the diffusion of innovations: A literature review	2017
3	IJIM	Handrich and Heidenreich	The willingness of customer to co-create innovative, technology-based services: Conceptualisation and measurement	2013
4	IJIM	Heidenreich and Spieth	Why innovations fail - The case of passive and active innovation resistance	2013
5	IJIM	Kuester and Hess	The role of defaults in precenting innovation rejection	2015
6	IJIM	Schweitzer	The negative effect of a perceived lack of an installed base on technology adoption	2015
7	IJIM	Stock and Schulz	Understanding consumers' predisposition toward new technological products: Taxonomy and implications for adoption behaviour	2015
International Journal of Research in Marketing				
8	IJRM	Arts, Frambach, and Bijmolt	Generalizations on consumer innovation adoption: A meta-analysis on drivers of intention and behavior	2011
9	IJRM	Baumgartner and Steenkamp	Exploratory consumer buying behavior: Conceptualization and measurement	1996
10	IJRM	Cestre and Darmon	Assessing consumer preferences in the context of new product diffusion	1998
11	IJRM	Ein-Gar, Goldenberg and Sagiv	The role of consumer self-control in the consumption of virtue products	2012
12	IJRM	Gielens and Steenkamp	Drivers of consumer acceptance of new packaged goods: An investigation across products and countries	2007

13	IJRM	Hoffmann and Broekhuizen	Understanding investors' decisions to purchase innovative products: Drivers of adoption timing and range	2010
14	IJRM	Kuester, Feurer, Schuhmacher, and Reinartz	Comparing the incomparable? How consumers judge the price fairness of new products	2015
15	IJRM	Prins, Verhoef, and Franses	The impact of adoption timing on new service usage and early disadoption	2009
16	IJRM	Simon and Usunier	Cognitive, demographic, and situational determinants of service customer preference for personnel-in-contact over self-service technology	2007
17	IJRM	Taylor and Todd	Decomposition and crossover effects in the theory of planned behavior: A study of consumer adoption intentions	1995
18	IJRM	Vandercasteele and Geuens	Motivated Consumer Innovativeness: Concept, measurement, and validation	2010
		Journal of the Academy of Marketing Science		
19	JAMS	Boyd and Mason	The link between attractiveness of "Extrabrand" attributes and the adoption of innovations	1999
20	JAMS	Burnham, Frels, and Mahajan	Consumer switching costs: A typology, antecedents, and consequences	2003
21	JAMS	Claudy, Garcia, and O'Driscoll	Consumer resistance to innovation - a behavioral reasoning perspective	2015
22	JAMS	Dabholkar and Bagozzi	An attitudinal model of technology-based self-service: Moderating effects of consumer traits and situational factors	2002
23	JAMS	Ellen, Bearden, and Sharma	Resistance to technological innovations: An examination of the role of self-efficacy and performance satisfaction	1991
24	JAMS	Im, Bayus, and Mason	An empirical study of innate consumer innovativeness, personal characteristics, and new-product adoption behavior	2003
25	JAMS	Im, Mason, and Houston	Does innate consumer innovativeness relate to new product/service adoption behavior? The intervening role of social learning via vicarious innovativeness	2007
26	JAMS	Labrecque, Wood, Neal, and Harrington	Habit slips: when consumers unintentionally resist new products	2017
27	JAMS	Montoya-Weiss and Grewal	Determinants of online channel use and overall satisfaction with a relational, multichannel service provider	2003
28	JAMS	Rijsdijk, Hultink, and Diamantopoulos	Product intelligence: its conceptualization, measurement and impact on consumer satisfaction	2007
29	JAMS	Sääksjärvi and Samiee	Assessing multifunctional innovation adoption via an integrative model	2011
30	JAMS	Szymanski, Kroff, and Troy	Innovativeness and new product success: insights from the cumulative evidence	2007

		Journal of Business Research		
31	JBR	Al-Qeisi, Dennis, Al-amanos, and Jaya-wardhena	Website design quality and usage behav-ior: Unified Theory of Acceptance and Use of Technology	2014
32	JBR	Anderson and Ortinau	Exploring consumers' postadoption atti-tudes and use behaviors in monitoring the diffusion of a technology-based discon-tinuous innovation	1988
33	JBR	Andrews and Bianchi	Consumer internet purchasing behavior in Chile	2013
34	JBR	Bartels and Reinders	Consumer innovativeness and its corre-lates: A propositional inventory for future research	2011
35	JBR	Chang, Yu, and Lu	Persuasive messages, popularity cohe-sion, and message diffusion in social me-dia marketing	2015
36	JBR	Chen and Granitz	Adoption, rejection, or convergence: Con-sumer attitudes toward book digitization	2012
37	JBR	Choi, Kim, and Kim	Driving factors of post adoption behavior in mobile data services	2011
38	JBR	Delrea, Jagera, Bijmolt, and Janssen	Targeting and timing promotional activi-ties: An agent-based model for the takeoff of new products	2007
39	JBR	Ferreira, da Rocha, and da Silva	Impacts of technology readiness on emo-tions and cognition in Brazil	2014
40	JBR	Garaus, Wolfsteiner, and Wagner	Shoppers' acceptance and perceptions of electronic shelf labels	2016
41	JBR	Heidenreich, Kraemer, and Handrich	Satisfied and unwilling: Exploring cogni-tive and situational resistance to innova-tions	2016
42	JBR	Huh and Kim	Do early adopters upgrade early? Role of post-adoption behavior in the purchase of next-generation products	2002
43	JBR	Jahanmir and Lages	The late-adopter scale: A measure of late adopters of technological innovations	2016
44	JBR	Kim and Park	Effects of social influence on consumers' voluntary adoption of innovations prompted by others	2011
45	JBR	Kim, Srivastava, and Han	Consumer decision-making in a multi-generational choice set context	2001
46	JBR	Laukkanen	Consumer adoption versus rejection deci-sions in seemingly similar service innova-tions: The case of the Internet and mobile banking	2016
47	JBR	Lee, Park, Chung, and Blakeney	A unified perspective on the factors influ-encing usage intention toward mobile fi-nancial services	2012
48	JBR	Mostaghel	Innovation and technology for the elderly: Systematic literature review	2016

49	JBR	Pascual-Miguel, Agudo-Peregrina, and Chaparro-Peláez	Influences of gender and product type on online purchasing	2015
50	JBR	Porter and Donthu	Using the technology acceptance model to explain how attitudes determine Internet usage: The role of perceived access barriers and demographics	2006
51	JBR	Reinhardt and Gurtner	Differences between early adopters of disruptive and sustaining innovations	2015
52	JBR	Rieple and Snijders	The role of emotions in the choice to adopt, or resist, innovations by Irish dairy farmers	2018
53	JBR	Sheth, Newman, and Gross	Why we buy what we buy: A theory of consumption values	1991
54	JBR	Stroborn, Heitmann, Leibold, and Frank	Internet payments in Germany: a classificatory framework and empirical evidence	2004
55	JBR	Truong, Klink, Simmons, Grinstein, and Palmer	Branding strategies for high-technology products: The effects of consumer and product innovativeness	2017
56	JBR	Vag	Simulating changing consumer preferences: A dynamic conjoint model	2007
57	JBR	Vandecasteele and Geuens	Revising the myth of gay consumer innovativeness	2009
58	JBR	Veeck and Burns	Changing tastes: the adoption of new food choices in post-reform China	2005
59	JBR	Venkatraman and Price	Differentiating between cognitive and sensory innovativeness: Concepts, measurement, and implications	1990
60	JBR	Wangenheim, Wünderlich, and Schumann	Renew or cancel? Drivers of customer renewal decisions for IT-based service contracts	2012
61	JBR	Wright and Stern	Forecasting new product trial with analogous series	2015
Journal of Consumer Psychology				
62	JCP	Gill and Dube	What is a Leather Iron or a Bird Phone? Using Conceptual Combinations to Generate and Understand New Product Concepts	2007
Journal of Consumer Research				
63	JCR	Mukherjee and Hoyer	The Effect of Novel Attributes on Product Evaluation	2001
64	JCR	Steenkamp and Gielens	Consumer and Market Drivers of the Trial Probability of New Consumer Packaged Goods	2003
65	JCR	Wood and Lynch	Prior Knowledge and Complacency in New Product Learning	2002

Journal of Economic Psychology				
66	JEP	Akhter	Digital divide and purchase intention: Why demographic psychology matters	2003
67	JEP	Foxall	Behavior analysis and consumer psychology	1994
68	JEP	Foxall	Theoretical progress in consumer psychology: The contribution of a behavioural analysis of choice	1986
69	JEP	Foxall and Bhate	Cognitive styles and personal involvement of market initiators for 'healthy' food brands: Implications for adoption theory	1993
70	JEP	Heidenreich and Kraemer	Passive innovation resistance: The curse of innovation? Investigating consequences for innovative consumer behavior	2016
71	JEP	Kleijnen. Lee, and Wetzels	An exploration of consumer resistance to innovation and its antecedents	2009
72	JEP	Pepermans, Verleye, and van Cappellen	Wallbanking', innovativeness and computer attitudes: 25–40-year-old ATM-users on the spot	1996
73	JEP	Sultan and Winer	Time preferences for products and attributes and the adoption of technologydriven consumer durable innovations	1993
74	JEP	Venkatesh and Vitalari	A post-adoption analysis of computing in the home	1987
Journal of Marketing				
75	JM	Lambert-Pandraud and Laurent	Why Do Older Consumers Buy Older Brands? The Role of Attachment and Declining Innovativeness	2010
76	JM	Meuter, Bitner, Ostrom, and Brown	Choosing Among Alternative Service Delivery Modes: An Investigation of Customer Trial of Self-Service Technologies	2005
77	JM	Müller-Stewens, Schlager, Häubl, and Herrmann	Gamified Information Presentation and Consumer Adoption of Product Innovations	2017
78	JM	Schreier, Fuchs, and Dahl	The Innovation Effect of User Design: Exploring Consumers' Innovation Perceptions of Firms Selling Products Designed by Users	2012
79	JM	Wood and Moreau	From Fear to Loathing? How Emotion Influences the Evaluation and Early Use of Innovations	2006
Journal of Marketing Research				
80	JMR	Alexander, Lynch, and Wang	As Time Goes By: Do Cold Feet Follow Warm Intentions for Really New Versus Incrementally New Products?	2008

81	JMR	Herzenstein, Posavac, and Brakus	Adoption of New and Really New Products: The Effects of Self-Regulation Systems and Risk Salience	2007
82	JMR	Hoeffler	Measuring Preferences for Really New Products	2003
83	JMR	Jhang, Grant, and Campbell	Get It? Got It. Good! Enhancing New Product Acceptance by Facilitating Resolution of Extreme Incongruity	2012
84	JMR	Ma, Gill, and Jiang	Core Versus Peripheral Innovations: The Effect of Innovation Locus on Consumer Adoption of New Products	2008
85	JMR	Moreau, Lehmann, and Markman	Entrenched Knowledge Structures and Consumer Response to New Products	2001
Journal of Product Innovation Management				
86	JPIM	Basoglu, and Daim, and Polat	Exploring Adaptivity in Service Development: The Case of Mobile Platforms	2013
87	JPIM	Burke	Seeking Simplicity in Complexity: The Relative Value of Ease of Use (EOU) Based Product Differentiation	2013
88	JPIM	Evanschitzky, Iyer, Pillai, Kenning, and Schütte	Consumer Trial, Continuous Use, and Economic Benefits of a Retail Service Innovation: The Case of the Personal Shopping Assistant	2014
89	JPIM	Feiereisen, Wong, and Broderick	Analogies and Mental Simulations in Learning for Really New Products: The Role of Visual Attention	2008
90	JPIM	Gerlach, Stock, and Buxmann	Never Forget Where You're Coming from: The Role of Existing Products in Adoptions of Substituting Technologies	2014
91	JPIM	Gounaris and Koritos	Adoption of Technologically Based Innovations: The Neglected Role of Bounded Rationality	2012
92	JPIM	Heidenreich and Handrich	What about Passive Innovation Resistance? Investigating Adoption-Related Behavior from a Resistance Perspective	2014
93	JPIM	Heidenreich and Kraemer	Innovations - Doomed to Fail? Investigating Strategies to Overcome Passive Innovation Resistance	2015
94	JPIM	Heidenreich, Spieth, and Petschnig	Ready, Steady, Green: Examining the Effectiveness of External Policies to Enhance the Adoption of Eco-Friendly Innovations	2017
95	JPIM	Holak and Lehmann	Purchase Intentions and the Dimensions of Innovation: An Exploratory Model	1990
96	JPIM	Kaplan, Schoder, and Haenlein	Factors Influencing the Adoption of Mass Customization: The Impact of Base Category Consumption Frequency and Need Satisfaction	2007
97	JPIM	Kawakami and Parry	The Impact of Word of Mouth Sources on the Perceived Usefulness of an Innovation	2013

98	JPIM	Kawakami, Kishiya, and Parry	Personal Word of Mouth, Virtual Word of Mouth, and Innovation Use	2012
99	JPIM	Kim and Srinivasan	A Conjoint-Hazard Model of the Timing of Buyers' Upgrading to Improved Versions of High-Technology Products	2009
100	JPIM	Klink and Athaide	Consumer Innovativeness and the Use of New versus Extended Brand Names for New Products	2009
101	JPIM	Lee and Coughlin	PERSPECTIVE: Older Adults' Adoption of Technology: An Integrated Approach to Identifying Determinants and Barriers	2014
102	JPIM	Mugge and Dahl	Seeking the Ideal Level of Design Newness: Consumer Response to Radical and Incremental Product Design	2013
103	JPIM	Olshavsky and Spreng	An exploratory Study of the Innovation Evaluation Process	1996
104	JPIM	Parry, Kawakami, and Kishiya	The Effect of Personal and Virtual Word-of-Mouth on Technology Acceptance	2012
105	JPIM	Radford and Bloch	Linking Innovation to Design: Consumer Responses to Visual Product Newness	2011
106	JPIM	Ram	Successful innovation using strategies to reduce consumer resistance: An empirical test	1989
107	JPIM	Reinders, Frambach, and Schoormans	Using Product Bundling to Facilitate the Adoption Process of Radical Innovations	2010
108	JPIM	Rijsdijk and Hultink	"Honey, Have You Seen Our Hamster?" Consumer Evaluations of Autonomous Domestic Products	2003
109	JPIM	Rijsdijk and Hultink	How Today's Consumers Perceive Tomorrow's Smart Products	2008
110	JPIM	Schmidt, Zayer, and Calantone	Grumpier Old Men: Age and Sex Differences in the Evaluation of New Services	2011
111	JPIM	Schuhmacher, Kuester, and Hultink	Appetizer or Main Course: Early Market vs. Majority Market Go-to-Market Strategies for Radical Innovations	2018
112	JPIM	Song and Parry	Information, Promotion, and the Adoption of Innovative Consumer Durables	2009
113	JPIM	Song, Parry, and Kawakami	Incorporating Network Externalities into the Technology Acceptance Model	2009
114	JPIM	Talke and Heidenreich	How to Overcome Pro- Change Bias: Incorporating Passive and Active Innovation Resistance in Innovation Decision Models	2013
115	JPIM	Talke and Snelders	Information in Launch Messages: Stimulating the Adoption of New High-Tech Consumer Products	2013
116	JPIM	Zhang and Wang	The Role of Product Originality, Usefulness and Motivated Consumer Innovativeness in New Product Adoption Intentions	2014

117	JPIM	Ziamou, Gould, and Venkatesh	"Am I Getting It or Not?" The Practices Involved in "Trying to Consume" a New Technology	2012
Journal of Service Research				
118	JSR	Ordanini, Parasuraman, and Rubera	When the Recipe Is More Important Than the Ingredients A Qualitative Comparative Analysis (QCA) of Service Innovation Configurations	2013
119	JSR	Weijters. Rangarajan, Falk, and Schillewaert	Determinants and Outcomes of Customers' Use of Self-Service Technology in a Retail Setting	2007
Psychology and Marketing				
120	P&M	Antón, Camarero, and Rodríguez	Usefulness, Enjoyment, and Self-Image Congruence: The Adoption of e-Book Readers	2013
121	P&M	Crowley	The Golden Section -	1991
122	P&M	Kim, Ko, Takahasi, Schnellhase, Kim, and Lee	A Model of Adoption of Digital Multimedia Broadcasting (DMB) Service: Comparisons in Korea, Japan, and Germany	2008
123	P&M	Lennon, Kim, Johnson, Jolly, Damhorst, and Jasper	A Longitudinal Look at Rural Consumer Adoption of Online Shopping	2007
124	P&M	Lin, Shin, and Sher	Integrating Technology Readiness into Technology Acceptance: The TRAM Model	2007
125	P&M	Lowe, Fraser, and Souza-Monteiro	A Change for the Better? Digital Health Technologies and Changing Food Consumption Behaviors	2015
126	P&M	Sun, Tai, and Tsai	Perceived Ease of Use in Prior E-Commerce Experiences: A Hierarchical Model for its Motivational Antecedents	2010

Appendix I.2 Survey to identify relevant journals

Thank you for participating in my short survey. It will only take **3 minutes** of your time.

The **aim** of this survey is to **identify the most relevant journals for consumer-focused innovation adoption literature**. Building on your choices, i will then systematically screen the journals databases and perform a bibliographic analysis to identifed articles to hopefully reveal fruitful research ares for our scientific community.

1) In the following i would like to ask you to answer the demographic and experience related questions.

Gender	female		*Please indicate your gender by placing a "X" in the corresbonding white cell*
	male		
	other		
Expertice in academia		years	*Please write your experience in years in the white cell*

2) Next, i would like to ask you to name the most relevant **journals** for **consumer focused innovation adoption research**. Thereby, you can name as many Journals as you want. Please indicate you choice by plaing an "x" in the white cell next to the journals name.

Once your done, please send the short survey to jan.millemann@uni-saarland.de
--- Again, i very much appreciate your support. ---

Journal Name (sorted alphabetically)	*CHOICES* (please mark with **X**)	*Journal Name* (sorted alphabetically)	*CHOICES* (please mark with **X**)
Academy of Management Annals		Journal of International Marketing	
Academy of Management Journal		Journal of Management	
Academy of Management Perspectives		Journal of Management Inquiry	
Academy of Management Review		Journal of Management Studies	
AMS Review		Journal of Marketing	
British Journal of Management		Journal of Marketing Research	
Business Research		Journal of Product Innovation Management	
California Management Review		Journal of Retailing	
European Management Journal		Journal of Service Management	
Industry & Innovation		Journal of Service Research	
International Journal of Innovation Management		Journal of Small Business Management	
International Journal of Management Reviews IJMR		Journal of the Academy of Marketing Science	
International Journal of Research in Marketing		JPP&M Journal of Public Policy & Marketing	
International Marketing Review		JPSSM - Journal of Personal Selling & Sales Management	
Journal of Advertising		Long Range Planning	
Journal of Applied Psychology		Management Science	
Journal of Behavioral and Experimental Economics		Marketing Letters	
Journal of Behavioral Decision Making		Marketing Science	
Journal of Business Economics (JBE) (früher: Zeitschrift für Betriebswirtschaft ZfB)		Psychology & Marketing	
Journal of Business Research		R&D Management	
Journal of Business Venturing (JBV)		Research Policy	
Journal of Consumer Psychology		Review of Managerial Science	
Journal of Consumer Research		Scandinavian Journal of Management	
Journal of Economic Psychology		Science	
Journal of Forecasting		The Journal of Technology Transfer	
Journal of Interactive Marketing		Schmalenbach Business Review	
Other:			

Appendix II Chapter 3 (Essay 2) To Buy or Not to Buy? Investigating Determinants and Differences of Temporary and Continuous Rejections of Innovations

Appendix II.1 Framework of potential reasons for innovation rejections based on Talke and Heidenreich (2014)

Functional Barriers (Innovation-specific Factors)		
Barrier	Definition	Source
Value Barrier	refers to a perceived lack of relative advantage or superior performance by the innovation over existing alternatives	(Hoeffler, 2003; Ram and Sheth, 1989)
Complexity Barrier	occurs if an innovation is perceived as relatively difficult to understand (complexity of the idea) or use (complexity of execution)	(Ram, 1987; Rogers, 2003)
Trialability Barrier	relates to perceived difficulties in testing the innovation prior to adoption	(Laukkanen, Sinkkonen, and Laukkanen, 2008; Ram, 1987)
Compatibility Barrier	emerges if an innovation is perceived as incompatible with existent and past products	(Laukkanen et al., 2008; Molesworth and Suortfi, 2001)
Co-dependence Barrier	emerges if consumers perceive a product as depending too heavily on additional products for full functionality	(Laukkanen et al., 2008; Molesworth and Suortfi, 2001)
Communicability Barrier	reflects a perceived ineffectiveness when describing the benefits or shortcomings of an innovation to others	(Moore and Benbasat, 1991; Rogers, 2003)
Visibility Barrier	emerges when consumers perceive difficulties in observing others using the innovation.	(Molesworth and Suortfi, 2001; Moore and Benbasat, 1991)
Amenability Barrier	arises when an innovation seemingly has limited potential to be modified, updated, or tailored to specific consumer needs	(Ram, 1987; Szmigin and Foxall, 1998)
Realisation Barrier	occurs if the time span before the benefits of the innovation become manifest is perceived as too long	(Ram, 1987)

Psychological Barriers (Innovation-specific Factors)		
Barrier	Definition	Source
Norm Barrier	occurs if an innovation is perceived as violating group norms, or societal and family values	(Laukkanen et al., 2008; Ram, 1987)
Image Barrier	relates to unfavorable associations attributed to an innovation, such as its brand, manufacturer, or country of origin	(Kuisma et al., 2007; Ram and Sheth, 1989)
Usage Barrier	relates to the innovation's inconsistencies with past experiences that threaten to disrupt established usage patterns	(Hoeffler, 2003; Ram and Sheth, 1989)
Information Barrier	relates to perceived information asymmetries that make consumers uncertain of unwanted consequences	(Kuisma et al., 2007)
Personal Risk Barrier	fear that an innovation entails physical risks or that it could cause harm to one´s property	(Bredahl, 2001; Pandit, Karpen, and Josiassen, 2008; Ram and Sheth, 1989)
Functional Risk Barrier	fear that the innovation performs improperly and functions unreliably	(Molesworth and Suortfi, 2001; Pandit et al., 2008)
Economic Risk Barrier	fear that the innovation represents a bad value for money	(Szmigin and Foxall, 1998; Woodside and Biemans, 2005)
Social Risk Barrier	fear that the innovation will prompt disapproval from relevant social groups	(Ram and Sheth, 1989)

Inclination to Resist Changes (Adopter-specific Factors)		
Barrier	Definition	Source
Routine Seeking	refers to the tendency to resist change because of fear to lose control over certain life situations	(Nov and Ye, 2008)
Cognitive Rigidity	represents a form of stubbornness and unwillingness to consider alternative ideas or perspectives	(Rokeach, 1960)
Emotional Reaction	describes a person's limited ability to cope with change as a stressor	(Swilley, 2010)
Short-Term Focus	refers to the extent to which individuals are distracted by the short-term inconveniences involved in change	(Oreg et al., 2008)
Status Quo Satisfaction (Situation-specific Factors)		
Barrier	Definition	Source
Status Quo Satisfaction - Product	reflects satisfaction with existing products	(Dethloff, 2004; Helm, 2001)
Status Quo Satisfaction - Innovation	reflects satisfaction with the extent of innovation	(Cowart, Fox, and Wilson, 2008; Wood and Swait, 2002)

Appendix II.2 First-order measurement model

Appendix II.2 a First-order measurement model – Active Innovation Resistance (AIR)

1st Order Construct	Item	Functional Barriers							
		Temporary Rejection				Continuous Rejection			
		Loadings	t-value	AVE	CR	Loadings	t-value	AVE	CR
	This product offers advantages that are not offered by competing products. (r)	0.926	108.764			0.910	65.289		
Value Barrier	This product is, in my eyes, superior to competing products. (r)	0.930	74.726	0.871	0.953	0.939	122.317	0.872	0.953
	This product solves a problem that I cannot solve with competing products. (r)	0.945	127.130			0.951	170.133		
	I am afraid the handling of the product would be difficult and unclear.	0.903	44.729			0.907	61.397		
Complexity Barrier	Overall. I believe this product would be difficult to use.	0.857	32.014	0.798	0.922	0.871	35.138	0.805	0.925
	I believe it would be hard to get this product to do what I want it to do.	0.921	74.610			0.913	57.511		
	I know where I can go to satisfactorily try out this Product. (r)	0.898	73.954			0.892	56.234		
Trialability Barrier	I would have the opportunity to give the product a try. (r)	0.932	99.352	0.767	0.908	0.932	96.182	0.806	0.925
	I would have the opportunity to test the product over a certain period of time. (r)	0.792	23.436			0.867	58.603		
	I can use the product in combination with products I already own. (r)	0.799	34.149			0.831	36.783		
Compatibility Barrier	Many conventional products can be connected with the product. (r)	0.921	94.014	0.787	0.917	0.928	89.648	0.802	0.924
	The product is highly compatible with other conventional products. (r)	0.936	128.387			0.924	98.030		
	I can only use the full range of the product once I have purchased additional products.	0.957	13.025			0.957	136.010		
Co-dependence Barrier	All functions of the product can only be used once I own additional products.	0.959	15.647	0.872	0.953	0.967	193.803	0.914	0.970
	In order to use the product and all its functions I am forced to buy additional products.	0.884	10.495			0.944	92.672		

		Functional Barriers							
		Temporary Rejection				Continuous Rejection			
1st Order Construct	Item	Loadings	t-value	AVE	CR	Loadings	t-value	AVE	CR
Value Barrier	This product offers advantages that are not offered by competing products. (r)	0.926	108.764	0.871	0.953	0.910	65.289	0.872	0.953
	This product is, in my eyes, superior to competing products. (r)	0.930	74.726			0.939	122.317		
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	Overall. I believe this product would be difficult to use.	0.857	32.014			0.871	35.138		
	I believe it would be hard to get this product to do what I want it to do.	0.921	74.610			0.913	57.511		
Trialability Barrier	I know where I can go to satisfactorily try out this Product. (r)	0.898	73.954	0.767	0.908	0.892	56.234	0.806	0.925
	I would have the opportunity to give the product a try. (r)	0.932	99.352			0.932	96.182		
	I would have the opportunity to test the product over a certain period of time. (r)	0.792	23.436			0.867	58.603		
Compatibility Barrier	I can use the product in combination with products I already own. (r)	0.799	34.149	0.787	0.917	0.831	36.783	0.802	0.924
	Many conventional products can be connected with the product. (r)	0.921	94.014			0.928	89.648		
	The product is highly compatible with other conventional products. (r)	0.936	128.387			0.924	98.030		
Co-dependence Barrier	I can only use the full range of the product once I have purchased additional products.	0.957	13.025	0.872	0.953	0.957	136.010	0.914	0.970
	All functions of the product can only be used once I own additional products.	0.959	15.647			0.967	193.803		
	In order to use the product and all its functions I am forced to buy additional products.	0.884	10.495			0.944	92.672		

Functional Barriers

1st Order Construct	Item	Temporary Rejection Loadings	t-value	AVE	CR	Continuous Rejection Loadings	t-value	AVE	CR
Visibility Barrier	I have already seen other people using the product. (r)	0.945	92.960			0.964	158.042		
	I already witnessed other people using the product. (r)	0.969	237.350	0.919	0.971	0.971	236.905	0.932	0.976
	People used the product in my presence. (r)	0.961	176.189			0.961	146.870		
Communica-bility Barrier	I would have difficulties explaining the product's benefits to other people.	0.850	48.243			0.892	68.657		
	I would hardly be able to communicate the advantages or disadvantages of using the product to other people.	0.920	66.614	0.808	0.927	0.934	99.647	0.838	0.939
	I might have difficulties pointing out advantages and dis-advantages of using the product.	0.925	85.101			0.920	77.936		
Amenability Barrier	The product is easy to update. (r)	0.854	51.626			0.903	49.603		
	The product can be updated with modifications.(r)	0.862	41.438	0.750	0.900	0.926	60.553	0.857	0.947
	The product can easily be improved by keeping it updated. (r)	0.881	43.962			0.948	137.551		

Psychological Barriers

1st Order Construct	Item	Temporary Rejection Loadings	t-value	AVE	CR	Continuous Rejection Loadings	t-value	AVE	CR
Realisation Barrier	It might take a certain time until the benefits of using the product evolve.	0.917	9.098			0.924	82.357		
	Benefits of using the product might take some time to oc-cur.	0.909	7.462	0.839	0.940	0.947	97.158	0.871	0.953
	It might take some time until the use of the product leads to a personal benefit.	0.923	8.052			0.928	85.529		
Social Risk Barrier	Having bought the product, my environment might react negatively towards it.	0.929	2.201			0.919	65.015		
	There is a chance that my friends might respond negatively if I purchase the product.	0.952	2.300	0.875	0.955	0.939	93.466	0.821	0.932
	It is likely that many people might advise me not to buy the product.	0.925	2.362			0.861	37.792		
Norm Barrier	The product suits me. (r)	0.961	154.572			0.961	129.239		
	The product matches my values and norms. (r)	0.969	203.237	0.933	0.977	0.977	232.819	0.943	0.980
	The product fits to my personality. (r)	0.967	215.438			0.974	243.553		

Appendix II.2 b First-order measurement model - Passive Innovation Resistance (PIR)

1st Order Construct	Item	Psychological Barriers							
		Temporary Rejection				Continuous Rejection			
		Loadings	t-value	AVE	CR	Loadings	t-value	AVE	CR
Economic Risk Barrier	The product offers a good price performance ratio. (r)	0.948	117.334			0.940	66.274		
	The price performance ratio appears to be fair.(r)	0.959	116.295	0.904	0.966	0.951	88.026	0.897	0.963
	The price performance ratio represents a fair value. (r)	0.945	92.715			0.951	118.005		
Image Barrier	I have only positive feeling towards the product's producer/manufacturer. (r)	0.834	37.338			0.838	49.066		
	I have a negative image of the product's producer/manufacturer.	0.940	128.546	0.819	0.931	0.917	83.689	0.793	0.920
	I don't like the product's producer/manufacturer.	0.938	118.340			0.913	91.523		
Usage Barrier	The use of the product requires a new behaviors.	0.933	28.506			0.946	96.976		
	This product does not fit with the way I like to get things done.	0.950	20.933	0.895	0.962	0.950	86.228	0.904	0.966
	Using this product is not compatible with my needs.	0.954	21.209			0.955	134.954		
Information Barrier	I feel well informed about the product. (r)	0.928	92.554			0.889	55.320		
	As far as I am concerned, I have all information needed to evaluate the product. (r)	0.966	160.078	0.912	0.969	0.957	147.896	0.878	0.956
	I think that I collected all necessary information about the product.(r)	0.971	276.424			0.963	170.065		
Personal Risk Barrier	The use of the product is save for me. (r)	0.941	70.053			0.926	10.594		
	The use of the product does not result in any form of danger for me. (r)	0.939	63.306	0.719	0.882	0.910	9.142	0.835	0.938
	Negative consequences might result from using the product.	0.625	7.598			0.906	15.639		
Functional Risk Barrier	I have certain doubts about the product's reliability.	0.940	97.818			0.924	11.785		
	I am doubtful whether or not the product works as advertised.	0.959	100.122	0.912	0.969	0.960	19.036	0.898	0.963
	I question the advertised functions of the product.	0.966	180.060			0.958	31.620		

1st Order Construct	Item	Inclination to Resist Changes							
		Temporary Rejection				Continuous Rejection			
		Loadings	t-value	AVE	CR	Loadings	t-value	AVE	CR
Routine Seeking	I generally consider changes to be a negative thing.	0.847	51.754	0.741	0.895	0.863	58.952	0.741	0.896
	I like to do the same old things rather than try new and different ones.	0.861	51.497			0.883	50.451		
	I'd rather be bored than surprised.	0.873	53.411			0.836	34.570		
Emotional Reaction	If I were to be informed that there's going to be a significant change regarding the way things are done at work, I would probably feel stressed.	0.896	72.143	0.800	0.923	0.863	43.175	0.784	0.916
	When I am informed of a change of plans, I tense up a bit.	0.913	88.699			0.920	98.347		
	When things don't go according to plans, it stresses me out.	0.872	60.019			0.872	60.775		
Short Term Focus	Changes of plans irritate me.	0.884	37.757	0.813	0.929	0.881	56.737	0.796	0.921
	Often, I feel a bit uncomfortable even about changes that may potentially improve my life.	0.935	126.930			0.920	93.405		
	When someone pressures me to change something. I tend to resist it even if I think the change may ultimately benefit me.	0.884	72.516			0.875	47.857		
Cognitive Rigidity	My views are very consistent over time.	0.803	30.648	0.692	0.871	0.821	35.519	0.730	0.890
	Having made a decision, I am unwilling to change it.	0.868	41.128			0.894	55.625		
	I don't change my mind easily.	0.824	43.748			0.846	63.240		
Status Quo Satisfaction - Innovation	Overall, my personal need for innovations in the field of technological products has been by far not covered in the past. (r)	0.795	31.918	0.779	0.913	0.773	23.162	0.774	0.911
	Overall, I consider the number of innovations in the field of technological products as being low. (r)	0.931	120.536			0.939	160.729		
	Overall, I consider the pace of innovations in the field of technological products as being too low. (r)	0.915	92.618			0.917	89.760		
Status Quo Satisfaction - Product	Past technological products fully met my requirements.	0.907	57.431	0.850	0.944	0.902	60.829	0.836	0.938
	In my opinion, past technological products were completely satisfactory so far.	0.928	66.127			0.938	112.993		
	In the past, I was very satisfied with available technological products.	0.927	100.673			0.902	49.475		

Appendix II.2 c First-order measurement model - Transactional Innovation Resistance (TIR)

1st Order Construct	Item	Monetary Constraints							
		Temporary Rejection				Continuous Rejection			
		Loadings	t-value	AVE	CR	Loadings	t-value	AVE	CR
Price Restrictions	I think that the product's price level was adequate. (r)	0.970	266.160	0.940	0.979	0.947	71.823	0.922	0.973
	The price level corresponds to the product. (r)	0.975	245.832			0.967	39.792		
	The product price was reasonable. (r)	0.964	135.742			0.967	80.758		
Financial Restrictions	At that time, I couldn't buy the product due to financial reasons.	0.959	114.504	0.932	0.976	0.971	181.864	0.953	0.984
	I did not have enough financial resources to buy the product.	0.975	240.211			0.986	356.228		
	I could not afford the product financially.	0.961	107.199			0.971	105.353		

1st Order Construct	Item	Purchase Constraints							
		Temporary Rejection				Continuous Rejection			
		Loadings	t-value	AVE	CR	Loadings	t-value	AVE	CR
Time Restrictions	At that time, I did not have enough time to purchase the product.	0.972	145.673	0.960	0.986	0.968	138.460	0.942	0.980
	At that time, I was unable to purchase the product because I was short on time.	0.989	447.851			0.979	232.950		
	I did not have enough time to eventually buy the product.	0.978	338.183			0.964	107.850		
Availability Restrictions	After purchasing the product, I would have been able to use it immediately. (r)	0.940	29.029	0.883	0.958	0.934	64.438	0.891	0.961
	I could have taken the product with me right after the purchase. (r)	0.949	28.340			0.965	170.212		
	At that time, the product was in stock. (r)	0.930	21.889			0.933	59.445		

Appendix II.2 d First-order measurement model – Intention to temporary / continuously reject

Item	Scale	Intention to temporary / continuously reject							
		Temporary Rejection				Continuous Rejection			
		Loadings	t-value	AVE	CR	Loadings	t-value	AVE	CR
how likely is it, that you might buy the product in the future?	very unlikely - very likely	0.953	65.339			-	-		
	unimaginable - imaginable	0.978	196.356	0.938	0.978	-	-	-	-
	impossible - possible	0.974	181.812			-	-		
how likely is it, that you refrain from purchasing the product in the future?	very unlikely - very likely	-	-			0.936	78.206		
	unimaginable - imaginable	-	-	-	-	0.969	164.080	0.913	0.969
	impossible - possible	-	-			0.961	130.777		

Appendix II.3 Second-order measurement model

Appendix II.3a Second-order measurement model - Active Innovation Resistance (AIR)

	Functional Barriers			
1st Order Construct	**Temporary Rejection**		**Continuous Rejection**	
	VIF= 1.737		VIF= 2.101	
	Weights	**t-value**	**Weights**	**t-value**
Value Barrier	0.277	13.754	0.178	13.804
Complexity Barrier	0.100	5.089	0.121	8.518
Trialability Barrier	0.196	14.870	0.158	13.445
Compatibility Barrier	0.244	16.041	0.186	16.134
Co-dependence Barrier	0.044	1.425	0.167	15.126
Communicability Barrier	0.273	12.696	0.177	13.621
Visibility Barrier	0.181	8.541	0.175	14.047
Amenability Barrier	0.214	13.851	0.199	19.648
Realisation Barrier	0.007	0.067	0.155	12.151

	Psychological Barriers			
1st Order Construct	**Temporary Rejection**		**Continuous Rejection**	
	VIF= 2.596		VIF= 2.197	
	Weights	**t-value**	**Weights**	**t-value**
Norm Barrier	0.287	15.709	0.311	17.086
Image Barrier	0.243	21.066	0.244	17.955
Usage Barrier	0.060	1.687	0.145	5.618
Information Barrier	0.251	13.242	0.208	10.874
Personal Risk Barrier	0.206	19.990	0.082	2.956
Functional Risk Barrier	0.134	3.057	0.048	1.708
Economic Risk Barrier	0.169	4.876	0.278	19.675
Social Risk Barrier	0.095	2.209	0.204	11.340

Appendix II.3 b Second-order measurement model – Passive Innovation Resistance (PIR)

	Inclination to Resist Changes			
1st Order Construct	**Temporary Rejection**		**Continuous Rejection**	
	VIF= 2.903		VIF= 3.515	
	Weights	**t-value**	**Weights**	**t-value**
Routine Seeking	0.295	30.320	0.283	34.643
Cognitive Rigidity	0.212	13.845	0.241	18.618
Emotional Reaction	0.329	33.340	0.314	32.339
Short-Term Focus	0.335	30.791	0.322	35.082

	Status Quo Satisfaction			
1st Order Construct	**Temporary Rejection**		**Continuous Rejection**	
	VIF= 1.129		VIF= 1.209	
	Weights	**t-value**	**Weights**	**t-value**
Status Quo Satisfaction - Product	0.698	14.782	0.693	20.694
Status Quo Satisfaction - Innovation	0.517	10.328	0.488	17.335

Appendix II.3 c Second-order measurement model - Transactional Innovation Resistance (TIR)

	Monetary Constraints			
1st Order Construct	**Temporary Rejection**		**Continuous Rejection**	
	VIF= 1.454		VIF= 1.005	
	Weights	**t-value**	**Weights**	**t-value**
Price Restrictions	0.765	13.519	0.657	2.689
Financial Restrictions	0.551	9.491	0.799	3.208

	Purchase Constraints			
1st Order Construct	**Temporary Rejection**		**Continuous Rejection**	
	VIF= 1.452		VIF= 1.0	
	Weights	**t-value**	**Weights**	**t-value**
Time Restrictions	0.972	20.532	0.733	4.496
Availability Restrictions	0.256	1.914	0.682	3.538

Appendix II.4: Overview findings systematic literature review

#	Year	Author	Journal	Cont. Rejection			Temp. Rejection	Method	Determinants Cont. Rejection *(T = Theoretical Suggestion/ E = Empirical Evidence)*		Determinants Temp. Rejection *(T = Theoretical Suggestion/ E = Empirical Evidence)*	
				exclusively	*some hints on temp. Rejection*	*Cont. Reject-ion and Temp. Rejection*	*exclusively*	T/ Equal/ Equant	*Passive Innovation*	*Active Innovation*	*Passive Innovation*	*Active Innovation*
1	1981	Sheth	Research in Marketing	x	-	-	-	T	T	T	-	-
2	1987	Ram	Advances in Consumer Research	x	-	-	-	T	T	T	-	-
3	1987	Zeithaml and Gilly	Journal of Retailing	x	-	-	-	Equant	-	E	-	-
4	1989	Ram	Journal of Product Inno-vation Management	x	-	-	-	Equant	-	E	-	-
5	1989	Ram and Sheth	Journal of Consumer Mar-keting	-	x	-	-	T	-	T	-	-
6	1991	Ellen. Bearden and Sharma	Journal of the Academy of Marketing Science	x	-	-	-	Equant	E	E	-	-
7	1992	Herbig and Day	Marketing Intelligence and Planning	x	-	-	-	T	T	T	-	-
8	1992	Lunsford and Burnett	Journal of Consumer Mar-keting	x	-	-	-	T	-	T	-	-
9	1994	Herbig and Kramer	Journal of Consumer Mar-keting	x	-	-	-	T	-	T	-	-

9	1994	Herbig and Kramer	Journal of Consumer Marketing	x	-	-	-	T	-	T	-	-
10	1995	Dunphy and Herbig	The Journal of High Technology Management Research	x	-	-	-	T	-	T	-	-
11	1995	Greenleaf and Lehmann	Journal of Consumer Research	-	-	-	x	Equant	-	-	-	E
12	1996	Olshavsky and Spreng	Journal of Product Innovation Management	-	-	x	-	Equal	E	E	-	-
13	1997	Nabih. Bloem and Poiesz	Advances in Consumer Research	-	-	x	-	T	-	T	-	-
14	1998	Aggarwal. Cha and Wilemon	Journal of Consumer Marketing	x	-	-	-	T	-	T	-	-
15	1998	Szmigin and Foxall	Technovation	-	-	x	-	Equal	E	E	-	-
16	1999	Bagozzi and Lee	Advances in Consumer Research	x	-	-	-	T	T	T	-	-
17	2001	Molesworth and Suortfi	Journal of Consumer Behaviour	-	x	-	-	Equal	-	E	-	-
18	2002	Walker. Craig-Lee. Hecker and Francis	International Journal of Service Industry Management	x	-	-	-	Equant	-	E	-	-
19	2003	Schilling	California Management Review	-	x	-	-	T	-	T	-	-
20	2004	Rudolph. Rosenbloom and Till-mann	Journal of International Con-sumer Marketing	x	-	-	-	Equant	-	E	-	-

21	2006	Gourville	Harvard Business Review	x	-	-	-	T	-	T	-	-
22	2007	Goldenberg and Oreg	Technological Forecasting and Social Change	-	-	-	x	T	-	-	T	-
23	2007	Heiskanen. Hyvönen. Niva. Pantzar. Timonen and Varjonen	European Journal of Innovation Management	x	-	-	-	Equal	E	E	-	-
24	2007	Kuisma. Laukkanen and Hiltunen	International Journal of Information Management	-	x	-	-	Equal	T	E	-	-
25	2007	Laukkanen. Sinkkonen. Kivijärvi and Laukkanen	Journal of Consumer Marketing	x	-	-	-	Equant	-	E	-	-
26	2008	Laukkanen. Sinkkonen and Laukkanen	International Journal of Bank Marketing	-	-	x	-	Equant	-	E	-	-
27	2008	Pandit. Karpen and Josiassen	Australian and New Zealand Marketing Academy Conference Proceedings	-	-	-	x	Equant	-	-	-	E
28	2009	Hess	Doctoral thesis. University of Mannheim. Mannheim.	x	-	-	-	Equant	T	E	-	-
29	2009	Kleijnen. Lee and Wetzels	Journal of Economic Psychology	-	-	x	-	Equal	-	E	-	E

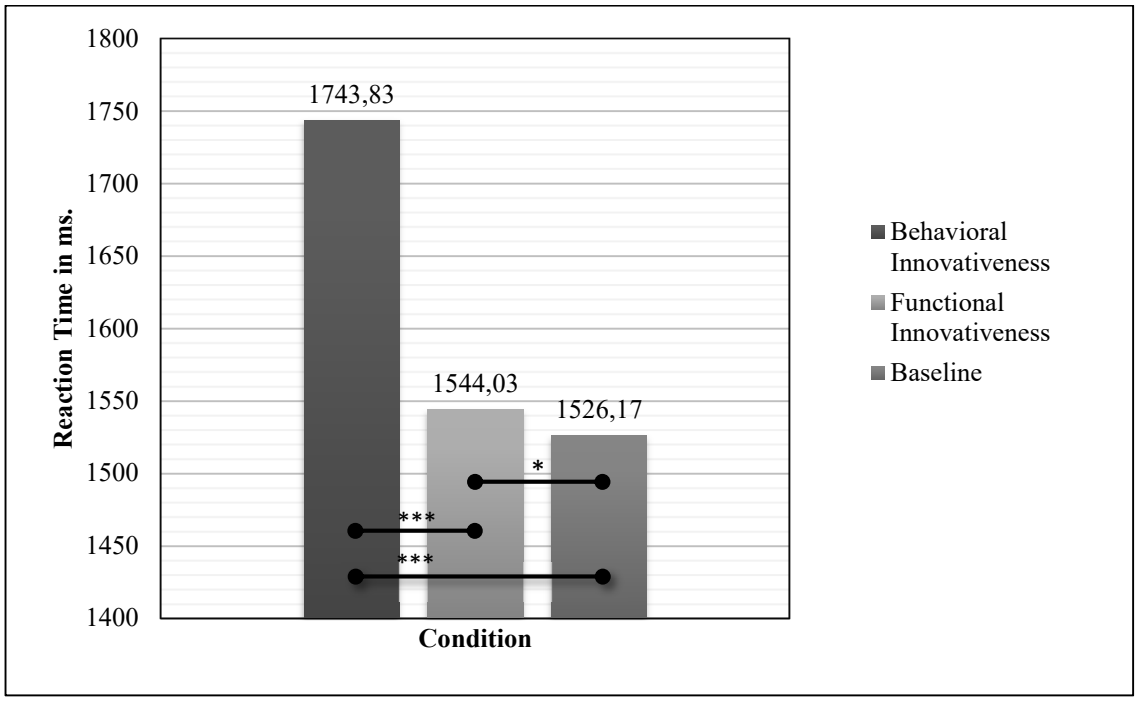
30	2009	Laukkanen. Sinkkonen and Laukkanen	International Journal of Information Management	-	x	-	-	Equant	-	E	-	-
31	2010	Antioco and Kleijnen	European Journal of Marketing	x	-	-	-	Equant	-	E	-	-
32	2010	Laukkanen and Kiviniemi	International Journal of Bank Marketing	x	-	-	-	Equant	-	E	-	-
33	2010	Reinders	Doctoral thesis. Vrije Universiteit Amsterdam. Amsterdam	-	x	-	-	Equant	T	E	-	-
34	2010	Sääksjärvi and Morel	European Journal of Innovation Management	x	-	-	-	Equant	T	E	-	T
35	2010	Swilley	Journal of Consumer Marketing	x	-	-	-	Equant	T	E	-	-
36	2011	Bartels and Reinders	Journal of Business Research	x	-	-	-	T	T	-	-	-
37	2011	Claudy	Doctoral thesis. Dublin Institute of Technology. Dublin	-	-	x	-	Equant	E	E	-	E
38	2011	Elbadrawy and Aziz	International Journal of Managing Information Technology	-	-	x	-	Equant	-	E	-	E
39	2011	Wiedmann. Hennings. Pankalla. Kassubek and Seegebarth	Journal of Business Research	x	-	-	-	Equant	-	E	-	-
40	2012	Patsiotis. Hughes and Webber	International Journal of Bank Marketing	x	-	-	-	Equant	-	E	-	-

41	2013	Antón. Camarero and Rodríguez	Psychology and Marketing	x	-	-	-	Equant	E	E	-	-
42	2013	Chen. Anders and An	Food Quality and Preference	x	-	-	-	Equant	-	E	-	-
43	2013	Cornescua and Adam	International Economic Conference of Sibiu 2013 Post Crisis Economy	-	x	-	-	T	T	T	-	-
44	2013	Heidenreich and Spieth	International Journal of Innovation Management	x	-	-	-	Equant	E	E	-	-
45	2013	Lee	Telematics and Informatics	x	-	-	-	Equant	T	E	-	-
46	2013	Lian and Yen	Computers in Human Behavior	-	x	-	-	Equant	-	E	-	E
47	2013	Tseng and Chiang	Journal of High Technology Management Research	-	-	x	-	Equant	-	E	T	-
48	2013	Patsiotis. Hughes and Webber	Journal of Services Marketing	-	x	-	-	Equant	-	E	-	-
49	2014	Talke and Heidenreich	Journal of Product Innovation Management	-	-	x	-	T	T	T	T	T
50	2015	Claudy. Garcia and O'Driscoll	Journal of the Academy of Marketing Science	x	-	-	-	Equant	-	E	-	-
51	2015	Heidenreich and Handrich	Journal of Product Innovation Management	x	-	-	-	Equant	E	-	-	-
52	2015	Kuester. Heß and Hermann	International Journal of Innovation Management	x	-	-	-	Equant	E	E	-	-

53	2015	Zsifkovits and Günther	Central European Journal of Operations Research	x	-	-	-	Equant	-	E	-	-
54	2015	Herrmann. Sprott and Schlager	Total Quality Management and Business Excellence	-	-	-	x	Equant	-	-	-	E
55	2016	Heidenreich. Kraemer and Handrich	Journal of Business Research	x	-	-	-	Equant	E	-	-	-
56	2016	Heidenreich and Kraemer	Journal of Economic Psychology	x	-	-	-	Equant	E	-	-	-
57	2016	Labrecque. Wood. Neal and Harrington	Journal of the Academy of Marketing Science	x	-	-	-	Equant	E	-	-	-
58	2016	Laukkanen	Journal of Business Research	x	-	-	-	Equant	-	E	-	-
59	2016	Mani and Chouk	Journal of Marketing Management	x	-	-	-	Equant	-	E	-	-
60	2016	Heidenreich and Kraemer	Journal of Product Innovation Management	x	-	-	-	Equant	E	-	-	-

Appendix III Chapter 4 (Essay 3): A Sneak Peek into the Brain: Investigating Neuronal Reactions to New Products Using Functional Magnetic Resonance Imaging (fMRI)

Appendix III.1 Differences in reaction time between conditions



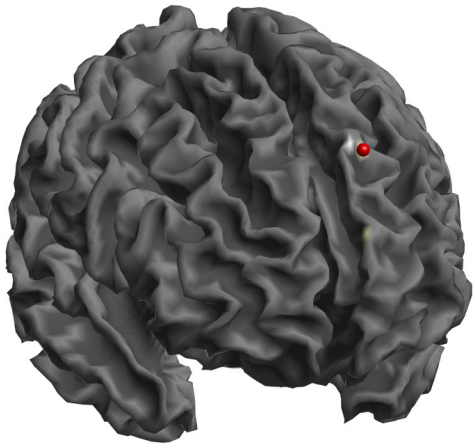
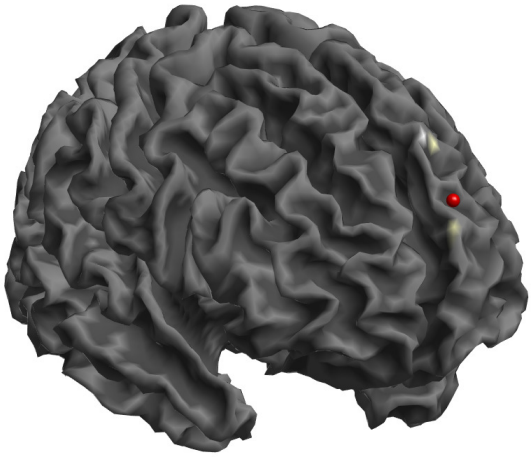
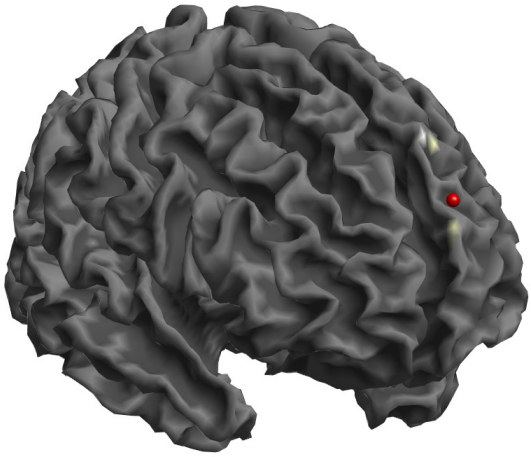
***p < 0.01; **p < 0.05; *p < 0.1; n.s. = not significant

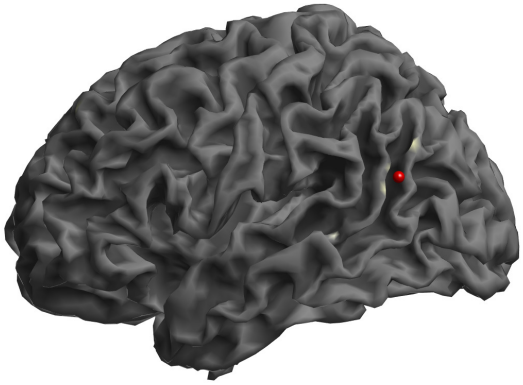
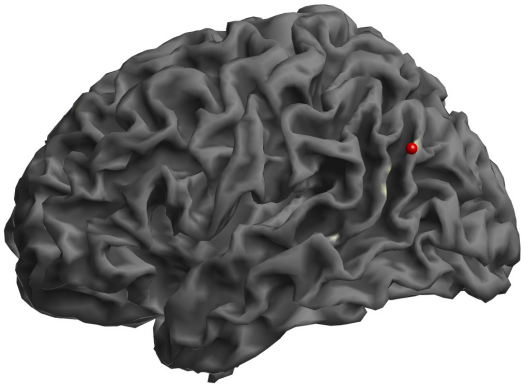
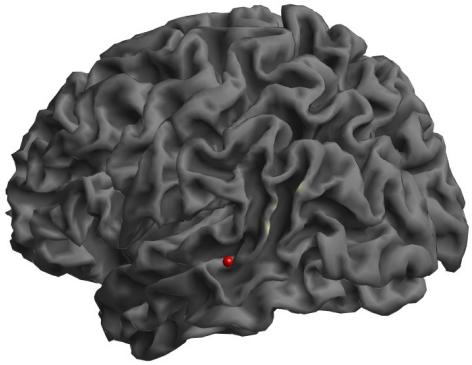
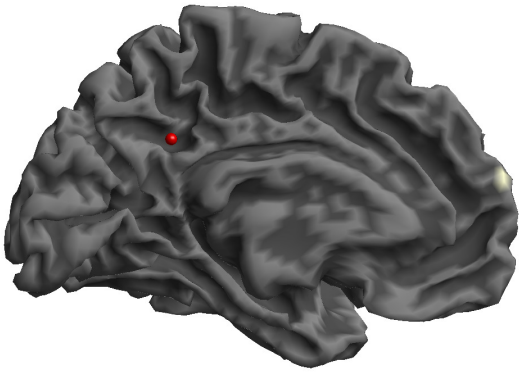
Condition	N Total Events	N Missed Action	N Reaction	Mean	SD
				in ms.	
Behavioral Innovativeness	5496	31	5465	1743,83	474,014
Functional Innovativeness	5502	25	5477	1544,03	409,616
Baseline	5514	28	5486	1526.17	385,537
Total	16512	84	16428		

Appendix III.2 Whole brain analysis results

Appendix III.2 a Whole brain analysis results (contrast functional innovativeness > baseline)

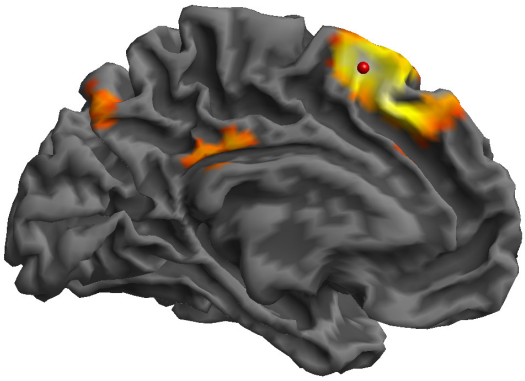
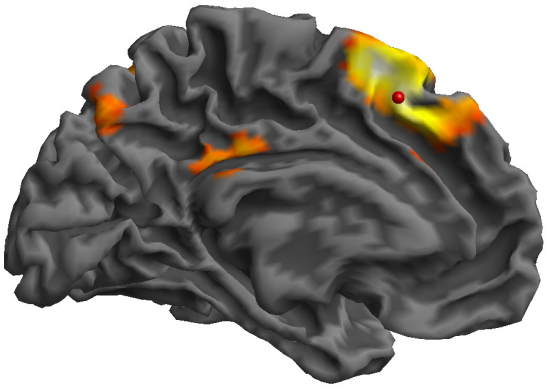
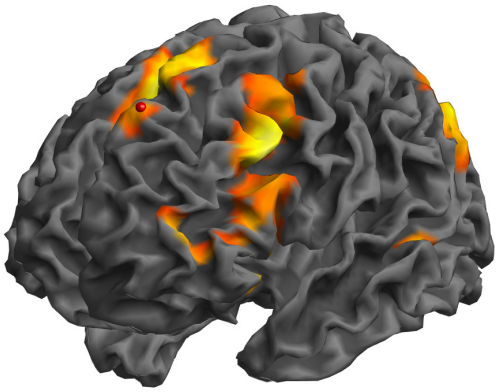
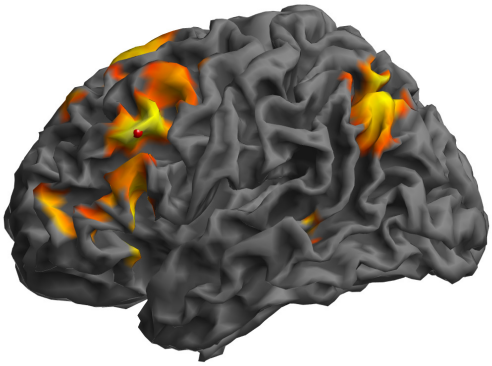
functional innovativeness > baseline										
Cluster Level			**Peak Level**				**MNI**			**Correlate**
$P_{FWE-corr.}$	k_E	$P_{uncorr.}$	$P_{FWE-corr.}$	T	Z	$P_{uncorr.}$	X	Y	Z	
0.000	185	0.002	0.000	6.21	6.03	0.000	-10	52	44	Medial Prefrontal Cortex
			0.000	5.89	5.74	0.000	-8	58	38	Dorsomedial Prefrontal Cortex
			0.011	4.83	4.75	0.000	-6	62	28	Medial Prefrontal Cortex
0.004	48	0.084	0.011	4.85	4.77	0.000	-56	-64	20	Inferior Parietal Lobule
			0.013	4.80	4.72	0.000	-54	-68	30	Angular Gyrus
0.021	10	0.419	0.011	4.85	4.77	0.000	-54	-42	0	Middle Temporal Lobule
0.014	18	0.276	0.023	4.66	4.58	0.000	-4	-50	32	Posterior Cingulate Cortex

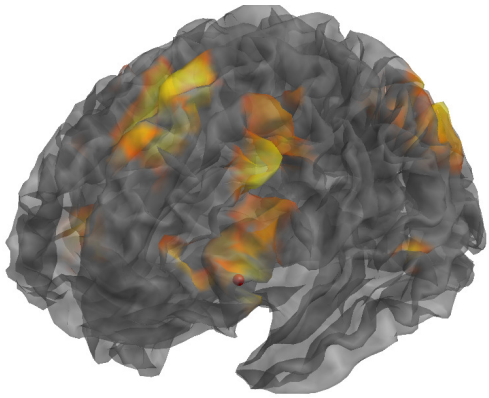
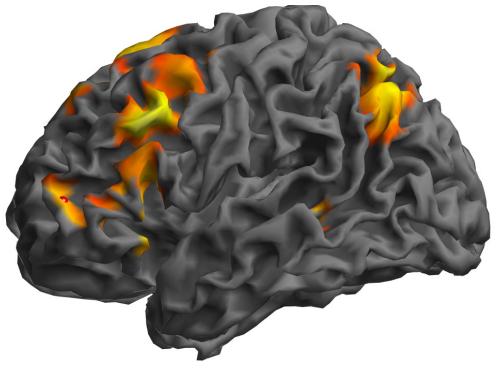
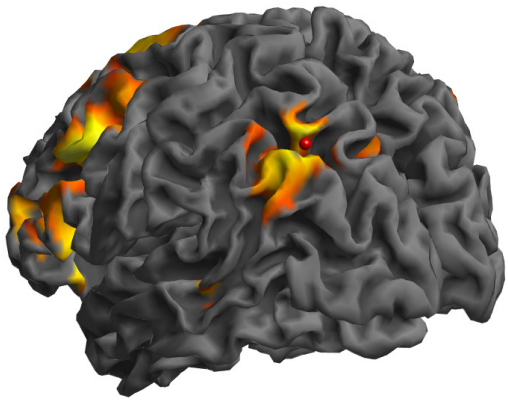
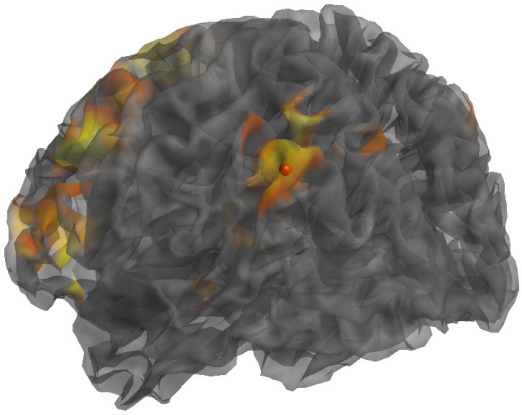
X	Y	Z	Correlate	ROI center
-10	52	44	Medial Prefrontal Cortex	
-8	58	38	Dorsomedial Prefrontal Cortex	
-6	62	28	Medial Prefrontal Cortex	

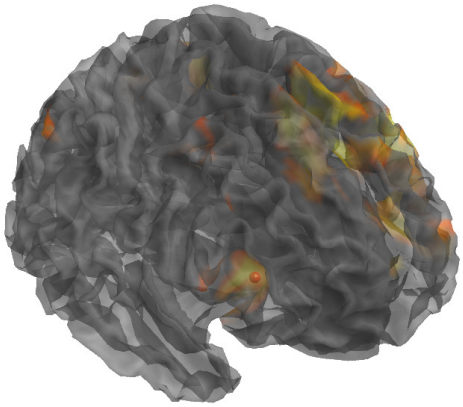
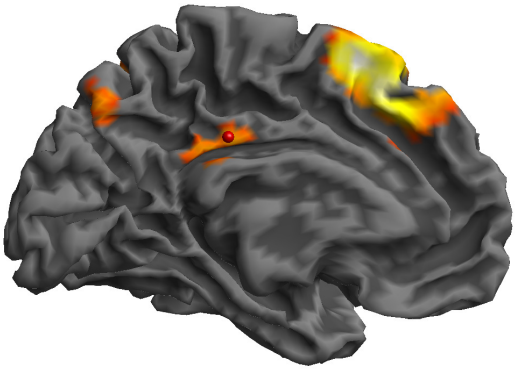
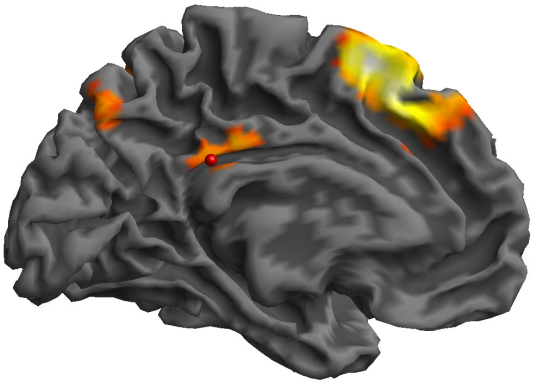
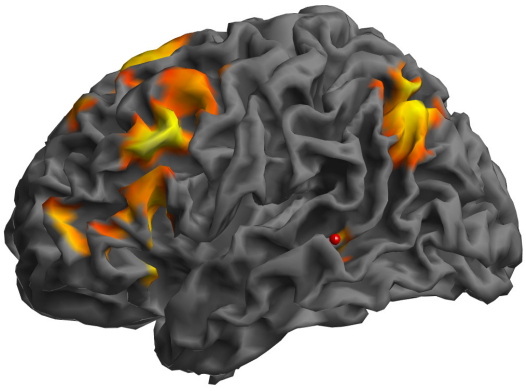
X	*Y*	*Z*	**Correlate**	**Anatomic ROI center**
-56	-64	20	Inferior Parietal Lobule	
-54	-68	30	Angular Gyrus	
-54	-42	0	Middle Temporal Lobule	
-4	-50	32	Posterior Cingulate Cortex	

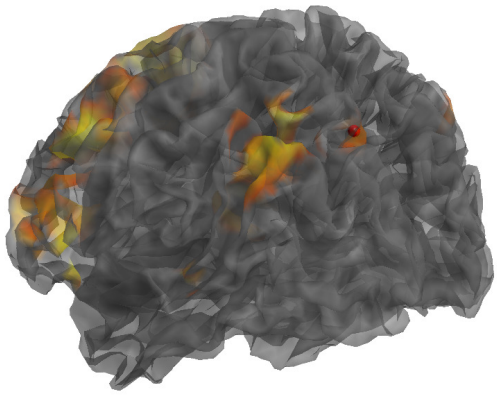
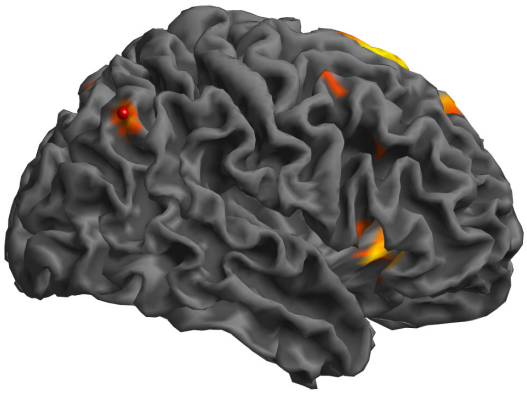
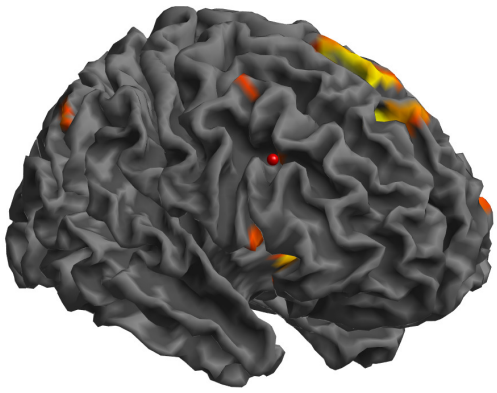
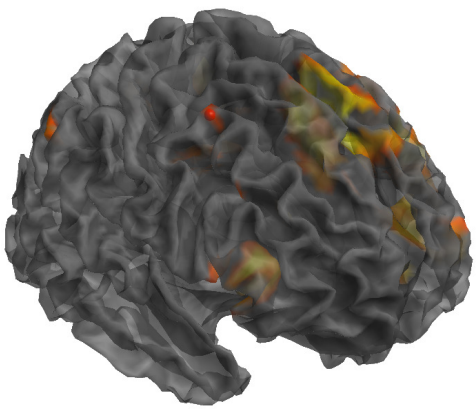
Appendix III.2 b Whole brain analysis results (contrast behavioral innovativeness > functional innovativeness)

behavioral innovativeness > baseline										
Cluster Level			***Peak Level***				***MNI***			***Correlate***
$P_{FWE-corr.}$	k_E	$P_{uncorr.}$	$P_{FWE-corr.}$	T	Z	$P_{uncorr.}$	X	Y	Z	
0.000	2493	0.000	0.000	9.63	Inf	0.000	-4	14	56	Supplementary Motor Cortex
			0.000	9.09	Inf	0.000	-2	20	48	Supplementary Motor Cortex
			0.000	6.26	6.08	0.000	-12	42	46	Medial Prefrontal Cortex
0.000	3044	0.000	0.000	8.32	Inf	0.000	-48	18	32	Dorsolateral Prefrontal Cortex
			0.000	7.88	7.54	0.000	-38	22	-4	Anterior Insula
			0.000	6.48	6.29	0.000	-38	48	4	Dorsolateral Prefrontal Cortex
0.000	1138	0.000	0.000	8.15	7.77	0.000	-36	-72	48	Superior Parietal Lobule Intraparietal Sulcus
			0.000	7.26	6.99	0.000	-36	-64	36	Angular Gyrus
0.000	648	0.000	0.000	8.08	7.72	0.000	34	26	4	Anterior Insula
0.000	289	0.000	0.000	6.79	6.56	0.000	-2	-30	32	Posterior Cingulate Cortex
			0.000	6.37	6.19	0.000	0	-38	26	Posterior Cingulate Cortex
0.001	87	0.025	0.000	6.62	6.42	0.000	-54	-42	0	Middle Temporal Lobule
0.000	160	0.004	0.000	5.92	5.77	0.000	-6	-72	44	Precuneus
0.001	110	0.014	0.000	5.87	5.73	0.000	48	-64	44	Superior Parietal Lobule
0.011	24	0.211	0.010	4.87	4.78	0.000	44	20	30	Dorsolateral Prefrontal Cortex
0.009	29	0.171	0.017	4.74	4.66	0.000	36	2	54	Premotor Cortex

X	Y	Z	Correlate	Anatomic ROI center
-4	14	56	Supplementary Motor Cortex	
-2	20	48	Supplementary Motor Cortex	
-12	42	46	Medial Prefrontal Cortex	
-48	18	32	Dorsolateral Prefrontal Cortex	

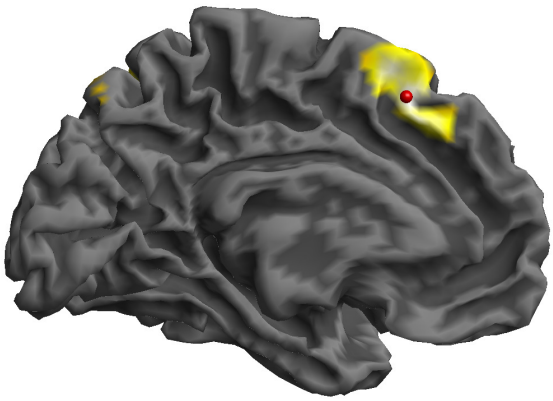
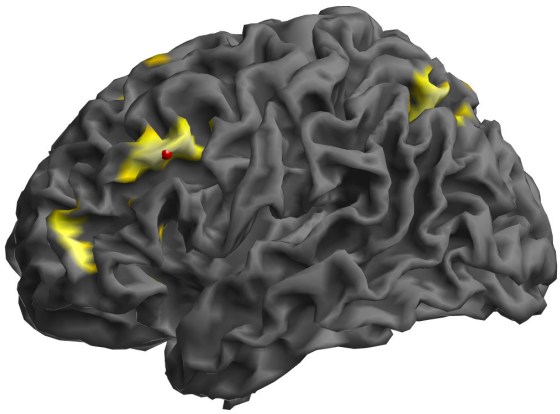
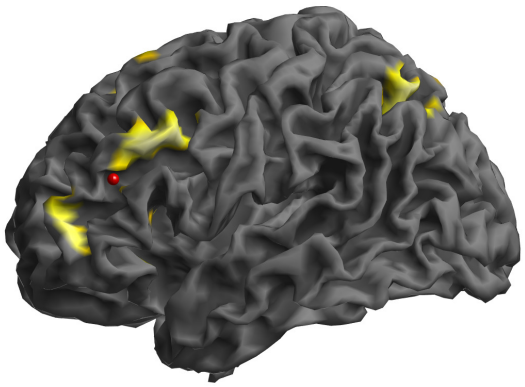
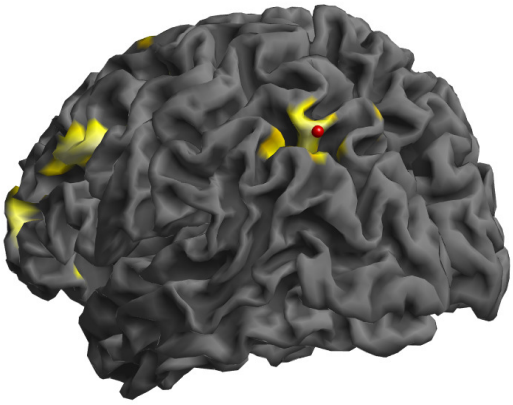
X	*Y*	*Z*	Correlate	Anatomic ROI center
-38	22	-4	Anterior Insula	
-38	48	4	Dorsolateral Prefrontal Cortex	
-36	-72	48	Superior Parietal Lobule Intraparietal Sulcus	
-36	-64	36	Angular Gyrus	

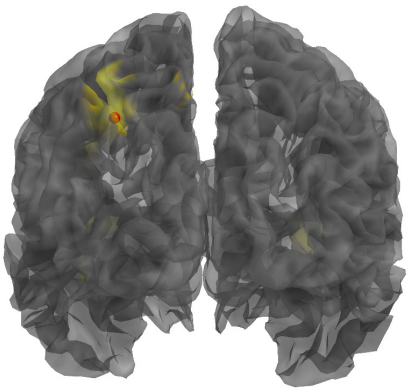
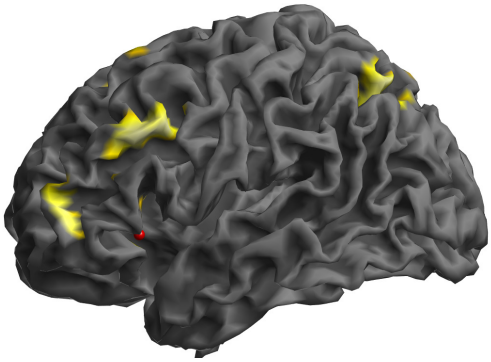
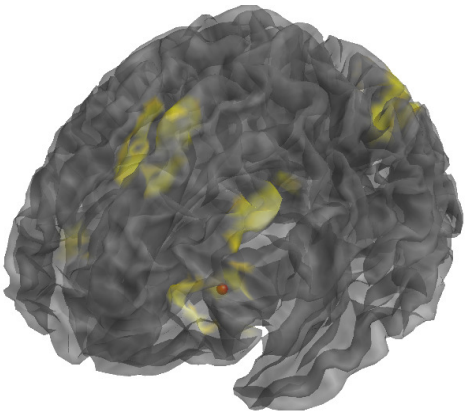
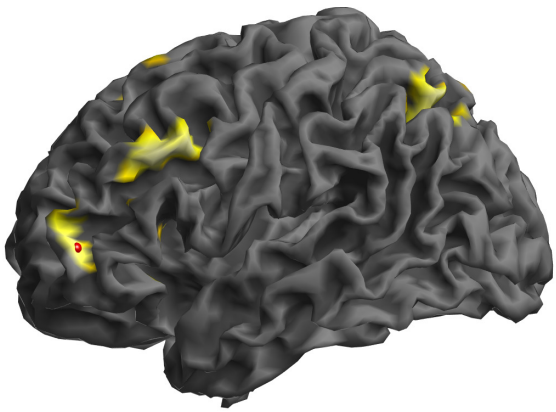
X	*Y*	*Z*	**Correlate**	**Anatomic ROI center**
34	26	4	Anterior Insula	
-2	-30	32	Posterior Cingulate Cortex	
0	-38	26	Posterior Cingulate Cortex	
-54	-42	0	Middle Temporal Lobule	

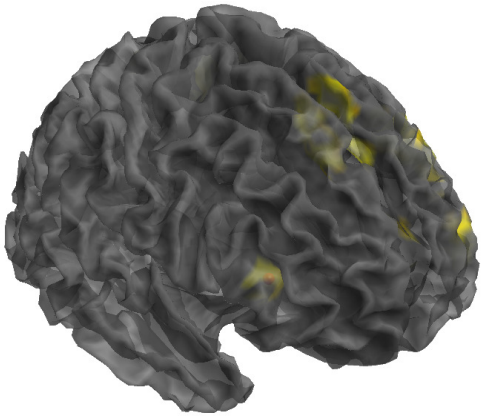
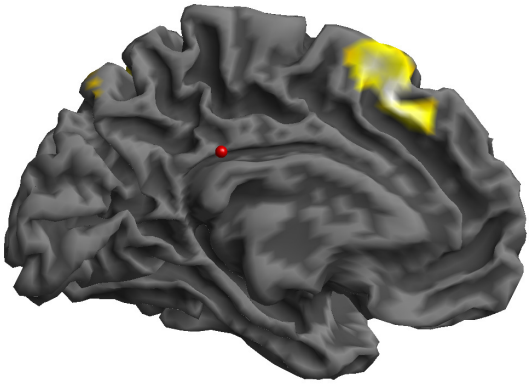
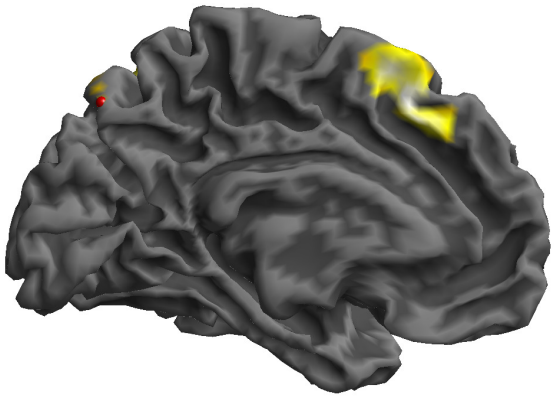
X	*Y*	*Z*	**Correlate**	**Anatomic ROI center**
-6	-72	44	Precuneus	
48	-64	44	Superior Parietal Lobule	
44	20	30	Dorsolateral Prefrontal Cortex	
36	2	54	Premotor Cortex	

Appendix III.2 c Whole brain analysis results (contrast behavioral innovativeness > functional innovativeness)

behavioral innovativeness > functional innovativeness										
Cluster Level			***Peak Level***				***MNI***			***Correlate***
$P_{FWE-corr.}$	k_E	$P_{uncorr.}$	$P_{FWE-corr.}$	*T*	*Z*	$P_{uncorr.}$	*X*	*Y*	*Z*	
0.000	1086	0.000	0.000	7.06	6.81	0.000	0	20	48	Supplementary Motor Cortex
0.000	813	0.000	0.000	6.37	6.19	0.000	-48	18	32	Dorsolateral Prefrontal Cortex
			0.006	4.99	4.90	0.000	-46	32	20	Inferior Frontal Gyrus
0.000	595	0.000	0.000	6.19	6.02	0.000	-32	-70	50	Intraparietal Sulcus
			0.000	5.76	5.63	0.000	-30	-62	40	Intraparietal Sulcus
0.000	200	0.002	0.000	6.08	5.92	0.000	-36	20	-4	Anterior Insula
			0.000	5.59	5.46	0.000	-32	24	4	Anterior Insula
0.000	191	0.002	0.000	6.00	5.84	0.000	-38	46	2	Dorsolateral Prefrontal Cortex
0.000	262	0.000	0.000	5.98	5.83	0.000	34	26	4	Anterior Insula
0.019	12	0.375	0.017	4.74	4.66	0.000	-2	-34	28	Posterior Cingulate Cortex
0.018	13	0.355	0.030	4.59	4.52	0.000	-6	-74	46	Precuneus

X	*Y*	*Z*	Correlate	Anatomic ROI center
0	20	48	Supplementary Motor Cortex	
-48	18	32	Dorsolateral Prefrontal Cortex	
-46	32	20	Inferior Frontal Gyrus	
-32	-70	50	Intraparietal Sulcus	

X	*Y*	*Z*	Correlate	Anatomic ROI center
-30	-62	40	Intraparietal Sulcus	
-36	20	-4	Anterior Insula	
-32	24	4	Anterior Insula	
-38	46	2	Dorsolateral Prefrontal Cortex	

X	*Y*	*Z*	**Correlate**	**Anatomic ROI center**
34	26	4	Anterior Insula	
-2	-34	28	Posterior Cingulate Cortex	
-6	-74	46	Precuneus	

Appendix III.3 Correlation analysis

Appendix III.3 a Correlation analysis (contrast functional innovativeness > baseline)

functional innovativeness > baseline				
Correlate	**Behavioral Innovativeness**		**Functional Innovativeness**	
	Path	**Sig.**	**Path**	**Sig.**
L Angular Gyrus	-0.083	1.560	0.033	0.595
L Dorsomedial Prefrontal Cortex	-0.242	4.060	0.013	0.225
L Inferior Parietal Lobule	-0.146	2.741	0.025	0.423
L Medial Prefrontal Cortex	-0.319	4.981	0.087	1.450
L Medial Prefrontal Cortex	-0.278	4.290	0.016	0.253
L Middle Temporal Lobule	-0.197	3.554	0.149	2.531
L Posterior Cingulate Cortex	-0.132	2.341	-0.078	1.297

Appendix III.3 b Correlation analysis (contrast behvaioral innovativeness > baseline)

behavioral innovativeness > baseline				
Correlate	**Behavioral Innovativeness**		**Functional Innovativeness**	
	Path	**Sig.**	**Path**	**Sig.**
L Angular Gyrus	0.274	4.837	-0.034	0.462
R Anterior Insula	0.132	2.121	0.040	0.688
L Anterior Insula	0.322	5.240	-0.054	0.815
L Dorsolateral Prefrontal Cortex	0.126	1.868	-0.760	1.115
R Dorsolateral Prefrontal Cortex	0.061	1.058	0.154	2.566
L Dorsolateral Prefrontal Cortex	0.149	2.207	0.027	0.407
L Medial Prefrontal Cortex	-0.047	0.615	-0.039	0.573
L Middle Temporal Lobule	0.200	2.989	-0.051	0.864
L Posterior Cingulate Cortex	0.131	1.992	0.001	0.011
L Posterior Cingulate Cortex	0.152	2.336	0.056	0.832
L Precuneus	0.141	2.148	0.040	0.605
R Premotor Cortex	0.207	3.010	0.065	0.998
L Superior Parietal Lobule	0.234	3.702	-0.033	0.482
R Superior Parietal Lobule	0.135	2.161	0.029	0.453
L Supplementary Motor Cortex	0.104	1.989	0.032	0.562
L Supplementary Motor Cortex	0.103	1.830	0.046	0.807

Appendix III.3 c Correlation analysis (contrast behavioral innovativeness > functional innovativeness)

behavioral innovativeness > functional innovativeness				
Correlate	**Behavioral Innovativeness**		**Functional Innovativeness**	
	Path	**Sig.**	**Path**	**Sig.**
L Anterior Insula	0.206	3.228	-0.034	0.497
R Anterior Insula	0.133	2.214	0.042	0.693
L Anterior Insula	0.334	5.595	-0.033	0.420
L Dorsolateral Prefrontal Cortex	0.152	2.224	-0.064	0.930
L Dorsolateral Prefrontal Cortex	0.158	2.405	0.028	0.420
L Inferior Frontal Gyrus	0.133	1.888	-0.056	0.744
L Intraparietal Sulcus	0.246	4.061	-0.010	0.144
L Intraparietal Sulcus	0.178	2.968	0.051	0.749
L Posterior Cingulate Cortex	0.147	2.468	0.044	0.676
L Precuneus	0.134	2.085	0.049	0.791
L Supplementary Motor Cortex	0.103	2.082	0.045	0.744

N = 258; Bootstrapping with 1000 samples; IV measured with three items; Calculation of BI FI in separate models; Controls: Age, Gender, Education;
***p < 0.001; **p < 0.01; *p < 0.05; n.s. = not significant

Appendix III.4 Findings meta-analysis

Appendix III.4 a Findings meta-analysis contrast functional innovativeness > baseline

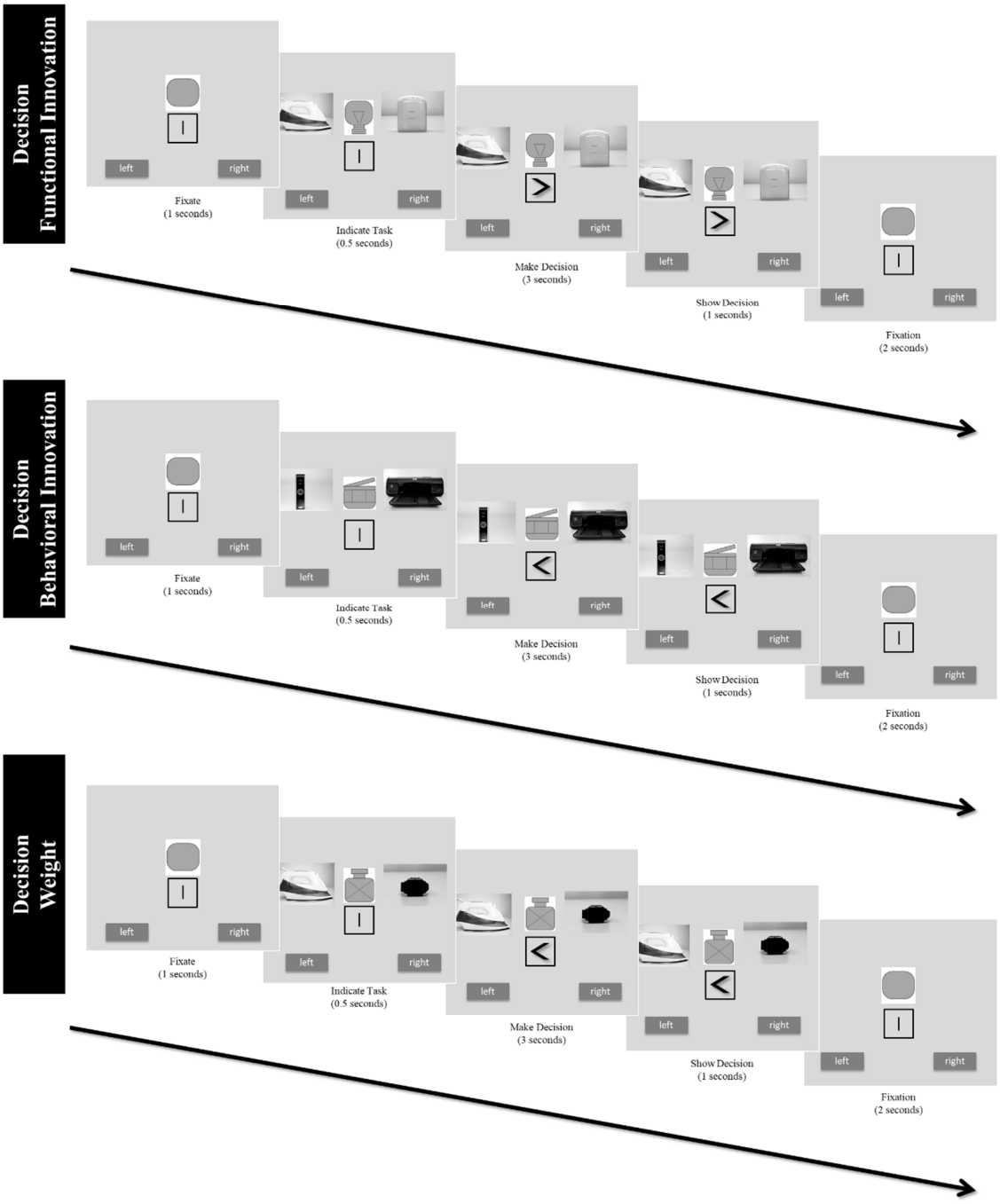
Correlate*	Associated Term	z-Score	est. Posterior probability
L Angular Gyrus	memories	5.07	0.79
L Dorsomedial Prefrontal Cortex	comprehension	6.03	0.80
L Inferior Parietal Lobule	recognition	4.59	0.72
L Medial Prefrontal Cortex	attribute	4.59	0.86
L Middle Temporal Lobule	semantic	11.46	0.79
L Posterior Cingulate Cortex	thinking	4.78	0.78

Appendix III.4 b Findings meta-analysis contrast behvaioral innovativeness > baseline

Correlate	Associated Term	z-Score	est. Posterior probability
L Angular Gyrus	memory retrieval	4.38	0.78
L Anterior Insula	response inhibition	5.24	0.71
R Anterior Insula	stop signal	4.4	0.74
L Dorsolateral Prefrontal Cortex	memory	6.51	0.64
R Dorsolateral Prefrontal Cortex	target detection	5.34	0.83
L Medial Prefrontal Cortex	self referential	5.07	0.83
L Middle Temporal Lobule	visual word	7.26	0.84
L Posterior Cingulate Cortex	memory retrieval	4.37	0.75
L Precuneus	encoding retriveal	5.3	0.82
L Premotor Cortex	spatial	5.78	0.67
L Superior Parietal Lobule	episodic memory	3.53	0.74
R Superior Parietal Lobule	self	3.99	0.69
L Supplementary Motor Cortex	retrieval	4.89	0.63

* Similar coordinates within the same contrast have been merged

Appendix III.5 fMRI experimental task sequence



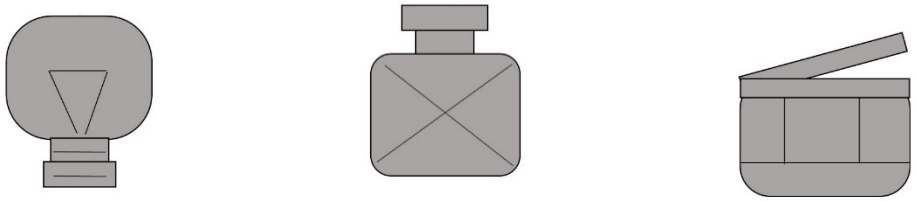
Appendix III.6 fMRI data acquisition

fMRI (EPI) scan: Two runs of each 871 scans, each including 4 prescans in respect to the saturation effect from radio pulses. These prescans were further excluded from data processing. Scan parameters: TR = 1,78 ms, TE = 30 ms, flip angle = 90°, resolution = 3.0 mm x 3.0 mm x 3.0 mm, 0.75 mm gap between slices, and FOV = 192 mm. *Anatomical scans:* Three Dimensional Magnetization Prepared Rapid Acquisition of Gradient Echoes (MPRAGE) sequence with following scan parameters: echo time [TE] / repetition time [TR] / inversion time = 2.13 / 1900 / 900 ms, flip angle = 9°, matrix = 256 x 256, field of view [FOV] = 256 mm, resolution = 0.94 mm x 0.94 mm x 0.9 mm, 192 saggital slices of 0,9 mm thickness without gap

Appendix III.7 experimental icons

Before entering the fMRI, we introduced the participants to the experimental symbols. Each symbol has been identified and extensively pretested with Interviews and fMRI experiments to avoid misinterpretation and ambiguous neuronal activity. Associations: a) From your perspective, which product offers more innovative functionality? (Functional Innovativeness); b) From your perspective, which product is heavier? (Baseline Condition); c) From your perspective, which product is more difficult to use? (Behavioral Innovativeness)

a) b) c)



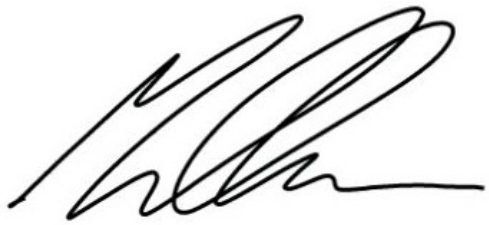
Appendix III.8 Overview experimental stimuli

Experimental Use	Product	Name	Weight	Price*
Baseline Products		Floor lamp	4.4 kg	17 €
		Stone lamp	6.3 kg	15 €
Non innovative Products		Iron	1.8 kg	21 €
		Desktop printer	6.3 kg	38 €
Innovative Products		Smart-watch	0.14 kg	220 €
		Graph tablet	0.28 kg	39 €
		Solar base station	0.17 kg	28 €
		Portable smartphone printer	0.29 kg	160 €
		Laser keyboard	0.14 kg	160 €
		Gesture controller	0.19 kg	130 €

* Product Prices from Summer 2016

DECLARATION

I declare on my word of honor, that I am the sole author of this thesis. The exceptions to this are the sections for which one or more co-authors were involved; these sections are explicitly identified and the names of the co-authors are completely and truthfully listed. I confirm that I made a significant contribution to the sections for which one or more co-authors were involved that justifies my own co-authorship. The work was completed using only the cited sources. All information taken directly from source material or ideas based on information taken from source material have been clearly identified through the cited references.



Saarbrücken, 21.11.2018