I. Introduction

This chapter is divided into five sections. The first section explains the motivation for this research by highlighting the importance of the digital transformation of the mobility sector and the potential use of the business model concept to better understand this phenomenon. The second section describes the research gaps as regard the business model concept in general and business models in the mobility sector in particular and uses them to derive three research questions. While the third section develops the research design conceived to address these three questions, implemented in six individual studies, the fourth section outlines anticipated contributions to research and practice. Finally, the fifth section provides an overview of the structure of the thesis, detailing the individual parts, chapters, and sections and their key relationships to one another.

I.1 Motivation

When you innovate, look at the forest, not the trees. (Amit and Zott 2012, p. 49)

There are four megatrends significantly influencing the present and future of the mobility sector (BCG 2012; McKinsey&Company 2016; PWC 2016; Roland Berger 2013). First, the demand for mobility is drastically increasing, driven both by global population growth from 7.3 billion in 2015 to an estimated 8.5 billion in 2030 (UN 2015) as well as by the rising share of urban population, expected to grow from 54% in 2015 to 60% in 2030 (UN 2014). Second, the development of sustainable modes of transportation is more and more an imperative, as natural resources are becoming scarcer and transportation accounts for nearly one quarter of global CO_2 emissions (IEA 2015). Third, consumers are changing their values, preferring to use or share over owning and tending to strive for individuality and convenience (Botsman and Rogers 2011; Roland Berger 2014; TREND-MONITOR 2015).

The challenges resulting from the former three trends might be solved by the fourth megatrend: the increasing diffusion of advanced technologies. This refers on the one hand to technological advances of existing products, such as electrification and advanced driver assistance, and on the other hand – where the focus of this thesis lies – to advances in digital technologies, such as big data, cloud computing, machine-to-machine communication, mobile connectivity, and sensors (BCG 2013; McKinsey&Company 2016; Roland Berger 2013), which enable completely new digital business models for the mobility sector.

Incumbent firms from the mobility sector have already started to invest heavily in these opportunities. One example comes from BMW, the world's leading premium automotive manufacturer. For more than half a century, BMW's business model was producing and selling cars; however, in 2007, the company announced a remarkable strategy shift: "The BMW Group is the leading provider of premium products and premium services for individual mobility" (BMW 2007, p. 5). In line with this new focus, BMW introduced several of these premium services for individual mobility in the following years, all fundamentally out of line with its traditional business model of manufacturing physical products. These services included carsharing (DriveNow), parking services (JustPark, ParkNow), and a city portal

(MyCityWay). Furthermore, BMW founded BMW i Ventures, a venture capital company investing in high-potential technology startups from the mobility sector. Another example of an incumbent firm using digital technologies to develop new business models is the German national railway company Deutsche Bahn. In addition to its traditional business model, which is passenger transport by train, the company now offers bikesharing (Call a Bike) and carsharing (Flinkster) in various German cities. The Deutsche Bahn has also recently launched its own venture fund (Deutsche Bahn Digital Venture) to invest in new technology startups.

Incumbent firms are not the only companies employing new digital technologies to innovate business models for the mobility sector; new companies taking advantage of digital advances have also emerged. Two of the most impressive examples of these are the technology startup Uber and the IT company Alphabet (formerly Google). Founded in 2009, Uber offers an on-demand ridesharing service. In February 2015, Uber finished the Series E funding round at $2.8 billion, which is more than Airbnb, Dropbox, and Spotify had raised combined (New York Times 2015). Hence, it took the company just six years to become more valuable than 80% of the S&P 500 companies, including the Ford Motor Company, the General Motors Company, and Delta Air Lines (Bloomberg 2015). The second example is the IT giant Alphabet, which is developing several of its own offerings while also investing in various startups from the mobility sector (Figure A-1). Alphabet offers free real-time navigation with Google Maps, a flight comparison portal with Google Flights, and technology for smartphone projection in cars via Android Auto. In 2013, Alphabet acquired the crowd-sourced navigation service Waze for more than $1 billion (Business Insider 2015). Furthermore, Alphabet is an investor in Space X, Turo, and Uber. Finally, one the firm's leading innovation projects is Waymo, formerly the Google self-driving car project, which develops autonomous driving technology.

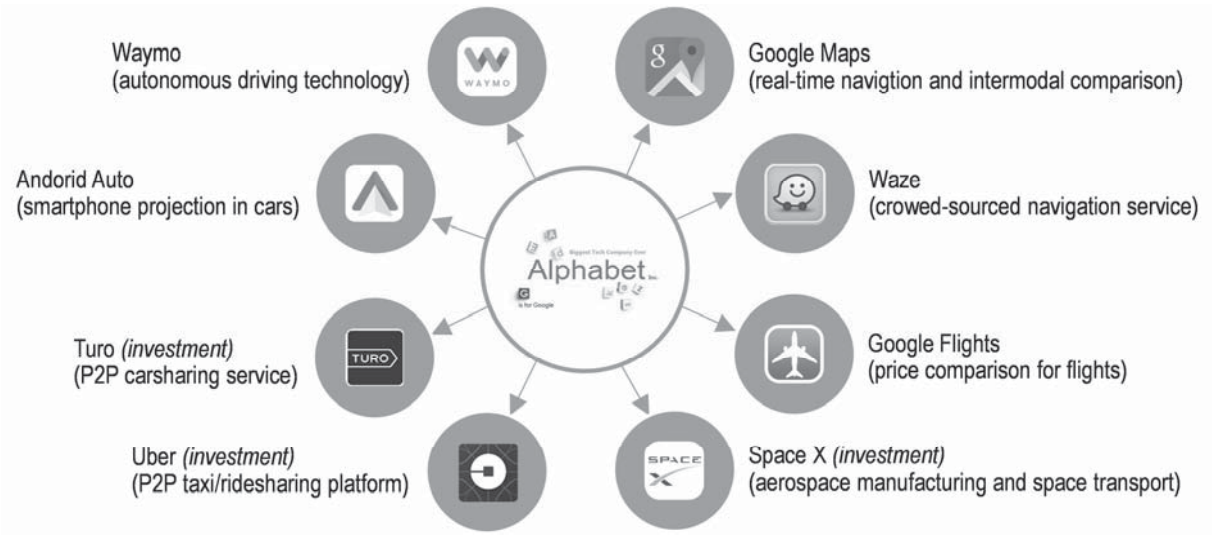

Figure A-1. Offerings, projects, and investments of Alphabet in the mobility sector.

The new digital business models described above certainly offer great opportunities for solving challenges related to the mobility of the future, e.g., by enabling a more efficient use of existing resources (Malhotra et al. 2013). However, managers from the mobility sector –

particularly those from incumbent firms – often struggle to understand their underlying logics. A recent survey of managers from the automotive industry revealed that fewer than one-third of them felt well prepared for the digital transformation (Roland Berger 2015). This result is unsurprising, as digital business logics deviate fundamentally from their previous knowledge and these managers must not only understand new digital logics but also learn to integrate digital and physical operations (Hylving and Schultze 2013). Therefore, managers from the automotive industry as well as other traditional industries are increasingly requesting that research offer concrete guidance for the digital transformation of their businesses (Hess 2012).

Nevertheless, the digital transformation of business models in primarily physical industries remains surprisingly underresearched (Yoo et al. 2010). Thus far, some well-known researchers have described the implications that arise from the increasing diffusion of digital technologies into physical products, though on a rather generic level. For instance, Porter and Heppelmann (2014) describe how physical products are increasingly becoming smart, allowing them to perform tasks autonomously. El Sawy and Pereira (2013) emphasize that the creation of products and services is no longer assembled along a linear value stream but rather created simultaneously by an ecosystem with various actors involved. Furthermore, Yoo et al. (2010) explain that the new modular, layered product architecture alters traditional competitive rules, for instance by making it necessary for firms to cooperate on one layer while remaining competitors on another. Many of these articles use firms from the mobility sector as narrative examples – probably because the mobility sector was one of the first and largest primarily physical industries to begin undergoing a digital transformation (Roland Berger 2015). However, research directly addressing the digital transformation of business models from the mobility sector is rare. While there are some notable exceptions that include authors applying the concept to bikesharing, carsharing, ridesharing, and electric (e)-mobility (e.g., Abdelkafi et al. 2013; Barth and Shaheen 2002; Cohen and Kietzmann 2014; Kley et al. 2011), these articles only cover specific subdomains of the mobility sector and do not provide an exhaustive overview of old and new business models in the mobility sector.

Findings from research, however, suggest that the business model concept offers several specific advantages that might aid in better understanding the digital transformation of the mobility sector as a whole. First, the business model concept serves as an intermediary for systematically relating technological advances – which are currently driving the digital transformation of the mobility sector – to the realization of economic value (Al-Debei and Avison 2010). Second, the concept makes the underlying business logics of new products and services explicit (Magretta 2002), facilitating their more thorough analysis, innovation, and management (Osterwalder et al. 2005). Third, the business model concept accounts for important interdependencies between the resource and demand sides of a firm (Priem et al. 2013) and thus enables managers and researchers alike to “look at the forest, not the trees” (Amit and Zott 2012, p. 49).

Due to these and several other advantages of the business model concept, the first overarching goal of this research is as follows:

Goal 1: Increase the understanding of the digital transformation in the mobility sector by applying the business model concept.

The application of the business model concept to a specific sector will likely result in new insights regarding business model research, leading to the second overarching goal of this work:

Goal 2: Advance existing business model research by developing the business model concept through findings from its application to the mobility sector.

I.2 Research Questions

In the past new digital business models have already transformed sectors such as media, retail, and financial services (Veit et al. 2014). The mobility sector, however, is different because it is a primarily physical industry and thus depends on significant physical assets, such as production plants, vehicles, and transport infrastructure. Furthermore, the digital transformation of the mobility sector is expected to occur more quickly and be more intensively than in most other primarily physical industries (Roland Berger 2015).

As outlined above, this thesis has the objective to increase the understanding of the digital transformation of the mobility sector, and in turn to advance business model research. Existing research on business models can be categorized as taking either a static or a dynamic perspective (Burkhart et al. 2011; Wirtz et al. 2016). The static perspective can be further divided into two different but interconnected conceptual layers: components and types (Hedman and Kalling 2003; Osterwalder et al. 2005). Business model components describe the elements belonging to the business model (e.g., value proposition, value delivery, value creation, and value capture), whereas business model types describe frequently observable configurations of some of these components (e.g., disintermediation, freemium, razors/blades). The dynamic perspective mainly concerns the change of one or several business model components, i.e., business model innovation (e.g., Dell implemented a business model innovation by disintermediating retailers for its computers). The three research questions (RQs) of this thesis are related to these three categories – business model components, types, and innovation (Figure A-2) – and are further explained below.

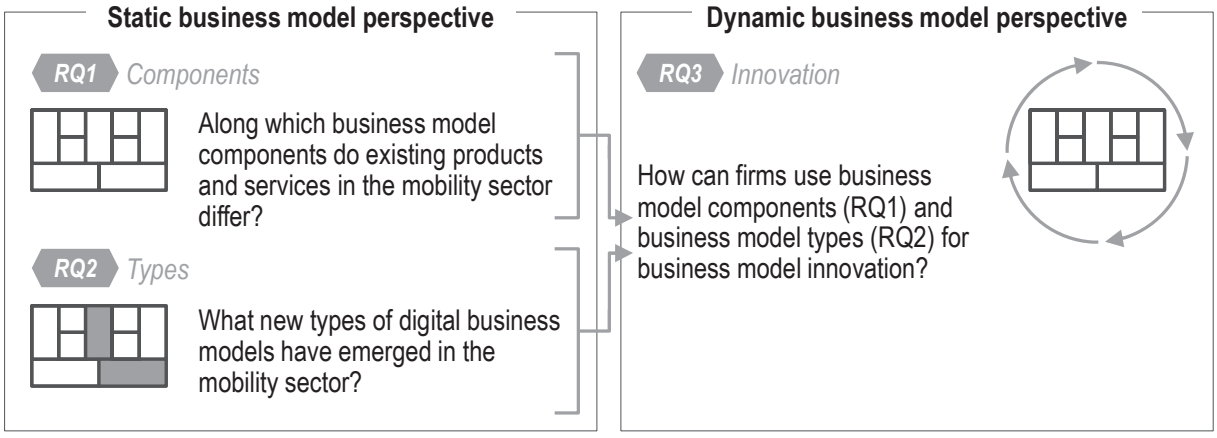

Figure A-2. Overview of research questions.

In the recent years, research on business model components has matured significantly and the business model canvas from Osterwalder and Pigneur (2010) with its nine components has become the most frequently applied framework (Spieth et al. 2014). More recently, several additional frameworks addressing the specifics of digital business models have evolved (e.g., Al-Debei and Avison 2010; El Sawy and Pereira 2013; Weill and Woerner 2013).

Veit et al. (2014, p. 46), however, make the following observation with regards to existing business model frameworks: “most business model concepts consider generic aspects but fail to take into consideration industry-specific aspects.” In line with that, Al-Debei and Avison (2010) maintain that one of the top three needs for future business model research is an analysis of the relative importance of generic components in the context of specific industries. Burkhart et al. (2011, p. 15) observe another research gap related to business model components, noting the “absence of formalized means of representations as well as [a] procedure model to allow a structured and comparable visualization of business models.” To counteract this weakness, morphological boxes (Zwicky 1967) could provide “a consistent and traceable representation of business models” (Veit et al. 2014, p. 49). Furthermore, morphological classification would provide the opportunity for empirically identifying the most frequent configurations, i.e., business model types (e.g., Haas et al. 2014; Labes et al. 2013; Peters et al. 2015). Hence, business model components could be directly linked to business model types, which would contribute a more comprehensive picture of the business model concept (Osterwalder et al. 2005). Due to these advantages, morphological representations are one opportunity for advancing future business model research (Veit et al. 2014, p. 49).

Like in most sectors, morphological business model representations are also rare in the mobility sector. The only exception is Kley et al. (2011), who develop a morphological representation of e-mobility business models. However, as their analysis only concerns a very specific subdomain of the mobility sector, the first research question of this thesis is as follows:

> ***RQ1: Along which business model components do existing products and services in the mobility sector differ?***

The research question addresses the following related issues:

- RQ1.1: What are the most relevant dimensions and their characteristics for creating a morphological box of business models in the mobility sector?
- RQ1.2: What are the most frequently observable configurations, i.e., archetypes, of these dimensions and characteristics (using the example of carsharing)?

The second conceptual layer of the static business model concept (Figure A-2) – business model types – provides a powerful tool for analyzing existing business models (Weill et al. 2005) and boosting the innovation of new ones (Johnson 2010b). Research has shown that 90% of all business model innovations are just recombinations of existing types (Gassmann et al. 2014). The initial research on business model types stems from Timmers (1998), who proposes 10 business model types for electronic markets. Since then, various other

researchers have assembled additional collections of business model types, with some also focusing on electronic markets (e.g., Applegate 2001; Rappa 2001; Weill and Vitale 2001) and others without a particular focus (e.g., Gassmann et al. 2014; Johnson 2010b; Tuff and Wunker 2010).

However, existing collections of business model types are incomplete, overlapping, and inconsistently structured. These collections are incomplete in that even the most exhaustive one (Gassmann et al. 2014, 2014) fails to include over two thirds of the available types. Furthermore they can be deemed overlapping – roughly every second business model type proposed can be found in multiple collections – and inconsistently structured, as the types are presented in random order, arranged alphabetically, or structured along other dimensions, which makes it difficult to access types from multiple collections in parallel. These shortcomings could be mitigated by an integrative framework, which would make the valuable collections of business model types more easily accessible and ready for future advancement. One such area for prospective growth would be to update electronic business model types (typically referred to today as digital business model types) for opportunities from more recent technological advances, as the majority of existing collections are rather outdated.

Some authors have already transferred the idea of business model types to the mobility sector. For instance, Abdelkafi et al. (2013) use a selection of existing business model types to develop new business models for e-mobility, Andersson et al. (2013) suggest three archetypes for P2P ridesharing platforms, and Shaheen and Cohen (2013) propose eight carsharing archetypes. However, these and most other studies from the mobility sector focus on specific subdomains. The only exception to this trend is Williams (2007), who comes up with three archetypes of product-service systems (PSS) in the automotive industry: product-oriented services, use-oriented services, and result-oriented services. His analysis, however, focuses only on the automotive industry and neglects important aspects of the business model concept, such as the value capture component (e.g., accounting for differences between service providers and brokers). Therefore, the second research question aims to take a more holistic perspective:

RQ2: What new types of digital business models have emerged in the mobility sector?

The research question addresses the following connected issues:

- RQ2.1: What generic business model types has existing research identified?
- RQ2.2: How have the business model types of technology startups from the mobility sector changed over the past decade?
- RQ2.3: What new digital business model types have been developed by startups in the mobility sector in the past decade?
- RQ2.4: Which of these newly identified digital business model types from within the mobility sector are also relevant for other industries?

Business model innovation is among the most important challenges for today's firms, which is why "managers expect concrete guidance from the academic world" (Frankenberger et al. 2013, p. 269). In line with that, a recent survey by Wirtz et al. (2016, p. 14) has identified "change & evolution" as well as "innovation" as the two most important directions for future business model research. Thus far, several researchers have described the generic phases of the business model innovation process (e.g., Frankenberger et al. 2013; Osterwalder and Pigneur 2010; Schneider and Spieth 2013). Furthermore, research has found that although a linear representation of the phases helps managers understand cause-and-effect relationships (Frankenberger et al. 2013), the process actually depends on trial-and-error learning (Sosna et al. 2010, p. 383) and thus requires discovery-driven approaches (McGrath 2010, p. 247).

To provide managers the desired guidance for business model innovation (Frankenberger et al. 2013), Schneider and Spieth (2013, p. 23) propose addressing the following question: "How can firms be supported in conducting business model innovation in terms of tool[s] and methods?" The importance of tools is demonstrated by Garfield et al. (2001), who find that the application of tools during innovation projects is as important as the people applying them. The first two research questions of this thesis focus on two concepts that can also be applied as tools for business model innovation: business model components and types. Eppler et al. (2011), however, reveal that frameworks based on the former offer various benefits for innovation projects, such as facilitating group interaction, but significantly decrease creativity. With regards to business model types, the above-described challenges of the individual collections being incomplete, overlapping, and inconsistently structured might hinder their efficient and effective application for business model innovation. Therefore, the third research question is as follows:

> ***RQ3: How can firms use business model components (RQ1) and business model types (RQ2) for business model innovation?***

The research question addresses the following associated issues:

- RQ3.1: How can the decomposition of business models into their specific dimensions and characteristics facilitate the discovery new configurations?
- RQ3.2: How can existing collections of business model types be applied for the systematic discovery of new configurations?

I.3 Research Design

Six studies aim to answer the three research questions in this thesis. Studies 1 and 2 pertain to the first research question, while Studies 3, 4, 5, and 6 focus on the second research question. Studies 1 and 3 also address the third research question. All of the studies share an exploratory nature, i.e., they concern the identification of constructs and relationships, rather than a confirmatory one, which tests pre-defined relationships (Straub et al. 2004). However, the six studies differ fundamentally regarding their underlying research philosophies and specific research designs (Table A-1).

Table A-1. Overview of studies' research philosophy and design.

Study	RQ			Research philosophy		Research design			Key results
	1	2	3	Epistemology	Paradigm	Level of analysis	Data collection	Data analysis	
No. 1	X		X	Positivist and design	Behaviorally and design oriented	Various companies from the mobility sector	Expert interviews, structured secondary data collection, case study	Taxonomy building (Nickerson et al. 2013)	Taxonomy of business models in the mobility sector, method for business model innovation
No. 2	X			Positivist	Behaviorally oriented	Carsharing operators (worldwide)	Literature review, structured desk research, e-mail survey	Taxonomy building (Nickerson et al. 2013), cluster analysis (Landau and Everitt 2004)	Taxonomy of carsharing business models, empirical carsharing archetypes
No. 3		X	X	Positivist and design	Behaviorally and design oriented	All available business model types	Literature review, case study	Taxonomy building (Nickerson et al. 2013)	Database of generic business model types, method for business model innovation
No. 4		X		Positivist	Behaviorally oriented	US technology startups from the mobility sector	Database retrieval (CrunchBase)	A priori coding (Weill et al. 2005), trend study (Babbie 2016)	Indication of changes among new business models in mobility sector
No. 5		X		Positivist	Behaviorally oriented	US technology startups from the mobility sector	Database retrieval (CrunchBase)	A priori coding (Weill et al. 2005), pattern discovery	New digital business model types that are relevant for the mobility sector
No. 6		X		Positivist	Behaviorally oriented	Top 1,000 venture-funded technology startups (worldwide)	Database retrieval (CrunchBase)	A priori coding (Weill et al. 2005), pattern discovery	New digital business model types that are relevant for all industries

The research philosophy of the studies that focus on answering the first two research questions differ most strikingly from those parts of the studies contributing to the third research question. The underlying epistemology, i.e., theory of knowledge (Audi 2010), of the studies addressing the first two research questions is positivistic, as the six studies assume independent researchers, who analyze specific cases to deduct generic rules (Orlikowski and Baroudi 1991). Furthermore, their positivistic epistemology can be observed in their assumption that organizations follow a joint goal that is accepted and pursued by their members (Chua 1986). Thus, it is assumed that the business model of an organization is a useful abstraction of a company's business logic, potentially neglecting deeper social and economic conflicts that might occur within and among organizations (Chua 1986). As the first two research questions concern the classification of organizations, independence was assured by including various researchers in the coding and the discussion of the results. In addition, rigorous methods were applied to derive the generic rules. Nonetheless, it must be acknowledged that – particularly with respect to the interpretative perspective – each researcher still had a subjective interpretation of the reality (Lee 1991), which might have

influenced some results. In addition to a positivistic epistemology, the two studies answering the third research question, i.e., Studies 1 and 3, also follow a design epistemology (Vaishnavi and Kuechler 2015), as both studies develop an artifact in the form of a new method (Gregor and Hevner 2013). Thus, during the iterative development phases, the researchers' epistemologies changed from intervening in reality by constructing a new method, to becoming positivist observers when analyzing the application of these artifacts, and then applying subjective judgment to interpret the observations.

In line with the epistemology, the six studies also differ in terms of their research paradigms. The first two research questions deal with better understanding the business models of firms from the mobility sector, i.e., they seek to explain the behavior of organizations. Hence, all six studies can be considered behavioral science (Wilde and Hess 2007).[1] The third research question, however, involves creating tools and methods for business model innovation. Therefore, Studies 1 and 3 also follow a design-oriented paradigm in that they both create new artifacts for solving a problem (Hevner et al. 2004).

The following paragraphs explain how these philosophical thoughts are translated into concrete research designs. Two studies are carried out to answer the first research question: Study 1 identifies the different products and services from the mobility sector, combining state-of-the-art business model research with the application of a rigorous taxonomy-building method to disassemble their business models. The result is a taxonomy that decomposes business models from the mobility sector into their different dimensions and characteristics. Study 2 further extends the approach from Study 1 by applying a cluster analysis that enables the empirical identification of industry-specific business model archetypes. By focusing exclusively on carsharing business models, this study allows for a more fine-grained classification.

The second research question is addressed by Studies 3, 4, 5, and 6. Study 3 reviews and integrates existing business model types into a database by applying a rigorous taxonomy-development method. To identify new types and analyze changes over time, Studies 4, 5, and 6 survey startup data samples, because young firms tend to adopt innovations earlier than incumbents and their business models are purer and thus easier to analyze. Study 4 is a trend study analyzing changes in the types of business models employed by new firms from the mobility sector, while Study 5 uses the same data sample to systematically identify new types of digital business models in the mobility sector. Study 6 surveys a non-industry specific startup data sample to validate and extend the digital business model types from Study 5 and complement the existing business model types from Study 3.

The third research question is addressed by Studies 1 and 3. In addition to their contributions to the first two research questions, both studies attempt to provide generic tools and methods for better understanding existing business models and the design of new ones. Study 1 develops a method to systematically disassemble and recombine the business models of a

[1] Studies 1 and 2 develop a business model taxonomy to better understand the focal firms and Study 3 develops a taxonomy of business model types. The taxonomy method applied during these studies includes several design and test cycles, which is partly why they might also be considered design science as described by Hevner et al. (2004).

specific target market, while Study 3 shows how business model types can be applied during the business model innovation process. Each study evaluates and illustrates its proposed methodology with a simplified case study.

In sum, this work makes theoretic contributions to both analysis as well as design and action (Gregor 2006). All studies involved put forth new theories for analysis by describing the status quo (Gregor 2006). They achieve this either by defining the dimensions and characteristics of specific business models or by analyzing existing and identifying new business model types. Studies 1 and 3 also contribute to design and action, as they both describe a method (Gregor 2006) for the discovery of business models. In addition to this theoretic contribution, all studies attempt to follow Corley and Gioia's (2011) appeal for high impact research by integrating theoretic contributions with practical usefulness. The anticipated contributions to theory and practice are further explained in the next section.

I.4 Anticipated Contributions

The thesis aims to contribute to theory in three areas: the digital transformation of physical industries, the static business model perspective, and the dynamic business model perspective. Furthermore, this work aims to make relevant contributions for managerial practice.

Digital technologies are diffusing into physical products at an increasing rate, also affecting more traditional industries (Porter and Heppelmann 2014). Surprisingly though, the impact of digital technologies on these sectors remains underresearched (Yoo et al. 2010). This work aims to contribute to a better understanding of this phenomenon by using the business model concept to demonstrate how these technological advances result in new ways to realize economic value (Al-Debei and Avison 2010). For instance, Studies 1 and 2 might be useful for understanding how new digital technologies affect different business model components in the mobility sector, whereas Study 5 might aid in understanding which new business model types these technologies enable. As the mobility sector is one of the first primarily physical industries to undergo a digital transformation, some of these findings might also be relevant for other such industries.

Existing research analyzing business models from a rather static perspective can be divided into research on components and types (Hedman and Kalling 2003; Osterwalder et al. 2005). Research on business model components, however, does not yet sufficiently account for industry-specific aspects (Veit et al. 2014). Studies 1 and 2 might provide a suitable approach for doing so by developing a new procedure model. Research on business model types is less mature and might also benefit from several studies in this thesis. The review conducted in Study 3 might help overcome some of the confusion related to business model types, while Study 6 might contribute with its update of existing types for recent technological advances.

In addition to the anticipated contributions for the static perspective on business model research, this thesis also aims to contribute to the themes change and evolution as well as innovation, both belonging to the dynamic perspective (Wirtz et al. 2016). With regards to

change and evolution, Study 4 might reveal new insights through its analysis of how business models in the mobility sector have changed over the past decade. The study also follows the call from Demil et al. (2015) for further analysis of large empirical datasets rather than solely conducting case studies. Furthermore, the taxonomy developed in Study 1 might contribute to a better understanding of transitional effects from physical to digital business models. Finally, this work aims to contribute to business model innovation by following the appeal from Schneider and Spieth (2013) for more concrete tools and methods to support this transition. As these tools and methods are also a significant contribution to managerial practice, they are elaborated upon in the next paragraph.

Managers might find the results of this work useful for actively engaging in the innovation of their existing business models or the development of completely new ones. Study 1 could serve as a blueprint for how to disassemble existing business models and identify new configurations, while Study 3 could be surveyed to determine how to use business model types more efficiently and effectively.

The anticipated contributions are summarized in Table A-2.

Table A-2. Summary of anticipated contributions.

Field		Anticipated contribution
Research	Digital transformation of physical industries	(1) Insights on how advances in digital technologies result in new ways to create, deliver, and capture value for physical industries
		(2) Overview of new digital business models that have emerged in physical industries
	Static business model perspective	(1) Refinement of existing business model concepts by relating them to specific industries and firms
		(2) Structuring of existing business model types and updating them for new digital business model types
	Dynamic business model perspective	(1) Insights on the evolution from physical to digital business models as well as changes in digital business models over time
		(2) Concrete tools and methods for the discovery of new business models
Business Practice		(1) Understanding of new digital business models as well as transitional effects from physical to digital ones
		(2) Discovering new business model configurations that are relevant for a specific firm and suit the digital era

I.5 Thesis Structure

This cumulative dissertation is structured along three parts. Part A provides the foundations for this work by introducing the topic and explaining the theoretical background. Part B is the main part of this thesis, covering the six studies involved. Part C discusses the findings of these studies and concludes the work. Each part is explained in greater detail below.

Part A is divided into two chapters. The introduction chapter describes the motivation for this research, derives research questions, proposes a research design to answer these, and anticipates the contributions that will be made. Next, the theoretical background chapter explains the conceptual foundations for this research by (1) summarizing existing research on business models, (2) elaborating upon the specifics of digital business models, (3) explaining business model innovation, and (4) briefly discussing existing research on business models in the mobility sector.

Part B reflects the logic of the three research questions. The first chapter analyzes the components of digital business models in the mobility sector. Study 1 analyzes the mobility sector as a whole, whereas Study 2 adopts the example of the carsharing market, allowing for some more specific analyses. The second chapter analyzes archetypes of digital business models in the mobility sector and beyond. Study 3 reviews and integrates existing generic business model archetypes into one database. Study 4 then takes a more detailed view on new digital business models from the mobility sector and evaluates how they have changed over the past decade. Study 5 uses this data sample to identify new business model archetypes. As these archetypes are derived by looking solely at the mobility sector, Study 6 attempts to generalize these findings by repeating this analysis without focusing on a specific sector. The resulting new digital business model types allow the database from Study 3 to be updated for recent technological advances. The third chapter has an explicit focus on business model innovation. While Study 1 proposes a concrete method that supports the analysis of existing business models and discovery of new ones within an industry, Study 3 suggests a concrete method to support these two steps by systematically transferring business model innovations across industries. Two studies have already been accepted or published in scientific journals, while three studies have been produced in the proceedings of international conferences and one study is currently under review. An overview including further details on the ranking of these outlets as well as the position of each study in the thesis is provided in Table A-3.

Table A-3. Overview of studies included in the thesis.

Study	Outlet	Ranking	Status	Section	Addressed sub-RQ
No. 1	Journal of Business Strategy	C	Accepted	B.I & B.III	1.1, 3.1
No. 2	International Conference on Information Systems	A	Published	B.I	1.2
No. 3	International Journal of Innovation Management	B	Published	B.II & B.III	2.1, 3.2
No. 4	American Conference on Information Systems	D	Published	B.II	2.2
No. 5	Pacific Asia Conference on Information Systems	C	Published	B.II	2.3
No. 6	Long Range Planning	B	Submitted	B.II	2.4

Note: the ranking is based on VHB-JOURQUAL3.

Part C contains four chapters. First, the findings chapter summarizes the results with respect to the three research questions as well as their corresponding subresearch questions. This chapter also provides a synthesis of the findings by demonstrating how they jointly contribute to a better understanding of digital business models in the mobility sector and thus advance business model research. Second, the implications chapter explains how the studies contribute to theory and practice. Third, the chapter on limitations and future research briefly explains the most important issues with regard to both these themes. Finally, the last chapter concludes.

Figure A-3 provides an overview of the three parts of this thesis, their chapters and sections, as well as the most important relationships.

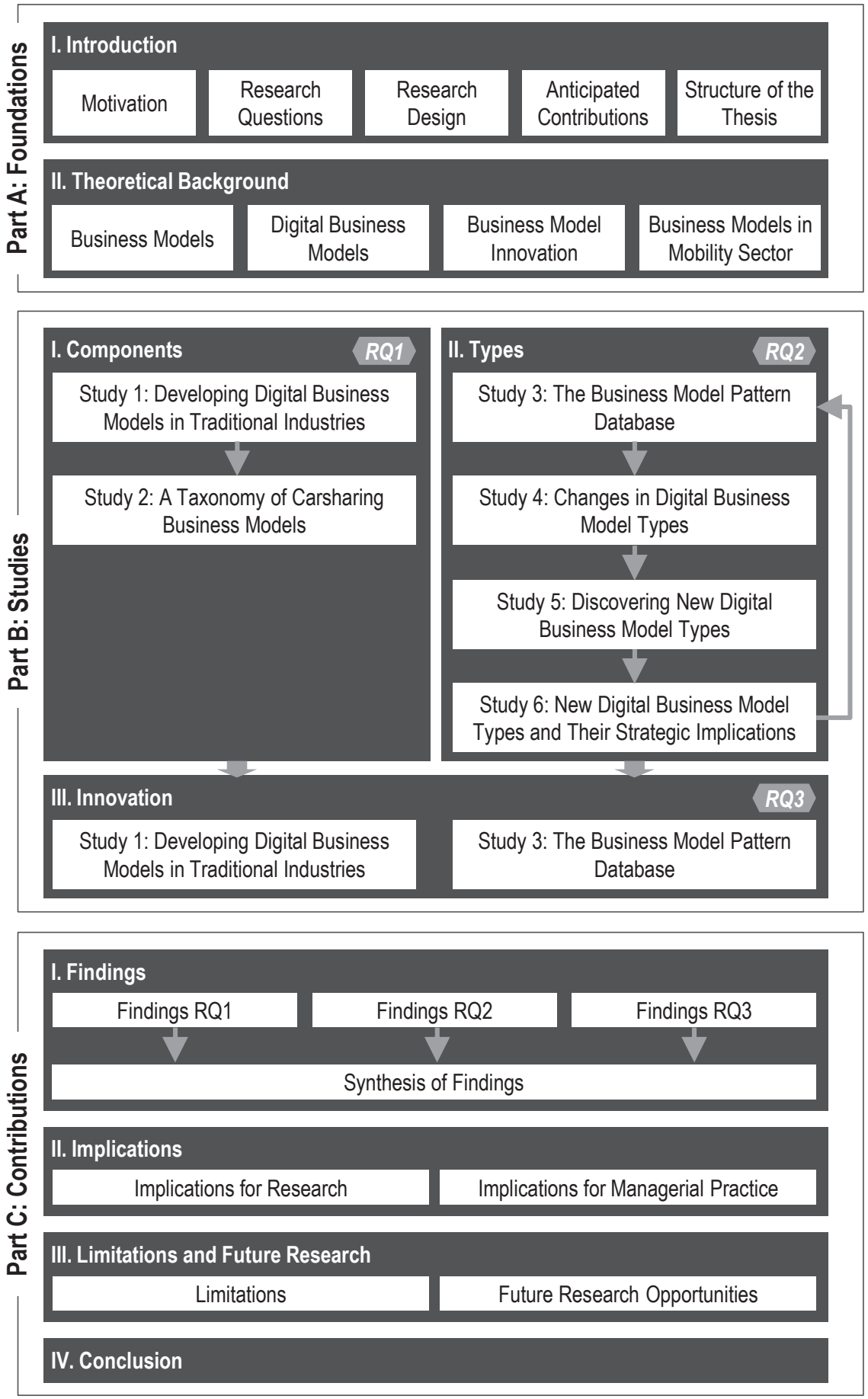

Figure A-3. Structure of the thesis.

II. Theoretical Background

The theoretical background chapter is divided into four sections, each defining a key concept of this thesis and summarizing key research contributions to these concepts. First, the business model is described as a tool for understanding an organization's value creation, value delivery, and value capture. Second, digital business models are defined as the significant use of digital technologies for one of these value dimensions. The third section explains business model innovation, which means significantly changing one or several of the aforementioned dimensions. The fourth and final section summarizes business model research in the mobility sector, which includes all organizations supporting people in traveling from one location to another.

II.1 Business Models

It must be admitted that business models are not a new concept. From a practical perspective, companies have always employed business models, as they are deemed to capture value from the products and services that they provide. From a theoretical perspective, research has spent many decades analyzing customer perceptions, the more efficient use of resources, supplier relationships, and many other streams that relate to individual components of a business model. However, the conceptualization of these and other aspects under the joint umbrella of the business model concept was first begun two decades ago by Timmers (1998). Hence, the business model concept does not achieve legitimacy through the individual components assigned to a business model but by viewing these components as an interdependent system, thereby integrating the two perspectives of a firm: the demand side (e.g., products creating value for end users) and the resource side (e.g., actors and activities to create the value) (Priem et al. 2013). This integrated perspective is particularly useful in situations such as analyzing and comparing firms, designing and communicating new business ideas, as well as recognizing and managing change (Osterwalder et al. 2005).

A business model can be defined as follows:

> *A business model describes the rationale of how an organization creates, delivers, and captures value. (Osterwalder and Pigneur 2010, p. 14)*

With regard to value creation and value delivery, the business model concept specifies a focal firm's boundaries as it links the activities performed by the focal firm to activities of partners, suppliers, and customers (Zott and Amit 2010). The value-capture aspect then shows how these activities result in economic value for these actors. Hence, the business model concept can be considered as an intermediary between business strategy – which has a stronger focus on a firm's competitors than the business model concept – and business processes – which unlike the business model largely neglect the need for activities to result in value capture (Al-Debei and Avison 2010).

The majority of existing business model research can be separated into three hierarchical layers (Figure A-4). The components[2] level concerns the identification of the elements belonging to a business model. The most established of these is the business model canvas from Osterwalder and Pigneur (2010), comprising nine elements: (1) customer segments, (2) value propositions, (3) channels, (4) customer relationships, (5) revenue streams, (6) key resources, (7) key activities, (8) key partnerships, and (9) cost structure. The type[3] level involves the identification of business model archetypes describing recurring configurations of certain business model elements, such as razors/blades (e.g., Gillette), disintermediation (e.g., Dell), and freemium (e.g., Skype). Some of the most well-known collections of types stem from Timmers (1998), Rappa (2001), and Gassmann et al. (2014). Research on the instance level deals with the use of the business model concept to better understand specific firms, such as Chesbrough and Rosenbloom (2002) did for their famous Xerox case. All three layers make sense and are most powerful when they are linked to one another (Osterwalder et al. 2005).

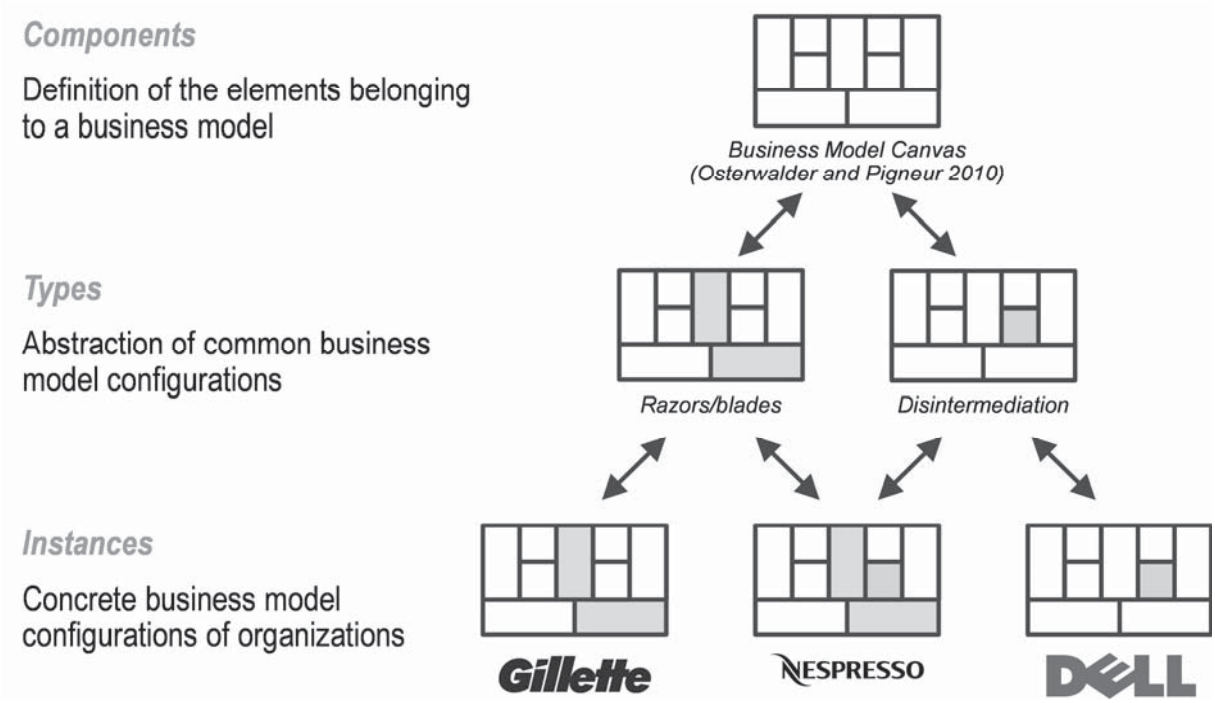

Figure A-4. Hierarchical layers of business model research and examples for each layer (adapted from Osterwalder et al. 2005).

II.2 Digital Business Models

The majority of today's new business models are significantly enabled by or fully embedded in digital technologies. Most of these digital business models follow logics that are fundamentally different from more traditional ones. First, the value for the customers cannot

[2] In the literature, various alternative terms are used for business model components. These are considered as synonyms in this work and include "building blocks" (Osterwalder and Pigneur 2010), "design elements" (Zott and Amit 2010), "dimensions" (Al-Debei and Avison 2010), "elements" (Teece 2010), and "pillars" (Osterwalder et al. 2005).

[3] In the literature, various alternative terms are used for business model types. These are considered as synonyms in this work and include "atomic business models" (Weill and Vitale 2001), "business model analogies" (Johnson 2010b), "business model archetypes" ((Weill et al. 2005), "business model patterns" (Gassmann et al. 2014), "operating business models" (Linder and Cantrell 2000), and "profit models" (Tuff and Wunker 2010).