1 Introduction

1.1 The relevance of dynamic, user-centric business model design and change

Today, enterprises operate their business models in **ever-changing dynamic environments**. They face intense competition and increasing globalization. Within the first quarter of 2019, 256,000 companies started business in the United States alone.[1] The global export volume multiplied by a factor of 300 from 1950 to 2018.[2] Shorter innovation cycles and deregulation make this environment even more dynamic. The number of worldwide patent applications has increased steadily over the years, reaching 3.32 million patents in 2018.[3] Market regulations have decreased worldwide, dropping by 42% in Germany within a 15-year period.[4]

"Not only do established firms frequently fail to embrace opportunities through digitization and big data analytics, they also struggle to adapt their business models to reflect the associated economic features and underlying mechanisms."[5]

Digitalization accelerates these developments and companies have begun to embrace the full spectrum of technological opportunities.[6] Enabling innovation, improving customer experience, and running artificial intelligence applications are the top three drivers of IT transformation.[7] Companies are investing more than ever in technologies that enhance their digital evolution, and the worldwide market revenue is expected to double to 2.3 trillion U.S. dollars between 2019 and 2023.[8] Cloud computing, Internet of Things,

[1] Refer to Bureau of Labor Statistics 2019.

[2] Refer to UNCTAD 2019.

[3] Refer to WIPO 2019.

[4] Indicator of product market regulation (PMR) in Germany in 1998 compared with 2013. The PMR includes state control of business enterprises, legal and administrative barriers to entrepreneurship, and barriers to international trade and investment. Refer to OECD.

[5] Loebbecke and Picot 2015, 151.

[6] Within the scope of this dissertation, *digitalization* is chosen over *digitization.* The latter means the conversion of analog material into a digital, i.e. numerical format. Digitalization, on the other hand, "[…] means that business now uses technology to engage with people to precisely address their particular needs." Prause 2016.

[7] Refer to Datrium 2019

[8] Refer to IDC and Statista estimates 2019.

artificial intelligence and machine learning, and big data (analytics) are expected to have the greatest impact on analytic initiatives over the next five years.[9]

"Your customers are the judge, jury, and executioner of your value proposition. They will be merciless if you don't find fit!"[10]

Digital transformation also strengthens the **role of the customer** thanks to effortless access to information, alternatives, communication, and transactions. In 2018, the estimated global online access rate was 51.2%. Worldwide mobile data traffic has a compound annual growth rate of 46%.[11] In 2018, 52.2% of all website traffic was generated through mobile phones.[12] These mobile technologies allow consumers to immerse themselves in a hybrid space with ubiquitous connections to others, with no distinction between online and offline realities. These days, companies meet users in their hybrid spaces, at their points of use.[13] Digital interaction allows providers to gain insight into their customers' journey. Users become active participants in open innovation processes, and new sources of user data and techniques for real-time data processing facilitate user-centric design and change processes.[14] Digitalization not only enables user centricity but also forces companies to adopt user-centric business models and value propositions to be successful.[15]

"[…] far from being static, business models need to be in a continuous flux, responding to opportunities and threats in the firm's external environment."[16]

A firm must assess the opportunities and threats from its external environment and fit with its internal environment to be competitive in the long run.[17] In a constant state of disequilibrium, the business model strives for **dynamic consistency** because it stays between the external and internal fit. Managers must overcome the static perspective of business models and acquire dynamic capabilities to implement a constant process of

[9] Refer to Forbes and MicroStrategy 2019.
[10] Osterwalder et al. 2014, 43.
[11] Refer to Cisco Systems 2018; ITU 2018.
[12] Refer to We are Social and StatCounter 2018.
[13] Refer to Šimůnková 2019, 41–67.
[14] Refer to Gerdes 2018, 190–194; Pinkwart 2018, 359.
[15] Refer to Osterwalder et al. 2014, 42–44; Kalka and Abel 2018, 6.
[16] Saebi 2015, 145.
[17] Refer to Pfau 2001, 5.

business model design and change.[18] A user-centric business model must create value that produces customized solutions rather than single products and services.[19] Here, the user is the driver and co-creator of business model design and change.[20] Both strategic management and marketing professionals need processes and tools for the dynamic, user-centric design and change of business models and their underlying value propositions.[21]

"Transportation is the center of the world! It is the glue of our daily lives. When it goes well, we don't see it. When it goes wrong, it negatively colors our day, makes us feel angry and impotent, curtails our possibilities."[22]

The **mobility sector** is an example of a rapidly changing market. The automotive industry in particular faces challenges because nine European countries are currently discussing banning internal combustion engines by 2030, and CO_2 penalty payments to the European Union are imminent. This could cost the automotive industry up to 15 billion euros by 2021 if they do not expand their product portfolio with more electric vehicles.[23]

Traditionally segmented industries or modes of transport, such as rail, public transport, car, bike, or aviation are converging into a new market where mobility is a service. Numerous competitors from other sectors and new mobility business models have entered this market in the last decade. A market volume between 2.2 and 2.5 trillion U.S. dollars is estimated in mobility businesses by 2030.[24] With increasing population growth in urban areas, the worldwide mobility demand is expected to rise by 88% to 48.4 trillion passenger kilometers from 2010 to 2030.[25]

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[18] Refer to Demil and Lecocq 2010, 239; Amit and Zott 2015, 11–15.

[19] Refer to Vandermerwe and Rada 1988, 315–317; Sawhney 2006, 8; Pawar et al. 2009, 474–475.

[20] Refer to Norman and Ramirez 1993, 66; Vargo and Lusch 2004, 7–12; Lamberti 2013.

[21] Refer to Demil and Lecocq 2010, 239–244; Daecke and zu Knyphausen-Aufseß 2011, 143–162; Evanschitzky et al. 2011, 659; Frankenberger et al. 2013a, 265–268; Loebbecke and Picot 2015, 149–155; Bruhn 2018, 37–39.

[22] Robin Chase, co-founder of Zipcar. Refer to Schawbel 2012.

[23] Refer to Tschiesner et al. 2019, 9

[24] Refer to BI Intelligence and Business Insider 2018; Tschiesner et al. 2019, 9. Data from BI Intelligence and Business Insider consider mobility services that represent non-personally owned modes of transportation that are consumed as a service, such as car-sharing.

[25] Refer to Wagner 2019, 20.

Mobility providers offer access to – but do not necessarily own – shared fleets of public buses, cars, bicycles, or electric scooters. Digitalization and mobile technologies have paved the way for on-demand mobility that integrates long-established (e.g. public transport) and new (e.g. ridepooling[26]) mobility services into one digital offering. Digital transformation has strongly shaped the mobility sector; over the last five years, the average yearly investments were 20.9 billion U.S. dollars for software-based and 18.7 billion U.S. dollars for hardware-centered mobility start-ups worldwide.[27]

Shifting user demands also drive market change. Users are seeking more individuality and independence, and choose from diverse transportation modes to handle the growing complexity of their daily lives. The most flexible means of transportation – the car – has gained from this development. But multimodal travel and intermodal trip-making has also gained users.[28] The more means of transportation are used within a weekly mobility routine, the less kilometers are travelled by car.[29] Mobility providers face a heterogeneous market that is highly competitive and dynamic, driven by digitalization, user demands, and environmental regulations. Here, processes for dynamic, user-centric business model design and change are urgently needed.

1.2 Research gap and objective

Dynamic, user-centric business model design and change are relevant to the complex and fast-moving nature of markets and industry landscapes. Progressive digitalization and users that choose a hybrid space with no distinction between being online and offline have made dynamic, user-centric business model design and change not only possible but also inevitable for companies that want to be competitive.[30]

In **corporate practice**, the processual observation of business models and their design, management, and change over time has not been integrated systematically.[31] Although it is not clear how many companies already use a systematic process model, certain enterprises have successfully managed user-centric and dynamic business model de-

[26] Ridepooling "[…] involves sharing a ride at a reduced fare with someone else taking a similar route […]". Shaheen and Cohen 2019, 431.

[27] Refer to McKinsey et al. 2019.

[28] Refer to Klinger 2017, 221–225.

[29] Refer to Nobis and Kuhnimhof 2018, 59.

[30] See previous chapter.

[31] Refer to Demil and Lecocq 2010, 227–230; Sosna et al. 2010, 383–384; Hienerth et al. 2011, 346; Priem et al. 2018, 25–26.

sign and change in the long run. For example, *Netflix* have assessed and redefined their business model multiple times using data analytics. The company started by renting out DVDs via mail. Based on customer orders, *Netflix* sent the ordered DVDs and recommended new ones. This early use of data analytics improved demand management and distribution of the product, and improved the relationship between provider and user via recommendations. At that time, *Netflix* was not able to monitor when their customers watched the ordered DVDs and the actual value in use was unfolding. With the evolution of information technology, the company changed and redesigned its business model to provide unlimited video streaming as a subscription service. With this business model, *Netflix* can gather and process real-time or context-user data (e.g. search terms, stream queues and plays, ratings, ratings from friends, interactions, external sources such as film reviews, and social data). Additionally, *Netflix* can intervene in use processes wherever their customers are using the service (which could be anywhere from their living room to a public train). Big data analytics have allowed *Netflix* to personalize content and recommendations, and to adapt sequels of their shows to their users' preferences and needs. This has changed the value proposition and probably value creation component of their business model, because *Netflix* eventually started producing their own content.[32]

Companies that dynamically design and change their user-centric business model with fast-evolving, smart technologies and techniques are outnumbered by companies with traditional, static business models.[33] This pool of practiced business models gets even smaller when customers can co-create value, which is one of the requirements of user centricity.[34]

This user-centric and dynamic perspective of business model design and change, regardless of whether smart technologies are applied or not, represents a **research gap in management and marketing literature**.[35] The published literature and concepts

[32] For this paragraph, refer to Lycett 2013, 382–383; Günther et al. 2017, 198–201

[33] For further examples, such as New York Times (big data analytics) refer to Günther et al. 2017, 198, 7-eleven Japan (big data analytics) refer to Woerner and Wixom 2015, 61, smart shoe technology in health-care (Internet of Things) refer to Eskofier et al. 2017, elevator industry (Internet of Things), refer to Lai et al. 2017. See also chapter 5.3.4.1 for more examples.

[34] Refer to Hienerth et al. 2011, 346. Customer co-creation is one of the requirements of user centricity, see chapter 2.3.

[35] Refer to Demil and Lecocq 2010, 239–244; Sosna et al. 2010, 385; Daecke and zu Knyphausen-Aufseß 2011, 143–162; Evanschitzky et al. 2011, 659; Hienerth et al. 2011, 344–348; Frankenberger et al. 2013a, 250–253; Loebbecke and Picot 2015, 151–155; Mathis and Köbler 2016, 460; Bruhn 2018, 37–39.

discussed herein do not include business model design and change, applied attributes (dynamic, user-centric), or thorough theoretical grounding.[36] Most of the works examined here discuss static frameworks instead of processual models that reflect the logic of dynamic approaches.[37] Wirtz et al. found that relevant future research into business model processes should focus on change, evolution, innovation, and design.[38]

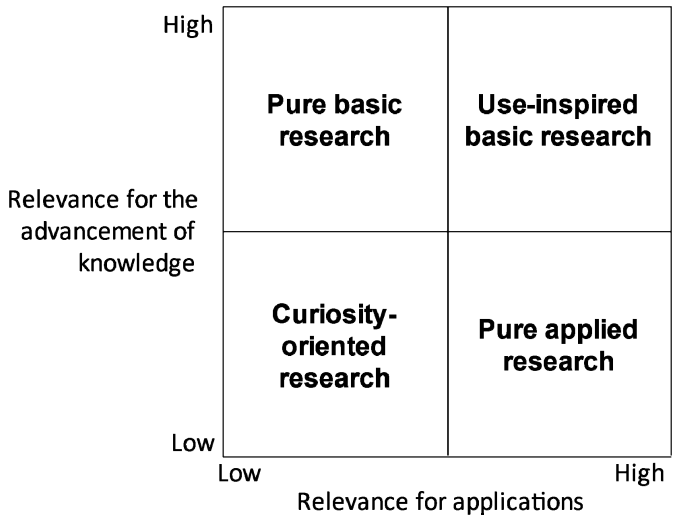

Figure 1: Quadrant model of scientific research.
Adapted from Stokes 1997, 73.

The **objective of this dissertation** is to develop a dynamic, user-centric process model for business model design and change and to evaluate the model's ability to maintain a competitive advantage with evidence from the mobility sector. Another objective is to meet the requirements of basic and applied research. Stokes' quadrant model of scientific research illustrates how four types of research contribute to knowledge advancement and application relevance (Figure 1).[39] An example of pure basic research is the atom model by Bohr, which was never intended to be practically applied. Use-inspired basic research has a theoretical foundation but aims to be practically relevant. For ex-

[36] See chapter 3.2.1.2 for the state of the art in business model dynamics and chapter 4.1 for the state of the art in theoretical concepts that integrate the dynamic, user-centric perspective of business models.

[37] Refer to Frankenberger et al. 2013a, 253–256. See also chapter 2.1 for characteristics of dynamic approaches.

[38] Refer to Wirtz et al. 2016, 50–51.

[39] Refer to Stokes 1997, 73.

ample, game theory can be applied to real-world problems, such as energy regulations, stock market, or insurance. Pure applied research does not advance general knowledge; instead, it focuses on real-world application, e.g. study of mixed strategies by management consultancies in a specific industry. The scientific approach of this dissertation is use-inspired basic and pure applied research.

By deductive reasoning,[40] this research creates a theoretically grounded process model for dynamic, user-centric business model design and change: **the business model cycle (BMC)**. The BMC is characterized by three hierarchies with different levels of abstraction and granularity.[41] These models determine the phases, underlying components, activities, connecting input, and output streams for dynamic, user-centric business model design and change. This will help practitioners in strategic management or marketing divisions to understand and apply:

- universal mechanisms of dynamic, user-centric business model design and change (BMC meta-model)
- abstract steps in the procedure of dynamic, user-centric business model design and change (BMC sub-model)
- specific process activities and data input and output within a business process diagram for dynamic, user-centric business model design and change (modeled instance of the BMC).

This dissertation will also describe secondary research and a case study to further increase the relevance of the findings to real-world applications. The case study will demonstrate all three process models and evaluate them in reference to the mobility sector.

1.3 Research questions and dissertation structure

In the previous chapter, the research gap and research objectives were defined. The leading **research question** of this dissertation is: How is a dynamic, user-centric process model for business model design and change configured?

This question will be divided into the following subordinate questions:

(1) What are the requirements of a dynamic, user-centric approach?
(2) What are the static, dynamic, and user-centric perspectives in business model theory?

[40] Refer to Töpfer 2012, 63–64.
[41] See chapter 5.1.4 for BMC hierarchies and classifications.

(3) What are the universal mechanisms, phases, components, and input/output streams of a dynamic, user-centric process meta-model for business model design and change?
(4) What are the specific components, process steps, and input/output streams of a dynamic, user-centric process sub-model for the design and change of digitalized business models?
(5) What are the specific activities and input/output streams of a dynamic, user-centric business process for the design and change of digitalized business models?

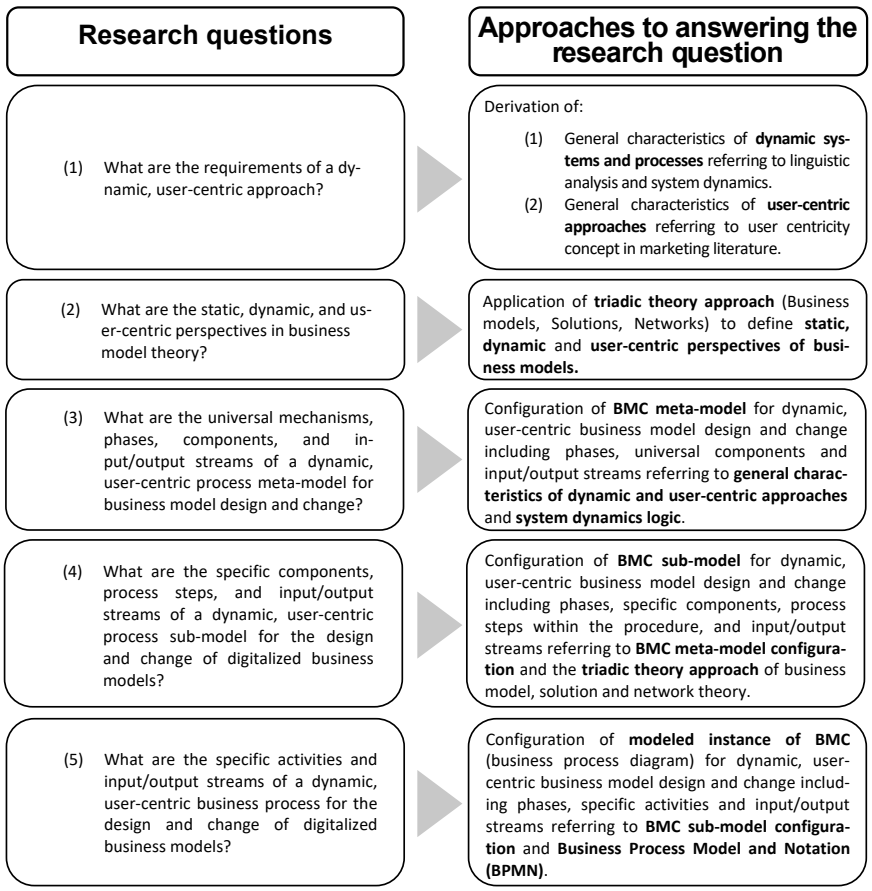

Figure 2: Research questions and corresponding approaches.

The dissertation aims to answer these questions to configure the BMC and its three hierarchical manifestations: BMC meta-model, BMC sub-model, and modeled instance of the BMC. The research questions and the corresponding solutions are illustrated with reference to applied theories and methodologies in Figure 2.

Requirements for dynamic systems and processes will be derived by linguistically analyzing key terms and by applying mechanisms of system dynamics. The characteristics

of user-centric approaches will be determined by analyzing the literature on the user centricity concept. Scientific literature in the field of business models, solution marketing, and network theory will be examined to define a static, dynamic, and user-centric perspective of the business model concept. To configure the BMC meta-model, the general characteristics of dynamic, user-centric approaches (research question 1) will be combined with system dynamics logic. The BMC sub-model for digitalized business models will be based on the meta-model configuration and triadic theory, including business model, solution, and network theory. The modeled instance of the BMC will be based on the BMC sub-model configuration and BPMN business process modeling technique.

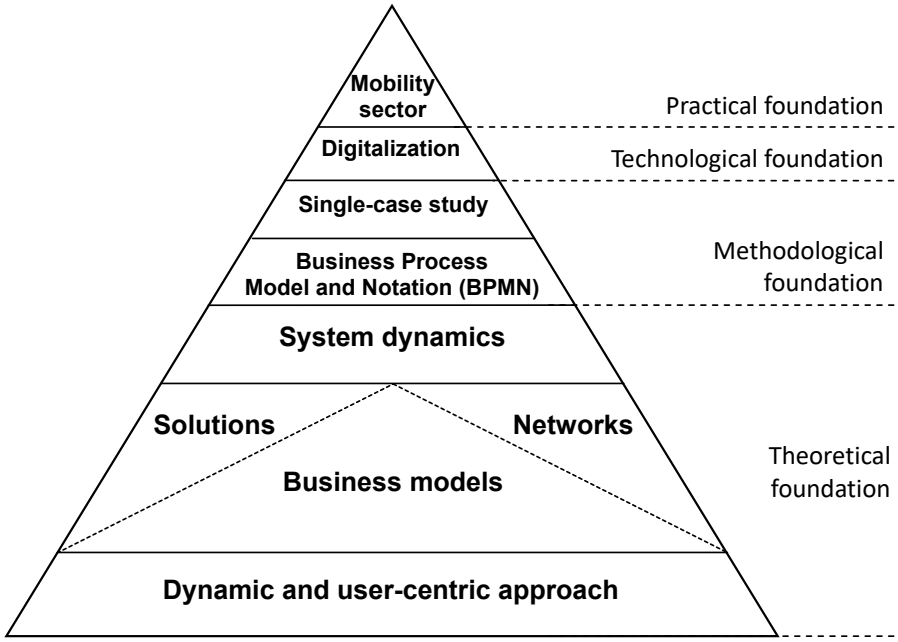

Figure 3: Research foundations.

The research objective is to develop a dynamic, user-centric process model for business model design and change and to meet the requirements of use-inspired basic and pure applied research as defined by Stokes.[42] Basic research will be implemented through deductive reasoning.[43] A theoretically grounded process model for dynamic, user-centric business model design and change (the BMC) will be configured. In ac-

[42] Refer to Stokes 1997, 73. Also see Figure 1.
[43] Refer to Töpfer 2012, 63–64.

cordance with the pure applied science approach, the BMC will be applied to a single-case study in the German mobility sector.

Figure 3 illustrates the research foundations that also map out the **dissertation structure**. Chapter 1.1 discusses the relevance of a dynamic, user-centric business model design and change in the face of ever-evolving external environments. It also describes the research problem, research objective, research questions, and structure of investigation. Chapter 2 defines the characteristics of a dynamic, user-centric approach, and includes a review of system dynamics logic and the user centricity concept. The findings from chapter 2 are applied throughout the dissertation and have been used to configure the BMC meta-model, sub-model, and the modeled instance of the BMC. Business models, solution marketing, and network theory have been examined to broaden the static, dynamic, and user-centric aspects of business models. Chapters 3.1 and 3.2 define business model definition, business model conceptualization, and business model design and change from a static to a dynamic point of view, business model dynamics, business model environment, and theory of dynamic consistency. Chapter 3.3 focuses on the user-centric configuration of business models, and applies solution marketing theory to business model value proposition. This includes a solution-centered specification of the offering, a user-centric, mixed-criteria segmentation approach, and the behavioral customer model as a means of delivering market solutions. Network theory is also examined to help with value creation and distribution of a user-centric business model. Focus was placed on the value network approach since it integrates the user into networked value creation and distribution.

Chapter 4 summarizes and concludes the theoretical foundation (Figure 3). It also describes the triadic theory (comprising business model, solution, and network theory), which summarizes the findings of chapter 3, and looks at the overlaps between the theories. The findings of scientific papers in these three research fields are analyzed, and this literature review substantiates the research gap and how the research questions were derived.

The BMC meta-model, sub-model, and the modeled instance of the BMC are discussed in chapter 5. System dynamics logic and the methodological foundation of Business Process Model and Notation (BPMN) as well as the technological foundation of smart digitalization technologies and techniques[44] are also applied in this chapter (Figure 3).

[44] Ambient intelligent environment, Internet of Things, big data analytics, artificial intelligence.