Digital Actor Engagement Platforms

Design and Evaluation on a Local High Street

der Fakultät für Wirtschaftswissenschaften
der Universität Paderborn

zur Erlangung des akademischen Grades
Doktor der Wirtschaftswissenschaften
- Doctor rerum politicarum –

vorgelegte Dissertation

von

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Paderborn 2022

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Termin der mündlichen Prüfung	23.11.2022

Foreword

Even after the advent of online shopping, mobile technology, and cashless payments, stationary retail continues to be a cornerstone for the livability of our cities. From a commercial point of view, the reasons are apparent. Prospering retail allows citizens to buy products and services they need (or, at least, want to consume). Still, retailers require customers to make a living and provide people with attractive jobs and secure their income.

Still, the observation that retail is subject to change is self-evident. In this vein, "Handel ist Wandel" (retail is change) is a proverb referring to the dynamic and often disruptive change undergone by retail. The last couple of years have been particularly eventful to this end. Continuing a long-term trend for online retail and mobile shopping, the Covid-19 pandemic has had disruptive implications for stationary retailers who had not digitally transformed their businesses, most of all their customer interfaces, soon enough. Even after the pandemic has faded, the situation many retailers face looks pretty grim. Even the prominent retail chain Galeria Karstadt Kaufhof recently went bankrupt, highlighting the profound implications of "Handel ist Wandel" once more. Apparently, a wave keeps accumulating that might affect the retail sector and our quality as citizens.

In his dissertation thesis, Ingo Berendes provides innovative ideas on how stationary retail may counter some of these adverse effects in a quest to save themselves and the quality of living for citizens. Core to the concept is to digitalize actor engagement on the ecosystems level of an entire high street, pointing beyond digitalizing each store individually. After all, retailers can hardly sustain competition with digital platforms for online retail much longer if they stay on their own. Actor engagement may play an important role, enabling retailers to collaborate to provide citizens with unique shopping experiences that integrate physical and digital touchpoints into a seamless shopping experience. The papers in the dissertation thesis explain how designers

can develop IT artifacts to make this happen and present first-hand evidence from one-of-a-kind field studies performed in the city of Paderborn.

The research reported in this dissertation was part of SmartMarket², a research project funded by the German Federal Ministry of Education and Research. In SmartMarket², we developed new insights and IT artifacts to promote actor engagement in stationary retail. Core to the project was designing and implementing new IT artifacts and evaluating them in comprehensive field experiments on a real high street. Amongst others, this quest involved equipping the high street with Beacons, allowing tracing and analyzing offline shopping trips. Thanks to cooperating with a local network of retailers and the city of Paderborn, we evaluated our artifacts with over 150 retailers (and other regional actors) and more than two thousand citizens willing to innovate stationary retail.

I see this dissertation thesis as an essential step towards developing new — maybe also revitalizing traditional — strengths of stationary retailing in our cities. These results may play an important part in turning "Handel is Wandel" from a dystopic into a utopic promise for our cities. Much more is needed to make it happen for the quality of life in our cities.

Paderborn, May 2023   Prof. Dr. Daniel Beverungen

Acknowledgements

Contents

Part A

Part B

List of Figures

Part A

Part B

List of Tables

List of Abbreviations

GPS   Global Positioning System
IS   Information Systems
IT   Information Technology
LBA   Location-based Advertising
LBS   Location-based Service

Part A
Research Overview

1 Exposition

1.1 Background and Motivation

In recent years, digital platforms have become omnipresent. International derivatives such as Amazon, Airbnb, eBay, Facebook, and Uber are part of daily life. Increasingly complex and distributed in nature (Henfridsson et al., 2014), they combine markets, technologies, and institutions (de Reuver et al., 2018) and even shape business and organizational models and, thus, transform entire economies (Tiwana, 2014; Evans and Schmalensee, 2016; G. G. Parker et al., 2016). Unsurprisingly, the 2020 world's five most valuable brands are platform providers: Apple, Google, Microsoft, Amazon, and Facebook (in descending order) (Swant, 2020). Nowadays, digital platforms are often regarded as revolutionary technology (G. G. Parker et al., 2016; Verhoef et al., 2021). No wonder, then, that traditional service providers are aiming to evolve into platform providers (Beverungen et al., 2020) and establish digital engagement ecosystems (Breidbach and Brodie, 2017).

Service systems are socio-technical systems (Böhmann et al., 2014) that enable actors to engage in value co-creation processes (Vargo and Lusch, 2004). Digital platforms as digital service systems allow actors to actively participate in value co-creation activities (Grönroos and Voima, 2013) and even allow them to shift roles making all actors become producers and consumers (Verhoef et al., 2021). Taking on the role of either mediator (e.g., Latour, 2005) or intermediary (e.g., de Reuver et al., 2018), digital platforms enable direct or indirect connection of at least two groups of actors spanning at least two-sided markets (e.g., Hagiu, 2006) and, thus, enable different groups of actors to interact with each other (e.g., Boudreau and Hagiu, 2009; Gawer, 2014; Hagiu and Wright, 2015; van Alstyne et al., 2016) via touchpoints (Zomerdijk and Voss, 2010). Digital platforms are boundary objects that make the provision of digital services possible and thus contribute to enhanced value propositions (Beverungen et al., 2019). Thereby, they enable actors to digitally interact with each

other by integrating and exchanging their resources (Lusch and Nambisan, 2015). In many business-to-customers markets (G. Parker et al., 2017) and also in business-to-business markets (Ordanini and Pol, 2001), digital platforms allow the development of new business models (Eisenmann et al., 2006; G. Parker et al., 2017), the provision of innovative services (Gawer, 2014), or to digitize existing business models (van Alstyne et al., 2016).

However, only a few digital platforms can assert themselves on the market (Hagiu, 2015). This is due to the fact that the design, implementation, and offering of a digital platform are only one side of the coin. The crux of the matter is to build a two-sided or multi-sided market in a platform ecosystem that is subject to the forces of both direct and indirect network effects (Beverungen et al., 2020; Gawer, 2014; van Alstyne et al., 2016). While direct network effects in a platform ecosystem refer to those within an actor group, indirect network effects refer to those among the groups (Beverungen et al., 2020). How strong the effects are, depends on the platform's openness regarding providers, technology, and users (Ondrus et al., 2015). Thereby, successful digital platforms manifest their competitive advantage (van Alstyne et al., 2016) and become quasi-monopolists in their markets by conquering an ever-increasing share of actors and value created (Iansiti and Karim R. Lakhani, 2017). Thus, "[network] effects [are] the driving force behind every successful platform" (van Alstyne et al., 2016, p. 5). In this highly competitive environment, there is often only one winner (Iansiti and Karim R. Lakhani, 2017).

Unsurprisingly, recent research in the information systems discipline and related disciplines has investigated digital platforms through different lenses, e.g., as information technology (IT) artifacts (Boudreau, 2012; Tiwana et al., 2010), as ecosystems (Hein et al., 2020), or as socio-technical concepts (Kapoor et al., 2021; Tilson et al., 2012). As IT artifacts, platforms also consist of a layered architecture with different modules built around a core (Tiwana et al., 2010; Yoo et al., 2010). This platform core is managed by the operators, while third parties can provide their own applications as modules (van Alstyne et al., 2016; de Reuver et al., 2018). As ecosystems, digital platforms provide technology to bring demand and supply together, enabling actors to co-create value (Hein et al., 2020). Socio-technical approaches focus on the conjunction of technical and social aspects being a key driver for the design and performance of complex systems (Kapoor et al., 2021).

In contrast, service science developed the concept of customer engagement. Earlier research has been investigating how firms and consumers engage in value co-creation processes (e.g., Brodie et al., 2011; Brodie et al., 2013; Storbacka et al., 2016), incorporating emotional and behavioral aspects (Brodie et al., 2013; Kumar and Pansari, 2016). Recent research shifted from the dyadic view of engagement to a multiple actor view: the concept of actor engagement (e.g., Alexander et al., 2018; Blasco-Arcas et al., 2020; Brodie et al., 2019). This broadened view is in line with the service-dominant logic that involves all actors in value co-creation processes (Brodie et al., 2019; Vargo and Lusch, 2004; Vargo et al., 2008) and links concepts of service ecosystems, platforms, and co-creation processes (Blasco-Arcas et al., 2020).

Actor engagement is a multi-actor concept that does not only "[encompass] emotional and/or behavioral aspects" (Brodie et al., 2013, p. 107) but also embodies social and economic actors in an actor-to-actor view claiming that all actors continuously integrate resources (Brodie et al., 2019). Thus, actor engagement is defined as the "activity of engaging in an interactive process" (Storbacka et al., 2016, p. 3008) "reflecting actors' dispositions to invest resources in their interactions with other connected actors in a service system" (Brodie et al., 2019, p. 183) and is "conceptualized as a microfoundation for value co-creation within the context of a service ecosystem" (Storbacka et al., 2016, p. 3008). However, actor engagement also depends on the voluntariness to participate in interactions, not only on providing opportunities for resource exchange (Brodie et al., 2019). In service systems, actors need to integrate resources voluntarily (Vargo and Lusch, 2004) and offer value propositions voluntarily that attract other actors to engage in value co-creation processes for mutual benefit (Chandler and Lusch, 2015; Vargo et al., 2008).

The concept of actor engagement describes service ecosystems that enable resource integration and resource exchange through both physical and virtual touchpoints leading to increased engagement (Breidbach et al., 2014; Ramaswamy, 2009). Digital platforms thus are a means to establish engagement platforms that foster actor engagement (Blasco-Arcas et al., 2020) and extend the possibilities to an interaction between different actors (Frow et al., 2015), enabling modern value co-creation and service innovation (Lohrenz et al., 2021). Engagement platforms are digital applications "that extend the reach and speed of interactions with multiple and diverse actors" (Frow et al., 2015, p. 472) by providing "physical or virtual customer touch points where actors exchange resources and co-create value" (Breidbach et al., 2014, p. 592). Service providers can make use of engagement platforms to add digital

touchpoints to their former purely physical servicescape (Breidbach et al., 2014). By engaging them in value co-creation processes, actors integrate their resources and mutually benefit from them (Vargo et al., 2008).

However, little is known about designing and applying digital engagement platforms in specific contexts and their impact on humans' behavioral patterns. While in IS discipline, various research methods exist to design IT artifacts (e.g., Peffers et al., 2007; Sein et al., 2011) and, thereby, develop prescriptive design knowledge (Gregor and Hevner, 2013), the socio-technical aspect often remains unconsidered. It is the humans using and accepting a technology innovation rather than technological innovations themselves that transform a service system and expedite changes in social systems and individuals' behavioral patterns (Bostrom and Heinen, 1977).

Following the call for further research on engagement platforms in specific contexts (Brodie et al., 2019; de Reuver et al., 2018) and for empirical validation of the concept of actor engagement (Blasco-Arcas et al., 2020), this dissertation strives to investigate design, implementation, and usage of digital engagement platforms and their impact on actors' behavior and willingness to engage in value co-creation processes in a local high street ecosystem. In line with the dual mission of design science research of contributing to the knowledge base while developing innovative IT artifacts for solving a problem in practice (Sein et al., 2011), the dissertations' purpose is twofold. The aim is not only to contribute to theoretical knowledge but also to solve a critical practical problem.

Traditionally, high streets and marketplaces were the centers of commerce and exchange of goods where interaction between various and heterogeneous groups of actors took place (Tauber, 1972). Later, they evolved into retail landscapes where shopping malls, department stores, discounters, and even specialized stores matured (Teller, 2008). Historically, interactions and the exchange of goods in city centers and high streets have been purely analog and physical. The development of various technologies, such as warehouse management systems, gave rise to large retail chains (Hagberg et al., 2016). In recent years, evolved platform-based retail business models, such as Amazon or eBay, further fueled the digital transformation (Hänninen et al., 2019) and made the traditional business model of small and medium-sized retailers in city centers and high streets more difficult (Eichholz-Klein et al., 2015). However, while large retail chains succeeded in implementing multi-channel and omnichannel solutions and, therefore, can provide both digital and physical touch-

points, small and medium-sized retailers lack operant and operand resources (Payne et al., 2008) to establish similar digital interactions with their customers (Bollweg et al., 2016; Hänninen et al., 2018). As a consequence, a declining number of high street visitors leads to a reduction in the number and diversity of high street stores and vice versa (Hart et al., 2013). The erosion of local inner cities' high street retail leads to negative consequences for the urban quality of living (Townsend et al., 2017).

Local high street retail is currently in a state of upheaval and undergoing significant changes that are — reinforced by the covid-19 pandemic — caused by changes in customers' shopping behavior and digital transformation (Brynjolfsson et al., 2013; Verhoef et al., 2015; Hagberg et al., 2016; Hokkanen et al., 2021). All over the world, local high street retailers have been losing market share in favor of digital online shops, which is also expressed by their continuous growth rates (Grimmer, 2021; HDE, 2018). Different statistics and studies point out that nowadays, customers prefer online shopping to physical (high street) shopping (Arnoldy et al., 2019; Tordjman et al., 2021). The German Retail Association attests to a leap in the online retail of 23 percent, largely due to the covid-19 pandemic (HDE, 2021). Orders via smartphones, in particular, have increased in percentage terms (HDE, 2021).

In modern high street retail, digital technologies enable retailers—in addition to physical interaction—to interact digitally with customers (Betzing et al., 2018; Breidbach et al., 2014). Therefore, local high streets could benefit from an engagement platform as it transforms the local high street into a physical and digital service ecosystem (Hänninen et al., 2018) and enables considering customers as "both recipients and resources of value" (Hänninen et al., 2018, p.162). For local high street retail, such a platform could be an answer to digital transformation and changing customer behavior as it could adopt successful strategies from e-commerce and make them available in the local high street context (Demko-Rihter and ter Halle, 2015), fulfilling customer expectations for digital, personalized real-time services (Piotrowicz and Cuthbertson, 2014). An engagement platform for local high streets could also satisfy customer demand for a multi-channel concept (Demko-Rihter and ter Halle, 2015).

Contrary to other platform-based business models, (high street) retail was originally an analog, non-platform-based business model (e.g., Tauber, 1972; Teller, 2008). Through various transformations taking place, high street retail shifts from a traditionally purely physical to a physical and digital ecosystem (Hänninen et al., 2019), bearing potential for both business innovations and research. In practice, an en-

gagement platform could guide struggling — mainly small and medium-sized — retailers out of the crises by supporting them in innovating their business models (Broekhuizen et al., 2021) and equipping them with the lacking digital channel. Providing digital touchpoints not only leads to increased "research online, purchase offline" behavior but also leads to outflows of online purchases to offline purchases (Gallino and Moreno, 2014). Research benefits from the opportunity to study the digitization phenomenon and the impact of engagement platforms on actors' interactions and their willingness to engage in value co-creation processes in a context that was originally purely physical (Tauber, 1972). In high street retail, various and heterogeneous groups of actors — e.g., municipal and ecclesiastical institutions, customers, and businesses[1], including retailers, gastronomy, entertainment and cultural venues, and other (commercial) service providers (Voorhees et al., 2017) — provide and consume various services, interact, and exchange resources for mutual benefit (Tauber, 1972; Vargo et al., 2008). This is consistent with the concept of actor engagement, which posits a multiple actor view (Blasco-Arcas et al., 2020; Brodie et al., 2019). As a former purely analog servicescape such as high street retail, added digital touchpoints (Breidbach et al., 2014; Jocevski, 2020) allow the investigation of impacted interaction (Jocevski, 2020) and engagement behavior of all actors through engagement platforms enabling an empirical validation of the actor engagement concept (Blasco-Arcas et al., 2020). That are good conditions to study how digitally strengthened value co-creation processes in a former purely physical servicescape take place and how the additional digital touchpoints are accepted as high street retail manages without digital touchpoints, as shown over decades. To investigate the impact of digital engagement platforms on interactions, high street retail is thus virtually predestinated as a design and evaluation context for engagement platforms.

On digital engagement platforms for local high streets, location-based advertising (LBA) is a means to attract high street actors in value co-creation processes and encourage them to integrate their resources (e.g., from their smartphones) to foster engagement. It facilitates digital interactions via digital touchpoints (Grönroos and Voima, 2013) and, thereby, enables the connection of different high street actor groups. LBA — as a sub-type of location-based service (LBS) for mobile marketing (Bruner and Kumar, 2007; Küpper, 2005) — uses the customer's physical location for the provision of improved value propositions (Bellavista et al., 2008). In retail, previ-

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[1] In this work, we use the term business to group retailers, gastronomy, entertainment and cultural venues, and other service providers.

ous studies revealed the potential of LBA for increased visiting rates, in-store time, and purchase likelihood (e.g., Fang et al., 2015; Molitor et al., 2016; Molitor et al., 2018). In the information systems discipline, research on LBA examines the impacts that its different types have on customers' shopping behavior (Klumpe et al., 2020). However, the effectiveness of LBA is contingent on several factors. These include, inter alia, the position between customer and business (Banerjee and Dholakia, 2008; Spiekermann et al., 2011; Luo et al., 2014), weekday and time (Luo et al., 2014; Ghose et al., 2019), the number of co-located customers (Molitor et al., 2016; Ghose et al., 2020), outside temperature (Molitor et al., 2016), and the customers' income (Ghose et al., 2019). Additionally, customers' shopping motives seem to impact how customers behave on high streets and the extent to which they respond to LBA (Horváth and Adıgüzel, 2018; Tauber, 1972).

In academic literature, two main shopping motives are distinguished: hedonic and utilitarian shopping values (Jones et al., 2006). Since LBA was shown to be able to nudge customers towards the desired behavior (Ghose et al., 2019) and hedonic shoppers are usually more open to spontaneous purchases (Horváth and Adıgüzel, 2018), there is reason to suspect that interactions can be stimulated and, in turn, spontaneous shop visits and purchases can be triggered most effectively among hedonic-shaped shoppers. Targeting only those customers who are open to being nudged could further foster actor engagement. Being in line with the finding that hedonic motivated customers respond differently to nudging than utilitarian customers (Horváth and Adıgüzel, 2018), the provision of recommendations based on customers' behavioral patterns on high streets increases customers' satisfaction rates (Ghose et al., 2019).

In LBA research, two types of information delivery are differentiated: push-based methods and pull-based methods (Kölmel and Alexakis, 2003; Unni and Harmon, 2007; Klumpe et al., 2020). While push-based delivery technologies, in general, use the smart device's location, pull-based ones also manage without the knowledge of the user's location (Klumpe et al., 2020). However, the technology of information delivery does have an impact on effectiveness. Campaigns delivered via push-based technology are more likely to be seen and more likely to lead to store visits than pull-based technologies (Molitor et al., 2016; Molitor et al., 2018). In contrast to digital stores, in physical retail stores, push-based delivery technologies seem to impact customers more than pull-based ones (Molitor et al., 2018). However, there is no empirical study validating LBA's effectiveness in a natural high street setting. Until

now, LBA's effectiveness has solely been surveyed in experimental settings or other contexts.

Overall, it can be concluded that it is possible to nudge customers towards the desired behavior through LBA. To stimulate interactions and foster actor engagement, LBA is a means to attract high street customers in value co-creation processes to foster engagement on digital engagement platforms.

1.2 Problem Formulation and Research Goal

While research so far has concentrated on the managerial and economic effects of digital platforms, research on the design of digital platforms and engagement platforms, in particular, has been neglected (Brodie et al., 2019; de Reuver et al., 2018).

Two major shortfalls characterize the academic literature. Firstly, it is unclear how digital platforms — and engagement platforms in particular — ought to be designed (de Reuver et al., 2018; Brodie et al., 2019) to foster interactions between actors by adding digital touchpoints to a previously purely physically shaped servicescape (Frow et al., 2015). Research has developed only little design knowledge for digital platforms (de Reuver et al., 2018) and engagement platforms (Brodie et al., 2019). Merely initial design knowledge on digital platforms that span a multi-sided market (Schreieck et al., 2016) was contributed. Further studies identified contexts in which digital platforms create value (e.g., Asadullah et al., 2018; Hönigsberg, 2020; Schreieck et al., 2016). These include, among others, design knowledge instantiated as elderly care assistance systems (Spagnoletti et al., 2015) or systems for bridging cultural reservations against economic exchange with foreigners (Avgerou and Li, 2013). Secondly, there is a lack of empirical knowledge to which extent interactions can be fostered on actor engagement platforms in specific contexts (Blasco-Arcas et al., 2020), e.g., in the local high street context. Previous research argued for interactions being restricted between specific actors (Brodie et al., 2013). The actor engagement concept (Brodie et al., 2019) regards all actors in a service ecosystem as being involved in resource integration and exchange processes via multiple channels. However, due to the novelty of the concept, a deeper understanding of the actor engagement concept is required to understand all actors' interactions (Brodie et al.,

2019) and how actor engagement can be fostered on engagement platforms (Breidbach et al., 2014) instantiated as type one engagement platform (Frow et al., 2015).

The need for further research as regards actor engagement and engagement platforms has been manifested by various researchers (e.g., Breidbach et al., 2014; Brodie et al., 2019; Blasco-Arcas et al., 2020; Gawer, 2014; Ramaswamy, 2009; de Reuver et al., 2018; Schreieck et al., 2016; van Alstyne et al., 2016). Therefore, the research problem is formulated as follows:

> **Research problem:** We do not know how digital engagement platforms ought to be designed to enable actor engagement and impact actors' behavioral patterns. In addition, it is unclear to which extent IT artifacts foster actor engagement in specific contexts.

The stated research problem lends itself to being mainly addressed via a design-oriented approach that is in line with calls for further research on actor engagement and actor behavior on engagement platforms (e.g., Blasco-Arcas et al., 2020; Brodie et al., 2019). In particular, the design-oriented approach enables generating prescriptive knowledge on IT artifacts (Hevner et al., 2004; March and Smith, 1995) for specific contexts.

The research problem is approached from interrelated perspectives by a research goal that structures the research process of this dissertation. The statement and composition of the research goal are inspired by the fundamental design cycle in information system research consisting of an iterative cycle of designing and evaluating IT artifacts (Hevner et al., 2004). By focusing on engagement platforms for local high streets, this dissertation targets both theoretical investigation and solving a critical business problem (Sein et al., 2011), namely the erosion of high street retail (Townsend et al., 2017).

Engagement platforms for local high streets focus — in contrast to globally acting platforms — on a local community in which the users benefit from their local specificity and relevance. Their success depends largely on the willingness (Brodie et al., 2019) of local high street actors (e.g., customers and businesses) to engage on them and further factors. As IT artifacts, engagement platforms are regarded as an interface between actor groups that facilitate interactions (Star, 2010; Beverungen et al., 2019). However, it is unclear how to attract actors to engage them in value

co-creation processes (Vargo et al., 2008) and how engagement platforms for local high streets ought to be designed.

In this dissertation, we argue that LBA is a means to foster actor engagement on engagement platforms for local high streets as it facilitates interactions among different actor groups via digital touchpoints (Grönroos and Voima, 2013) that are added to a previously physical service ecosystem (Frow et al., 2015). The potential of LBA to impact customers' behavior on high streets was shown in artificial settings, where it was able to increase, inter alia, visiting rates, purchase likelihood, in-store duration, or same-day purchases (Fang et al., 2015; Molitor et al., 2016; Molitor et al., 2018). Previous research studied LBA's effectiveness in experimental settings such as laboratory experiments or secondary data analytics. However, empirical studies that shed light on the effectiveness of LBA in a natural high street context and its impact on actor engagement have been lacking. In addition, there is a lack of conceptualizations of digital engagement platforms that apply LBA to encourage customers to engage in value co-creation activities and empirically evaluate its effectiveness in a naturalistic setting (ter Halle and Weber, 2014).

Supporting Brodie et al.'s (2019) call for further research in specific contexts to generate knowledge on how to design platforms that enable actor engagement and taking up the call to validate the actor engagement concept (Blasco-Arcas et al., 2020; Brodie et al., 2019) by evaluating actor engagement in the high street retail context, the research goal is stated as follows:

> **Research goal:** To design and evaluate engagement platforms as IT artifacts that foster interactions via LBA between actors on local high streets.

In this regard, this dissertation aims to solve an important and present business problem while contributing theory to the academic knowledge base. As regards theory, the first design theory (Gregor and Jones, 2007) on how digital engagement platforms for high street retail ought to be designed is contributed. This novel theory describes a class of IT artifacts that augments previous research on the digitization of brick-and-mortar high street stores and shopping malls (e.g., Ghose et al., 2019; Heilman et al., 2002; Luo et al., 2014). The design theory is evaluated empirically in a naturalistic environment.

1.3 Structure of the Dissertation

This dissertation consists of two parts. Part A is composed as follows: Section 2 describes the theoretical background of this work, including fundamentals of customer behavior and customer journey, service systems and service ecosystems, digital engagement platforms, actor engagement, and location-based advertising in high street retail. Section 3 explains and justifies the research design of this dissertation, which is composed of different research methods such as design-oriented methods and behavior-oriented methods. It also explains how each research method was used and justifies its use. Section 4, concluding Part A, summarizes the contributions of the individual research papers in this dissertation, provides a synthesis of the contributions, describes limitations, previews future research, and presents implications for theory and practice.

Part B consists of eight research papers[2], all of which have undergone double-blind peer reviews. In the VHB-JOURQUAL 3 of Information Systems, all papers are published in journals or conference proceedings in classification levels from A to C or are under peer review. Journals and conference proceedings include the *European Journal of Information Systems (EJIS)*, the conference proceedings of the *International Conference on Business Information Systems (BIS), European Conference on Information Systems (ECIS), International Conference on Information Systems (ICIS)*, and *International Conference on Wirtschaftsinformatik (WI)*.

The following is a content overview of the individual research papers from Part B. The explanations include the respective motivations, applied research methods, and contribution to the scientific body of knowledge. In addition, the contribution to the synopsis (Part A of this dissertation) and, in particular, to the research goal is depicted.

P1 *Usage Of Local Online Platforms In Retail: Insights From Retailers' Expectations.* High street retailers face increasing competition from online retailing while the city center's attractiveness declines. Additionally, customers more and more expect digital answers from high street retailers. To meet their expectations, many retailers are trying to use digital technologies, such as digital platforms,

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[2] The papers in Part B correspond to the published or submitted versions. The versions may differ only with regard to the correction of minor mistakes such as spelling errors or source citations. However, the formatting has been adapted to that used in this dissertation. Therefore, the positions of figures or tables may have changed.

to offer their customers new digital touchpoints. However, it is currently unclear how and to what extent high street retailers use local online platforms bound to a geographic area. To close this research gap and derive requirements for the design of the digital actor engagement platform, this paper investigates the usage of local online platforms by high street retailers. In the qualitative research approach, interviews with small and medium-sized retailers were conducted to identify retailers' expectations of local platforms for high street retail, to what extent they intend to use them, and key barriers to the usage. This paper addresses the research goal by deriving requirements for the design and provision of the engagement platform for local high street retail that must be considered in the design process.

P2 *Privacy-friendly User Location Tracking with Smart Devices: The BeaT Prototype.*
On digital engagement platforms for local high street retail, location-dependent services are provided. To do so, the current location of the user must be determined. Using the global positioning system (GPS) bears privacy risks and comes at the expense of battery life. A privacy-friendly solution, therefore, is required so that customers are not deterred because of permanent monitoring and tracking. This paper, thus, proposes a novel location tracking algorithm based on Bluetooth low energy that enables tracking only in close vicinity to signal broadcasting businesses on high streets both indoor and outdoor, enabling further services that require indoor positioning. Tracking outside the high street area is ruled out. After development, the algorithm was evaluated as a component of a digital engagement platform for location determination that can, e.g., be used for location-based services provided on the platform. Thus, this paper contributes to the research goal by designing a component for the digital actor engagement platform.

P3 *Data-driven Customer Journey Mapping in Local High Streets: A Domain-specific Modeling Language.*
Digital transformation and information technology impact customer demands and expectations. They are permanently changing local high streets and also the way customer experience is co-created during a high street customer journey. The usage of information technology on local high streets impacts traditional customer journeys and transforms them into online-offline encounters (Bartelheimer et al., 2018). By this usage, digital data traces are produced during the customer journey in the form of event logs, e.g., tracked on digital

engagement platforms for local high streets. However, current modeling tools and languages are not suitable to depict sequential high street customer journeys based on data describing contacts with both digital and physical touchpoints that appear in a digitized physical servicescape. Therefore, this paper suggests a novel modeling language as an IT artifact (March and Smith, 1995) that enables the description of customer journeys in the domain of a digitized high street. The language provides various constructs needed to map, analyze, and predict online-offline customer journeys on local high streets. The design process of the High Street Journey Modeling Language followed the design science research methodology. This paper contributes to the research goal by expanding the knowledge base to IT artifacts for describing and analyzing customer journeys on digital engagement platforms for high streets to derive the extent to which customers on high streets engage with other actors.

P4 *Designing Multi-Sided Community Platforms for Local High Street Retail.*
In local high street retail, many small and medium-sized businesses are suffering from growing online competition. While larger businesses and retail chains have already found solutions, e.g., in the form of omnichannel concepts, small and medium-sized businesses lack operant and operand resources (Bollweg et al., 2016) to find independent answers to the digitization and changing customer expectations. Integration of physical and digital touchpoints, i. e., augmenting the physical high street servicescape with digital touchpoints, is regarded to enhance the co-creation of customer experience on physical high streets to prevent the decline of a high street's and a city's attractiveness. These touchpoints enable resource integration of high street actor groups, above all, businesses and customers for a digital co-creation of customer experience. Following the design science research methodology, this paper strives to design and evaluate a multi-sided community platform for local high street retailing. Insights into the design and evaluation process are generalized in a nascent design theory (Gregor and Jones, 2007), describing a new class of IT artifacts. This paper adds to the research goal and contributes to the information systems knowledge base by presenting a design theory on digital platforms in the context of high streets. It is one of the first papers addressing this particular field.

P5 *Towards Analyzing High Street Customer Trajectories - A Data-Driven Case Study.*
Small and medium-sized businesses, in particular, are finding it increasingly

challenging to address customers in a digitized world. At the same time, larger businesses and chains have established their own solutions to address their customers and make it possible to get to know these customers and study their behavior, as is common in online retailing. In contrast, city management and most local high street businesses hardly know their customers and therefore find it challenging to respond to customers' wishes and interests in order to improve their customer experience. Data generated on digital platforms for local high streets can contribute to understanding customer behavior on local high streets and targeting customers. This paper uses a quantitative approach to identify customers' movement patterns on local high streets. It shows that customers can be assigned to clusters mapped to the shopping motives from the marketing literature. Addressing customers considering these shopping motives in combination with techniques like location-based advertising could support a targeted, personalized customer approach. This paper, therefore, contributes to the research goal by evaluating the designed tracking algorithm and data quality for a determination of the shopping motivation to target customers specifically on the engagement platform. Furthermore, this publication adds knowledge about behavioral aspects of customers on local high streets to the knowledge base.

P6 *Designing Digital Actor Engagement Platforms for Local High Streets - An Action Design Research Study.*
High street retail is suffering from the ever-increasing competitive pressure of online retailing and changes in customer expectations and behavior. This leads to more empty stands due to store closures on high streets, which in turn leads to fewer visitors to the city center. A downward spiral is setting in. Digital platforms that offer various services and digitize the previous physical servicescape through the use of digital technologies can help to foster actor engagement through new digital channels on local high streets (Frow et al., 2015), enabling interactions between actor groups and enhancing their value propositions (Breidbach et al., 2014). Following an Action Design Research approach (Sein et al., 2011), a digital actor engagement platform for local high streets is designed and evaluated in an iterative research cycle in this paper. The 18-month lasting field study was conducted on a German high street. In particular, the study investigated the impact of LBA on actor engagement on digital engagement platforms. The conducted study, thereby, is the first re-

search project investigating digital actor engagement platforms and the impact of LBA in a real-world setting. This paper addresses the research goal by generalizing the results in a design theory (Gregor and Jones, 2007), describing Digital Actor Engagement Platforms for local high streets as a novel class of IT artifacts as an outcome of multiple interventions and evaluation cycles. Besides solving an important business problem, the research paper extends the academic literature in the field of Actor Engagement in a real-world context.

P7 *Quantifying the Impact of Geospatial Recommendations: A Field Experiment in High Street Retail.*

The provision of recommendations based on the customers' current position on the high street can stimulate engagement with other actors, above all, with high street businesses. Analyzing customer behavior on high streets and their trajectories enables businesses to selectively address customers and provide personalized, location-dependent, data-driven recommendations fitting individual customers' needs and interests. Being the standard and one success factor of online retailing, this approach has never been established in a digitized physical servicescape such as local high streets (Gavalas 2004). This paper, therefore, proposes and instantiates a geospatial recommendation system (Liu und Wang 2016) for local high streets as an IT artifact and aims to investigate the extent to which this system impacts the engagement of actors, their behavior on high streets, and the high street's attractiveness. The investigation is proposed to be conducted in a field experiment. Derived hypotheses suggest that geospatial recommendations positively impact the value-in-use and strengthen the high street's competitive position against e-commerce. This paper, thus, contributes to the research goal by designing a component of a digital actor engagement platform and evaluating its impact on the engagement of actors in a high street context.

P8 *Designing City Center Area Recommendation Systems.*

High streets face the challenge of falling attractiveness caused by vacancies or businesses that are not of interest to customers. To counteract, data on customer behavior and geographic characteristics can help select relevant businesses of customer interest. New high street businesses that are interested in opening a store benefit from an optimal location for their business. Embedded in an engagement platform for local high streets, such a recommendation system can use customers' trajectory data and derive a recommendation for a suitable

city center area for a store location based on their behavior and interests. More
attractive businesses that fit customers' needs and interests strengthen the high
street attractiveness and foster, thereby, interactions. Currently, there is no
approach that prescribes the design of such a recommendation system for city
center areas. This paper aims to design and evaluate a prototype for retail
site recommendation that makes use of customers' interests and their behavior.
This research contribution, thus, adds to the research goal by designing and
evaluating a component for engagement platforms for local high streets.

All eight research papers contribute to the stated research goal. An overview of all
papers included in Part B of this dissertation, their applying research method, and
the outlet in which the individual papers are published is provided in Table 1.1.

No.	Title	Authors	Research method	Outlet
P1	Usage Of Local Online Platforms In Retail: Insights From Retailers' Expectations	C. I. Berendes, P. zur Heiden, M. Niemann, B. Hoffmeister, J. Becker	Qualitative interview study	ECIS 2020 (accepted)
P2	Privacy-friendly User Location Tracking with Smart Devices: The BeaT Prototype	J. H. Betzing, M. Niemann, C. I. Berendes	Design Science Research Methodology	WI 2019 (accepted)
P3	Data-driven Customer Journey Mapping in Local High Streets: A Domain-specific Modeling Language	C. I. Berendes, C. Bartelheimer, J. H. Betzing, D. Beverungen	Design Science Research Methodology	ICIS 2018 (accepted)
P4	Designing Multi-sided Community Platforms for Local High Street Retail	J. H. Betzing, C. Bartelheimer, C. I. Berendes, D. Beverungen	Design Science Research Methodology	ECIS 2018 (accepted)
P5	Towards Analyzing High Street Customer Trajectories - A Data-Driven Case Study	C. I. Berendes	Data Analytics	BIS 2019 (accepted)
P6	Designing Digital Actor Engagement Platforms for Local High Streets - An Action Design Research Study	C. Bartelheimer, C. I. Berendes, P. zur Heiden, D. Beverungen	Action Design Research	EJIS (Under Review, 2nd Round, Major Revisions)
P7	Quantifying the Impact of Geospatial Recommendations: A Field Experiment in High Street Retail	J. H. Betzing, C. Bartelheimer, M. Niemann, C. I. Berendes, D. Beverungen	Field Experiment	ECIS 2019 (accepted)
P8	Designing City Center Area Recommendation Systems	P. zur Heiden, C. I. Berendes, D. Beverungen	Design Science Research Methodology	WI 2020 (accepted)

Table 1.1: Overview of included papers

2 Theoretical Background

2.1 Digital Platforms as Service Systems

In service science, service is defined as the "application of specialized competences (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself" (Vargo and Lusch, 2004, p. 2), while the term "services" (plural) implies "units of outputs" (Lusch and Nambisan, 2015, p. 282).

Service systems are socio-technical systems (Böhmann et al., 2014) that encourage different (groups of) actors to engage in value co-creation processes by integrating and exchanging operand and operant resources (Vargo and Lusch, 2004). While operand resources are "resources that an actor acts on to obtain support (i.e., they enable or facilitate) [and] are often tangible and static (e.g., natural resources)" (Lusch and Nambisan, 2015, p. 159), operant resources are "resources that act on other resources to produce effects [...] are often intangible and dynamic (e.g., a human skill, both physical and mental)" (Lusch and Nambisan, 2015, p. 159). A service system, therefore, is defined as a "dynamic value-cocreation configuration of resources, including people, organizations, shared information (language, laws, measures, methods), and technology, all connected internally and externally to other service systems by value propositions" (Maglio et al., 2009, p. 399). The data generated during the use of the service system can serve as a resource in a value co-creation process (Ardolino et al., 2018).

Value co-creation processes are highly impacted by technological progress (Breidbach et al., 2020). Digital technologies transform service systems and, thereby, enable innovation and stimulate trends such as digitization (Rust and Huang, 2014)). Digitized services enable digital service interactions between service providers and service consumers (Beverungen et al., 2017) but also among different groups of actors. In these digital service systems, technology as a boundary object often is what makes

the provision of the service possible and, thereby, contributes to enhanced value propositions (Beverungen et al., 2019). E-commerce shops connecting retailers and customers or hotel/car rental booking platforms connecting different providers and travelers are just two examples. Digital service can be provided on digital platforms that enable its actors to interact with each other and to integrate and exchange their resources for value co-creation (Lusch and Nambisan, 2015). These service ecosystems are "relatively self-contained, self-adjusting systems of mostly loosely coupled social and economic (resource-integrating) actors connected by shared institutional logics and mutual value creation through service exchange" (Lusch and Nambisan, 2015, p. 161). The current literature does not provide a clear distinction between the terms service system and service ecosystem. However, in contrast to service systems, service ecosystems focus more on actor-to-actor structures and actors' mutual engagement in value co-creation through technology while regarding value co-creation as an outcome (Brozović and Tregua, 2022; Frow et al., 2015; Lusch and Nambisan, 2015; Vargo and Lusch, 2010; Vargo and Lusch, 2016).

Today, service is co-created in many constellations with the help of digital platforms. Digital platforms are a means to facilitate interactions among multiple actors in service ecosystems (Brodie et al., 2019) and are often regarded as "physical or virtual touch points designed to provide structural support for the exchange and integration of resources, and thereby co-creation of value, between actors in a service system" (Breidbach et al., 2014, p.596). They act as either mediators or intermediaries bringing different groups of actors together by enabling interactions among them in service ecosystems (van Alstyne et al., 2016; Boudreau and Hagiu, 2009). As mediators, they make use of and transform the resources integrated by actors to enable indirect actor engagement (Beverungen et al., 2020; de Reuver et al., 2018). As intermediaries, digital platforms do not directly intervene in actors' resource exchange and integration activities but only facilitate engagement among them (Latour, 2005; Storbacka et al., 2016). On a platform, they span a two-sided or multi-sided market, depending on the number of actor groups (Boudreau and Hagiu, 2009; Hagiu, 2006; Hagiu and Wright, 2015). Digital platforms are a means of digitizing existing business models by adding value propositions to heterogeneous actor groups (van Alstyne et al., 2016). Establishing new markets, services, or business models (Eisenmann et al., 2006; Parker and van Alstyne, 2012), digital platforms enable gaining competitive advantage by building up network effects (Iansiti and Karim R. Lakhani, 2017; McIntyre and Srinivasan, 2017) that stimulate the volume of interactions (van

Alstyne et al., 2016) and that are supported by external social communities (van Alstyne et al., 2016; Beverungen et al., 2020). It is not uncommon that these network effects lead to winner-takes-all scenarios (Iansiti and Karim R. Lakhani, 2017).

Digital platforms follow the composition and architecture of any (also non-digital) platforms (McIntyre and Srinivasan, 2017). Through recombination of (integrated) resources, digital platforms enable the development and provision of innovative services (Gawer, 2014). Usually consisting of a layered modular architecture (Alexander et al., 2018; Baldwin and Woodard, 2008; Constantinides et al., 2018; Gawer, 2009; Yoo et al., 2010), these ecosystems allow free development of the users and their behavior, contributing, again, to an evolution of the provided services (de Reuver et al., 2018).

Research is paying attention to digital platforms through different lenses: as digital platform ecosystems (e.g., Hein et al., 2020), from a design science perspective by considering digital platforms as IT artifacts (e.g., Boudreau, 2012; Tiwana et al., 2010), from a socio-technical perspective (e.g., Tilson et al., 2012), or by an approximation from an economically theoretical point of view (e.g., Katz and Shapiro, 1986). From a design perspective, initial design knowledge on digital platforms spanning a multi-sided market was gathered (Schreieck et al., 2016). Further studies identified domains in which digital platform create value (e.g., Asadullah et al., 2018; Hönigsberg, 2020; Schreieck et al., 2016). They comprise design knowledge instantiated for supporting elderly care assistance (Spagnoletti et al., 2015) and for bridging cultural reservations against economic exchange with foreigners (Avgerou and Li, 2013).

However, design knowledge on digital platforms that has been empirically evaluated remains scarce. Unsurprisingly, there are several calls for further research investigating design knowledge and IT artifacts' impact on the economy and actors' behavior in different contexts (e.g., Beverungen et al., 2020; Blasco-Arcas et al., 2020; Brodie et al., 2019; Gawer, 2014; de Reuver et al., 2018).

2.2 Platforms for Actor Engagement in High Street Retail Ecosystem

Earlier research within service science has been addressing engagement mainly between firms and consumers and has brought forth the concept of customer engagement (e.g., Brodie et al., 2011; Brodie et al., 2013; Storbacka et al., 2016) being defined as a "multidimensional concept that encompasses emotional and/or behavioral aspects" (Brodie et al., 2013, p. 107). Fostering relationships among different groups of actors in service ecosystems is the basis for engagement (Brodie et al., 2013) whereby, in addition to the interactions, the emotional relationship of customers to a firm is also implicated (Kumar and Pansari, 2016). In research, this dyadic view of engagement concepts between firms and consumers is prevailing.

Recent research in the field of marketing and service research, therefore, calls for an expanded and broadened view of actor engagement in service ecosystems that allows relationships among two and more different actors (e.g., Alexander et al., 2018; Blasco-Arcas et al., 2020; Brodie et al., 2019). This approach corresponds to the service-dominant logic, which sees all groups of actors in a service ecosystem involved in a value co-creation process, not solely consumers (Brodie et al., 2019; Vargo and Lusch, 2004; Vargo et al., 2008). In this view, actor engagement is thus defined as a "dynamic and iterative process, reflecting actors' dispositions to invest resources in their interactions with other connected actors in a service system" (Brodie et al., 2019, p. 139). On digital platforms in service ecosystems, interactions between different groups of actors are facilitated and fostered, leading to value co-creation processes (Brodie et al., 2019). However, in multiple-actor systems, actors potentially pursue diverging goals leading to restricted value co-creation (Hollebeek et al., 2022).

The concept of actor engagement links the concepts of service ecosystems, platforms, and value co-creation processes (Blasco-Arcas et al., 2020). It describes service ecosystems that enable actors' resource exchange and integration activities through both physical and virtual touchpoints leading to increased engagement (Breidbach et al., 2014). Digital platforms could therefore be a proven means of establishing engagement platforms that foster engagement (Blasco-Arcas et al., 2020) and provide "physical or virtual customer touch points where actors exchange resources and co-create value" (Breidbach et al., 2014, p. 592). Frow et al. (2015) identified five types of

engagement platforms: 1) digital applications fostering interactions among multiple groups of actors in a servicescape through adding digital touchpoints, 2) software tools that connect actors for regular interactions, 3) physical resources that enable interactions through resource exchange, 4) innovating joint processes that involve multiple groups of actors, and 5) specific actor groups.

Taking up the call for further research on actor engagement in specific contexts (Brodie et al., 2019) and the need for empirical validation of the actor engagement concept (Blasco-Arcas et al., 2020), this work investigates actor engagement in the high street retail context. It, thereby, both contributes theoretical knowledge to the academic knowledge base and solves an important business problem.

High streets are service ecosystems involving different groups of actors in value co-creation processes. Once the central place for the exchange of goods (Tauber, 1972), marketplaces have evolved into high streets consisting of various stores ranging from owner-operated stores to branches of larger retail chains (Teller, 2008). In a high street servicescape that mainly consists of SME businesses providing purely physical touchpoints, digital platforms are a means to foster actor engagement (Brodie et al., 2011; Brodie et al., 2019) set up as type one engagement platforms (Frow et al., 2015). Digital touchpoints added to a hitherto purely physical servicescape such as high street retail provide actors an additional interaction channel for mutual resource integration and exchange, leading to strengthening the co-creation of customer experience (Brodie et al., 2011). Such an engagement platform could stop the decline of high street retail and foster actor engagement by helping SME businesses, in particular, to digitally transform their business model (Demko-Rihter and ter Halle, 2015) while responding to changing customer expectations and behavior (Hänninen et al., 2018). Remote features on the platform that can be used for the preparation of the high street visit can additionally enhance customer experience (ter Halle and Weber, 2014).

2.3 Customer Behavior and Customer Journeys in High Streets

On the high street, customers interact with a variety of other customers, businesses, service providers, and others (Voorhees et al., 2017). These interactions take place

"along prepurchase, purchase and postpurchase situations" (Homburg et al., 2015, p. 384) in a time-logical sequence of touchpoint instances. Touchpoint instances are regarded as discrete interactions between customers and actors offerings services (Zomerdijk and Voss, 2010). On high streets, these interactions not only occur between entering and leaving the high streets but also before and after the high street visit (Homburg et al., 2015), e.g., during preparation and post-processing interactions (e.g., viewing advertisements of high street businesses or writing reviews about a visit in a store).

High streets are usually located in the city center and accommodate a variety of service offering actors covering different and not exclusively commercial services. Besides the shopping aspect (Teller, 2008), high streets offer entertainment (Teller et al., 2008), including restaurants, cafés, cultural activities, or public squares and market places. The reasons and goals to visit high streets are therefore manifold. Besides purely shopping concentrated shopping trips, "multi-purpose shopping trips" (Teller et al., 2008) are possible that include leisure time and entertainment activities.

Researchers have paid attention to how customers behave in high streets and how they shop for decades (Tauber, 1972). Their behavior on high streets is connected with the purpose and goal of the shopping trip (Saarloos et al., 2010). In general, research distinguishes between two main shopping goals: hedonic and utilitarian shopping goals (e.g., Arnold and Reynolds, 2003; Babin et al., 1994; Hirschman and Holbrook, 1982; Jones et al., 2006; Rintamäki et al., 2006; Ruiz et al., 2004; Saarloos et al., 2010; Teller et al., 2008. Utilitarian shopping goals are characterized by the efficiency of shopping (Jones et al., 2006; Kim, 2002). The efficiency is achieved by an optimal ratio between the process input and output (Teller et al., 2008), e.g., spending only a little time to find the desired product for a fair price. Hedonic shopping goals stand out due to the benefits that arise through the shopping trip for the customer (Babin et al., 1994; Jones et al., 2006). Hedonic shopping goals cover activities such as exploring shopping, idea shopping, and adventure shopping (Arnold and Reynolds, 2003; Jarboe and McDaniel, 1987). Consequently, the customer is not looking for a specific product but spends time shopping, often in company (Arnold and Reynolds, 2003).

Recent research is devoted to the question of how customer behavior can be influenced. The shopping goals set also play a role here. It has been shown that customer journeys with a hedonistic goal are easier to influence than those with a utilitarian

shopping motive (Horváth and Adıgüzel, 2018; Iyer et al., 2020). In particular, the hedonic-shaped shopping motivations gratification seeking, idea shopping, and role play contribute to impulse buying (Horváth and Adıgüzel, 2018). Since impulse buying — a typical hedonic shopping motivation (Arnold and Reynolds, 2003) — can be triggered via push-based LBA (Unni and Harmon, 2007), it can be assumed that mainly customers whose shopping motivations are hedonic will be tempted to engage in value co-creation processes with other high street actors, which in turn becomes visible through impacted purchasing behavior (e.g., longer in-store stay, more stores visited, more products purchased).

2.4 Location-Based Advertising in High Street Retail

In high street retail ecosystems, different actor groups engage with each other for mutual benefit. These actor groups comprise municipal and ecclesiastical institutions, customers, and businesses, including retailers, gastronomy, entertainment and cultural venues, and other service providers (Voorhees et al., 2017). To enable engagement among these actor groups, LBA is one means that enables digital interactions and facilitates interactions via digital touchpoints (Grönroos and Voima, 2013).

LBSs extend other services by integrating the customer's geographical location (Küpper, 2005; Schiller and Voisard, 2004) to support service innovation by a generation of enhanced value propositions (Bellavista et al., 2008). LBA — a specific type of LBS (Bruner and Kumar, 2007; Kölmel and Alexakis, 2003) — considers the customers' geographic position for enabling mobile advertising (Bruner and Kumar, 2007). It, thus, enables personalized targeting in multiple application scenarios (Koetsier, 2018). However, customers might feel spied on or monitored as it allows detailed, continuous tracking of customers and their behavior resulting in skepticism towards this kind of service (Unni and Harmon, 2007).

In recent times, LBA thoroughly changed customers' shopping behavior (Kurtz et al., 2021). It is often regarded as one of the most innovative business practices and an essential part of the mobile commerce of the future (Chiang and Chen, 2017). LBA as a means of advertising is defined as a "marketer-controlled information specially tailored for the place where users access the advertising medium" (Bruner and Kumar, 2007, p. 3) or — more precisely in the definition used in this dissertation —

as "marketer-controlled information customized for recipients' geographic positions and received on mobile communication devices" (Bruner and Kumar, 2007, p. 3).

Through LBA, traditional high street businesses can send personalized and contextual information and campaigns to nearby customers on their mobile devices (Reichhart, 2014) that can be triggered by both requests or automatic recommendations (Lin and Bautista, 2020). By delivering information about new products or attractive campaigns, this technology enables businesses to attract new customers, retain existing customers and increase sales (Lin and Bautista, 2020). Even customers' shopping behavior can further be impacted by means of LBA (Klumpe et al., 2020). This is particularly evident in the increased visit rates to stores, the length of time spent in stores, and an increased likelihood of purchase (Molitor et al., 2018), which leads to higher turnovers as a short-term effect (Fang et al., 2015; Heilman et al., 2002). In addition, LBA can contribute to unplanned expenses, especially when campaigns are delivered in-store (Hui et al., 2013).

There are several factors impacting the effectiveness of LBA. The main impacting factors include the distance between the store and the customer (Banerjee and Dholakia, 2008), the ambient temperature (Molitor et al., 2016), and the day of the week and time (Ghose et al., 2019; Luo et al., 2014). In addition, a higher income appears to influence the effectiveness of LBA (Ghose et al., 2019). Further, the number of fellows accompanying the customer influence LBA's effectiveness. However, research is divided concerning the effects (Molitor et al., 2016; Ghose et al., 2020).

Location-based campaign deliveries can be made in two ways: pull-based and push-based (Klumpe et al., 2020; Kölmel and Alexakis, 2003; Unni and Harmon, 2007). With pull delivery, the user deliberately retrieves the campaigns, while push delivery requires no action on the user's part. Therefore, no location data is required for pull delivery, but it is helpful to deliver campaigns in a specific manner (Klumpe et al., 2020), e.g., sorted by distance to the business. However, the delivery method is mainly responsible for the effectiveness of the delivered campaign. In principle, it can be assumed that a deliberate retrieval of information signals interest on the part of the customer and thus, in contrast to location-based push delivery, does not have to contend with privacy concerns (Unni and Harmon, 2007). However, early research in the context of physical retail has revealed a contrary effect, attributing greater effectiveness to push-based delivery (e.g., Molitor et al., 2018).

Some effects could negatively impact the customers' willingness to use LBA. Privacy concerns arise through a continuous disclosure of personal location data during its usage or even beyond (Lee and Hill, 2013; Unni and Harmon, 2007). This continuous processing of the customers' geographic location in real-time that is in particular needed for push-based LBA (Unni and Harmon, 2007) impacts the customers' attitude towards LBA negatively and leads to low acceptance intentions (Limpf and Voorveld, 2015). Additionally, customers may find push-based campaign delivery intrusive (Xu et al., 2009) as they have not explicitly activated or requested a campaign (Unni and Harmon, 2007). Balancing the benefits for all involved actors (Wang et al., 2015) against the concerns, therefore, is a crucial task when deploying LBS.

3 Research Design

3.1 Research Paradigms and Research Approach

In the information systems (IS) discipline, researchers deal with the "analysis, design, implementation, and use of information systems" (Hevner et al., 2004, p. 76) to "develop an understanding of how and why IT systems work or do not work" (March and Smith, 1995, p. 251). As an interdisciplinary research field (Becker and Niehaves, 2007), IS research strives to investigate socio-technical phenomena from multiple perspectives (Becker and Niehaves, 2007) at the intersection of organizations, information technology (Peffers et al., 2007), and people (Hevner et al., 2004). All IS research phenomena are regarded to be "inherently complex and multidimensional" (Mingers, 2001, p. 243). The extent to which understanding and explanation of the complex phenomena in IS research can be gained is restricted by the selection of research paradigms and research methods that are applied to approach the research problem (Morse, 2003). Therefore, a "synergistic approach" (Hevner and March, 2003, p. 113) is vital, "in which design science creates innovative artifacts for specific information problems and behavioral science meaningfully engages these artifacts in the development of theory" (Hevner and March, 2003, p. 113). Lee (2001), thus, argues that "research in the information systems field examines more than just the technological system, or just the social system, or even the two side by side; in addition, it investigates the phenomena that emerge when the two interact" (Lee, 2001, p. iii).

Being elementary for IS research (Hevner et al., 2004), design science and behavioral science are two "complementary but distinct paradigms" (Hevner and March, 2003, p. 111) that are used both to contribute to the theoretical knowledge base and to gain applicable knowledge for practitioners. While the design science paradigm aims at creating new and innovative artifacts to support people and organizations, the behavioral science paradigm pursues the goal of developing and verifying theory

for explaining and predicting organizational and human behavior (Hevner et al., 2004). Thus, in this dissertation, methods of both research paradigms are used and combined, firstly, to design an engagement platform for local high streets leading to a design theory and, secondly, to derive to theory for explaining and predicting the behavior of high street customers using the artifact. The goal of this dissertation is to generate truth and utility by applying behavioral science and design science methods, respectively (Hevner et al., 2004). The two mentioned goals are interlinked and inseparable: "Truth informs design and utility informs theory." (Hevner et al., 2004, p. 80).

Theory in IS research is structured into five interrelated types of theory that are: theory for analyzing and describing (type I), theory for explaining (type II), theory for predicting (type III), theory for explaining and predicting (type IV), and theory for design and action (type V) (Gregor, 2006). Gregor (2006) defines the types of theory as follows: A theory for analyzing and describing is particularly useful in an occurrence of a new phenomenon where little is yet known. It is mainly used to describe this phenomenon and analyze relationships. A theory for explaining tends to be used with a known phenomenon and explores how, why, and when a phenomenon behaves or occurs in a particular context providing a deeper understanding of the phenomenon. A theory for predicting provides probabilistic predictions regarding a phenomenon, but without describing it or explaining the relationships of its independent and dependent variables, whereas a theory of explaining and predicting brings together the previous two and aims to both understand the relationships of the underlying constructs and predict outcomes. Design science researchers in IS discipline usually advance IS design theories. A theory of this type explains how to design and evaluate IT artifacts and provides generalized knowledge in the form of, e.g., design theories or design principles. While it is not possible to clearly assign one theory type to the underlying research paradigm, particular paradigms fit some types of theory more than others (Gregor, 2006).

Since the overarching research goal of this dissertation is to provide a design theory for digital actor engagement platforms, the theoretical contribution is a type V theory (Gregor, 2006). The research approach of this dissertation is informed by Hevner et al.'s (2004) Information Systems Research Cycle, consisting of infinite, iterative cycles of designing and evaluating IT artifacts while considering the context, i. e., continuous judging against the environment and being informed by the knowledge base (see figure 3.1).
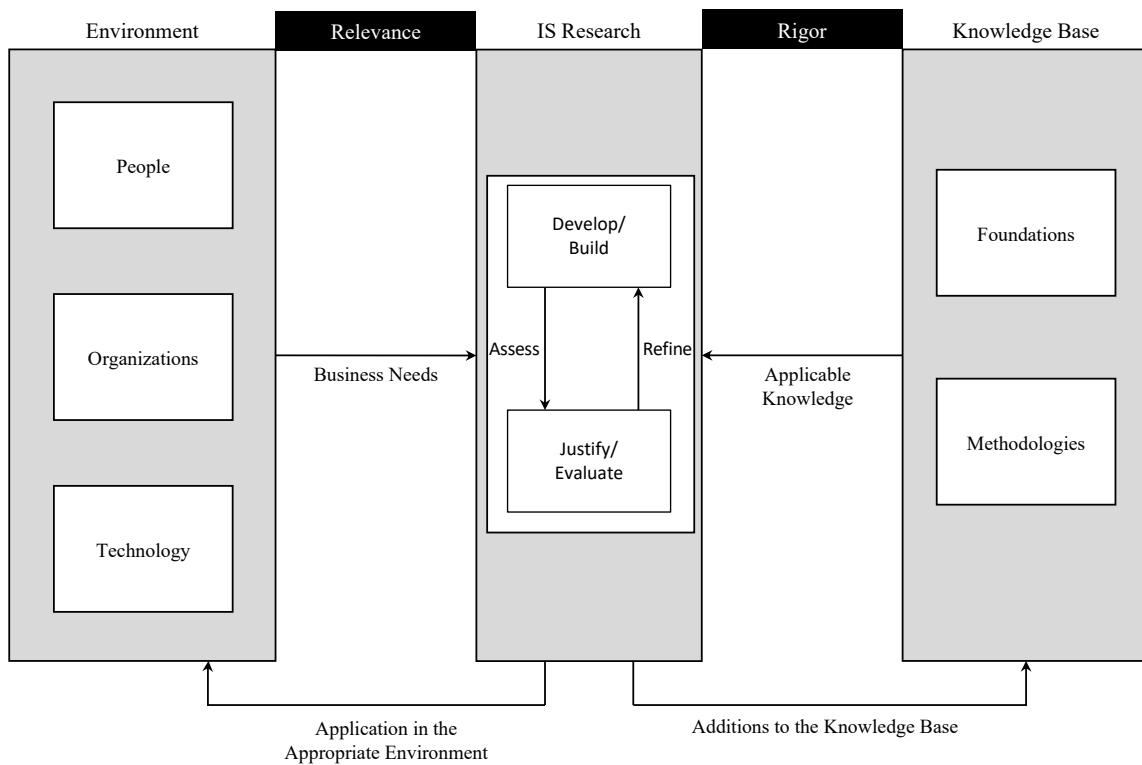
Figure 3.1: Information Systems Research Cycle (Hevner et al., 2004)

Multiple methods of both paradigms are applied. Each method has its benefits but also limitations (Hunter and Brewer, 2002) that enable and constrain pursuing the aimed research goal (Ahmed and Sil, 2009). Therefore, a combination of different types of research methods is needed to study a real-world phenomenon from all perspectives (Mingers, 2001) and to "[overcome] each method's weaknesses and limitations" (Hunter and Brewer, 2002, p. 578).

3.2 Applied Research Methods

3.2.1 Methods and concepts of Design Science

The design science paradigm has its origins in the field of engineering (Hevner and March, 2003) and is also termed "The sciences of the artificial" (Simon, 1996). As a "problem-solving paradigm" (Hevner et al., 2004, p. 76), it seeks to design innovative artifacts for the most effective and efficient use (Denning, 1997) and to "[answer] questions relevant to human problems via the creation of innovative artifacts, thereby

contributing new knowledge to the body of scientific evidence" (Hevner and Chat-
terjee, 2010, p. 5). In recent years, design science has emerged as a widely accepted
research paradigm and is nowadays considered one of the fundamental paradigms
in the information systems discipline (Peffers et al., 2018).

On its dual mission of solving a relevant problem by designing IT artifacts for an
application domain and developing generalized theoretical knowledge (Sein et al.,
2011), design science research designs IT artifacts as constructs, models, methods,
and instantiations (March and Smith, 1995) while it contributes to the knowledge
base in the form of five theory types (Gregor and Hevner, 2013).

Since the term "IT artifact" is inconsistently defined by information systems schol-
ars (Alter, 2015; Chatterjee et al., 2017), this dissertation follows the definition of
March and Smith (1995), who identified four types of IT artifacts:

- Symbols or vocabulary used in a domain (constructs)

- Set of propositions and expressions of relationships between constructs (mod-
  els)

- Set of steps, algorithms or guidelines (methods)

- Realized artifact (system, tool, etc.) in an environment; operationalized con-
  structs, models, and methods (instantiations)

Depending on the maturity of the artifact and of the application domain, a design
science research knowledge contribution can be classified into four types (Gregor
and Hevner, 2013): invention, improvement, exaptation, or routine design. An
invention represents a fundamental breakthrough and "a clear departure from the
accepted ways of thinking and doing" (Gregor and Hevner, 2013, p. 345). It describes
a new solution for new problems, whereas an improvement provides an innovative
solution for an already-known problem. An IT artifact being an exaptation adopts
known solutions to new problems. Routine designed artifacts apply known solutions
to known problems and represent a type of IT artifacts providing the least innova-
tive solutions without considerable knowledge contribution (Gregor and Hevner,
2013). Moreover, Gregor and Hevner (2013) propose three contribution types: situ-
ated implementations, nascent design theories, and well-developed design theories.
The types range from "more specific, limited, and less mature knowledge" (Gregor

and Hevner, 2013, p. 342) (the former) to "more abstract, complete, and mature knowledge" (Gregor and Hevner, 2013, p. 342) (the latter).

Although the term IT artifact is not uniformly defined, design science researchers have agreed on — meanwhile old-fashioned — basic guidelines for design science research (Hevner et al., 2004) and later on the anatomy of a design theory consisting of eight components (Gregor and Jones, 2007). However, design science researchers pursue differing goals leading inevitably to differing types of research contributions (Peffers et al., 2018). "For some researchers an artifact of value is a system or system component, while for others artifacts ought to be theories or theory components" (Peffers et al., 2018, p. 129), although the studies investigated all perform design processes and contribute to the knowledge base. The different interpretations of design science and diversity in the application are seen as auspicious due to the support of different research foci but detrimental due to lack of comparability and different contribution expectations. Therefore, Peffers et al. (2018) established design science contribution genres to guide researchers, reviewers, and editors and create comparability in design science publications. The five prototypically proposed genres are as follows (Peffers et al., 2018):

- The *Information Systems Design Theory* goes back to Gregor and Jones (2007), who proposed eight components of a design theory: 1) purpose and scope, 2) constructs, 3) principles of form and function, 4) artifact mutability, 5) testable propositions, 6) justificatory knowledge, 7) principles of implementation, and 8) expository instantiation. While the testable statement of propositions is considered mandatory, a description of the artifact's development and demonstration is not. However, the specification of the design principles underlying the design theory is recommended (Gregor and Jones, 2007). In a design theory, theory is the central contribution, whereas the instantiated artifact is regarded to be optional (Gregor and Jones, 2007). Being independent of the science where it was applied and often derived deductively, an information systems design theory thus resembles a theory in behavioral science (Peffers et al., 2018).

- Focusing on the design process of IT artifacts and their practically useful application, the *Design Science Research Methodology* proposes an iterative design process for developing artifacts that consists of six activities considering fundamentals in information systems research for each activity (Peffers et al., 2007).

Peffers et al.'s (2007) proposed design process consists of the following activities: 1) problem identification and motivation, 2) definition of the objectives of a solution, 3) design and development, 4) demonstration, 5) evaluation, and 6) communication. The approach favors the generalizability of the artifact's utility without explicitly demanding theory (Peffers et al., 2018).

- *Design-oriented information systems research* focuses on the "construction of 'better' IS-related problem solutions" (Winter, 2008, p. 470) and innovative concepts (Österle et al., 2011) with attention to the utility for practice (Peffers et al., 2018). The design process consists of the four phases analysis, design and construction, evaluation, and diffusion, emphasizing the latter (Österle et al., 2011; Winter, 2008). Theory building is not regarded to be design science research, whereas it is needed to explain real-world phenomena (Winter, 2008). Theories are rather regarded as "'intermediate' artefacts [that] need to be included in the system of relevant artefacts" (Winter, 2008, p. 472). Researchers of this genre argue for a defined set of evaluation methods to be applied (Österle et al., 2011), whereas others argue for a context-dependent selection and application of evaluation methods (Winter, 2008). This genre is particularly applied in the German speaking information systems community (Winter, 2008; Österle et al., 2011) where it is also referred to as "gestaltungsorientierte Wirtschaftsinformatik" (Peffers et al., 2018, p. 133).

- *Explanatory Design Theory* is a particular type of design theory with a focus on the design and evaluation of features and their impacts on the environment and is regarded to be the equivalent to theory in behavioral science (Baskerville and Pries-Heje, 2010; Niehaves and Ortbach, 2016; Peffers et al., 2018). In general, an explanatory design theory includes kernel theories for deductively deriving testable hypotheses (Baskerville and Pries-Heje, 2010; Peffers et al., 2018). In contrast to design-oriented genres, the artifact is not in the main interest of the investigation, but theory development is. This genre regards the artifact rather as an auxiliary object for theory development that is needed for the systematic manipulation of the artifact's design variables (Niehaves and Ortbach, 2016), while the evaluation of the derived explanatory design is deducted by methods for hypotheses testing (Niehaves and Ortbach, 2016; Peffers et al., 2018). Hence, the artifact description is part of the second component of an explanatory design theory, named "design practice theory" (Baskerville and Pries-Heje, 2010).

- *Action Design Research* proposed by Sein et al. (2011) is based on the action research paradigm (Susman and Evered, 1978). As an instance of the design science research paradigm, it incorporates elements of action research and design (Sein et al., 2011). The special feature of action design research is that the stages are iterated several times to compensate for disadvantages caused by sequential design processes so that the artifact is continuously improved (Sein et al., 2011). It focuses on the problem-solving design and evaluation of IT artifacts in an organizational setting while learning from the interventions (Sein et al., 2011). The approach depicted in figure 3.2 comprises four stages of seven principles that are passed sequentially and even run in parallel (Sein et al., 2011): Within the first stage, *problem formulation*, the problem space is identified as the central element of the context (Alexander, 1964), before in the second phase, *building, intervention and evaluation*, the IT artifact is designed according to the imposed requirements and evaluated in the stated context. The design process — a mutual interaction between the first and second stages — is continuously informed by the evaluation. In the third stage, *reflection and learning*, knowledge gained within the design process is abstracted to be applicable for the class of problems in the problem space. In the last stage, *formalization of learning*, the abstracted knowledge is formalized to contribute to the academic knowledge base. The knowledge contribution can be made in the form of, e.g., a design theory (Gregor and Hevner, 2013) or design principles (Gregor et al., 2020). This approach regards a problem being an instance of a class of problems. It demands generating of prescriptive design knowledge and an artifact that is embedded in theory (Peffers et al., 2018).

A type V theory (theory of design and action) (Gregor, 2006) explains how to design and evaluate IT artifacts and provides generalized knowledge. There are means to concentrate knowledge about an artifact's design, e.g., design theories or design principles (Gregor and Jones, 2007; Gregor et al., 2020; Walls et al., 1992). Design principles — one part of the design theory providing prescriptive knowledge — guide and constrain the design of IT artifacts and formulates design knowledge (Gregor et al., 2020). By merging existing formulations of design principles, Gregor et al. (2020) suggest a uniform schema for their formulation that includes the following components: 1) Aim, implementer, and user, 2) context, 3) mechanisms, and 4) rationale.
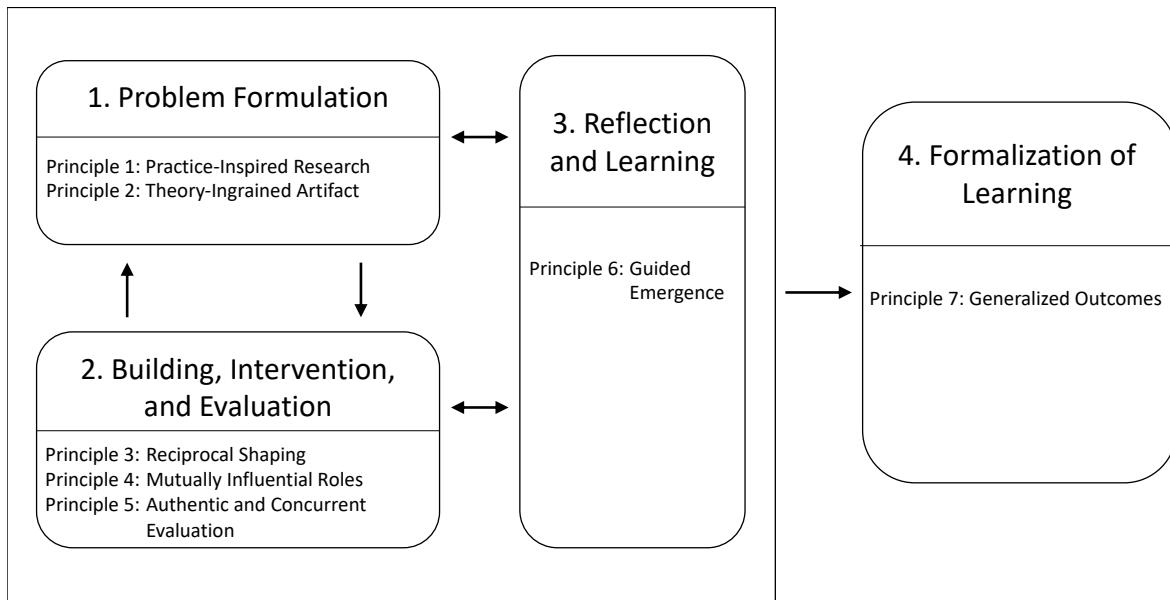
Figure 3.2: Action Design Research Method (adopted from Sein et al., 2011)

This dissertation contributes design knowledge (March and Smith, 1995; Simon, 1996) about a novel class of IT artifacts — namely digital actor engagement platforms — that is manifested in a design theory (Gregor and Jones, 2007) while it aims at solving the practical problem (Hevner et al., 2004) of the erosion of inner cities' high streets. It is positioned as an exaptation (Gregor and Hevner, 2013), adapting platforms that are widely used in other fields and other contexts to the local high street to provide a solution fostering engagement between multiple actors on the high street. This work uses action design research as the overarching research approach and, thus, can be classified as such in Peffers et al.'s (2018) contribution genres. This approach allows the artifact to be developed in iterative cycles with recurring evaluation and development phases. Especially in a context like inner cities' high streets, where technical restrictions and requirements, as well as human behaviors, have to be considered, the action design research approach, therefore, seems to be the most appropriate. It additionally stipulates the abstraction and formalization of knowledge gained in the design process leading — in this work — to a design theory (Gregor and Hevner, 2013).

3.2.2 Methods of Behavioral Science

The behavioral science paradigm in IS is rooted in natural science research methods (Hevner and March, 2003), providing both qualitative and quantitative research methods mostly borrowed and adopted from various disciplines.

Behavioral science methods, inter alia, comprise laboratory experiments, field experiments, field studies, surveys (including questionnaires and interviews), and case studies (Bariff and Ginzberg, 1982; Benbasat et al., 1987; Döring and Bortz, 2016; Harrison and List, 2004; Klein and Myers, 1999; Myers and Newman, 2007). Those research methods that are applied in papers included in this dissertation are briefly described as follows.

Semi-structured interviews belong to the qualitative data gathering tools enabling researchers to collect structured and comparable information while allowing interviewees to add their own insights, opinion, and views (Pinsonneault and Kraemer, 1993; Myers and Newman, 2007). In addition to the semi-structured interview, other types of interviews exist, such as structured, unstructured, and group interviews. In IS research, however, the semi-structured one is used most frequently (Myers and Newman, 2007). Interviews, in general, are part of various other research methods (e.g., case studies, action research, or grounded theory (Klein and Myers, 1999; Hesse-Biber and Leavy, 2011)) and can be positivist, interpretive as well as critical (Myers and Newman, 2007). Interviews are commonly used in an inductive research approach leading to deriving hypotheses. They can be applied face-to-face or remotely (e.g., by telephone) with respective abilities of interaction (Myers and Newman, 2007). In particular, semi-structured and unstructured interviews use incomplete scripts. Thus, there is a need for improvisation, openness, and flexibility (Myers and Newman, 2007). Since "everyone is an interpreter" (Myers and Newman, 2007, p. 16) and, therefore, the interpretation of the gained qualitative data is subjective, a later qualitative content analysis (Mayring, 2010) needs to strive for obtaining "intersubjectivity" (Nicholson and Sahay, 2004, p. 358) and is dependent on the skills and personal knowledge of the researchers (Bhattacherjee, 2012, p. 113). The qualitative content analysis aims to understand an investigated phenomenon and less predict or explain it.

Case study research known in social science (e.g., Benbasat et al., 1987; Lee, 1989; Yin, 2014) is nowadays widely accepted for conducting interpretative, commonly induc-

tive field research in information systems research (Hartley, 2004; Klein and Myers, 1999). Researchers using this method tend to derive a theory from the observed and collected field data (Bhattacherjee, 2012, p. 103) about a "contemporary phenomenon (the 'case') in its real-world context" (Yin, 2014, p. 2) "to provide an analysis of the context and processes which illuminate the theoretical issues being studied" (Hartley, 2004, p. 323). Both qualitative and quantitative data can be used (Hartley, 2004) that were collected beforehand by multiple data collection methods combined, inter alia, interviews, documents, observations, and questionnaires (Dubé and Paré, 2003; Eisenhardt, 1989; Verleye, 2019). There are three distinct purposes of case study research: descriptive, explanatory, and exploratory case studies (Benbasat et al., 1987; Yin, 2014). While the purpose of a descriptive case study is the description of a phenomenon in a particular real-world context, an explanatory case study aims to explain how and why things happened, whereas an exploratory case study is often used for pilot testing and targets the identification of research questions for a subsequent investigation (Yin, 2014, p. 238).

For empirical studies, the laboratory and field can be considered as the site of investigation. While laboratories are a controlled, artificial environment, the field is a natural, less controlled environment (Döring and Bortz, 2016, p. 205). The field as a study site is, therefore, the appropriate choice to evaluate an IT artifact as close to reality and natural context as possible and to avoid effects due to low external validity (Bhattacherjee, 2012; Rubin, 2005). This dissertation, therefore, mainly asses the designed artifact on the high streets of Paderborn, Germany. For technical and usability tests, a laboratory environment was preferred.

Experimental research is mainly applied for investigating cause-effect relationships, i. e., experiments are used for explanatory research (Bhattacherjee, 2012, p. 83). In an experimental setting, participants are randomly assigned to one or more treatment groups with different treatment levels and one control group. Due to the random group assignment, the design is also called true experimental design (in contrast to quasi-experimental designs) (Bhattacherjee, 2012, p. 89). One or more independent variables as treatments are manipulated for participants within the treatment groups while the results of the dependent variables are observed. Experiments can be conducted both in a laboratory and field environment, whereas the former is accompanied by low external validity due to the lack of generalizability and investigation in a non-real environment (Bhattacherjee, 2012, p. 83). Through its ability of treatment manipulation and, thus, its ability to link the cause to the effect, high

internal validity is inherent in experimental research designs (Bhattacherjee, 2012, p. 83). Field experiments, therefore, exhibit both high internal and external validity. Due to its experimental setting, (field) experiments are commonly applied in deductive research for testing hypotheses or theories. In contrast to field experiments, *field studies* do not follow an experimental setting, i. e., there are no treatment or control groups, and there is no treatment manipulation (Benbasat et al., 1987). The focus is on observing participants in an open, uncontrolled, and natural setting. Using field studies, researchers rather pursue the goal "to understand human thought and action in social and organizational contexts" (Klein and Myers, 1999, p. 67) to investigate phenomena in information systems research.

Quantitative analysis techniques are either used for *descriptive analyses*, i. e., to describe, aggregate, and present constructs and links between them, or for *inferential analyses*, i. e., to test hypotheses and theory (Bhattacherjee, 2012, p. 119). Descriptive analyses summarize sample data using sample ratios, while inferential analyses use sample data to infer population relationships (Döring and Bortz, 2016, p. 612). Univariate analysis and bivariate analysis, for instance, describe the properties of one variable in general and determine the relationship between two variables, respectively. Inferential analyses provide, inter alia, information about associations between variables to derive conclusions (Bhattacherjee, 2012, p. 129). An explanatory study aims to test hypotheses derived from theory to disprove them where applicable based on collected data. Since hypotheses cannot be accepted (and theories in general never be proven), researchers formulate opposite hypotheses (null hypotheses) that can be rejected and falsified and, thereby, indirectly support the original hypotheses (alternative hypotheses) (Bhattacherjee, 2012, p. 129). However, the change in the dependent variable cannot always be attributed to exactly one effect. Often, various external effects exert an impact on the dependent variable, but these cannot be controlled or measured, or only with difficulty (Bhattacherjee, 2012, p. 129). There are various analyses that test the statistical significance. Exploratory studies rather focus on formulating hypotheses by identification of effects and significance tests without necessarily testing hypotheses (Döring and Bortz, 2016, p. 613). Descriptive studies are used to describe populations. Quantitative analysis techniques are, therefore, usually deductive.

3.3 Research Process Overview

In order to pursue the stated research goal, this dissertation uses a multi-method approach that includes methods from design science, qualitative, and quantitative research. A multi-method approach is used to overcome the weaknesses and limitations of each method by combining different types of methods within the same research project (Hunter and Brewer, 2002, p. 578) and follows Myers's (2011) and Davison and Martinsons's (2011) claim for Ph.D. students being trained and socialized in multiple research methods.

The research approach of this dissertation is mainly based on the information systems research cycle proposed by Hevner et al. (2004), which incorporates an iterative cycle of design and evaluation to develop theory in the information systems discipline and provides for application in the appropriate environment and additions to the knowledge base. Environment and knowledge base inform the design and evaluation process with the aim of generating relevant design knowledge for practitioners (Hevner et al., 2004). To incorporate the relevance aspect involving the environmental context, this dissertation follows the action design research method proposed by Sein et al. (2011). It aims at designing innovative IT artifacts considering the targeted context and learning from the intervention and evaluation (Sein et al., 2011). This research method thereby focuses on the relevance cycle (Hevner et al., 2004; Hevner, 2007) and "[provides] explicit guidance for combining building, intervention, and evaluation in a concerted research" (Sein et al., 2011, p. 38).

To design and evaluate the digital actor engagement platform for local high streets, multiple methods from design science and behavioral science respectively were adopted and applied. This approach allows the rigorous and relevant design through adequate methods from design science and evaluation in a naturalistic environment and context to gain knowledge that is applicable to practitioners. Since the concept of actor engagement consists of multiple aspects and depends on actors' behavior and willingness to engage in value co-creation processes, a multi-method approach allows the investigation to which extent engagement platforms foster actor engagement from different perspectives (Mingers, 2001). Additionally, the environment — local high streets — in which the IT artifact is applied and evaluated is complex and diverse in nature, including people, organizations, and technology (Hevner et al., 2004). Each aspect must be investigated using an appropriate method.

By conducting this research approach, this dissertation contributes both truth and utility (Hevner et al., 2004). Figure 3.3 shows the action design research process conducted in this dissertation.

Within the *first iteration*, this dissertation gathers initial design knowledge for a digital platform for local high streets (publication *P4*), incorporating retailers' expectations and their usage intention (publication *P1*) as one actor group's requirements. Several artifacts and further knowledge for an initial instantiation of a platform for local high streets and its preparation are generated. Besides the initial set-up of a digital platform, the general goal of the iteration was to identify, design, and evaluate the basic technological instruments used for fostering actor engagement that transform the digital platform into an engagement platform that fosters interactions in the high street context. It covers the design of a privacy-friendly tracking algorithm for high streets based on the Bluetooth Low Energy technology (publication *P2*), its evaluation in a simulated environment (publication *P6*), the design of a modeling language that is able to depict trajectories as customer journeys through high streets that are recorded by the tracking algorithm (publication *P3*), and an investigation of customer behavior recorded with the tracking algorithm resulting in a derivation of behavioral patterns (publication *P5*). In particular, the latter publication elaborates on whether the setting, including the way of tracking the customers during their high street visits, enables the investigation of customer behavior as regards the customers' response to LBA. Altogether, the publications gathered in this iteration provide the design and evaluation of the technological basis for the following iterations to ensure the technical validity and functionality for later investigations. Therefore, in this iteration, methods from both the design science research paradigm and the behavioral science paradigm were applied:

- In publication *P1* (*Usage Of Local Online Platforms In Retail: Insights From Retailers' Expectations*), the focus is on gathering the expectations towards the engagement platform from one actor group's point of view, namely the high street retailers. The necessary data collection took place in the form of semi-structured interviews, in which the participating retailers were able to express their opinions and views while ensuring the comparability of the results (Pinsonneault and Kraemer, 1993; Myers and Newman, 2007). Techniques from inductive theory development methods were used to code the qualitative content of the interviews (Glaser and Strauss, 1967; Glaser, 1978; Corbin and Strauss, 1990; Glaser, 1992; Charmaz, 2014). Intercoder reliability was ensured (Lombard
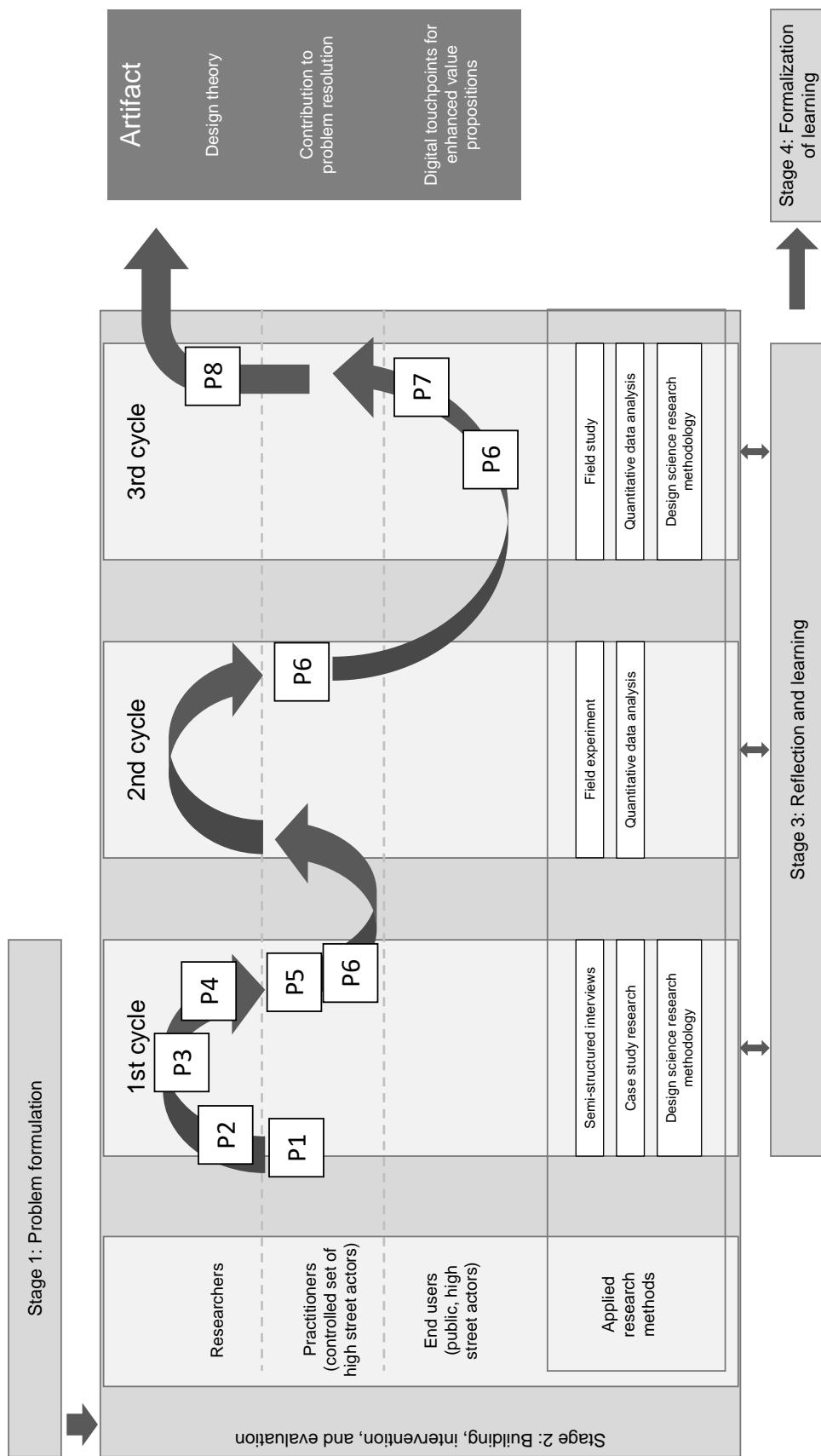
Figure 3.3: Action Design Research (Sein et al., 2011) inspired research process conducted in this dissertation

et al., 2002). The developed hypotheses about the retailers' usage intentions and requirements contributed to the design of the IT artifacts.

- Localization via GPS is not only problematic in terms of data protection and privacy but also consumes a lot of energy when used for long periods. To enable privacy-friendly location tracking of high street customers that also avoids battery drain, a tracking algorithm is developed in publication *P2* (*Privacy-friendly User Location Tracking with Smart Devices: The BeaT Prototype*) that uses the customers' smart devices and businesses' Bluetooth Low Energy beacons to determine the current position. The algorithm is designed under the application of the design science research methodology (Peffers et al., 2007).

- To understand customer behavior in high streets better and to depict customer trajectories on high streets, in publication *P3* (*Data-driven Customer Journey Mapping in Local High Streets: A Domain-specific Modeling Language*), a high street journey modeling language is developed that incorporates online-offline customer journeys based on data recorded by the proposed tracking algorithm for digital high street platforms. To design the modeling language, the design science research methodology (Peffers et al., 2007) is applied.

- An initial instantiation of a digital platform is described in publication *P4* (*Designing Multi-Sided Community Platforms for Local High Street Retail*). The paper makes use of the design science research methodology outlined by Peffers et al. (2007) to design and evaluate the digital platform as an IT artifact. Thereby, it incorporates the designed tracking algorithm. The design knowledge gathered within the design and evaluation process is subsequently generalized and postulated by Gregor and Jones's (2007) eight components of a nascent design theory in information systems research.

- To verify whether the data recorded by the designed tracking algorithm enables the analysis of customer behavior on high streets for shopping motivation determination and to gain insights into how customers actually behave on their shopping trips on high streets, an exploratory case study (Yin, 2014) is performed to gather behavioral data that is analyzed by data analysis techniques in a subsequent step in publication *P5* (*Towards Analyzing High Street Customer Trajectories - A Data-Driven Case Study*). This work targets the investigation of the possibility of determining customers' shopping motivation based on their shopping behavior.

- Publication *P6* (*Designing Digital Actor Engagement Platforms for Local High Streets - An Action Design Research Study*) follows an Action Design Research approach (Sein et al., 2011), iteratively covering both the artifact's design and evaluation in various iteration cycles. In the first iteration cycle described in the publication, the technical application is evaluated in a simulated environment to ensure the technical validity and functionality of the IT artifact.

The *second iteration* focused on the effectiveness of LBA via push notifications in the high street context. In this iteration, a field experiment was conducted as the means of investigation. Thus, the IT artifact was further developed and expanded for the implementation of the field experiment. This iteration, therefore, aims at analyzing the impact of LBA on customer behavior in a controlled environment with experimental groups to derive the extent to which LBA via push notifications fosters actor engagement in the high street context. In this dissertation, this investigation is conducted to evaluate whether LBA via push notifications is able to increase the view rates of delivered campaigns and, as a consequence, extends the high street trip length or the number of passed businesses (publication *P6*). Therefore, in this iteration, empirical research is conducted:

- In the second iteration cycle described in publication *P6* (*Designing Digital Actor Engagement Platforms for Local High Streets - An Action Design Research Study*), a field experiment is conducted to elaborate the extent of engagement by the usage of campaigns delivered by location-based push notifications.

Within the *third iteration*, the engagement platform for high street retail was further developed and evaluated in a naturalistic setting, thus, in the high street context to study its impact on customer behavior and to draw conclusions for the high street as such and its actors based on the usage and behavioral data. Further, modular extensions to the engagement platform are designed. Therefore, in this iteration, methods from both the design science and the behavioral science paradigm are applied:

- In the third iteration cycle described in publication *P6* (*Designing Digital Actor Engagement Platforms for Local High Streets - An Action Design Research Study*), a field study is performed to study the extent to which the designed engagement platform is able to stimulate interactions and, thereby, foster engagement in a naturalistic environment, i. e., in the context of a high street ecosystem.

- As an outlook, a field experiment is conducted in publication *P7* (*Quantifying the Impact of Geospatial Recommendations: A Field Experiment in High Street Retail*) based on the data collected in this third iteration to feed the geospatial recommendation system. This publication aims to identify and quantify the impact of geospatial recommendations in local high street retail on the customers' interactions with businesses. Inductively derived hypotheses from previous research assume that a recommendation system implemented on the designed engagement platform could further foster interactions in the high street context. The field experiment is conducted to test the hypotheses and to observe whether the delivery of geospatial recommendations via mobile devices based on the user's position impacts the customer journey and fosters engagement. Additionally, a subsequent quantitative survey is conducted to record further information about the customer journey.

- Publication *P8* (*Designing City Center Area Recommendation Systems*) applies the Design Science Research Methodology (Peffers et al., 2007) to design a recommendation system for site selection in city centers. It is regarded as a modular extension to the engagement platform by incorporating the assumption that attractive businesses in the high streets strengthen the city center's attractiveness and, thereby, foster both physical engagement and digital engagement via the platform.

Since a design science process involves the knowledge base and the environment (Hevner et al., 2004), this dissertation considers both sides to gain both relevant and rigor research results. In order to inform the design process in the best possible way and gain applicable knowledge for it, research papers P3, P5, and P6 elaborate on the *knowledge base* (see figure 3.1), not only from the information systems discipline but also from other relevant disciplines. This includes the development of constructs and models to describe the customer journey known in marketing and retail literature but as a chronological sequence of events. In addition, data analysis techniques were used to examine whether the shopping motives — also known in the marketing and retail literature — can be mapped to the event-based customer journey. The papers P1, P6, and P7 investigate the *environmental side* by investigating high street actors and technology to foster engagement on platforms.

The central design and evaluation of the engagement platform for local high street retail are carried out in P2, P4, P6, and P8. For the design of the IT artifact, design
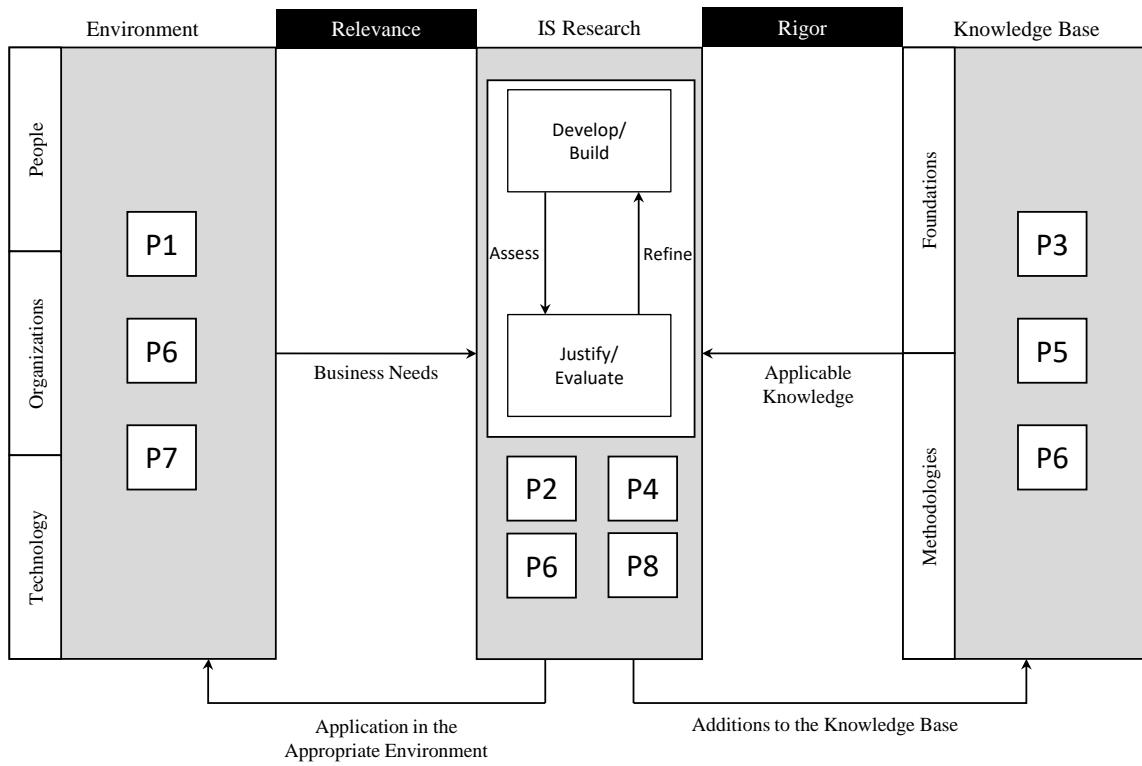
Figure 3.4: Multi-method approach taken in this dissertation (based on Hevner et al., 2004)

science methods are deployed. Mainly the approach outlined by Peffers et al. (2007) is used. For its evaluation (focused on in P6), various data analytics techniques are applied to study the impact of the IT artifact in its designated context, the local high street retail. P2, P4, and P8 focus on the design of the IT artifact or particular parts of it and apply the research approach proposed by Peffers et al. (2007) altogether.

4 Research Results and Contributions

4.1 Synopsis of Research Contributions

IS research is a complex undertaking (Niehaves, 2005). For this reason, the targeted research problem was decomposed (Simon, 1996) into several parts, all contributing individually to the overarching research goal. By approaching each part with an appropriate method, this dissertation — in total — follows multi-method research, which on the one hand, allows illuminating a real-world phenomenon from different perspectives, but on the other hand, also allows to compensate for the weaknesses of individual research methods (Hunter and Brewer, 2002; Mingers, 2001). Due to the fact that there is not only one way to decompose a complex real-world phenomenon, it is crucial that the decomposition is done appropriately with respect to the research goal (Alexander, 1964; Simon, 1996).

Thus, the findings in this dissertation will be presented as decomposed parts and as an assembled whole, as proposed by Weber (2012). The parts — represented by the individual publications — are depicted and organized in a conceptual framework (see figure 4.1) that is adapted from Poniatowski et al. (2021). All parts contribute to the platform as a system for actor engagement. In particular, P2, P4, and P8 describe the technical design of the IT artifact, for which P1 provides requirements regarding the governance. P1, P3, and P5 investigate third-party participation. P6 and P7 investigate the link between the platform itself and the parties (actors) and, thus, focus on actor engagement on the platform. The research publications included in this dissertation contribute to developing the digital actor engagement platform that is evaluated in the context of local high street retail. All contributions were published (or are under review) in peer-reviewed outlets in the IS discipline and, therefore, were found to make a valid contribution to the IS knowledge base. The engagement platform was designed and evaluated in various action design iteration cycles, all contributing to the stated research goal through which various contributions to
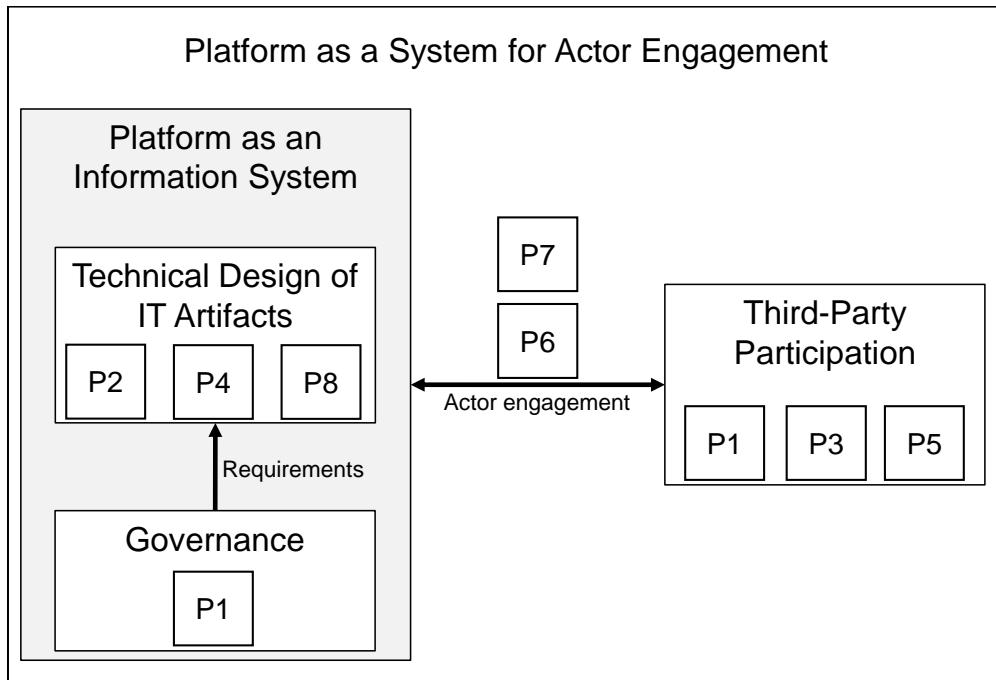
Figure 4.1: Synopsis of the research findings in a conceptual framework (adapted
          from Poniatowski et al., 2021)

science and practice have been generated. In the following, each publication's con-
tribution is outlined.

An instantiation of engagement platforms in specific contexts — in particular, in a
local high street service ecosystem — is new territory in academic literature. Little
is known about actors' intention to use digital platforms and their willingness to
engage in value co-creation processes for a mutual exchange of resources.

Engagement platforms enable actors to mutually exchange resources through physi-
cal and virtual touchpoints (Breidbach et al., 2014), leading to extended possibilities
of interactions among actors (Frow et al., 2015) with the goal of making actors "[en-
gage] in an interactive process" (Storbacka et al., 2016, p. 3008). Actors contribute
their resources in the interactions with other actors (Brodie et al., 2019), exchange
them, and, thereby, increase engagement (Breidbach et al., 2014).

However, actor engagement also depends on the actors' voluntariness to participate
in interactions (Brodie et al., 2019). In *publication P1* (*Usage of Local Online Platforms in
Retail: Insights From Retailers' Expectations*), we identified that retailers regard digital
platforms for local high streets as being beneficial for their business by fostering inter-
actions among all actors. They are generally willing to provide digital touchpoints to
their customers. Particularly, they see a great advantage in customer communication

on a local platform to digitally interact personalized with nearby local customers. The insights from one actor's perspective form the foundation and requirements of the engagement platform. *Publication P1* identified three major requirements. Firstly, local high street retailers would use digital platforms for local high streets for their customer communication. However, they only do so when the entry barriers are low as regards workload, fees, technology, and law. In particular, entry barriers need to be lower than those of competing (global) platforms. Secondly, local high street retailers would use digital platforms to attract new customers to their premises. They seek to specifically and personalized target customers and to promote their loyalty by knowledge about customers generated via the platform. Thirdly, local high street retailers would use digital platforms to strengthen the cooperation among other retailers on the high streets. Through strengthened cooperation of local high street retailers, they hope for a competitive advantage over online retailers leading to a beneficiary position for the local high street as a whole.

Additionally, privacy concerns could impact the voluntary usage of engagement platforms that determine the location of one actor group — the customer — to provide location-based campaigns as a means to foster engagement. Therefore, in *publication P2* (*Privacy-friendly User Location Tracking with Smart Devices: The BeaT Prototype*), we designed a privacy-friendly tracking algorithm that enables digital platforms to determine the current location of the customers to provide personalized location-based services. Using GPS to determine the customers' location bears risks and might negatively impact the customers' willingness to provide the location. Instead, the proposed algorithm uses Bluetooth Low Energy broadcasting devices for location determination. The customers' trajectory through the high streets is recorded as a chronological sequence of touchpoints that customers have with close-by businesses broadcasting the Bluetooth signal. The algorithm is subject to three identified requirements. Firstly, it prevents tracking in private situations. Therefore, it must not use satellite or WiFi-based localization techniques and must not access any sensors. Secondly, indoor and outdoor tracking must be possible. Thirdly, customers should have full control over their data while the algorithm enables automatic tracking. Fourthly, the solution must not be noteworthy to drain the battery. Consequently, the application of this means of location determination dispels possible privacy concerns and thus contributes to voluntariness to use the engagement platform.

Publication P3 (*Data-driven Customer Journey Mapping in Local High Streets: A Domain-Specific Modeling Language*) contributes the designed high street journey modeling

language as an IT artifact that visualizes online-offline customer journeys on local high streets as a chronological sequence of touchpoints with different actors. An exemplary visualization using the designed language is provided in figure 4.2. It was developed to enhance the understanding of customer behavior on high streets based on data generated during the usage of a digital engagement platform on the journey through the high street. The proposed modeling language is the only one described in previous literature that can depict an online-offline customer journey consisting of several touchpoints with high street actors. Therefore, customer journeys recorded as a chronological sequence of touchpoints (e.g., by the tracking algorithm described in *publication P2*) can be visualized with this modeling language. It is a means to depict and analyze information about the mutual resource integration of actor groups for a co-creation of value, how offline-online interactions take place, how customers react to delivered campaigns via LBA and the extent of actor engagement. Therefore, the developed language facilitates the evaluation processes of the designed engagement platform.

The design and evaluation of a digital platform as an IT artifact (March and Smith, 1995) are described in *publication P4* (*Designing Multi-sided Community Platforms for Local High Street Retail*) in line with the dual mission of design science (Sein et al., 2011). The designed artifact aims at enabling and facilitating digital interactions among different groups of actors by providing multiple services (see figure 4.3). While mobile services are aimed at customers, web-based services serve businesses. Backend services enable, inter alia, customers' location determination — through the application of the algorithm proposed in *publication P2* based on Bluetooth Low Energy signals transmitting beacons — and generate personalized recommendations. Customers can thereby search for and view campaigns previously posted by businesses. The campaigns are also recommended via generated push messages when customers approach a store that has interesting campaigns for them. These recommendations are personalized and automatically generated based on the interests stored in customer settings. Actors use specific interfaces to connect to the platform (see figure 4.4). The user group specific interfaces comprise mobile apps for users and web-based applications for businesses, platform providers, and municipal representatives. The IT artifact incorporates the retailers' requirements identified in *publication P1*. Design knowledge gathered in the design and evaluation process contributes to the initial design knowledge needed to build an engagement platform and is generalized and postulated by Gregor and Jones's (2007) eight components of a nascent design the-

Customer

| Browsing in app | Enter the city's high street | Enter vicinity of Retailer A | Receive personalized offer | Leave vicinity of Retailer A | Enter vicinity of Retailer B | Receive personalized offer | Enter store | Purchase product | Redeem Coupon | Leave store | Write and publish product review |

Platform/Intermediary

Data (C):

| Location Time Customer-ID | Location Time Customer-ID | Location Time Customer-ID | Location Time Customer-ID Coupon-ID | Location Time Customer-ID | Location Time Customer-ID | Location Time Customer-ID | Location Time Customer-ID | Location Time Customer-ID Offer-ID | Location Time Customer-ID Coupon-ID | Location Time Customer-ID | Location Time Customer-ID Text |

Events (icons)

Data (R):

| Product-ID Retailer-ID | | Beacon-ID Retailer-ID | Offer-ID Retailer-ID | Beacon-ID Retailer-ID | Offer-ID Retailer-ID | Offer-ID Retailer-ID | Beacon-ID Retailer-ID | Beacon-ID Retailer-ID | Coupon-ID Retailer-ID Coupon-ID | Beacon-ID Retailer-ID | Review-ID Retailer-ID Product-ID |

Retailers

| Retailer A Retailer B | | Retailer A | Retailer A | Retailer A | Retailer B | Retailer B | Retailer B | Retailer B | Retailer B | Retailer B | Retailer B |
| Products listed | | Beacon initialized | Offer activated | Beacon initialized | Beacon initialized | Offer activated | Beacon initialized | Advice given | Coupon provided | Beacon initialized | Product listed |

*) Events „Retailer A's vicinity left" and „Highstreet left" left out for better readability

Figure 4.2: Exemplary visualization of a customer journey through high streets (Berendes et al., 2018)

Figure 4.3: Provided services of the platform (Bartelheimer et al., 2018)

Figure 4.4: Interfaces of the designed platform (Bartelheimer et al., 2018)

ory. The proposed design theory describes a new class of IT artifacts that enable multi-sided online-offline customer experience on high streets by fostering interactions among different groups of high street actors. The results indicate how digital touchpoints can be added to the traditional physical servicescape and how to enable and facilitate interactions among all high street actor groups. A digital engagement platform for local high street retail responds to the changed customers' expectations and demands towards a modern high street ecosystem that evolves into a hybrid online-offline servicescape. The designed artifact was evaluated by user acceptance tests and by applying various evaluation strategies.

LBA as a means to foster interactions is applied on the engagement platform. Research showed that LBA is able to increase businesses' sales (Ghose et al., 2019; Lin and Bautista, 2020), trigger store visits, and increase the likelihood of purchases (Moli-

tor et al., 2018). In addition, it shows to be different in effectiveness when applied as push or as pull mechanism (Molitor et al., 2018; Unni and Harmon, 2007). Since shopping motives are known to further impact LBA's effectiveness (Horváth and Adıgüzel, 2018; Iyer et al., 2020), a case study was conducted (*publication P5*) to investigate the extent to which it is possible to derive a customer's shopping motive from the shopping trip prior to conducting the field experiment and study (*publication P6*).

Publication P5 (*Towards Analyzing High Street Customer Trajectories - A Data-Driven Case Study*) aims at analyzing the customer behavior on high streets based on data that is generated by the tracking algorithm proposed in *publication P2* and that describes the customer journey as a chronological sequence of touchpoints with different actors. The results from the conducted exploratory case study reveal five behavioral clusters, three of which summarize a hedonically shaped behavioral pattern and one of which is a utilitarian. The fifth one is unspecific. The findings, therefore, indicate that, firstly, customers behave on high streets in line with previous research in marketing science (e.g., Arnold and Reynolds, 2003; Babin et al., 1994; Jones et al., 2006; Saarloos et al., 2010; Teller, 2008) and, secondly, customer trajectories recorded by the tracking algorithm can be used to determine the current shopping motivation to target customers specifically, e.g., by proposing personalized recommendations, as shopping motives impact customers' response to recommendation and campaigns (Horváth and Adıgüzel, 2018; Iyer et al., 2020). The extent to which engagement platforms foster interactions based on campaigns delivered via LBA could therefore be impacted by customers' shopping motives. The results, e.g., led to the decision that field experiment participants (*publication P6*) had to indicate the purpose and motivation for their imminent high street visit to derive their possible shopping motivation.

Publication P6 (*Designing Digital Actor Engagement Platforms for Local High Streets - An Action Design Research Study*) investigates the impact of LBA and its particular delivery types on customer behavior on high streets. It reveals that LBA positively impacts actor engagement on high streets, being in line with prior and aforementioned research on LBA. Fostering engagement and facilitating interactions through LBA are particularly effective when campaigns are provided via push delivery in combination with the opportunity to request a list of all campaigns (pull delivery) (see table 4.1). The effect is significant. However, no evidence was found as regards the impact on customer behavior. In contrast to prior research (e.g., Fang et al., 2015; Heilman et al., 2002; Molitor et al., 2018), no impact on the high street trip length

Campaign delivery	Experimental group	Campaigns delivered	Share of campaigns viewed after delivery	Standard deviation	Standard error
LBA (push)	Treatment group	1,157	.29	.454	.013
Pull delivery	Treatment group	12,065	.24	.427	.004
Pull delivery	Control group	10,547	.20	.401	.004
Total		23,769	.22	.417	.003

Table 4.1: Campaign delivery in an experimental setting (Bartelheimer et al., 2022)

Customer behavior measurement	Experimental group	Number of trips	Average	Standard deviation	Standard error
High street trip length (in minutes)	Treatment group	487	43.53	51.73	2.34
	Control group	445	44.41	45.06	2.14
	Total	932	43.95	48.63	1.59
Number of businesses passed	Treatment group	487	8.44	7.53	.34
	Control group	445	9.37	7.53	.36
	Total	932	8.88	7.53	.25

Table 4.2: Analysis of customer behavior (Bartelheimer et al., 2022)

or the number of passed high street businesses was identified (see table 4.2). LBA provided via push delivery, though, led to a higher number of interactions and fostered, therefore, the engagement between customers and businesses in high street ecosystems, being again in line with prior research (Molitor et al., 2018; Unni and Harmon, 2007).

Publication P6 further studies the usage of the engagement platform and the impact on customer behavior on high streets in a field study. It came to light that all actors were able to integrate their resources and exchange them for value co-creation through the platform, which is a requirement for fostering engagement. In line with prior research (Evans and Schmalensee, 2010), however, reaching the critical mass with the study run-time was the main hazard. Only a small percentage of actors (short head) on both business and customer sides used the platform for mutual resource integration processes. That was evidently visible in the number of performed
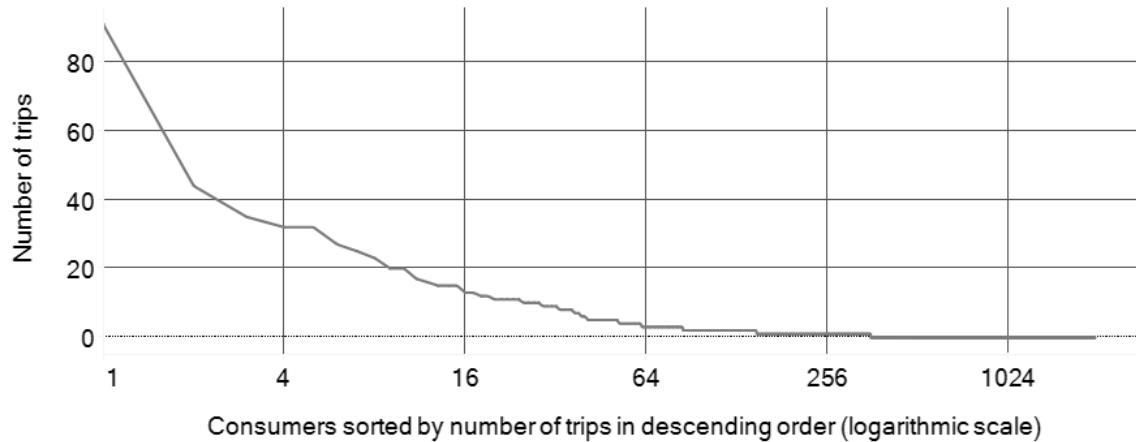
Figure 4.5: Customers sorted by number of trips in descending order (logarithmic scale) (Bartelheimer et al., 2022)

digital trips via the platform[3]. Ten percent of the participants recorded 86.5 % of all digital trips within the study period (see figure 4.5). On the business side, we could observe a similar pattern: The most active 10 % of businesses published more than 55 % of all campaigns. Attracting both businesses and customers requires a sufficient number of actors on both sides to establish network effects and generate value. The results indicate that short head businesses and short head customers regularly engaged in mutual value co-creation processes leading to actor engagement on high streets. However, we assumed that most customers mainly used the platform passively as an information source.

In *publication P7* (*Quantifying the Impact of Geospatial Recommendations: A Field Experiment in High Street Retail*), a field experiment is conducted to investigate the impact of geospatial recommendations on customer behavior in a high street ecosystem by an intervention in high street customer journeys. The results indicate that recommendations based on the customer's location are able to impact customer journeys and lead to a higher awareness of products and businesses. In other words, data-driven value propositions may stimulate interactions and foster actor engagement in the high street context by the integration of resources — in particular, the customer profile, including interests and the current location — for a co-creation of value.

Due to the modular architecture of the engagement platform, additional service modules can be implemented. *Publication P8* (*Designing City Center Area Recommendation Systems*) proposes a recommendation system for city center areas as an IT artifact. By

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[3] Starting a digital trip activated the tracking algorithm and the campaign delivery service in the background.

considering customers' interests and shopping behavior based on recorded geospatial data of their shopping trips, the IT artifact recommends retail sites for businesses that are interested in opening a store. The designed and evaluated IT artifact enables businesses and public town center managers to select optimal locations, grow businesses' profits, and increase the overall city center's attractiveness. Implemented as a service module on the engagement platform for local high streets and based on the data gathered on that platform, the IT artifact strengthens a high street's attractiveness and raises the number of businesses customers engage with and, thus, can foster interactions among them. The IT artifact is evaluated based on data that were collected by 500 customers within 1,100 shopping trips. Since there is no design knowledge yet available prescribing the design of city center area recommendation systems, this publication provides initial design knowledge that can be used as an extension of an engagement platform for local high street retail.

In total, digital actor engagement platforms are found to provide value propositions that possibly attract different actor groups to engage in value co-creation processes (Hein et al., 2020). The results indicate that engagement platforms are able to facilitate interactions and foster actor engagement both digitally and physically. However, actors' willingness to integrate resources with other actors — a fundamental proposition of actor engagement (Brodie et al., 2019) — might be connected with the presence of network effects that usually coincide with digital platforms (Iansiti and Karim R. Lakhani, 2017).

4.2 Research Contributions

This dissertation contributes knowledge for both research and management. This applies both to the individual publications and to the work as a whole (Weber, 2012). As an assembled whole, this work provides new knowledge on how to design digital actor engagement platforms. Classified in Gregor's (2006) five information system contribution types of theory, this dissertation and its included publications contribute to the academic knowledge base by adding knowledge, in particular, in the form of "Theory for Analyzing (Type I)", "Theory for Explaining (Type II)", and "Theory for Design and Action (Type V)". Each included publication has its own contribution to the information system knowledge base in the form of a contribution type (Gregor,
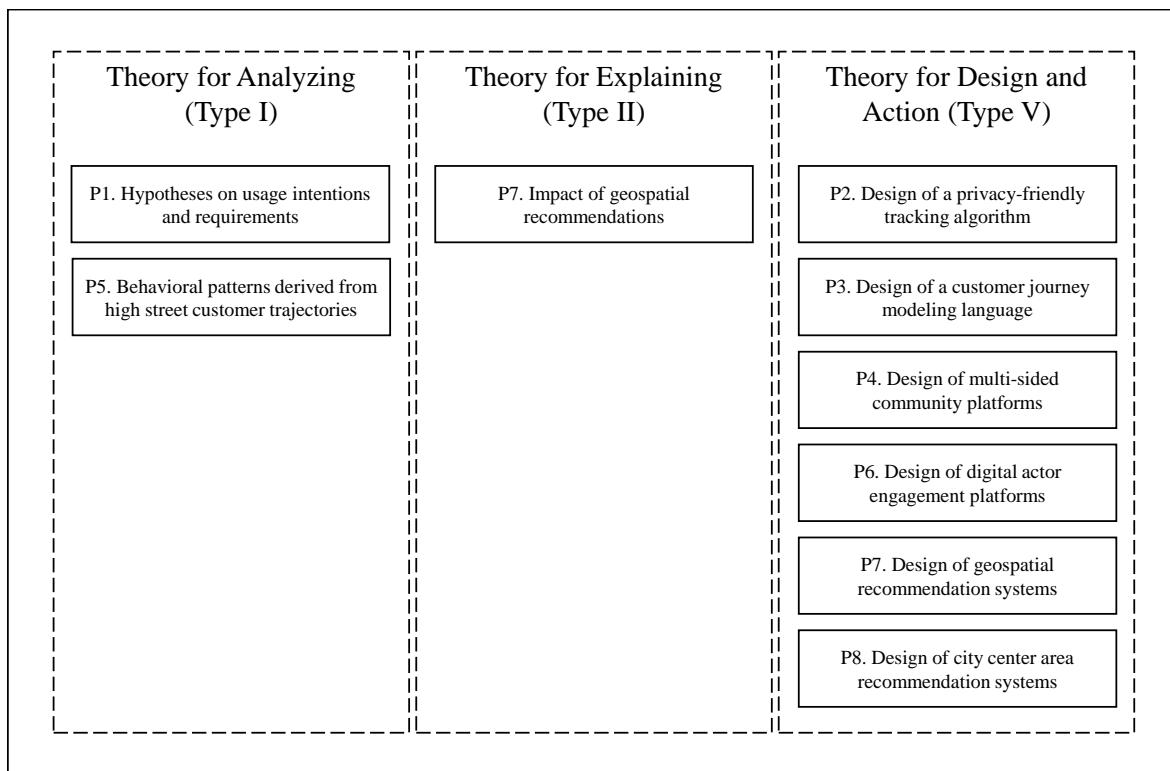
Figure 4.6: Contribution to the academic knowledge base - Assignment to contribution types (Gregor, 2006)

2006). Figure 4.6 provides an overview of the publications and their primary classification in Gregor's (2006) contribution types. While publications usually make several types of contributions, the focus of each publication was crucial for the classification. As a whole, this dissertation contributes knowledge on how engagement platforms ought to be designed and applied in a naturalistic environment. It, thus, contributes knowledge in the form of a theory for design and action (type V) (Gregor, 2006).

The research field of engagement platforms and, particularly, in the context of high streets is quite new and under-researched. Contributions of three different types are as follows: Firstly, this dissertation adds conceptual knowledge in the form of type I theory providing analysis and description (Gregor, 2006) to the IS knowledge base. That comprises, in particular, behavioral patterns derived from recorded high street customer trajectories to enable specific targeting and hypotheses on retailers' usage intentions and requirements for a local platform. Secondly, by going beyond analysis and description, this dissertation adds theory that provides explanations (type II theory) (Gregor, 2006) to the IS knowledge base, in particular, how further personalized systems impact customer behavior on high streets. As a third contribu-

tion type, knowledge in the form of theory for design and action (type V) (Gregor, 2006) is contributed. Knowledge of this contribution type includes instantiations of IT artifacts in the context of local high streets.

As an assembled whole, this dissertation provides three major contributions: Firstly, it contributes design knowledge in the form of a design theory for a new class of IT artifacts, namely digital actor engagement platforms for local high streets. By adding digital touchpoints to a former purely physical servicescape (Frow et al., 2015), this work describes how type one engagement platforms (Frow et al., 2015) ought to be designed to foster interactions and actor engagement (Brodie et al., 2019) in the high street retail ecosystem. Taking up the call for further research (e.g., de Reuver et al., 2018), the design theory is the first that prescribes how digital engagement platforms ought to be designed.

Secondly, this work provides evidence that digital actor engagement platforms that add digital touchpoints to a physical service ecosystem are a means to foster actor engagement. However, this may be accompanied by the limitation that it only applies to a subgroup in each actor group, as it was shown in *publication P6* that not all actors engaged increasingly in value co-creation processes leading to fostered actor engagement. This phenomenon is common on platforms, though (Enders et al., 2008; Jung and Pham, 2011).

Thirdly, this dissertation provides evidence that LBA is more effective when deployed by push-based than by pull-based techniques being in line with previous research (e.g., Molitor et al., 2018). The findings were gathered in a naturalistic setting, being one of the first studies conducted in a naturalistic environment and support previous related research (e.g., Fang et al., 2015; Ghose et al., 2019; Molitor et al., 2016; Molitor et al., 2018; Molitor et al., 2020). However, it was also shown that previous research probably overestimates the effects of LBA in artificial settings.

4.3 Managerial Contributions

Besides its theoretical contribution, this dissertation also provides high street stakeholders insights into how to design an engagement platform for local high streets and how to digitize local high streets to encourage digital interactions and, thus, foster engagement that, in turn, attracts more customers and maintains or increases

the city centers' attractiveness. Managerial target groups include stakeholders such as a union of retailers, an external platform provider, or a high street responsible.

In particular, the designed IT artifacts help those practitioners to digitize local high streets and instantiate an engagement platform, while the empirical evaluation gives advice on how to digitally interact with customers on local high streets. For practitioners, *publications P1, P2, P4, P6,* and *P8* provide knowledge about how to instantiate an engagement platform in a specific context, namely the local high streets. Practitioners can use this knowledge that is abstracted in design theories in P4 and P6 to digitize a local high street to foster interactions among customers and businesses for mutual benefit. By setting up their platform in a physical high street, practitioners obtain an additional digital channel to enable digital communication and interactions with and among different high street actor groups. To better target customers, they receive information about them and their interests. By specifically sending campaigns of interest, they get an instrument to personalize the broadcast of the campaigns. The developed customer journey modeling language (*publication P1*) can further be applied for the visualization and analysis of data gathered on the platform. *Publication P1* reflects the requirements of one high street stakeholder group by identifying their expectations towards a digital platform and their usage intentions. These requirements are playing a key role in shaping the introduction of the platform in high streets and thus the digitization of the high streets. Insights from *publication P5* allow practitioners to target customers personalized based on their trajectories through the high streets. *Publication P6* further describes findings of customer behavior when exposed to LBA, indicating that practitioners should implement LBA on their platform as it was shown to increase interactions through a higher awareness of published campaigns. Additionally, they could implement recommendation systems as described in *publication P7* to provide tailored, personalized campaigns that lead to more interactions among businesses and customers.

Overall, this dissertation provides practitioners a comprehensive work that they can use for their instantiation of an engagement platform in the local high street context, in which different behavioral aspects are examined. Primarily based on behavioral insights, they can draw their conclusions to further develop their own instantiation.

4.4 Conclusion and Outlook

This dissertation has taken up calls for further research on the concept of actor engagement and engagement platforms, especially in specific contexts. In this dissertation, a design theory on a digital actor engagement platform — the first in the IS knowledge base — was developed and instantiated, applied, and evaluated in a naturalistic context. The underlying theoretical concepts, above all, digital platforms, engagement platforms, actor engagement, and LBA informed this process. Taking the high street as the context for investigation, a set of research methods from design and behavioral science was applied to study engagement platforms and actors' behavior and engagement on them in a naturalistic environment. This work, therefore, contributes both design knowledge and empirical field evidence on actual actor behavior on engagement platforms in the high street retail context to the information systems knowledge base. The research process — applied as a search process (Hevner et al., 2004) — consisted of an interplay between design and evaluation of the engagement platform in which different research methods were applied to best overcome the weaknesses of each applied method to derive design knowledge that is empirically validated.

This work is one of the first to study digital actor engagement platforms in a naturalistic environment. The platform was designed, instantiated, and evaluated in the high street retail ecosystem. It was shown that digital actor engagement platforms are a means to foster interactions among actors. All actor groups integrated resources voluntarily (Vargo and Lusch, 2004) so that actors could engage in value co-creation processes (Chandler and Lusch, 2015; Vargo et al., 2008), leading to actor engagement (Brodie et al., 2013; Brodie et al., 2019). Within the high street context, digital actor engagement platforms are a technological innovation that has the potential to transform a former purely physical high street service system into a physical and digitized service ecosystem (Rust and Huang, 2014). Like in all service systems, the socio-technical aspect must not be neglected. Actors engaging (or not) on the platform determine the success or failure of the technological innovation (Bostrom and Heinen, 1977).

Future research can design and evaluate digital actor engagement platforms in other contexts besides high street retail to develop further design knowledge of this kind of IT artifacts and their impact in specific contexts (de Reuver et al., 2018; Brodie

et al., 2019). Additionally, empirically evaluating the actor engagement concept in further contexts could contribute to the validation of the concept (Blasco-Arcas et al., 2020). Also, future research can further develop the digital actor engagement platform for local high streets by adding additional services that potentially further nudge the customer and foster interactions, e.g., by implementing a recommendation system that considers behavioral patterns and predicts users' interests (Karthik and Ganapathy, 2021) to deliver more personalized campaigns via LBA. Furthermore, privacy concerns seem to hinder actors from voluntarily integrating resources in digital value co-creation processes (Klumpe et al., 2020; Unni and Harmon, 2007) that are requirements for digital actor engagement, although the platform was signaled to be in accordance with the General Data Protection Regulations. Future research can deeper investigate the link between data privacy concerns and actors' willingness to integrate resources on platforms to enable value co-creation processes. In addition, LBA was shown to be able to increase actor engagement. LBA via push-based technologies has proven to be more effective than via pull-based technologies being in line with previous research (e.g., Fang et al., 2015; Ghose et al., 2019; Molitor et al., 2016; Molitor et al., 2018; Molitor et al., 2020). It has also been shown that previous work that has audibly examined the effectiveness of LBA in an artificial environment overestimates it. This work was one of the first to determine the results in a natural environment. Further research in a natural, realistic environment is therefore needed to validate the results of this work. Finally, we assume that actors' willingness to engage in value co-creation processes with other actors (Brodie et al., 2019) is linked with the occurrence of network effects (Gawer, 2014). A deeper understanding of the relationship between the actors' willingness and network effects is necessary to understand how actor engagement is fostered on digital actor engagement platforms. This work was one of the first to provide design knowledge of engagement platforms fostering actor engagement that was evaluated in a specific context. Research in further contexts is needed to get a holistic view of how engagement platforms foster interactions. Future research, therefore, can build IT artifacts based on the design theory developed in this dissertation and test them in other contexts to validate the results presented in this work.

Part B
Included Publications

1 Usage of Local Online Platforms in Retail: Insights from retailers' expectations

Publication Type	Conference Proceedings
Publication Outlet	European Conference on Information Systems (ECIS)
VHB-JOURQUAL3	B
Status	Published

	Name	Contribution
Authors	C. Ingo Berendes	30%
	Philipp zur Heiden	25%
	Marco Niemann	20%
	Benedikt Hoffmeister	15%
	Jörg Becker	10%
Presentation	C. Ingo Berendes	

Full Citation	C. I. Berendes, P. zur Heiden, M. Niemann, B. Hoffmeister, and J. Becker 2020. "Usage of Local Online Platforms in Retail: Insights from retailers' expectations," in *Proceedings of the 28th European Conference on Information Systems*, ECIS 2020. Marrakech, Morocco

Table 1.1: Fact Sheet of Publication P1.

2 Privacy-friendly User Location Tracking with Smart Devices: The BeaT Prototype

Publication Type	Conference Proceedings
Publication Outlet	International Conference on Wirtschaftsinformatik (WI)
VHB-JOURQUAL3	C
Status	Published

	Name	Contribution
Authors	Jan H. Betzing	35%
	Marco Niemann	35%
	C. Ingo Berendes	30%
Awards	Best Demo Award	

Full Citation	J. H. Betzing, M. Niemann, and C. I. Berendes 2019. "Privacy-friendly User Location Tracking with Smart Devices: The BeaT Prototype," in *Proceedings of the 14th International Conference on Wirtschaftsinformatik*, WI 2019. Siegen, Germany, pp. 1967–1971

Table 2.1: Fact Sheet of Publication P2.

3 Data-Driven Customer Journey Mapping in Local High Streets: A Domain-Specific Modeling Language

	Name	Contribution
Publication Type	Conference Proceedings	
Publication Outlet	International Conference on Information Systems (ICIS)	
VHB-JOURQUAL3	A	
Status	Published	

	Name	**Contribution**
Authors	C. Ingo Berendes	45%
	Christian Bartelheimer	35%
	Jan H. Betzing	10%
	Daniel Beverungen	10%
Presentation	Christian Bartelheimer, C. Ingo Berendes, Jan H. Betzing	
Full Citation	C. I. Berendes, C. Bartelheimer, J. H. Betzing, and D. Beverungen 2018. "Data-driven Customer Journey Mapping in Local High Streets: A Domain-specific Modeling Language," in *Proceedings of the 39th International Conference on Information Systems*, ICIS 2018. San Francisco, CA, USA	

Table 3.1: Fact Sheet of Publication P3.

4 Designing Multi-Sided Community Platforms for Local High Street Retail

Publication Type	Conference Proceedings
Publication Outlet	European Conference on Information Systems (ECIS)
VHB-JOURQUAL3	B
Status	Published

	Name	Contribution
Authors	Christian Bartelheimer	40%
	Jan H. Betzing	30%
	C. Ingo Berendes	20%
	Daniel Beverungen	10%
Presentation	Christian Bartelheimer, Jan H. Betzing, C. Ingo Berendes	
Full Citation	C. Bartelheimer, J. Betzing, C. I. Berendes, and D. Beverungen 2018. "Designing Multi-sided Community Platforms for Local High Street Retail," in *Proceedings of the 26th European Conference on Information Systems,* ECIS 2018. Portsmouth, UK	

Table 4.1: Fact Sheet of Publication P4.

5 Towards Analyzing High Street Customer Trajectories - A Data-Driven Case Study

Publication Type	Conference Proceedings
Publication Outlet	International Conference on Business Information Systems (BIS), in: Lecture Notes in Business Information Processing (LNBIP)
VHB-JOURQUAL3	C
Status	Published

	Name	Contribution
Authors	C. Ingo Berendes	100%
Presentation	C. Ingo Berendes	

Full Citation	C. I. Berendes 2019. "Towards Analyzing High Street Customer Trajectories - A Data-Driven Case Study," *Business Information Systems Workshops. BIS 2019. Lecture Notes in Business Informatin Processing* (373)

Table 5.1: Fact Sheet of Publication P5.

6 Designing Digital Actor Engagement Platforms for Local High Streets: An Action Design Research Study

Publication Type	Working Paper
Publication Outlet	Paderborn University, Faculty of Business Administration and Economics
VHB-JOURQUAL3	N/A
Status	Published

	Name	Contribution
Authors	Christian Bartelheimer	30%
	C. Ingo Berendes	30%
	Philipp zur Heiden	30%
	Daniel Beverungen	10%
Full Citation	C. Bartelheimer, C. I. Berendes, P. zur Heiden, and D. Beverungen 2022. "Designing Digital Actor Engagement Platforms for Local High Streets: An Action Design Research Study," *Working Paper Series, Paderborn University, Faculty of Business Administration and Economics* (No. 101)	

Table 6.1: Fact Sheet of Publication P6.

7 Quantifying the Impact of Geospatial Recommendations: A Field Experiment in High Street Retail

Publication Type	Conference Proceedings
Publication Outlet	European Conference on Information Systems (ECIS)
VHB-JOURQUAL3	B
Status	Published

	Name	Contribution
Authors	Jan H. Betzing	25%
	Christian Bartelheimer	25%
	Marco Niemann	20%
	C. Ingo Berendes	20%
	Daniel Beverungen	10%
Presentation	Christian Bartelheimer, Jan H. Betzing, C. Ingo Berendes	
Full Citation	J. H. Betzing, C. Bartelheimer, M. Niemann, C. I. Berendes, and D. Beverungen 2019. "Quantifying The Impact of Geospatial Recommendations: A Field Experiment in High Street Retail," in *Proceedings of the 27th European Conference on Information Systems*, ECIS 2019. Stockholm, Sweden	

Table 7.1: Fact Sheet of Publication P7.

8 Designing City Center Area Recommendation Systems

	Name	Contribution
Publication Type	Conference Proceedings	
Publication Outlet	International Conference on Wirtschaftsinformatik (WI)	
VHB-JOURQUAL3	C	
Status	Published	

	Name	Contribution
Authors	Philipp zur Heiden	55%
	C. Ingo Berendes	35%
	Daniel Beverungen	10%
Presentation	Philipp zur Heiden	
Full Citation	P. zur Heiden, C. I. Berendes, and D. Beverungen 2020. "Designing City Center Area Recommendation Systems," in *Proceedings of the 15th International Conference on Wirtschaftsinformatik*, WI 2020. Potsdam, Germany	

Table 8.1: Fact Sheet of Publication P8.

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