ENHANCING THE OMNICHANNEL EXPERIENCE THROUGH CHANNEL INTEGRATION AND DIGITAL NUDGING

D I S S E R T A T I O N
of the University of St. Gallen,
School of Management,
Economics, Law, Social Sciences
and International Affairs
to obtain the title of
Doctor of Philosophy in Management

submitted by

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Dissertation no. 4844

Difo-Druck GmbH, Untersiemau 2019

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St.Gallen, October 23, 2018

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Preface

"At last I can speak out, and greet my friends with good humour. May they pardon my secrecy, and what has been, as it were, a subterranean journey hither. For scarcely to myself did I venture to say whither I was hurrying. Even on the road I often had my fears; and it was only as I passed under the Porta del Popolo that I felt certain of reaching Rome." (Johann Wolfgang von Goethe, 1786)

To this quote from Goethe's work *Italian Journey*, I can draw many parallels. In a way, writing this section represents my personal *Porta del Popolo*; it is a friendly reminder to realize what I have achieved and to speak out to those being part of it. It invites me to look back and reflect on the many steps and challenges that were taken and mastered on this journey.

The time at the Institute of Information Management of the University of St.Gallen was unique: It was challenging, provided me with many new stimuli, taught me a lot, and was a fun time, which I do not want to miss. From occasional Oktoberfest visits, over great projects and workshops, meeting super interesting people, and making it possible to spend a couple of fantastic months at LUISS University in Rome. However, in order to have lived through these experiences and arriving to this exact moment, many people prepared, influenced, accompanied, and supported me before and during this incredible time.

First of all, I want to thank Prof. Dr. Reinhard Jung, who gave me the opportunity to take this path and had the trust in me to obtain this title. He created an environment in which I enjoyed working and I was able to grow and develop. I also want to thank Prof. Dr. Stephan Aier for the supervision of my dissertation and the many valuable inputs. I am also grateful to my friend Dr. Alexander Wieneke, who I had the pleasure sharing an office with for almost 3 years, which were characterized by remarkable, fun, and odd situations as well as by mutual support. I also want to thank Dr. Christiane Lehrer for the support and trust during the many papers, projects, and workshops. Many thanks also go to Bernadette, Dr. Christian Grape, Elisabeth, and Natascha, who made the time at the institute even more pleasant. I also want to thank my family, my friends, and everyone being there before, during, and hopefully also after this journey. Therefore, gratitude goes out to Andreas, Axel, Christoph, Daniel, David, Dominique, Mrs. Edeling, Fabian, Giulia, Nico, and Sascha. Finally, I am especially grateful to my mother Heike and sister Muriel, who have provided me the necessary basis for this journey and the moral as well the emotional support. Therefore, I am dedicating this dissertation to you.

Thank you all for the encouragement, understanding, and support.

Zurich, November 30, 2018 — Tobias Mirsch

Research Papers

Research Paper 1	Mirsch, T., Lehrer, C., Jung, R. (2016). Channel integration towards omnichannel management: A literature review. In *Proceedings of the 20th Pacific Asia Conference on Information Systems (PACIS),* Chiayi, Taiwan, 1–16.
Research Paper 2	Mirsch, T., Lehrer, C., Jung, R. (2016). Transitioning to an omnichannel approach: A dynamic capability perspective. In *Proceedings of the 37th International Conference on Information Systems (ICIS),* Dublin, Ireland.
Research Paper 3	Lehrer C., Mirsch, T., Jung, R. (2018). Transitioning to omnichannel business: A dynamic capabilities perspective of firms' channel integration. *Working Paper*.
Research Paper 4	Mirsch, T., Lehrer, C., Jung, R. (2017). Digital nudging: Altering user behavior in digital environments. In *Proceedings of the 13th International Conference on Wirtschaftsinformatik (WI 2017)*, 634–648, St.Gallen, Switzerland.
Research Paper 5	Mirsch, T., Lehrer, C., Jung, R. (2018). Making digital nudging applicable: The Digital Nudge Design method, In *Proceedings of the 39th International Conference on Information Systems (ICIS),* San Francisco, CA, USA.
Research Paper 6	Mirsch, T. (2018). Ethical considerations on digital nudging – Identifying consumer concerns. *Working Paper*.

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List of Abbreviations

B2B	Business-to-Business
B2C	Business-to-Consumer
CRM	Customer Relationship Management
DND	Digital Nudge Design
HCI	Human-Computer Interaction
IoT	Internet of Things
IS	Information Systems
IT	Information Technology
OCRIS	Omnichannel Retail Information Systems
PDM	Product Data Management
PS	Persuasive Systems
RBV	Resource-Based View
UI	User Interface
UX	User Experience

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Abstract

By enabling an omnichannel experience, firms meet today's consumer needs and respond to technological developments. An omnichannel experience enables consumers to interact with a company across multiple channels, seamlessly switching between them while having a consistent experience. Consumers are increasingly interacting and making decisions in the digital sphere, often being overwhelmed by the great amount of accessible information, which potentially leads to deficient decision-making. To counteract this phenomenon, many companies are endeavoring an omnichannel approach that appropriately aligns, links, and designs channels. However, many firms have difficulties transforming their channel management into an omnichannel approach and providing a sufficient omnichannel experience. Despite these problems in practice, information systems research has done little to provide insights of how firms are reconfiguring and integrating their resources to pursue an omnichannel approach or to systematically design channels to support consumer decision-making and ultimately enhancing the omnichannel experience.

To be able to respond to consumer needs and technological peculiarities, firms need to build specialized skills and knowledge to handle increasingly complex customer journeys. Therefore, among other things, a deep understanding of how to integrate channels to establish omnichannel management and how to use digital nudging for channel design to support decision-making needs to be build. However, there is a gap between the channel management approaches implemented in practice and the vision of omnichannel management in research. Nevertheless, research has done little to answer the question of how companies can reconfigure their channel resources and integrate their channels to follow an omnichannel approach. Additionally, practice lacks knowledge of how channels should be designed to support consumers' decision-making and improve their experience through digital nudging. Research does not provide sufficient guidance yet. As a result, many companies are unable to follow an omnichannel approach and provide a satisfactory omnichannel experience. To bridge this research gap, this dissertation's overall research objective is to explore how companies can establish omnichannel management to enhance the omnichannel experience of consumers. Within the scope of this research objective, this dissertation deals with the two focus topics of channel integration and digital nudging. This dissertation consists of six research papers, all of which contribute to answering the overarching research objective. Research paper 1 presents the current state of omnichannel research and offers avenues for further research. Research papers 2 and 3 focus on identifying the specific skills firms need to provide omnichannel management. Research paper 4 initiates the discussion on digital nudging, whereas research paper 5 introduces the Digital Nudge Design Method and research paper 6 discusses ethical issues using digital nudging.

Kurzfassung

Das Schaffen einer Omnichannel Experience ermöglicht Unternehmen auf die Bedürfnisse von Konsumenten und technologische Entwicklungen zu reagieren. Eine Omnichannel Experience erlaubt Konsumenten mit Unternehmen kanalübergreifend zu interagieren, nahtlos zwischen Kanälen zu wechseln und eine konsistente Experience zu haben. Zunehmend interagieren und treffen Konsumenten Entscheidungen im digitalen Umfeld, was häufig dazu führt, dass sie von der Menge an zugänglichen Informationen überwältigt und Entscheidungen fehleranfällig werden. Um dem entgegenzuwirken sind viele Unternehmen bemüht einen Omnichannel-Ansatz zu verfolgen, sodass Kanäle angemessen ausgerichtet, verknüpft und gestaltet sind. Oft haben Unternehmen jedoch Schwierigkeiten ihr Kanalmanagement zu einem Omnichannel-Ansatz zu transformieren, sodass eine Omnichannel Experience möglich wird. In der Information Systems-Forschung wird bisher wenig untersucht, wie Unternehmen dazu befähigt werden einen Omnichannel-Ansatz zu verfolgen oder Kanäle systematisch zu gestalten, sodass die Konsumenten unterstützt und letztlich die Omnichannel Experience verbessert wird.

Um auf die Bedürfnisse der Konsumenten und technologische Besonderheiten reagieren zu können, müssen Unternehmen spezielle Fähigkeiten und Kenntnisse aufbauen, sodass zunehmend komplexere Customer Journeys handhabbar sind. Unter anderem ist ein tiefes Verständnis nötig, wie man Kanäle integriert, um Omnichannel Management zu etablieren, und wie man Digital Nudging für das Kanal-Design einsetzt, um das Entscheidungsverhalten zu unterstützen. Zwischen den in der Praxis implementierten Kanalmanagement-Ansätzen und der Vision von Omnichannel Management der Forschung, besteht eine Kluft. Die Forschung hat jedoch wenig unternommen, um zu beantworten, wie Unternehmen ihre Kanal-Ressourcen neu konfigurieren und ihre Kanäle integrieren können oder Digital Nudging für das Kanal-Design einzusetzen ist, um die Experience der Konsumenten zu verbessern. Daher sind viele Unternehmen weder in der Lage einen Omnichannel-Ansatz zu verfolgen noch eine zufriedenstellende Omnichannel Experience zu bieten. Um diese Forschungslücke zu schliessen, untersucht diese Dissertation wie Unternehmen Omnichannel Management etablieren können, um die Omnichannel Experience der Konsumenten zu verbessern. Im Detail befasst sich diese Dissertation, welche aus sechs Forschungsbeiträgen besteht, mit den Fokusthemen der Channel Integration und Digital Nudging, Forschungsbeitrag 1 legt den Stand der Omnichannel-Forschung dar. Forschungsbeiträge 2 und 3 ermitteln spezifische Fähigkeiten, notwendig für Omnichannel-Management. Forschungsbeitrag 4 initiiert die Diskussion zu Digital Nudging, wobei Forschungsbeitrag 5 die Digital Nudge Design Method einführt und Forschungsbeitrag 6 ethische Aspekte des Einsatzes von Digital Nudging diskutiert.

1. Introduction

Consumers' needs and behavior have changed significantly with the proliferation of digital devices and services, so how consumers engage with firms has changed as well (Hennig-Thurau et al. 2010, p. 311; Neslin et al. 2006, p. 96). Those technological advancements have affected whole industries, such as the travel industry, where new technologies enable the consumer to take over some functions that were once the purview of travel agencies. For example, consumers can now gather their own information, order tickets, and purchase travel insurance, making the travel agency as an intermediary obsolete (Hennig-Thurau et al. 2010, p. 311). Consumers also often use a variety of channels to plan their own journeys, from information search to purchase to the use of services (Neslin et al. 2006, pp. 95-98; Van Bruggen et al. 2010, p. 331). However, this empowerment engenders new consumer needs, as consumers want to interact with firms across both online and offline channels, enjoy seamless switching between and simultaneous use of channels, and have a consistent experience while doing so (Brynjolfsson et al. 2013, pp. 23-25; Verhoef et al. 2015, p. 175). In addition, since digital devices are increasingly ubiquitous, consumers' decision-making increasingly occurs in the digital sphere, and the vast amount of information that is available to the consumer there often causes information and cognitive overload (Benartzi and Lehrer 2015, pp. 1-8; Weinmann et al. 2016, pp. 433-434).

Against this backdrop, firms are challenged to provide and manage increasingly complex customer journeys and to design an experience that matches consumers' needs and responds to increasing media and channel fragmentation. Therefore, omnichannel management has become "the new norm" in channel management (Lemon and Verhoef 2016, p. 69). Omnichannel management refers to the integrated management of a firm's channels to enhance the customer experience and improve the overall channel performance (Verhoef et al. 2015, p. 176). However, there is a gap between the literature's vision of omnichannel management and practice's approaches to it (Brynjolfsson et al. 2013, p. 24; Mueller-Lankenau et al. 2006, pp. 187-188; Trenz 2015, p. 10). Only a few papers have addressed the question concerning how firms can reconfigure their channel resources and integrate channels to follow an omnichannel approach (e.g., Hansen and Sia 2015; Koch 2010; Wilson and Daniel 2007).

In response to the growing number of decisions consumers make in digital contexts and the amount of time they spend in the digital sphere, the concept of digital nudging has gained increasing relevance to and attention from information systems (IS) research (Benartzi and Lehrer 2015; Meske and Potthoff 2017; Schneider et al. 2018; Weinmann et al. 2016). Digital nudging is an approach to purposeful channel design that supports individuals' decision-making, which is affected by cognitive boundaries and limitations

(Weinmann et al. 2015, p. 434). Through digital nudging, the consumer's experience can be enhanced at certain points during his or her journey (Lemon and Verhoef 2016, p. 85). Although the general concept of nudging has been discussed in many disciplines and is a successful tool in attempts to influence decision-making and change behavior, research on digital nudging is still in its early stages and has until recently received no attention from IS research (Benartzi and Lehrer 2015; Meske and Potthoff 2017; Schneider et al. 2018; Weinmann et al. 2016). In addition, although digital nudging is a powerful tool for channel designers, it is not yet systematically used in practice. Only some practitioners are knowledgeable about the concept and how to use it for channel design in a way that ensures that consumers are not overwhelmed while using the firms' channels but are supported throughout their journeys but research does not provide sufficient guidance. Furthermore, because of how it influences decision-making, digital nudging often raises questions about its ethical appropriateness, that is, whether firms are using the concept to exploit consumers' cognitive flaws by manipulating the decision-making process (Hansen and Jespersen 2013, p. 5; Selinger and Whyte 2011; Sunstein 2015).

However, to follow an omnichannel approach and respond to consumer needs and technological particularities, firms must be have an in-depth understanding of how manage channel integration to establish omnichannel management and how to use digital nudging to design channels. Therefore, this dissertation focuses on the overarching research topic of omnichannel management. In particular, the dissertation first investigates the topic of channel integration, a required capability for firms that want to pursue omnichannel management. The second topic the dissertation investigates is digital nudging, a tool for channel design that supports an omnichannel approach and enhances consumers' omnichannel experience. An omnichannel experience is the result of a firm's pursuing an omnichannel management approach that provides the consumer who uses the firm's channel ecosystem with seamless switching across channels and interchangeability and simultaneity in using them, ultimately erasing the distinctions between them (Brynjolfsson et al. 2013, p. 24; Verhoef et al. 2015, p. 176). The dissertation's objective is to *support the ability of establishing omnichannel management of firms in order to enhance the consumers' omnichannel experience* in firms that seek to construct channel integration capabilities and apply digital nudging principles in the design of digital channels.

Research on omnichannel management has primarily focused on three topics: theoretical conceptualization of omnichannel management and the requirements for it (e.g., Beck and Rygl 2015; Mueller-Lankenau et al. 2004; Tate et al. 2004), transition to omnichannel management (e.g., Brynjolfsson et al. 2013; Hansen and Sia 2015; Piotrowicz and Cuthbertson 2014; Verhoef et al. 2015), and the obstacles and benefits of omnichannel management (e.g., Lewis et al. 2014; Neslin et al. 2006; Stone et al. 2002).

Only a limited number of papers have been concerned with how firms can reconfigure their resources and integrate their channels to provide omnichannel management (e.g., Hansen and Sia 2015; Koch 2010; Wilson and Daniel 2007). Furthermore, only limited guidance for the use of digital nudging is used is provided (Meske and Potthoff 2017; Schneider et al. 2018).

The dissertation aims to contribute to the body of knowledge on omnichannel management, channel integration, and digital nudging by enriching and extending insights into how firms can deliver an omnichannel experience that responds to consumers' expectations and needs by providing an omnichannel experience. In particular, the dissertation provides insights into the capabilities that are necessary to transition firms' approaches to channel management to omnichannel management. This effort supports practitioners with decision support for transitioning their channel management to providing an omnichannel experience. For research, the dissertation provides insights into how digital channels can be designed by systematically employing digital nudging in the design of channels to support consumers' decision-making and enhance their experience while they use a firm's channels. Digital nudging can help steer consumers through these channels, enhancing their omnichannel experience. Specifically, this dissertation provides an artifact, the digital nudge design (DND) method, which provides concrete guidance in designing user interfaces (UI), user experience (UX), and digital services. To extend this guidance and help firms avoid pitfalls while digitally nudging consumer, this dissertation also highlights the possible ethical boundaries of digital nudging. These concrete insights help to clarify channel design to support omnichannel management and enhance the consumers' experience. The dissertation also addresses aspects of information technology (IT) in the context of omnichannel management and the design of digital channels through digital nudging. From a practitioner's point of view, these insights help to close the gap between the reality and the ideal vision of omnichannel management by providing a basis for managerial decision support.

This dissertation takes a business-to-consumer (B2C) perspective since the firm's goal is to design and construct a sustainable customer experience through the implementation of an omnichannel approach and targeted channel design through digital nudging. However, consumers and their needs are important drivers of the decision to pursue an omnichannel approach, so the consumer's perspective is taken into account throughout the research process.

The dissertation is structured as follows. First, the theoretical background of the investigated topics of omnichannel management, channel integration, and digital nudging is provided. Then the research project's research objectives, questions, and approach are outlined. Next, the research papers, which are the substance of the dissertation, are outlined. Finally, the results are discussed, and the dissertation concludes with a summary, limitations, and proposals for further research.

2. Theoretical Background

2.1. New Consumer Behavior and Needs

Consumer needs are key guiding criteria for firms, and meeting them is a critical objective (Van Bruggen et al. 2010, p. 338). Consumers' behavior and needs have changed significantly in response to the proliferation of digital devices and services, which have also changed how consumers engage with firms (Hennig-Thurau et al. 2010, p. 311; Neslin et al. 2006, p. 96). Consumers are more empowered than ever: Not only have they made some roles, such as that of the travel agent, obsolete by taking over their functions (Hennig-Thurau et al. 2010, p. 311), they also use multiple channels, switch between them, and use them in parallel. For example, a consumer might use a mobile app on his or her phone during a visit to a physical store (Brynjolfsson et al. 2013, p. 23), but the consumer expects to have a consistent experience across all of the channels offered (Van Bruggen et al. 2010, pp. 334-336). The consumer's experience can be described as a journey that is taken "with a firm over time during the purchase cycle across multiple touch points" (Lemon and Verhoef 2016, pp. 74). The journey is a dynamic process in which the consumer flows from the pre-purchase stage to the purchase stage to the post-purchase stage (Lemon and Verhoef 2016, pp. 74-76). In making this journey, consumers want a consistent experience that allows them to interact with the firm across online and offline channels without difficulty in switching between channels or using them simultaneously (Brynjolfsson et al. 2013, pp. 23-29; Verhoef et al. 2015, pp. 174-176).

Technological developments changed the behavior and needs of consumers, but they also caused a rise in the number and type of digital devices and services. Digital devices are increasingly ubiquitous and have become an all-but-essential part of our everyday lives. Therefore, an increasing number of decisions are made within the digital sphere. Instead of browsing in a physical store and buying a product there, consumers have moved to websites, mobile apps, and even Internet of Things (IoT) devices (Benartzi and Lehrer 2015, pp. 81-83; Weinmann et al. 2015, p. 434). The kinds of decisions that can be made in the digital sphere are as varied as those made in the offline world, ranging from choosing a travel destination to finding the right life partner, car, or investment. However, in digital environments, consumers are particularly prone to making suboptimal decisions because the vast amount accessible of information available is difficult to process, so consumers often make decisions with too little or the wrong information, hampering their overall consumer experience and increasing the need for purposefully designed channels that do not overwhelm the consumers' cognitive capacities (Benartzi and Lehrer 2015).

2.2. Evolution of Channel Management

The concept of omnichannel management has been discussed as a promising approach to meeting the new needs of consumers (e.g., Aubrey and Judge 2012; Brynjolfsson et al. 2013; Hansen and Sia 2015; Verhoef et al. 2015). Omnichannel management can be described as an evolutionary improvement in multichannel and crosschannel management. Multichannel management refers to a firm's offering consumers more than one channel, such as when a retailer runs a retail store and an online shop that do not "communicate" with each other (e.g., a product purchased online cannot be returned in the retail store because they might have separate stocks and management). With crosschannel management, on the other hand, a few of the channels a firm offers, but not all, are integrated and connected (Beck and Rygl 2015, pp. 171-175), such as when a retailer runs a retail store, an online shop, and a mobile app, but only the retail store and the mobile app are integrated (e.g., the consumer receives a voucher on his smartphone but can redeem it only in the retail store, not in the online shop). The crosschannel approach, which can be described as a transitional phase between multichannel and omnichannel management, can range from a low degree of channel integration to a high degree. Omnichannel management offers the maximum amount of channel integration to enhance consumers' experience across all channels offered (Verhoef et al. 2015, p. 176).

The terms used to describe approaches to channel management, with the term *multichannel* often used as an umbrella term, often cause confusion (Beck and Rygl 2015, p. 171), the definition this dissertation uses is that of Verhoef et al. (2015), who defined omnichannel management "as the synergetic management of the numerous available channels and customer touchpoints, in such a way that the customer experience across channels and the performance over channels is optimized" (p. 176). A firm that integrates its channels to provide omnichannel management allows consumers to use all of the firm's available channels interchangeably and to switch seamlessly among them while having a consistent experience (Beck and Rygl 2015, pp. 171-175), ensuring that consumers' new needs are satisfied. Such an approach to channel management can attract consumers and lead to an advantage in comparison to firms not allowing such an experience when using its channels (Ghemawat 1986). In fact, the omnichannel management approach is, for many firms, a key strategic imperative if they are to meet their consumers' expectations (Brynjolfsson et al. 2013).

The responsibilities in channel management are varied, and research in this domain has identified seven basic tasks of channel management: Formulating channel strategy, designing channels, selecting channel members, motivating channel members, coordinating channel strategy with channel members, assessing channel members' performance, and managing channel conflict (Rosenbloom and Anderson 1985, p. 98). Completing all of these tasks at any depth can present a challenge for firms. However, this dissertation

investigates the overarching topic of omnichannel management and the resulting consumer experience, but the focus topic digital nudging relates to the task of designing channels, and the focus topic of channel integration is related to the tasks of selecting channel members, coordinating channel strategy with channel members, and managing conflict.

2.3. Research Areas of Omnichannel Management

2.3.1. Internal Capabilities

Since technology is constantly changing, firms must be able adapt quickly by, for example, building the capabilities that ensure that consumers' experiences match their expectations and needs (Brynjolfsson et al. 2013; Hansen and Sia 2015; Lemon and Verhoef 2016; Van Bruggen et al. 2010; Verhoef et al. 2015). To respond to those consumer needs by providing a coordinated and consistent experience along the customer journey, firms must design and manage a cohesive set of channels (Van Bruggen et al. 2010, pp. 333-334), where each channel not only provides its particular benefits but also complements and seamlessly connects to the whole experience (Verhoef et al. 2015, pp. 178-179). Channel management can refer to anything from fully separated channels to complete integration (Neslin et al. 2006, p. 106) but, in any case, it is necessary for a firm to achieve omnichannel management (Neslin et al. 2006, p. 101; Verhoef et al. 2015, pp. 174-175). The number of channels a firm has that have unique characteristics increases the complexity of the customer's journey and with it the challenge of channel integration and delivering consumers an omnichannel experience (Lemon and Verhoef 2016, p. 69).

Channel integration describes firms' ability to combine channels to create synergies between channels and the whole channel ecosystem (Cao and Li 2015, p. 198). Providing a harmonized channel experience does not necessarily mean offering the same channel assortment for every firm, but leveraging each channel's benefits and specifics (Verhoef et al. 2015, p. 178) so the firm can profit from channel integration through increased brand and sales performance (Verhoef et al. 2015, 176).

Omnichannel management is a key strategy for many firms, as it is likely the new norm in meeting consumers' needs (Brynjolfsson et al. 2013, p. 24) and the most desirable approach to channel management (e.g., Hansen and Sia 2015; Verhoef et al. 2015). However, there is a gap between this omnichannel management ideal and the approaches that real firms usually pursue (Brynjolfsson et al. 2013, p. 24; Mueller-Lankenau et al. 2006, p. 187-188; Trenz 2015, p. 10). Whereas many firms have supplemented offline channels (e.g., their physical stores) with online channels like websites and mobile apps, these channels are seldom integrated, perhaps because of a lack of the necessary capabilities. Despite the need,

only a few papers have addressed the questions concerning how firms can reconfigure their resources to integrate their channels and which capabilities are indispensable in this effort (e.g., Hansen and Sia 2015; Koch 2010; Wilson and Daniel 2007).

2.3.2. Channel Design

Omnichannel management is driven and enabled by IT (Brynjolfsson et al. 2013, pp. 24-25; Hansen and Sia 2015, pp. 51-52; Verhoef et al. 2015, p. 175). IT drove the rise of smart mobile devices like smartphones and tablets, and IT will continue to drive emerging technologies like smart glasses, virtual reality, smart speakers, and 3D printing (Brynjolfsson 2013, pp. 24-25), so the number of decisions made using digital channels will increase. However, whether consumers' cognitive abilities can keep up with the high rate with which the number of channels, available information, and services increases and the IT capabilities evolve remains in question. Therefore, consumers' cognitive capacities are often exceeded while they are making decisions (Maedche et al. 2016, p. 367).

The plethora of digital channels and the constantly growing amount of available information increases the complexity of both the consumers' journey and their decision-making processes (Benartzi and Lehrer 2015, pp. 1-8). Therefore, firms need to take into account that consumers might fail to make the right decision at least in part because their cognitive limits are exceeded while they are using the firm's channels (Weinmann et al. 2016, p. 434). New kinds of decisions will take place in the digital sphere in new situations and new sectors on new kinds of devices through new forms of communication and services. Therefore, firms are not only challenged to integrate and coordinate the channels they offer, but their channel designers are also challenged to be aware of the risks of delivering an undesirable consumer experience if their channel designs are defective. The right design of a digital channel can support consumers' decision-making, making it easier and more desirable to use a firms' omnichannel ecosystem, thereby enhancing the overall omnichannel experience (Lemon and Verhoef 2016, p. 84; Weinmann et al. 2016, p. 433).

Against this backdrop, digital nudging presents a valuable approach with which to design digital channels. The concept of digital nudging is grounded in behavioral economics and the original concept of nudging from Thaler and Sunstein (2009). Nudging alters choice environments in a way that increases the probability that individuals will make a certain decision or behave in a certain way, resulting in easier decision-making and increasing the chance of finding the optimal choice. To alter the choice environment, nudging steers individuals by implementing interventions that address the individual's heuristics and biases (Thaler and Sunstein 2009) either by using them or helping to avoid them (Thaler and Sunstein 2009; Weinmann et al. 2016, p. 434) while preserving the consumers' full freedom of choice (Thaler and Sunstein

2009). This dissertation adapts Hansen's (2016, p. 174) definition of digital nudging to the digital context. Weinmann et al.'s (2016, p. 433) definition of digital nudging as the "use of user-interface design elements to guide people's behavior in digital choice environments" does not sufficiently capture the behavioral economistic background and the mechanisms for how digital nudging works. Since these are essential aspects of the concept, a more detailed definition of digital nudging is proposed: Digital nudging is the attempt to influence individuals' decision-making, behavior, or judgment in a predictable way by using or counteracting cognitive the boundaries, biases, routines, and habits that hinder individuals from acting in their own best interests in the digital sphere. Attempts to digitally nudge individuals do not preclude or add any rational choice option, change incentives significantly, or provide rational argumentation.

Digital nudges are realized through UI design elements, which encompass graphics, specific texts, and other features (Weinmann et al. 2016, p. 434). An example of intervention by a digital nudge is a push notification on a mobile phone that helps consumers to remember to stay active (e.g., the fitness application Runtastic) or that gives feedback about energy consumption (e.g., Nest thermostats) (Weinmann et al. 2016, p. 434).

In this dissertation, digital nudging is a tool of omnichannel management that is used to design channels and so is a valuable component of the effort to enhance the consumer's experience. Digital nudging is related in this dissertation to the channel management task of channel design, so it is a component of omnichannel management. Using digital nudging in the design of channels in the omnichannel context can enhance the consumer's experience significantly by integrating channels so the customer can use them in the best possible way. Through digital nudging, the consumer can be steered to the best decision and the best path through a firm's omnichannel ecosystem, and both the consumer and the firm can benefit. For example, while browsing a firm's mobile shopping app, the consumer could see a notification designed according to digital nudging principles, such as information that most of the firm's customers subscribe to a newsletter that sends them special offers redeemable in the mobile shopping app. By subscribing to the newsletter, the consumer receives the special offers and profits from the channel integration and the direct connection between these channels, enhancing the consumer's omnichannel experience. For the firm, nudging the consumer results in optimized channel usage and increased sales.

While research on nudging has been conducted mainly in the offline sphere and has gained momentum in various fields of research and practice, digital nudging is still in its early stages and has received little attention from IS research (e.g., Benartzi and Lehrer 2015; Meske and Potthoff 2017; Schneider et al. 2018; Weinmann et al. 2016). Considering the ongoing technological developments and changes in consumer behavior, digital nudging is a promising tool for those who are responsible for omnichannel management

and designing firms' channels. In research, first attempts have been made to support the design digital nudges (Meske and Potthoff 2017; Schneider et al. 2018), but these approaches are solely conceptual, neglecting practice requirements and are not empirically validated. In addition, they remain mostly abstract and lack concrete guidance, which hampers applicability.

To integrating channels, the channel design also plays an important role in providing consumers with a desirable and unique experience, since it constructs the interface between the consumer and the firm, so it is an important component of building consumer relationships (Lemon and Verhoef 2016, p. 83). Insights on digital nudging provide channel designers with information about digital channels should be designed to support consumers' decision-making and to create a sustainable omnichannel experience. Digital nudging is expected to be important for both IS scholars and IS practitioners, as insights on digital nudging will influence design-oriented IS research and provide guidance for UI, UX, and digital service design (Lemon and Verhoef 2016, p. 85; Weinmann et al. 2016, pp. 433-435).

3. Research Project

3.1. Research Objectives and Questions

This dissertation's **overarching research topic** is omnichannel management, and the internal capabilities of omnichannel management and channel design are investigated as two research areas within that topic, along with channel integration and digital nudging as necessary capabilities for omnichannel management and channel design, respectively. Of course, other internal capabilities may be required for omnichannel management.

The **overarching research objective** this dissertation pursues is to *support the ability of establishing omnichannel management of firms in order to enhance the consumers' omnichannel experience*. Initially, this objective is achieved by creating preparatory clarity about the concept of omnichannel management as it relates to other channel-management approaches. To explain how firms can establish omnichannel management, the dissertation focuses on the topics of channel integration and digital nudging as capabilities and tools that are required for omnichannel management and channel design. Focusing on these two topics allows the dissertation to obtain more granularity and more concrete answers about the concept of omnichannel management in support of managerial decision-making so firms can transition to omnichannel management and to close the gap between this ideal approach and the reality of approaches used in practice. In pursuit of the overarching research objective, this dissertation addresses two research questions:

Research question 1 (RQ1): *What capabilities support the provision of an omnichannel experience?*

Research question 2 (RQ2): *How can and should digital nudging be used to support an omnichannel experience?*

RQ1 addresses the research topic of channel integration and the internal capabilities required for omnichannel management, whereas RQ2 addresses the topic of digital nudging as a tool for channel design. Answering RQ1 and RQ2 extends the omnichannel literature with insights into how firms can establish effective omnichannel management and how channel design can be improved. In addition, the literature on digital nudging and the literature on channel integration are extended by means of empirical insights. In answering these research questions, the dissertation also stimulates a plethora of further research opportunities that will drive both topics in IS research forward.

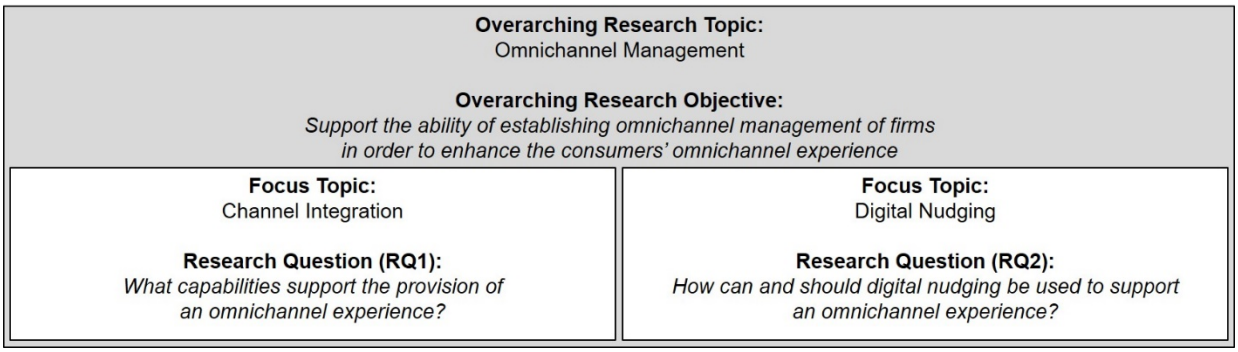

Figure 1: Overview of Research Topics, Objective, and Questions

3.2. Research Approach, Methodology, and Results

The dissertation uses single research papers to address the overarching research objective and question by addressing more specific research objectives and questions. Therefore, the overall aim and structure of this dissertation are supported by increased specificity of the research questions in the individual research papers (Green 2008; Sauders et al. 2007).

The dissertation includes six research papers (research papers 1-6), four of which (research papers 1, 4, 5, and 6) are independent projects, while research papers 2 and 3 are connected. Research paper 2, a research-in-progress publication that was published at a conference, describes the research plan that is further developed through research paper 3. With the exception of paper 6, a single-author paper, all of the research papers were produced in collaboration with other authors. Figure 2 lists the research papers that are included in this dissertation in correspondence with the research topics they address.

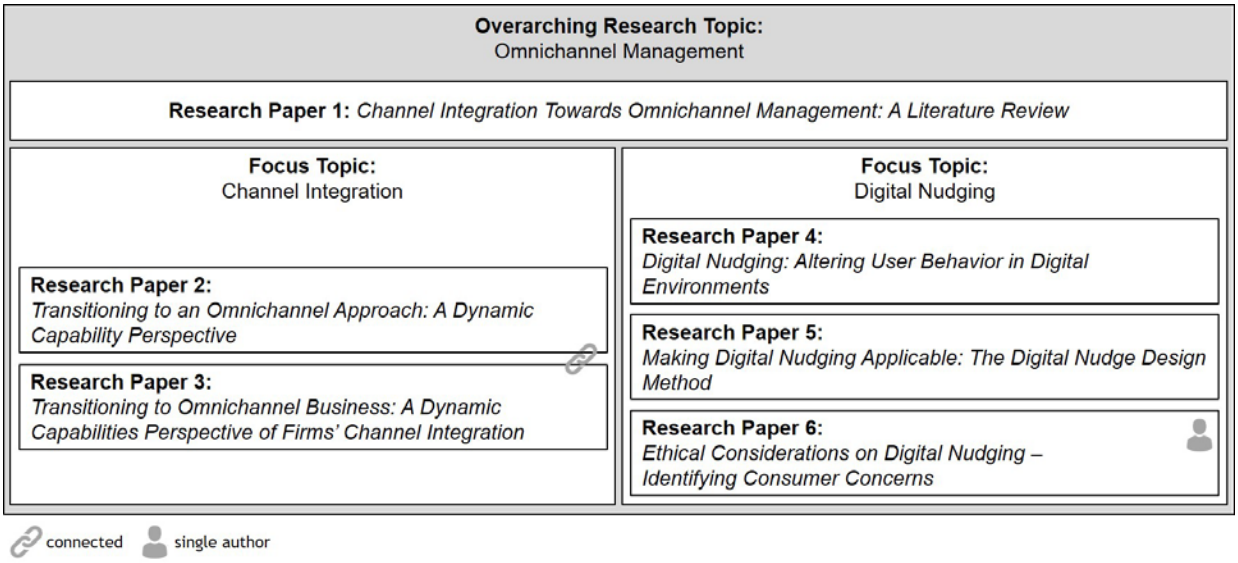

Figure 2: Research Paper Overview

In the following, the individual research papers are outlined in regard to their backgrounds (i.e., motivations and purposes), applied methodologies (i.e., research approaches), (expected) results, contributions to literature and practice, and how they contribute to this dissertation's objective and research questions.

3.2.1. Research Paper 1: Channel integration towards omnichannel management: A literature review

Motivation and Purpose

Research has broadly discussed the management of multiple channels (e.g., Ansari et al. 2008; Avery et al. 2012; Geyskens et al. 2002; Homburg et al. 2014; Neslin et al. 2006; Pauwels et al. 2011; Trenz 2015; Venkatesan et al. 2007), which has been established as a key approach to sales for many retailers since they want to provide consumers with the opportunity experience their channels the way they prefer (Beck and Rygl 2015; Brynjolfsson et al. 2013; Lewis et al. 2014; Verhoef et al. 2015; Zhang et al. 2010). The omnichannel strategy can fulfill consumers' needs for an experience that offers the opportunity to use channels simultaneously and to switch seamlessly among them (Beck and Rygl 2016; Lewis et al. 2014; Verhoef et al. 2015; Zhang et al. 2010), but firms apply various approaches to channel management (Mueller-Lankenau et al. 2006, pp. 187-188; Trenz 2015, pp. 10-11). A look into omnichannel research shows that the term omnichannel management is comparatively new in the academic literature, and more than one term has been used to describe approaches to managing several channels. Since the term is not fully established and widely accepted, this research paper seeks to provide a solid basis on which research

and practice can reduce the fuzziness of the term and demark the related (but different) concepts of multichannel and crosschannel management, while laying out the current state of research. By clarifying the term omnichannel management, research paper 1 provides research and practice with a detailed understanding of the concept that can be shared. A structured analysis of the current omnichannel-related literature has not yet been performed, so research paper 1 addresses this gap. This analysis helps to clarify the term in both research and practice by addressing three research questions: (1) *How can omnichannel management be defined and differentiated from related management concepts?* (2) *What is the current status of omnichannel research?*, and (3) *What are the avenues for further omnichannel research?*

The paper spans the topic of omnichannel management and its many facets and serves as a preparatory basis for this dissertation.

Research Approach

For the analysis of omnichannel management's use and demarcation from related terms (e.g., multichannel management, crosschannel management), a structured literature review broadly followed the approach Vom Brocke et al. (2009) proposed. The literature search used multidisciplinary databases (EBSCOhost, AISeL, ScienceDirect, Emerald) to access academic journals and conference proceedings and limited the database search to titles, keywords, and abstracts to focus the results. Four search phrases were used: (1) (multichannel OR multi-channel) AND (management OR strategy), (2) (crosschannel OR cross-channel) AND (management OR strategy), (3) (omnichannel OR omni-channel) AND (management OR strategy), and (4) "multiple channel" OR "channel integration" OR "integrated channels."

To capture the extent of the omnichannel literature, strategies and concepts that matched the description of the omnichannel concept were included, regardless of the term used (e.g., "multichannel integration strategy" or "integrated service delivery"). Irrelevant articles were filtered out based on predefined criteria. The authors, research areas (e.g., marketing, retailing, IS), and the terms used to describe the channel management concept were listed to show the current state of omnichannel research, and the identified articles were clustered into topics based on the articles' orientation. Doing so helped to clarify the focus and thematic orientation of each article and the overall state of omnichannel research.

Results

The structured literature review resulted in 1,683 potentially relevant articles. After these articles were filtered and screened, 69 articles about the management of multiple channels remained, of which 18 articles on omnichannel management were identified that either described omnichannel management directly or described a construct that could be assigned to omnichannel management because of matching

characteristics. The literature review made it possible to formulate a clear definition of the concepts of multichannel management, crosschannel management, and omnichannel management and to provide an overview of their key characteristics. In addition, three clusters of articles were identified: those that dealt with transformation toward omnichannel management, those that addressed strategy conceptualization and requirements, and those that identified the obstacles and benefits of omnichannel management. Research questions were proposed that were either extracted from the literature review's findings or formulated based on those findings. These proposed research questions open opportunities for further research. Twenty-eight proposed research questions were assigned to the identified clusters of topics (e.g., pricing, mobile devices, performance).

Contribution

This research paper provides an essential starting point for the topic of omnichannel management and contributes to the overarching research objective by paving the way for further investigations. Since the current state of research is limited, important characteristics of the topic are outlined and the terms used in addressing the topic are clarified. In addition, by reviewing the current state of knowledge and the approaches that research has used, the paper outlines other necessary investigations (Vom Brocke et al. 2009; Webster and Watson 2002). The clear definition of the term and its demarcation from related concepts improve and consolidate the conceptualization of the term and pave the way for further research.

This dissertation supports practitioners and researchers in their efforts related to omnichannel management, such as implementing omnichannel management, integrating channels, and designing channels. Knowing what encompasses omnichannel management and related concepts supports the ability to establish omnichannel management to enhance the consumers' omnichannel experience. The topic is especially important for IS research because omnichannel management is strongly IT-driven -enabled (Brynjolfsson et al. 2013, pp. 24-25; Hansen and Sia 2015, pp. 51-52; Verhoef et al. 2015, p. 17) and because establishing omnichannel management in the firm requires providing the right IT infrastructure for the new technological requirements and the necessary capabilities to drive the channel integration (Hansen and Sia 2015).

3.2.2. Research Paper 2: Transitioning to an omnichannel approach: A dynamic capability perspective

Motivation and Purpose

In the context of a market environment that is driven by technological advancements and changing consumer behavior and needs, firms must establish new channel resources to remain competitive, rather than relying on existing channels (D'Aveni 1994). To pursue omnichannel management, firms must reconceive their channel configurations and channel management to enhance the customer experience (Brynjolfsson et al. 2013, p. 29). For many firms the omnichannel approach is the key strategic imperative for meeting today's consumers' expectations and sustaining competitive advantage (Beck and Rygl 2015; Brynjolfsson et al. 2013; Lewis et al. 2014; Verhoef et al. 2015; Zhang et al. 2010). However, market realities show that there is a gap between the ideal vision of omnichannel management as exhibited in the literature and current approaches in practice (Mueller-Lankenau et al. 2006, pp. 187-188; Trenz 2015, pp. 10-11). The channels firms offer are often not integrated or only partially so, perhaps because of a lack of all or some of the capabilities that are necessary for integrating channels and transitioning to an omnichannel approach. In other words, firms might not be able to pursue this kind of venture because they do not know how to proceed or have the capabilities they need. This situation may be explained by the lack of empirical studies on the capabilities firms need to transition to omnichannel management. Therefore, this research paper addresses the research question, "*What dynamic capabilities enable firms to transition to an omnichannel approach?*"

Research paper 2 is a research-in-progress article that seeks to validate the research plan of a subsequent study by gathering first reviews and opinions about the study so it can start at a high level of quality using assessments and inputs from other researchers. Based on the concept of dynamic capabilities (e.g., Eisenhardt and Martin 2000; Teece et al. 1997), the subsequent study seeks to identify the dynamic capabilities that are required for the transition of firms' channel management approaches to omnichannel management, thereby improving empirical insights in the field of dynamic capabilities, where empirical approaches are scarce (Pablo et al. 2007, p. 690). The study also identifies the dynamic capabilities that are necessary to provide a solid basis for managerial decision-making and encourage firms to transition to omnichannel management.

Research Approach

This research in progress uses the dynamic capabilities perspective, an influential theoretical framework in the strategic management literature, to explain how firms can achieve competitive advantage. The dynamic capabilities perspective can be seen as an extension of the resource-based view (RBV) of the firm, which explains a firm's superior economic performance as a function of its resource endowment (Barney 2001). Research paper 2 uses a case study approach, as outlined by Eisenhardt (1989), Paré (2004), and Yin (2009), and a qualitative approach, which facilitates an in-depth investigation of the theme being considered and is well-suited to capturing the nature of dynamic capabilities. Since the aim of this research paper is to achieve generalizable results, the study is undertaken using the positivist research paradigm (Eisenhardt 1989; Paré 2004), which is the dominant paradigm in IS case research (Dubé and Paré 2003, p. 599). The paper uses multiple case studies to increase the generalizability and the meaningfulness of its results (Eisenhardt 1989, p. 540; Paré 2004, p. 241), which is especially important in the context of dynamic capabilities because such capabilities tend to be common across firms and do not necessarily need to be firm-specific (Eisenhardt and Martin 2000, pp. 1116-1117).

The unit of analysis is the transition process of individual firms' channel management approaches to an omnichannel approach in the retail industry. The retail industry is an appropriate sector for the investigation since omnichannel management has been broadly discussed and researched in this context (e.g., Beck and Rygl 2015; Berman and Thelen 2004; Brynjolfsson et al. 2013; Hansen and Sia 2015; Piotrowicz and Cuthbertson 2014; Trenz 2015; Verhoef et al. 2015), and it is a key strategy in the retail industry (Beck and Rygl 2015; Lewis et al. 2014; Verhoef et al. 2015; Zhang et al. 2010). The research paper proposes to use cases with intrinsic similarities and shared characteristics (business model, cultural and geographic proximity, channel setup, and maturity in omnichannel transformation) to achieve an optimal level of comparability (Paré 2004, p. 249), so B2C retailers in Germany, Switzerland, and Austria with both click- and brick-and-mortar settings are the focus. To achieve a reasonable level of analytical generalizability, the plan foresees investigating four cases (Eisenhardt 1989, p. 545) that have successfully transitioned to an omnichannel approach—that is, to full integration of all of their offline (i.e., physical retail store) and online channels (i.e., mobile, online store) to provide a seamless customer journey. Data collection is to be done through semi-structured interviews with open-ended questions and document analysis "to provide a richer picture of the events and/or issues than would any single method" (Dubé and Paré 2003, p. 615). Considering that omnichannel management is a cross-functional (e.g., IT, marketing, sales) venture, at least four highly knowledgeable interview partners who span hierarchical levels and functions should be interviewed from each firm (Eisenhardt and Graebener 2007, p. 28). A within-case

analysis and a cross-case analysis will be conducted for the data analysis (Eisenhardt 1989; Paré 2004; Yin 2009).

Results

This research-in-progress paper uses Wilson and Daniel's (2007) publication as a starting point for its investigation of omnichannel management. However, the results and therefore, the dynamic capabilities for omnichannel management, are expected to differ from those for multichannel management, which Wilson and Daniel (2007) identified. Accordingly, transferring the dynamic capabilities identified for multichannel management to omnichannel management is not possible. One reason is that multichannel management differs from omnichannel management as channel management approach. Furthermore, Wilson and Daniel's study focused on the business-to-business (B2B) sector, which is fundamentally different from the B2C sector (Kotler and Pfoertsch 2006, pp. 20-34). Additionally, because technology has developed since 2007 when their study took place, and new opportunities for channel offerings have arisen (e.g., smart mobile phones) that are especially important in bridging the gap between the physical (store) and online channels (Brynjolfsson et al. 2013, p. 23) and new data types (e.g., sensor data), can lead to different results. In addition, dynamic capabilities are expected to differ since an omnichannel approach depends more on technology (i.e., data streams and data analytics) than a multichannel approach does (Neslin et al. 2006, p. 97). Overall, the outlined study is expected to show that dynamic capabilities with a technology foundation are essential to omnichannel management. To categorize the identified capabilities, it was planned to use the framework proposed by Koch (2010). This framework includes inside-out, outside-in, spanning, and dynamic capabilities. Among the inside-out capabilities are capabilities that focus on internal routines and processes like the processes and technology for collecting, analyzing, and processing consumer data from all channels (Neslin et al. 2006, p. 94), which are expected to be required to build and maintain 360-degree customer profiles (Stone et al. 2002, p. 49). Among the outside-in capabilities are the integration and management of external partners (e.g., dealer networks) (Hansen and Sia 2015, pp. 62-63), and the sharing and integration of data across channels and departments are expected to be necessary to build complete customer profiles. Based on this expectation, spanning capabilities are likely to be identified because routines and processes that support communication and close collaboration across a firm's functional areas are necessary.

Contribution

This paper contributes to this dissertation's overarching research objective by answering RQ1, "What capabilities support the provision of an omnichannel experience?". As the study seeks to provide empirical

insights and to give practitioners decision support, insights into how firms transform their channel strategies and how they transition their multichannel resources to an omnichannel approach are expected, especially in regard to an environment that is affected by technological changes and consumer needs. Since few qualitative studies have been performed in this context, this research paper supports further research and helps to clarify how dynamic capabilities are deployed in the omnichannel context.

3.2.3. Research Paper 3: Transitioning to omnichannel business: A dynamic capabilities perspective of firms' channel integration

Motivation and Purpose

Research paper 3 is the continuation of the study outlined and planned in research paper 2. The paper's motivation is based on the proliferation of digital devices and services that have profoundly changed consumers' behavior and needs and how they engage with firms across online and offline channels and the possibility of seamless switching and simultaneous use of those channels. The omnichannel concept has been proposed as an appropriate way to respond to these demands to enhance consumers' experience. However, only a minority of firms have transitioned from multichannel to omnichannel businesses. Most firms offer supplemented offline channels, such as by supplementing a physical store with online channels like websites and mobile apps, but these channels are not usually integrated. Only a small number of papers have dealt with the question concerning how firms can reconfigure their channel resources to integrate their channels (e.g., Hansen and Sia 2015; Koch 2010; Wilson and Daniel 2007), which is a necessity for omnichannel management. One reason that firms have not provided full channel integration may be the dynamic capabilities that enable the firm's management to reconfigure the organization to pursue an omnichannel approach are missing. Dynamic capabilities in this context are processes that support the integration, creation, and reconfiguration of resources and operational capabilities (Teece et al. 1997). This study investigates organizational transformation by shedding light on the microfoundations of firms' IT-enabled dynamic capability of channel integration, which is necessary for omnichannel management. Microfoundations are "distinct skills, processes, procedures, organizational structures, decision rules, and disciplines" (Teece et al. 2007, p. 1319). Within this context, IT resources and capabilities are used to address the challenge of providing a desirable omnichannel experience. Therefore, firms employ omnichannel retail information systems (OCRIS) so they can be agile and adapt to dynamic market changes and customer needs. More specifically, OCRIS allow the integration of previously isolated systems (e.g., e-commerce, customer relationship management (CRM), product data management (PDM)) and

functionalities so a uniform and satisfactory consumer experience across channels is provided (Tambo 2014).

Against this backdrop, the paper addresses the research question, "*How do organizations achieve dynamic capabilities by using OCRIS?*" In comparison to paper 2, which sought to identify dynamic capabilities, research paper 3 undertakes an in-depth investigation of the microfoundations of channel integration. The core purpose of this research paper, then, is to provide insights into the microfoundations firms require to integrate channels to establish omnichannel management.

Research Approach

The research approach is based on the concept of dynamic capabilities, which is broadly used in the IS context for the identification of transformative processes through which firms reconfigure their resource bases (e.g., Daniel and Wilson 2003; Koch 2010; Liu et al. 2013). As planned and outlined in research paper 2, empirical data is used to identify the microfoundations of successful channel integration. The data are collected from two B2C firms that operate in Switzerland in a click-and-mortar setup for which integrating channels in the sense of omnichannel management is a core issue (e.g., Brynjolfsson et al. 2013; Verhoef et al. 2015). Both case firms, one a retailer and one an insurance firm, have successfully integrated their offline and online channels to pursue an omnichannel approach. Data was collected through document analysis and semi-structured interviews with market and technical experts to gain a rich picture of the case organizations (Dubé and Paré 2003, pp. 615-616). The data analysis broadly follows Eisenhardt's (1989), Paré's (2004), and Yin's (2009) recommendations. To conceptualize the microfoundations of dynamic capabilities, the study uses the sense-and-respond approach proposed by Haeckel (1995; 1999), which has been applied in the IS domain to investigate IT-enabled transformative processes (e.g. Singh et al. 2011; West et al. 2014) as tools for management to develop and manage dynamic capabilities (Haeckel 1995; Haeckel 1999). The approach helps to explain how firms' overall flexible and responsive design can support dynamic capabilities (Haeckel 1999).

Results

Based on Haeckel's (1999) four adaptive organization principles, the study examines how the case firms transitioned to omnichannel management by combining these principles and employing OCRIS. The case firms used four groups of sense-and-respond strategies for this venture: "processes that learn," as firms need to be able to learn and adapt to environmental change, often enabled through technology-provided information; "value-based governance," which creates an adaptive organization by articulating values and embedding principles into organizational routines; "dynamic commitment of resources" to adapt to

changes; and "modular design" so processes are designed modularly to be quickly and easily reconfigurable.

Contribution

With regard to this dissertation's overarching research objective, the results of this paper provide concrete insights that support firms' ability to establish omnichannel management to enhance their consumers' omnichannel experience. The paper's insights also show on which concrete microfoundations the channel integration capability is founded, so it contributes to answering RQ1.

This research paper contributes to both theory and practice as they relate to understanding and applying omnichannel management. First, it provides the first empirical investigation of the microfoundations of channel integration's transition to omnichannel business to a field in which empirical insights are scarce and quantitative studies are dominant. Second, from the IS perspective, this paper helps to clarify omnichannel business's strong connection to IT. The role of IT assets and their continuous reconfiguration for firms' channel-integration capabilities are central to this transition. Third, the identified microfoundations provide important decision support regarding how to transition to an omnichannel approach, which can help firms that face this venture. These contributions provide scholars and practitioners concrete insights into how to deploy dynamic capabilities in practice.

3.2.4. Research Paper 4: Digital nudging: Altering user behavior in digital environments

Motivation and Purpose

The concept of digital nudging has gained attention as a tool for designing digital channels since increasing numbers of decisions take place in digital environments (Benartzi and Lehrer 2015, pp. 138-191). In the digital sphere, individuals could benefit from decision support through the use of digital nudges since cognitive limits are often exceeded by information overload, with deficient decision-making as consequence (Benartzi and Lehrer 2015, pp. 1-8). However, as opposed to the general concept of nudging in the offline context, the concept of digital nudging is largely unaddressed in IS research despite manifold research opportunities for IS research and human-computer interaction (HCI) research and its many advantages (e.g., easier, faster, and cheaper implementation over its use in the physical sphere, the possibility of tracking users, and ad hoc personalization). Therefore, research paper 5 investigates the underlying psychological mechanisms of digital nudging and provides the basis for further research in this context. The paper also seeks to clarify how to design channels in the digital context to enhance consumers' channel experience.

Research Approach

To capture the research on nudging and identify the underlying mechanisms that may be at play in the digital sphere, a systematic literature review that encompasses research from several disciplines was conducted, broadly following the approach Vom Brocke et al. (2009) proposed. The literature was captured using the four search phrases "nudging or nudge," "choice architecture," "libertarian paternalism," and "behavioral economics AND online" in a search spanning multidisciplinary databases (EBSCOhost, AISeL, ScienceDirect). The search produced articles published in academic journals and conference proceedings and was limited to the titles, keywords, and abstracts to ensure a high level of relevance to the topic. Duplicates, irrelevant articles, and articles that did not report on digital nudges or/and psychological effects were excluded. Desk research on examples of digital nudges on well-known websites was also conducted to identify examples in practice.

Results

The literature review identified the psychological effects that underlie nudging, so the paper presents an overview of psychological effects in the context of nudging. All identified psychological effects are shown in a table with the frequency of their appearance and the references that identified them (for the full list see Appendix 4). The results show that nudging is mainly discussed in regard to promoting healthful and environmentally friendly behavior. In the context of health, nudges that influence food choices (e.g., nutrition labels, optimized positioning of healthful food) are in focus. In the eco context, social-norm nudges (e.g., referring to the masses) and loss-aversion nudges (e.g., subsidizing polluting travel options) are in focus. The identified psychological effects are described and enriched with examples of digital nudges from well-known websites.

Contribution

This paper provides an essential starting point for the research topic of digital nudging and serves as a starting point for the dissertation and for IS and HCI research to investigate digital nudging. It describes the current state of research regarding nudging and its underlying psychological effects, thereby illuminating the theoretical mechanisms that could be relevant to digital nudging. The paper helps to answer RQ2 concerning how digital nudging can and should be used in channel design to support an omnichannel experience. The results may also guide design-oriented researchers and, from the practical perspective, UI, UX, and digital service designers in designing IS and interventions that support individual decision-making in the digital context. Providing the psychological effects that influence decision-making, including practical examples, help channel designers to enhance consumers' omnichannel experiences. Therefore,

this paper contributes to the efforts of research and practice to use digital nudging as a tool to design channels.

3.2.5. Research Paper 5: Making digital nudging applicable: The Digital Nudge Design method

Motivation and Purpose

Research paper 5 also investigates the research topic of digital nudging and ties in with the background of research paper 4, indicating that consumers could benefit from digital nudges used as a tool to support decision-making when cognitive limits are exceeded (Benartzi and Lehrer 2015, pp. 1-8). Digital nudging becomes more useful as the number of decisions in digital environments rises, so its usefulness as a tool with which to design digital channels does as well. Therefore, the topic has been an increasing focus of IS research (Meske and Potthoff 2017; Schneider et al. 2018; Weinmann et al. 2016). However, the widespread use of digital nudging is hampered by the lack of knowledge about digital nudging and a systematic approach to designing digital nudges, so the opportunity to improve digital choice environments by supporting consumers using digital nudges has not been fully embraced Often, information about digital nudging is sparse or held by only a few individuals with the right knowledge. While first advances have been made in providing the necessary information, these approaches do not address practitioners' requirements or include empirical validation and concrete guidance. With this research paper, the research question, *how can the systematic process of designing digital nudges, incorporating theoretical and practical requirements, be presented and guided* is aimed to be answered. Therefore, this research paper develops a method for DND as an artefact—including requirements from practice and empirical validation—that allows practitioners and researchers working in fields like UI, UX, and digital service design to design, implement, and evaluate digital nudges for digital choice environments. Ultimately, supporting the design of digital channels leads to an enhanced omnichannel experience.

Research Approach

To develop the DND method, this research paper applied a design science research approach as proposed by Hevner (2007). This methodology is suitable when the purpose of the research is to build an artifact and the research is motivated by "the desire to improve the environment" (Hevner 2007, p. 2). The method's development was done iteratively and included evaluation and refinement since it is a new artifact. This research was motivated by an identified need and opportunities for improvement in the application UI, UX, and digital service design. Starting from practitioners' stated need for improvement, this paper turned to a review of the academic literature on digital nudging and persuasive systems (PS) using academic databases

(EBSCO, AISeL and ScienceDirect) and broadly following Vom Brocke et al. (2009) to identify process models that are suitable for designing digital nudges (Meske and Potthoff 2017; Schneider et al. 2018) and PS (Fogg 2009; Oinas-Kukkonen and Harjumaa 2009). Approaches to general UI design (e.g., standard interaction design process (ISO 9241-210) (DIS 2009), design thinking processes (Brown and Katz 2011), and agile development processes (Cao et al. 2009) were not considered for developing the method since many of these approaches are used in practice and were captured through the subsequent interviews with practitioners. Complementing the requirements inferred from the literature were requirements revealed in interviews through a multisite case study (Eisenhardt 1989; McLaren et al. 2011) with professionals in the field of UI, UX, and digital service design from five firms in various industries (i.e., full service digital consultancy, click-and-mortar retailer, three e-commerce firms) to ensure a solid grounding in practice. The interviews also facilitated the derivation of requirements and tools that do not interfere with the firm's current modi operandi but incorporate and harmonize current work practices, tools, and methods to make the method more readily applicable. Based on the defined requirements, a prototype was built that was then evaluated by the interviewees and, after refinement, through a field test (Hevner et al. 2004; Sonnenberg and Vom Brocke 2012).

Results

The result of this research paper is the DND method, which unifies the theoretical and practical perspectives. The method 's purpose is to allow researchers and practitioners working in the fields of UI, UX, and digital service design to design, implement, and evaluate digital nudges to influence decision-making. The method contains four main phases for the DND: the digital nudge context, digital nudge ideation and design, digital nudge implementation, and digital nudge evaluation. The DND method can be adapted to multiple contexts and be applied in multiple business functions since it was developed with a degree of abstraction (for a full description of the method see Appendix 5).

Contribution

This research paper contributes to the IS literature, particularly to literature on digital nudging and PS. The DND method contributes to design-oriented research and to practice since it enhances firms' ability to design digital nudges systematically by unifying extant approaches and providing concrete guidance (enriched through the provision of a set of tools and techniques) for the development process. By including the experts' perspective and a two-step evaluation process, the development method ensures that the resulting artifact is highly applicable and useful. Thus, this research paper supports the dissertation's overarching objective and helps to answer RQ2 by providing concrete guidance through the developed

DND method for systematically designing digital nudges to increase the effectiveness of digital channels and enhance consumers' omnichannel experience. The research paper provides a tool that anchors information for the practices of UI, UX, and digital service design.

3.2.6. Research Paper 6: Ethical considerations on digital nudging – identifying consumer concerns

Motivation and Purpose

Today's consumers have their choice of a plethora of digital devices, which opens new opportunities for interaction between firms and consumers. To enhance the experience consumers have using a firm's channels, firms seek to improve the channels they provide using approaches like the standard interaction design process (ISO 9241-210) (DIS 2009), but firms are also starting to use digital nudging to support consumers' decision-making in the digital sphere in the context of cognitive processing limitations (Benartzi and Lehrer 2015; Zhan and Rajamani 2008). Especially when consumers are making decisions about purchasing goods and services, digital nudging can be a double-edged sword because of its ethical implications (e.g., Weinmann et al. 2016), as digital nudging might be used to influence on consumers' decisions solely based on what is beneficial for the firm. Therefore, discussions about the ethical acceptability of approaches to behavior change like (digital) nudging have emerged (e.g., Hansen and Jespersen 2013; Selinger and Whyte 2011; Sunstein 2015). IS scholars have highlighted the importance of ethics in the context of IT and IS (e.g., Mingers and Walsham 2010; Myers and Venable 2014) and with regard to digital nudging (e.g., Meske and Potthoff 2017; Schneider et al. 2018; Weinmann et al. 2016) but without further elaboration. Since digital nudging is relatively new, the lack of information about its ethical issues makes the issue difficult for groups like consumers, practitioners, researchers, and governmental institutions to grasp. Being not aware of ethical implications or the inability to assess if a digital nudge exceeds ethical boundaries, possibly causes harm for both firms and consumers. To illuminate the ethical perspective on digital nudging and close the research gap, this paper identifies consumers' ethical considerations about digital nudging and assesses the ethics of digital nudges in the design of UI, UX, and digital services.

Research Approach

Existing approaches for ethical classification in the context of nudging are identified from the literature and discussed in relation to their theoretical backgrounds. To identify consumers' ethical considerations about behavior change tactics like digital nudging, the study employs a text-mining approach that broad follows Debortoli et al.'s (2016) recommendations. First, relevant web articles on behavior change that included

user comments were retrieved from two social news aggregators, Hacker News and Reddit, using the search query nudg* OR (persuasive OR persuade OR persuasion) OR (motivating OR motivate OR motivation) OR (manipulative OR manipulate OR manipulation) OR (influence OR influencing) OR (deceitful OR deceptive) OR steers OR (behavior OR behavior) OR UX OR patterns OR dark patterns). An equivalent hashtag search was conducted on Twitter. After the results were filtered, automated text mining was performed on the user comments using the cloud-based text-mining tool minemytext.com, resulting in categories of text (i.e., user comments assigned to categories, namely topic clusters).

Results

The text mining resulted in fifteen topics, each consisting of the most probable words. The topics were assigned to the ethical objections proposed by Sunstein (2015), resulting in an overview of possible ethical objections in the context of digital nudging. For example, Topic 7 with the most probable words fee, clean, pay, extra, paper, service, hotel, and cheap was mapped to the objection manipulation (for the whole topic mapping see Appendix 6).

Contribution

The presented results make three primary contributions to practitioners and researchers. First, the study is in the specific application context of digital nudging, so the results contribute to research that has focused on the discussion of ethics in the context of IS design by extending the general discussion on ethics and digital nudging. Second, the study contributes to research by disclosing consumers' ethical considerations on digital behavior-change tactics and providing empirical insights into the new field of digital nudging. Third, the study provides guidance for practitioners and design-oriented researchers in designing UI, UX, and digital services that avoid ethical issues and possible negative consequences.

With regard to this dissertation, this study contributes to answering RQ2 by giving guidance on how digital nudging can and should be used without harming the consumer, thereby supporting the omnichannel experience. The study also supports the overarching research objective, since crossing ethical boundaries may harm consumers' omnichannel experience.

4. Discussion of Results

This dissertation is comprised of six research papers, all of which are embedded in (and created with respect to) the overarching research topic of omnichannel management, which is divided into two focus topics, channel integration and digital nudging. While research paper 1 presents an overall starting point for the

dissertation by expounding on the current state of research on omnichannel management and providing research questions for further research, the other five research papers each address either the research topic of channel integration (research papers 2 and 3) or digital nudging (research papers 4, 5, and 6) to address the research objective with increased granularity and answer each focus topic's research question (RQ1 and RQ2). For example, research paper 1 proposes that further research address the research questions "How can full channel integration be achieved to transform towards omnichannel management?" "How should companies be configured (technologically/organizationally) to provide a beneficial basis for omnichannel management?" and "What is required to provide a seamless omnichannel customer experience?" These suggestions for further research are picked up by research papers 2 and 3, whereas research papers 4, 5, and 6 address the questions "How can specific customer contact points improve the omnichannel performance?" or "Which models can be applied to represent and understand consumer choices within the omnichannel environment?" and therefore, how digital nudging can be applied in this context.

Based on the results of each research paper, approaches are derived to contribute to the **overarching research objective** of *supporting the ability of establishing omnichannel management in order to enhance the consumers' omnichannel experience*. In more detail, the results identify *what capabilities support the provision of an omnichannel experience* (**RQ1**) and *how can and should digital nudging be used to support an omnichannel experience* (**RQ2**). The next section discusses how the research papers address the objective and research questions and how they contribute to research and practice. Figure 3 exhibits the correlation between the research questions and objective.

4.1. Focus Topic Channel Integration

Research papers 1, 2, and 3 address the research topic of channel integration. Research paper 1 also presents a general foundation for the dissertation and for the focus topic of channel integration in particular. Research paper 2 prepares for research paper 3 by outlining the research venture that is refined in research paper 3. The insights generated by these research papers address RQ1's issue regarding *what capabilities support the provision of an omnichannel experience*. Four primary conclusions are derived:

(1) Organizational and technological microfoundations enable successful channel integration so firms can transition to omnichannel management and provide consumers an omnichannel experience.
(2) To achieve channel integration the microfoundations "processes that learn," "value-based governance," "dynamic commitment of resources," and "modular design" should be established.

(3) IS enables the transition to omnichannel management and is the foundation for employing capabilities like OCRIS as tools for enabling omnichannel management for retail and insurance firms. However, the microfoundations build the basis to achieve the necessary capabilities.

(4) To allow a complete perspective on and provide a sufficient foundation for the transition to omnichannel management, alignment between business and IT (knowledge) should be encouraged. Since IS plays a major role in enabling omnichannel management, IT should be a substantial part of the business.

The insights generated for the focus topic of channel integration make several contributions to research. First, the related research paper is the first to examine empirically the microfoundations of firms' ability to integrate channels to transition to an omnichannel business, so it provides empirical insights for the field of omnichannel management, where empirical studies are scarce and mostly conceptual in nature (e.g., Hansen and Sia 2015).

Second, the dissertation responds to Hansen and Sia's (2015) call to clarify how channel integration can be accomplished and the challenges that arise when a firm implements an omnichannel strategy.

Third, in addition to contributing to research on omnichannel management, the dissertation contributes to research on dynamic capabilities by identifying the abilities that underlie transformative processes like firms' transition to omnichannel management. In addition, the dissertation provides empirical insights for a field of research in which they are scarce (Pablo et al. 2007) and tend to be abstract and generic (e.g., Ambrosini and Bowman 2009; Easterby-Smith et al. 2009).

Fourth, for IS research a deeper understanding of omnichannel management with regard to IT is highly relevant, since it is a main driver as well as enabler: technological developments like digital devices and services drive the topic forward, and the dynamic reconfiguration of IT assets improves firm's ability to integrate their channels. The dissertation's insights also contribute to IS research by shedding light on the emerging role of IT in business transformation and providing concrete insights into the changing and enhanced interplay between IT and business departments and how to transition to omnichannel business.

The dissertation also makes a valuable contribution to practice. Awareness of the microfoundations that are necessary to transition to omnichannel business enables managers to make the right adjustments in the firms' practices and processes, leading to successful transformation processes to omnichannel business, which only a few firms have accomplished.

4.2. Focus Topic Digital Nudging

Research papers 4, 5, and 6 address the topic of digital nudging. Research paper 4 presents a basis for this focus topic by laying out the psychological effects of digital nudging, while research paper 5 provides an artifact to support the design of digital nudges that can enhance consumers' omnichannel experience, which is a core result of the dissertation. Research paper 6 presents the ethical perspective, another aspect of using digital nudging in the context of channel design. The insights these papers generate answer RQ2: *how can and should digital nudging be used to support an omnichannel experience?* Two primary conclusions are drawn in answering this research question:

(1) Digital nudging that is applied in channel design to enhance consumers' decision-making and their omnichannel experience should be done in a systematic way that considers the specific context (i.e., technology channel, firm and/or consumer goals, and consumers' characteristics and decision-making), emphasizing ideation and design (i.e., theoretical mechanisms that underlie digital nudging, creativity processes, and prioritization of outcomes), implementation of technology channels, and evaluation in terms of defined KPIs to increase the digital nudging's effectiveness (development process and the results).

(2) To enhance the omnichannel experience through digital nudging and avoid possible negative consequences, ethical boundaries must be respected.

(3) Digital nudging as a tool for designing digital channels allows firms to support consumers' decision-making, steer them through an omnichannel environment, and ultimately enhance their experience.

The insights generated for the focus topic of digital nudging make three primary contributions to research. First, the dissertation contributes to IS research by focusing on the newly developed topic of digital nudging, driving it forward in general (Weinmann et al. 2016) and providing research that focuses on the ethical perspective, replacing solely superficial statements about ethics in this context with solid research (e.g., Meske and Potthoff 2017; Schneider et al. 2018; Weinmann et al. 2016).

Second, the dissertation suggests and stimulates additional research into digital nudging in general and specific psychological principles, ethical concerns, and how to design digital channels to influence consumers' decision-making (e.g., Meske and Potthoff 2017; Schneider et al- 2018; Weinmann et al. 2016). Especially for design-oriented research, the dissertation enhances the ability to design digital nudges systematically and consistently, providing a more solid and unified basis for measuring its effects on decision-making and investigating related ethical concerns.

Third, the results extend, harmonize, and validate prior approaches to the systematic design of behavior-change interventions and PS (Fogg 2009; Oinas-Kukkonen and Harjumaa 2009; Meske and Potthoff 2017; Schneider et al. 2018) to a single approach for DND. The dissertation also extends insights in the digital nudging context by the first empirical investigation of consumers' ethical concerns in the context and offers guidance and stimulus for further investigations.

The dissertation makes valuable contributions for practitioners as well. First, awareness of digital nudging's underlying mechanisms and ethical boundaries gives practitioners general information about the limits of the approach, making it more accessible and implementable as a tool with which to design digital channels.

Second, by providing a systematic approach that uses concrete tools for designing digital channels with digital nudges, the dissertation provides practitioners with guidance and decision support that make channel designers more effective in supporting consumers' decision-making, enhancing consumers' omnichannel experience, respecting ethical boundaries, saving firms' resources by developing digital nudges effectively and efficiently, and avoiding negative consequences.

4.3. Overarching Research Topic Omnichannel Management

The overarching research topic of omnichannel management comprises the focus topics of channel integration and digital nudging, both of which are valuable components of achieving omnichannel management and a satisfactory omnichannel experience. In light of this dissertation's overarching research objective of *supporting the ability of establishing omnichannel management in order to enhance the consumers' omnichannel experience*, research paper 1 provides the basis for the subsequent investigation by laying out the current state of research into omnichannel management and possible avenues for further research. Concluding it can be said that the ability of integrating and designing channels with digital nudging supports firms in establishing omnichannel management and enhancing the consumers' omnichannel experience.

These insights make several contributions to research. First, they help to explain how the consumers' experience can be supported during their journey through an omnichannel environment (Lemon and Verhoef 2016). The analysis of both channel integration as a necessary capability and digital nudging as a tool with which to design channels provides concrete approaches clarifies for research how to conduct a satisfactory omnichannel approach.

Second, research is extended by the dissertation's empirical research on three research topics where empirical insights are scarce: omnichannel management, channel integration, and digital nudging. The

research is especially for IS research since omnichannel management is driven and enabled through IT (Brynjolfsson et al. 2013, pp. 24-25; Hansen and Sia 2015, pp. 51-52; Verhoef et al. 2015, p. 175).

Besides contributing to research, the dissertation makes valuable contributions to practice. Practitioners receive support in their efforts in relation to omnichannel management in general, but also in their efforts to integrate and design channels. The right IT infrastructure and the processes, capabilities, and tools to develop it are necessary for a firm to establish omnichannel management (Hansen and Sia 2015). As a result, the dissertation helps to close the gap between the vision of omnichannel management and the approaches that have been implemented in practice because of a lack of guidance (Brynjolfsson et al. 2013, p. 24; Mueller-Lankenau et al. 2006, pp. 187-188; Trenz 2015, p. 10).

5. Summary, Limitations, and Outlook

The aim of this dissertation is to *support the ability of establishing omnichannel management in order to enhance the consumers' omnichannel experience*. In particular, it seeks to answer the questions concerning *what capabilities support the provision of an omnichannel experience* and *how digital nudging can be used to support an omnichannel experience*. Based on the insights generated by research papers 1-6, conclusions were drawn that support firms' ability to establish omnichannel management to enhance consumers' omnichannel experience, identify the capabilities that support the provision of an omnichannel experience, and explain how digital nudging can be used to support an omnichannel experience. This dissertation focuses on the B2C context and the provision of an omnichannel setting to consumers, closes research gaps, and extends the research that supports practice in mastering challenges in the context of omnichannel management, channel integration, and digital nudging to provide consumers a satisfactory experience.

The dissertation meets its overarching research objective by focusing on the two focus topics of channel integration and digital nudging and their related research questions, which are answered by the individual research papers that are related to each topic. Research paper 1 provides the starting point for the dissertation by laying out the current state of research on omnichannel management and avenues for further research. Research paper 2, and based on it, research paper 3 focused on identifying the specific capabilities required to provide omnichannel management. The result of this bundled research venture are four identified microfoundations of channel integration that facilitate the establishment of omnichannel management: processes that learn, value-based governance, dynamic commitment of resources, and modular design. Research paper 4 initiates the investigation of digital nudging by screening the literature for the psychological principles that underlie this concept and enriching the most common psychological principles

with examples of how they can be affected by digital nudging. Research paper 5 provides concrete guidance on how to design digital nudges for digital channels by introducing a method that brings together approaches from theory and practice. Research paper 6 extends guidance on using digital nudging by providing a list of ethical principles to avoid when using digital nudging. In summary, then, the research papers and thereby, this dissertation, (1) raise awareness, (2) provide the necessary knowledge base, and (3) guidance for firms to establish omnichannel management and enhance consumers' omnichannel experience.

The dissertation has several limitations. First, the generalizability of the results should be examined because of their derivation from qualitative research methods, the limited access to certain industries and firms, and possible issues with data analysis (e.g., coding interview transcripts in research paper 3). Second, the dissertation focuses on channel integration as a capability with which to establish and manage an omnichannel approach and digital nudging as a tool for channel design. However, the study uses only some of what can support the establishment of omnichannel management, so the dissertation does not claim to generate a holistic view on omnichannel management in support of omnichannel experience-enhancing capabilities and tools. Additional research is encouraged to validate the presented results to increase their generalizability. For example, based on research paper 3, other firms in other industries could be analyzed. In addition, another analysis of user opinions on ethics in the context of digital nudging or research on identifying ethical considerations qualitatively, based on research paper 6, could be conducted. Future research might also look into other tasks of channel management and how they can strengthen support for establishing omnichannel management by identifying additional capabilities and microfoundations. Further research could also use the DND method in other settings, such as in the context of design-oriented research and to measure effects of new digital nudges and how they support consumers in using firms' channels or how capable they are in steering the consumer through an omnichannel environment. In this context, it could also be useful to assess the strength of the omnichannel experience's effect. Furthermore, it could be useful to investigate to what degree digital nudging is accepted as ethical and how digital nudges can be used to manage and avoid channel conflict (Rosenbloom and Anderson 1985, p. 98). From a firm's perspective, useful research could emerge from an investigation of how digital nudges can be used to motivate employees to abolish silos and enhance collaboration or increase their productivity, taking a business-to-employee approach of digital nudging.

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Appendix

Appendix 1: Research Paper 1

Title	Channel integration towards omnichannel management: A literature review
Authors	Tobias Mirsch Christiane Lehrer Reinhard Jung
Publication Type	Conference Paper
Status of Publication	Published
Reference	Mirsch, T., Lehrer, C., Jung, R. (2016). Channel integration towards omnichannel management: A literature review. *In Proceedings of the 20th Pacific Asia Conference on Information Systems (PACIS),* Chiayi, Taiwan, 1–16.
Access	http://aisel.aisnet.org/pacis2016/288

CHANNEL INTEGRATION TOWARDS OMNICHANNEL MANAGEMENT: A LITERATURE REVIEW

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Abstract

The evolution of technology and the constant digitalisation strongly influence how consumers behave, how markets develop, and how companies and consumers interact. By offering many channels, companies attempt to react to these developments. In recent years, researchers as well as practitioners have proposed omnichannel management as the best approach to offer several channels. An omnichannel strategy enables consumers to use channels seamlessly and interchangeably and experience the channels uniquely. However, reality looks different: many channel management approaches coexist in practice, and in research, terms to describe different concepts are used without clear distinctions. This paper seeks to eliminate ambiguities regarding the term omnichannel management. By delimiting the term from related approaches and understanding current topics discussed by omnichannel management research, this paper creates a common basis from which to fully understand the concept. Omnichannel management has shown relevance in many areas, but particularly in retailing, marketing, and information systems (IS) research. IS plays an important role in the implementation of the omnichannel approach because obstacles are often technology-related and companies are strongly dependent on information technology (IT). To move research on omnichannel management forward, this paper proposes directions for further research.

Keywords: omnichannel management, channel integration, multichannel, literature review

1 INTRODUCTION

Technological advancements have driven the proliferation of possible channels with which firms communicate with consumers, sell products, and render services available (Dimitrova & Rosenbloom 2010;

Lewis et al. 2014; Schramm-Klein et al. 2011; Seck & Philippe 2013; Zhang et al. 2010). These changes have significantly influenced business models, sales channels, and more importantly, consumer behaviour and demand (e.g., Aubrey & Judge 2012; Backhaus & van Doorn 2007; Brynjolfsson et al. 2013; Dimitrova & Rosenbloom 2010; Verhoef et al. 2015). In addition to physical stores, hotlines, and catalogues, many companies operate, for example, websites, mobile apps, and social media presences (Piotrowicz & Cuthbertson 2014). Consumers willingly use new channels when those channels are offered. In many cases, consumers do not complete a purchase process using only one channel (Aubrey & Judge 2012). Of globally polled customers, 86% shop in various channels and want to use channels simultaneously (McPartlin & Feigen Dugal 2012). This indicates, for example, that consumers use their mobile devices in the physical store, retrieving information during the store visit on their mobile devices to gather more information regarding products or the best prices and offers. Of consumers who use their mobile devices in-store for information purposes, 71%, regard the mobile device to be an important component of their shopping experience (Krueger 2015). Additionally, consumers desire a seamless and unified experience across all phases of the purchase process and across all channels (Nunes & Cespedes 2003; Van Bruggen et al. 2010). Of consumers, 81% want to experience the brand as a whole across all channels, and 54% would consider cancelling their relation with a company if personalised content is not available (Mohapatra 2014).

As previously described, the evolution of technology and ongoing digitalisation have rendered consumers' interchangeable and seamless use of channels possible. Therefore, the lines between different channels increasingly blur (Brynjolfsson et al. 2013; Trenz 2015). Particularly in retailing, this trend implies significant change. Classical brick-and-mortar stores offer the uniqueness of consumers' being able to touch products with immediate satisfaction; however, online channels can lure with more information, price comparisons, and user-generated content such as ratings and reviews (Aubrey & Judge 2012; Kim 2002). Thus, retailers must adjust their channel management to provide the appropriate channel configuration and consumer experience (Brynjolfsson et al. 2013). Many retailers have previously adjusted their channel strategies towards multichannel retailing, i.e., offering a broad range of channels. This strategy has been established as the most significant and most dominant approach for many retailers (Beck & Rygl 2015; Lewis et al. 2014; Verhoef et al. 2015; Zhang et al. 2010). In many cases, these channel expansions were not the result of meticulous planning, but were driven by market developments and new consumer demands (Klaus 2013; Trunick 2015; Van Bruggen et al. 2010). However, to fully meet today's consumer needs for simultaneous channel use and seamless channel switching with a uniform brand perception, retailers must go one step further. The omnichannel strategy represents the vision of the ideal strategy to offer various channels with regard to the latest developments and to match today's consumer behaviour (Beck & Rygl

2015; Lewis et al. 2014; Verhoef et al. 2015; Zhang et al. 2010). Of globally polled retailers, 84% believe that a uniform consumer experience across channels is extremely important (Forbes 2015) to be competitive in a digitalised and constantly changing market environment (Piotrowicz & Cuthbertson 2014; Trunick 2015; Verhoef et al. 2015).

The management of several channels has been investigated in disciplines such as marketing, retailing, and information systems (IS). Research in these fields has primarily examined the consumer perspective, particularly multichannel shopper characteristics and behaviour across channels (e.g., Ansari et al. 2008; Venkatesan et al. 2007). Another research stream has focussed on the company perspective and analysed channels' effects on the performance of offline or online channel implementation (e.g., Avery et al. 2012; Geyskens et al. 2002; Homburg et al. 2014; Pauwels et al. 2011). In previous research on the management of several channels, studies primarily took a dichotomous viewpoint, making a clear distinction between online and offline channels. From a management perspective, the key question was whether a company should offer an online channel (e.g., Brynjolfsson et al. 2013; Chen & Ku 2013; Neslin et al. 2006; Trenz 2015).

However, in today's digitalised environment, the question of whether online channels should be implemented is no longer the focus. More important is the question of how the many channels can be handled synergistically to maximise the consumer experience. Against this background, research has focussed on the concept of omnichannel management. However, in the academic literature, the term omnichannel is rather new, first mentioned in April 2012 in Aubrey and Judge's (2012) article 'Re-imagine retail: Why store innovation is key to a brand's growth in the "new normal" , digitally connected and transparent world'. When analysing omnichannel research in detail, one observes numerous variations and terms to describe strategy concepts using several channels and that the omnichannel concept is not yet fully established (Trenz 2015). Terms such as multichannel management, crosschannel management, omnichannel management, channel integration, and other variations coexist. Such terms are often used interchangeably and without demarcation, which leads to uncertainty and a lack of distinction regarding the underlying concept (Beck & Rygl 2015; Klaus 2013). Many articles refer to the concept of multichannel and use the concept as an umbrella term to describe different strategies, regardless of the channel configuration (Beck & Rygl 2015; Verhoef et al. 2015). However, subsuming all channel concepts under the term multichannel does not appropriately express channel integration and the seamless, interchangeable use of channels (Neslin et al. 2006; Rigby 2011). Therefore, some authors are using the term omnichannel management to capture the new capabilities and features of this advanced channel management concept (e.g., Beck & Rygl 2015; Brynjolfsson et al. 2013; Piotrowicz & Cuthbertson 2014; Trunick 2015; Verhoef

et al. 2015) or suggest the extension of other terms (Trenz 2015). Trenz (2015) argued that there is 'a mismatch between this conceptualization of multichannel applied in research and today's market realities. It demonstrates that this conceptualization may no longer be sufficient to fully encompass the complexity of a converging multichannel environment' (p. 10) and that channel settings exist that are not covered by the currently prevailing multichannel concept. Considering omnichannel management as a distinct concept is promising because the term raises specific and relevant questions that were not relevant in the multichannel context and may be fruitful endeavours for IS research. Important topics include, but are not limited to, data integration, organisational change, pricing across various channels or the aligned management of a broad range of channels.

In this paper, we seek to answer the following research questions: (1) How can omnichannel management be defined and differentiated from other management concepts of several channels? (2) What is the status quo of omnichannel research? (3) What are avenues for further omnichannel research?

To answer these research questions, we conducted a systematic literature review encompassing research from different disciplines. The contribution of this paper is threefold. First, this research reduces the fuzziness of the term omnichannel management and provides a clear demarcation between multichannel and crosschannel management. Second, this study provides a consolidated overview of the body of knowledge regarding omnichannel management. Third, the paper offers proposals for further research based on the state of current omnichannel management research.

This paper is structured as follows: First, we present our elaborated definitions and distinction between the concepts multichannel, crosschannel, and omnichannel management. Subsequently, we provide an overview of existing research on omnichannel management. Finally, we summarise the primary conclusions and propose avenues for further research to drive omnichannel research forward.

2 OMNICHANNEL MANAGEMENT

To provide a comprehensive overview of the existing research on the management of multiple channels, we conducted a literature review in December 2015. To identify relevant literature regarding the management of multiple channels in general and more specifically, the concepts multi-, cross-, and omnichannel management, we followed the methodology proposed by vom Brocke et al. (2009). First, we performed a search spanning multidisciplinary databases providing access to academic journals and conference proceedings. We applied the search in the fields title, keywords, and abstract and divided the queries into four phrases to better understand the occurrence of the results. Afterwards, we excluded

duplicates, articles not published in journals, articles presented in conferences, and articles not published in English (993 articles). Subsequently, we examined the sum of identified articles (1683) to evaluate whether the articles could contribute to this paper. We excluded articles not topic-related, for example, articles regarding multiple channel EEG telemetric systems or multichannel ad hoc networks. After this evaluation, we determined 69 articles on the management of multiple channels to be relevant for this paper.

In addition to the consolidated definition of omnichannel management and the clear distinction from the other two concepts in section 2.1, it is our goal to provide a full overview of previous literature on omnichannel management as presented in section 2.2. Because the term omnichannel management is rather new and not used by all authors, we had to extract all papers from the previously identified body of knowledge (69 articles) that either used the term explicitly or at least referred to the underlying concept of omnichannel management. To identify relevant articles, we thoroughly analysed the entire stock of 69 selected articles by reading the channel concepts and strategy descriptions. Then, we compared the resultant insights into the definition of omnichannel management presented in section 2.1. As soon as the characteristics of the described strategies or concepts unquestionably matched the description of the omnichannel concept, we assigned those characteristics to this concept, no matter the terms used by the authors to identify their concept or strategy. For example, Mueller-Lankenau et al. (2006) described a concept with their multichannel integration strategy that foresees channels 'as complementary components of a multi channel system that aims to provide a high level of convenience to customers, e. g. through supporting channel hopping in and between transaction phases'(p. 9) and also referred to the harmonisation of (offline and online) presences and extensive integration. This description matches the characteristics of the omnichannel approach. Using this procedure, we identified a total of 18 relevant articles.

Table 1 shows the four applied search phrases and the results of the literature search.

Database	**Search Phrase 1** ("multichannel" OR "multi-channel") AND (management OR strategy)	**Search Phrase 2** ("crosschannel" OR "cross-channel") AND (management OR strategy)	**Search Phrase 3** ("omnichannel" OR "omni-channel") AND (management OR strategy)	**Search Phrase 4** "multiple channel" OR "channel integration" OR "integrated channels"
EBSCOhost	376	14	4	289
AISeL	72	16	2	0
ScienceDirect	906	83	14	723
Emerald	131	11	6	29
Excluded articles				993
Total identified articles				1683
Total identified multiple-channel-management articles				69
Total identified omnichannel articles				18

Table 1. Results of Literature Search

2.1 Defining and differentiating Multi-, Cross- and Omnichannel Management

Consumers tend to use increasingly more channels within the customer journey, either in the search, purchase, or after-sales phase (Neslin et al. 2006; Weinberg et al. 2007). Channels are the sum of routes or paths by which a company delivers products, services, or information to recipients (Mehta et al. 2002). Channels represent 'a customer contact point or a medium through which the firm and the customer interact' (Neslin et al. 2006, p. 96). Channels are, for example, a store, a hotline, or a website. Meanwhile, the consumer using multiple channels has become the norm. Therefore, a channel strategy matching market and consumer needs is crucial for businesses, particularly in today's competitive environment (Lewis et al. 2014; Payne & Frow 2004; Verhoef et al. 2015; Zhang et al. 2010). A channel strategy represents a 'broad set of principles by which a firm seeks to achieve its distribution objectives' (Mehta et al. 2002, p. 430). The channel strategy describes the manner in which channels contribute to the company's overall objective (Mehta et al. 2002). As previously stated, using multiple channels is a strategy widely employed by retailers as the key to satisfying consumer needs with the objective of increasing sales (e.g., Mueller-Lankenau et al. 2006; Verhoef et al. 2015). This approach is an answer to changed shopper behaviour rather than the result of meticulous channel and strategy planning (Lewis et al. 2014; Verhoef et al. 2015; Zhang et al. 2010). A company's channel management must consider many conditions. Channel management describes the process by which a company analyses, plans, organises, and controls their channels (Mehta et al. 2002). Channel management considers all channels regardless of their function, such as communication, customer service, or distribution of products and services (Stone et al. 2002). Channel management can range from the complete separation of channels with individual considerations to total integration with full channel coordination (Neslin et al. 2006). Nevertheless, between those two extremes exist many graduations and strategies (Trenz 2015). In this section, we define the terms multichannel, crosschannel, and omnichannel management, which are mentioned within the context of the management of multiple channels. Defining these terms will lead to a shared understanding of the term omnichannel and differentiate this concept from related channel management approaches.

2.1.1 Multichannel Management

Multichannel management refers to 'the set of activities involved in selling merchandise or services to consumers through more than one channel' (Zhang et al. 2010, p. 2). According to Neslin et al. (2006), this set of activities encompasses 'the design, deployment, coordination, and evaluation of channels to enhance customer value through effective customer acquisition, retention, and development' (p. 96). Multichannel management primarily indicates that a company offers multiple channels. For example, a retailer with a

website and a physical store may offer the possibility of ordering a product online although the product ordered online is not returnable to the store. This approach suggests that the channels are not interconnected. In fact, the channels are treated separately and generally managed by different teams, each with its own agendas and goals. This configuration also indicates that the teams are incentivised differently. Furthermore, there is no channel integration and therefore no exchange of data across channels. The focus of multichannel management is on each channel (Beck & Rygl 2015; Verhoef et al. 2015).

2.1.2 Crosschannel Management

Beck and Rygl (2015) described the crosschannel strategy as a partial integration of several channels. Crosschannel strategy indicates the possibility for a consumer to switch between certain, but not between all, available channels. For example, the customer can return a catalogue-ordered product to a physical store, or she can redeem a voucher in a store that she received via email. A crucial characteristic of the crosschannel approach is that there is a certain degree of interaction and integration among individual channels or touchpoints (De Faultrier et al. 2014). The crosschannel approach is not limited to channels; this approach also considers touchpoints (Beck & Rygl 2015). A touchpoint represents any point of contact between the consumer and the company and is not necessarily marked by interaction. Touchpoints are 'an episode of direct or indirect contact with a brand or firm' (Verhoef et al. 2015, p. 175). Touchpoints include, TV, billboards, or radio (Verhoef et al. 2015).

However, full integration across all available channels and touchpoints within the crosschannel approach is lacking. Therefore, within this strategy, the management and goal setting is per channel, per touchpoint, or per specific integration of channels or touchpoints. In addition, because of this setting, data cannot be shared across all channels and touchpoints. We regard crosschannel management to be an intermediate step between multichannel and omnichannel management.

2.1.3 Omnichannel Management

Omnichannel management represents an evolutionary step of the multichannel and crosschannel concept. Compared with the two previously described concepts, the barriers between all channels and touchpoints vanish completely. In fact, freely moving and switching by consumers among all contact points is not only anticipated but favoured (Piotrowicz & Cuthbertson 2014; Verhoef et al. 2015). The primary difference between the multichannel or crosschannel and the omnichannel approaches is the degree of channel coordination and integration. According to Bendoly et al. (2005), channel integration refers to the degree to which various channels in a channel environment interact with one another. This integration allows a

seamless customer experience, a unique brand image, data sharing, and overall management. In general, the omnichannel concept is the most extensive approach offering several channels and touchpoints (Verhoef et al. 2015).

To define omnichannel management, we follow Verhoef et al. (2015). Although Beck and Rygl (2015) defined the omnichannel approach similarly, we believe that the definition provided by Verhoef et al. (2015) better expresses the characteristics of omnichannel management (see Table 2) and better describes the underlying concept. Verhoef et al. (2015) defined omnichannel management as 'the synergetic management of the numerous available channels and customer touchpoints, in such a way that the customer experience across channels and the performance over channels is optimized' (p. 176). In addition, we highlight their statement that '[c]hannels are interchangeably and seamlessly used during the search and purchase process' (Verhoef et al. 2015, p. 175). Although this factor is implied in their definition, such a concept merits emphasis because this statement represents the key evolutionary step that distinguishes the omnichannel from the multichannel and crosschannel approaches. The synergetic management implies that the channels and touchpoints are managed as a unit. This unity of all possible contact points between the company and the consumer results in interaction and linkage among all channels and touchpoints as well as the possibility of simultaneous use. Thereby, the consumer experiences not simply the channel or touchpoint, but the brand as a whole (Piotrowicz & Cuthbertson 2014; Verhoef et al. 2015). Consumers can select their most preferred channel for every situation in their relation with the company. For example, a consumer may be attracted by a promoted product on a billboard that mentions a website. Later, at home, this consumer gathers more information and places the chosen product in the shopping basket but does not complete the purchase. While commuting to work by train, this consumer opens the company's own shopping app, in which the product is also in the shopping basket. This consumer then completes the purchase via the app and chooses store pick-up. As this example illustrates, consumers can switch from one channel to another without interrupting their transaction stage. If the consumer switches channels during the purchase phase, for example, from an online shop to a mobile app, this shift does not result in the loss of the progress the consumer has made. The omnichannel strategy aims at a seamless and unique experience regardless of the purchase phase the consumer is in or the channel the consumer uses (Brynjolfsson et al. 2013; Piotrowicz & Cuthbertson 2014; Rigby 2011; Rosenblum & Kilcourse 2013).

Another important characteristic of omnichannel management is data integration. Compared with the multichannel and crosschannel approaches, more data are fuelling the databases. New opportunities for data sources are provided, particularly by social and mobile channels. Insights regarding transactions and interactions can be generated. To leverage the opportunities for vast amounts of data gathered in the

omnichannel environment, companies must integrate consumer data from all channels and have the ability to analyse that data. Only then can a company create customer insights and correctly and personalised address the right consumer to enhance the experience (Brynjolfsson et al. 2013; Trenz 2015).

Table 2 presents a comprehensive overview of the characteristics of each channel management approach.

Characteristic	Multichannel	Crosschannel	Omnichannel
Path of Product/Service/ Information Delivery	Channels	Channels and touchpoints	Channels and touchpoints
Integration	No switching between channels possible	Switching between certain channels and touchpoints possible	Seamless switching among all channels and touchpoints possible
Management	Separated by channel	By channel or connected channels and touchpoints	Across all channels and touchpoints
Goals	By channel	By channel or connected channels and touchpoints	Across all channels and touchpoints
Interaction	Two-way	Any type	Any type
Data	Data are not shared across channels	Data are partially shared across channels	Data are shared across all channels

Table 2. Differentiation of Channel Management Concepts

2.2 State of Research on Omnichannel Management

In this section, we describe in detail the insights generated by these three streams of omnichannel research. When analysing the omnichannel literature, we discovered that all authors considered at least the channels store and web in combination; however, some authors focussed solely on these two channels. Many of the authors additionally considered the channels catalogue, telephone, and mobile devices. Only a few authors included the channels social media, sales or service force, and new technologies such as virtual channels. Analysing the omnichannel literature, we identified three primary topics: strategy conceptualisation and requirements, transformation towards omnichannel management, and the obstacles and benefits of omnichannel management.

2.2.1 Strategy Conceptualisation and Requirements

This stream of omnichannel research focuses on the strategic aspects of the omnichannel approach and the requirements for an omnichannel strategy. Mueller-Lankenau et al. (2004), de Faultrier et al. (2014), and Beck and Rygl (2015) developed an overview of different approaches to manage several channels. Based on the cases of four retail companies that conduct different multiple channel strategies, Mueller-Lankenau et al. (2004) classified and illustrated four types of multichannel strategies, from which one approach

describes an omnichannel strategy. The identified core strategies differ in channel interdependence and range from the complete isolation of channels to full integration. This view of differentiation was also adopted by de Faultrier et al. (2014), who identified eight retail channel strategies. In a later publication, Mueller-Lankenau et al. (2006) suggested a further distinction between four different developed typologies of multichannel strategies: offline focussed strategy, online focussed strategy, isolation strategy, and integration strategy (Bahn & Fischer 2003; Doolin & McQueen 2003; Gulati & Garino 2000; Venkatesh 1999). Mueller-Lankenau et al. (2006) based this further distinction on the existence of a broad variety of strategies that retailers apply, even when the integration strategy is described as the most preferred strategy. Based on this knowledge, those authors stated, 'there is no single best approach to multi channel retailing' (Mueller-Lankenau et al. 2006, p. 188); however, any approach must be strongly dependent on the company's overall strategy, market, and products. To support channel strategies, Mueller-Lankenau et al. (2006) developed a model of strategic channel alignment and applied that model to four retailers to illustrate the different approaches applied in practice. Beck and Rygl (2015) categorised the different approaches of multiple channel management within the retail context. Their work is based on a review of the multiple channel literature. Beck and Rygl (2015) synthesised their results to subsequently develop a taxonomy of multiple channel retailing. Their results render it clear, consistent with Mueller-Lankenau et al. (2006), that in addition to the developed categorisation and subcategories, there are many variations of the channel strategies.

Berman & Thelen (2004) described the requirements for 'a well-integrated multi-channel' (p. 147) retail strategy: integration of promotions, consistency of products across channels, and integrated information systems that are capable of capturing data regarding customers, price, and inventory across all channels. Furthermore, consumers should be able to initiate a purchase in one channel and complete it in another, perceive the company as one entity, and be offered various channel options within one channel system. Tate et al. (2004) also mentioned these characteristics in their conceptualisation of an omnichannel strategy. Additionally, Tate et al. (2004) mentioned logistics and customer management, process engineering, and market sensing as success factors. Kernaghan (2013), who broached the integration and migration of service channels, focussed on the 'removal of political and legal, structural, operational and managerial, and cultural barriers' (p. 135). All works emphasise that the channels should be perceived as a component of the overall mission without being treated as separate silos with their own agendas (Berman & Thelen 2004; Kernaghan 2013; Mueller-Lankenau et al. 2004; Mueller-Lankenau et al. 2006; Tate et al. 2004).

2.2.2 Transformation towards Omnichannel Management

This stream of omnichannel research focuses on the drivers, the need, and the process of transforming multiple channel strategies towards the omnichannel approach. Several of the articles on omnichannel management discussed technological developments and evolving customer needs. Technological developments and the change in customer needs are the primary drivers for companies to adapt an omnichannel strategy as a new and contemporary approach with several channels. This shift is described as an opportunity, particularly in retailing, which can be an advantage as long as retailers construct an ecosystem of connected offline and online channels within an omnichannel environment (Aubrey & Judge 2012; Brynjolfsson et al. 2013; Hansen & Sia 2015; Piotrowicz & Cuthbertson 2014; Trenz 2015; Verhoef et al. 2015). In particular, mobile devices and location-based services (Aubrey & Judge 2012; Brynjolfsson et al. 2013; Hansen & Sia 2015; Piotrowicz & Cuthbertson 2014; Verhoef et al. 2015) and social media (Hansen & Sia 2015; Piotrowicz & Cuthbertson 2014) are named as the primary drivers of this channel transformation. The majority of the authors focussed on the gap between offline and online channels because the lines between offline and online channels are constantly blurring caused by the increasing number of channels that connect the offline and online dimensions (Aubery & Judge 2012; Brynjolfsson et al. 2013; Hansen & Sia 2015; Piotrowicz & Cuthbertson 2014; Trenz 2015).

Hansen and Sia (2015) noted that companies must focus on changes in technology infrastructure and organisational practices to successfully transform towards an omnichannel strategy. Additionally, those authors identified four key learnings: (1) ‘embrace your channel partners in the omnichannel strategy’ (p. 62). This means that every channel, in this case the business-to-business partners of a company, must be considered, sensitised regarding the strategy, and integrated. Another learning is (2) ‘recognize that a successful omnichannel strategy requires deep change’ (p. 62), noting that the transformation to an omnichannel approach is not simply adding up channels, but committing to deep technological, organisational, and mind-set changes. The learning (3) ‘leverage the strategic role of chief digital officer’ (p. 63) also refers to the omnichannel mind-set that must be established in all areas of the company. Hansen and Sia (2015) noted the importance of the alignment of IT with business strategy during the transformation towards omnichannel management. The last key learning, (4) ‘evolve the role of CIO in enabling an omnichannel strategy’ (p. 65), refers to the extension of the boundaries of IT to lead the transformation process towards omnichannel management. By successfully extending IT, the company may benefit from this transformation process by increasing sales (Hansen & Sia 2015; Weinberg et al. 2007), brand awareness and visibility; improving e-commerce capabilities (Hansen & Sia 2015); and creating a unique brand image (Weinberg et al. 2007).

Using focus groups, Piotrowicz and Cuthbertson (2014) identified primary issues and trends in omnichannel management related to the role of technology and implementation in retailing. In addition to current technological in-store drivers of omnichannel strategies such as virtual screens, fitting rooms with virtual mirrors, intelligent self-services, or dynamic menus, Piotrowicz and Cuthbertson (2014) postulated that wearable technology and 3D printing will drive the transformation even further.

2.2.3 Obstacles and Benefits of Omnichannel Management

Within this stream of omnichannel research, the focus is on obstacles during the implantation or the management and benefits of the omnichannel approach. Lewis et al. (2014), Neslin et al. (2006), Goersch (2002), and Stone et al. (2002) elaborated on challenges that must be addressed to benefit from an omnichannel strategy. Lewis et al. (2014), Neslin et al. (2006), and Stone et al. (2002) emphasised these obstacles. Those authors noted the obstacles to understanding the need to acquire and change resources and channel integration, which are closely connected. Further obstacles are the enabling of a seamless and consistent consumer experience across all channels; the sharing of common resources; the generation and integration of analysable data across all channels, achieving a seamless view of the consumer; and the use of certain channel synergies. These tasks are challenging for many retailers. Often, channels are simply added to existing systems instead of providing a new IT infrastructure dedicated to an omnichannel setting. Moreover, with these challenges comes another: investment to acquire or switch resources to achieve channel integration (Lewis et al. 2014; Stone et al. 2002). Because not only the redesign is an obstacle, the ensuing investment for the right IT infrastructure must also be addressed when several channels are managed in an integrated system. A further challenge is the justification of channels because channels are measured separately. In isolation, a channel may not be profitable; however, within the omnichannel setting, a single channel may support overall performance. Therefore, the true performance of single channels is more difficult to evaluate. Additionally, Neslin et al. (2006) named resource allocation across channels as an obstacle, which is also challenging because of the isolated evaluation of channels. Moreover, Stone et al. (2002) mentioned the removal of organisational borders as a challenging task, and Goersch (2002) remarked that before benefits can be achieved, it is necessary to improve customer acquisition, customer extension, and customer retention; and a company must provide integrated branding across channels, channel cross-promotions, consistency, integrating logistics, channel-specific capabilities, and information management.

Goersch (2002), Stone et al. (2002), Neslin et al. (2006), and Lewis et al. (2014) also highlighted benefits resulting from an omnichannel strategy. Goersch (2002) noted that a successfully conducted

omnichannel strategy leads to increased awareness, trust, control over the customer, enhanced support, ubiquitous personalisation, and customer convenience. Additionally, Stone et al. (2002) mentioned the benefits of increased customer value, an improved consumer experience, increased customer loyalty, increased efficiency by channel synergy, increased organisational flexibility, and improved customer knowledge because of an improved database. Neslin et al. (2006) also noted better knowledge of customers as a benefit in addition to economies of scale, differentiated offerings on channels (Zettelmeyer 2000), reduced channel conflicts, price consistency (Tang & Xing 2001; Zettelmeyer 2000), improved intra-organisational communication, improved customer-firm relations, increased service quality (Sousa & Voss 2006), and the ability to compensate for a channel's weakness with another channel's strength (Achabal et al. 2005). In sum, Table 3 presents an overview of the literature on omnichannel management.

Author and Title	**Research Area**	**Term Used for Channel Concept**	**Topic Cluster**
Aubrey & Judge (2012): 'Re-imagine retail: Why store innovation is key to a brand's growth in the "new normal", digitally-connected and transparent world'	Marketing	Seamless Cross-Channel; (Integrated) Omnichannel Retail	Transformation towards Omnichannel Management
Beck & Rygl (2015): 'Categorization of multiple channel retailing in multi-, cross-, and omni-channel retailing for retailers and retailing'	Retailing	Omni-Channel Retailing	Strategy Conceptualisation and Requirements
Berman & Thelen (2004): 'A guide to developing and managing a well-integrated multi-channel retail strategy'	Retailing	Well-integrated Multichannel Retail Strategy	Strategy Conceptualisation and Requirements
Brynjolfsson et al. (2013): 'Competing in the age of omnichannel retailing'	Retailing	Omnichannel Retailing	Transformation towards Omnichannel Management
De Faultrier et al. (2014): 'Defining a retailer's channel strategy applied to young consumers'	Retailing	Multichannel Strategy (Transactional Integration)	Strategy Conceptualisation and Requirements
Goersch (2002): 'Multi-channel integration and its implications for retail web sites'	IS	Multichannel Integration	Obstacles and Benefits of Omnichannel Management
Hansen & Sia (2015): 'Hummel's digital transformation toward omnichannel retailing: Key lessons learned'	IS	Omnichannel Strategy	Transformation towards Omnichannel Management
Kernaghan (2013): 'Changing channels: Managing channel integration and migration in public organizations'	Public Admin-istration	Service Channel Strategy (Integrated Service Delivery)	Strategy Conceptualisation and Requirements
Lewis et al. (2014): 'Drivers and technology-related obstacles in moving to multichannel retailing'	Retailing	Multichannel Retailing Strategy	Obstacles and Benefits of Omnichannel Management
Mueller-Lankenau et al. (2004): 'Developing a framework for multi channel strategies. An analysis of cases from the grocery retail industry'	IS	Multichannel Integration Strategy	Strategy Conceptualisation and Requirements

Mueller-Lankenau et al. (2006): 'Strategic channel alignment: an analysis of the configuration of physical and virtual marketing channels'	IS	Multichannel Integration Strategy	Strategy Conceptualisation and Requirements
Neslin et al. (2006): 'Challenges and opportunities in multichannel customer management'	Service	Multichannel Strategy/ Integration	Obstacles and Benefits of Omnichannel Management
Piotrowicz & Cuthbertson (2014): 'Introduction to the special issue information technology in retail: Toward omnichannel retailing'	Retailing	Omnichannel Retailing	Transformation towards Omnichannel Management
Stone et al. (2002): 'Multichannel customer management: The benefits and challenges'	Marketing	Multichannel Customer Management	Obstacles and Benefits of Omnichannel Management
Tate et al. (2004): 'Theory and practice in multi channel e commerce strategies: A case study of an apparel and home-ware retailer'	IS	Multichannel E-Commerce Strategy	Strategy Conceptualisation and Requirements
Trenz (2015): 'The blurring line between electronic and physical channels: Reconceptualising multichannel commerce'	IS	Multichannel Continuum	Transformation towards Omnichannel Management
Verhoef et al. (2015): 'From multi-channel retailing to omni-channel retailing: Introduction to the special issue on multi-channel retailing'	Retailing	Omnichannel Management	Transformation towards Omnichannel Management
Weinberg et al. (2007): 'Multichannel marketing: Mindset and program development'	Marketing	Multichannel Marketing	Transformation towards Omnichannel Management

Table 3. Literature on Omnichannel Management

2.3 Discussion of the Findings

When analysing the omnichannel literature, one notes that research describing the need for a shift towards omnichannel management is rather new (2012-2015). The majority of studies agree that omnichannel management is the approach that companies should focus on; however, in reality, many companies apply different approaches (Mueller-Lankenau et al. 2006; Trenz 2015). This dichotomy may be an indicator that there is not a single established approach for companies; the channel management approach strongly depends on each company's factors, such as industry, products, or customers, as Mueller-Lankenau et al. (2006) stated. The dichotomy could also indicate that it is challenging to present strategic and practical guidance to create the ideal picture of an omnichannel strategy. Research has presented a clear picture of omnichannel management but lacks the guidelines to obtain there. Existing approaches either do not consider the latest technological developments (Berman & Thelen 2004) or are case-specific (Hansen & Sia 2015; Kernaghan 2013), which renders generalisability difficult. Furthermore, by focusing

predominantly on the offline-online gap, research does not provide a holistic view of omnichannel management, as Trenz (2015) stated. In addition to the missing view on all channels, the perspective on social media is rarely considered.

The majority of research focuses on the existing gap between offline and online channels and the underlying goal of merging the two channel dimensions. This focus is most likely because the majority of existing research was conducted within the retail context. This research is particularly important for retailers, who are often trying to connect their stores with their online presences to enhance the consumer experience (Piotrowicz & Cuthbertson 2014). In particular, mobile technologies are important considering the gap between offline and online channels. Mobile devices can bridge that gap because those devices can take the online experience into the brick-and-mortar store because of a comprehensive Internet connection and the independence of the location. In addition, the obstacles these studies noted may explain the gap between the ideal picture of omnichannel management proposed by research and the applied approaches in reality. Research noted that channel integration is an obstacle in many companies. To achieve full channel integration, companies are required to change IT infrastructure, establish an overall mission, and develop the appropriate mind-set. Companies must break down organisational silos and establish an omnichannel mind-set and overall mission. Hansen and Sia (2015) in particular highlight the role of IT. IT and business strategy must overlap and collaborate. Bharadwaj et al. (2013) noted the necessity of overthinking the role of IT and merging IT with business strategy. The development of this consciousness and commitment within a company towards omnichannel management is crucial for successful channel integration and management. The cross-functional mind-set and willingness to share all types of information and data across competencies and functions are important in building seamless customer knowledge across channels. Sharing data is also crucial to providing personalised consumer experiences in the channel environment. Maintaining the silo mentality that prevails in a multichannel setting prevents the transformation towards omnichannel management and prevents the free flow of any type of information.

Financial commitment is also deemed important. With regard to the obstacles to the integration process in a company, there is consensus regarding the challenge to acquire and change resources. This type of transformation requires extensive change and, therefore, greater investment. Because simply adding channels to an existing IT infrastructure is not sufficient, it is necessary to implement an entirely new system that can encompass the capabilities of an omnichannel setting, which requires a large investment. Small companies may not desire or may not be able to commit to a large investment and therefore cannot provide omnichannel management.

3 AVENUES FOR FURTHER RESEARCH

The previous section regarding the state of research on omnichannel management provides insights into the addressed topics. These findings open opportunities and create inspiration, which may constitute fruitful avenues for further research in the omnichannel domain. The proposed research questions were identified from previous works on omnichannel management. We identified relevant questions from the identified literature, adopted these questions, or used them as a basis to formulate new questions. In addition, we developed research questions based on the newly developed omnichannel insights and the gaps in previous research. In general, further research should focus on how companies can address obstacles to the transformation and channel integration process, how the omnichannel approach improves the customer experience, and how overall performance can be measured. Moreover, when conducting further studies on the topics mentioned in Table 3, researchers should consider the entire channel environment and provide guidance on integrating additional channels (e.g., social media). Table 4 presents the proposed research questions for further research on omnichannel management aligned with the previously identified clusters. Furthermore, Table 4 presents subcategories to provide more detailed information regarding the proposed research questions and their proposed direction.

Cluster	**Topic**	**Research Question**	**Source**
Transformation towards Omnichannel Management	Conceptualisation	- How different are the approaches to transform towards omnichannel management for offline retailers and online retailers? - How does the type of industry, company, or product influence the omnichannel strategy? - How can omnichannel management increase customer loyalty? - When should companies strive for omnichannel management? - Is omnichannel management (always) desirable?	Verhoef et al. 2015; Own
	Pricing	- How must pricing be rethought in an omnichannel setting?	Aubrey & Judge 2012; Hansen & Sia 2015; Trenz 2015
	Realisation	- How can full channel integration be achieved to transform towards omnichannel management? - How can operational issues of channel integration be resolved? - How should an omnichannel setting be configured (company and consumer perspectives)? - Should customers be steered through the omnichannel environment based on revenue?	Hansen & Sia 2015; Kernaghan 2013; Piotrowicz & Cuthbertson 2014; Verhoef et al. 2015; Own

	Channels and Touchpoints	- How broad should the range of offered channels be? - How can specific customer contact points improve the omnichannel performance? - Which role do social media play in the omnichannel environment?	Piotrowicz & Cuthbertson 2014; Verhoef et al. 2015; Own
	Unity	- What is required to provide a seamless omnichannel customer experience? - How can companies achieve a unified view of the customer across channels? -	Piotrowicz & Cuthbertson 2014 ; Verhoef et al. 2015
	Mobile	- What is the role of mobile devices in the omnichannel environment? - How can companies exploit the in-store possibilities of mobile channels regarding omnichannel retailing?	Aubrey & Judge 2012; Brynjolfsson et al. 2013; Hansen & Sia 2015 ; Lewis et al. 2014; Piotrowicz & Cuthbertson 2014; Verhoef et al. 2015
Obstacles and Benefits of Omnichannel Management	Conceptualisation	- Do the benefits of an omnichannel strategy outweigh the costs?	Own
	Channels and Touchpoints	- At what point does the integration of channels create additional value?	Verhoef et al. 2015
Further	Conceptualisation	- Which types of omnichannel services provide additional customer value over existing offline and online alternatives?	Verhoef et al., 2015
	Performance	- How should channels in an omnichannel strategy be evaluated? - How can the overall omnichannel performance be measured?	Weinberg et al. 2007; Own
	Channels and Touchpoints	- How do purchase specifics, external influences and individual differences influence consumers' choices of more or less IT-driven channel options? - Which models can be applied to represent and understand consumer choices within the omnichannel environment? - Which models and theories can be applied to study the customer journey within omnichannel environments?	Verhoef et al. 2015
	Realisation	- How should companies be configured (technologically/organisationally) to provide a beneficial basis for omnichannel management? - How can IT governance improve omnichannel management? - How should third party channels be managed within an omnichannel environment?	Own

Table 4. Proposed Research Questions for Further Research on Omnichannel Management

4 CONCLUSION

The evolution of technology and the increase in digital channels have been noted by many authors to be the key drivers of the latest channel management developments. Some of the concepts regarding managing several channels appear outdated and await replacement with new, more capable concepts. The omnichannel approach represents an appropriate measure with which to satisfy contemporary needs and respond to the latest technological developments. Companies are adjusting their multiple channel management strategies but apply countless variations of strategies and struggle with full channel integration. For companies, this venture is complex and requires considering many influences, such as being always and everywhere online, highly informed consumers asking for the best price and the best experience, strong competition, and an always-changing channel environment. In addition, companies face organisational, technological, and financial decisions and changes when transforming towards omnichannel management. Particularly for IT, this transformation is a major task because IT must provide the infrastructure for the new requirements and the capability to drive the integration.

An examination of the literature shows virtual consensus regarding the ideal management strategy for multiple channels: the omnichannel approach. However, studies leave open questions on how to achieve a perfect picture of fully integrated channels within an omnichannel setting. It appears that the path to full integration is unclear for many practitioners or that obstacles are insuperable. Studies also question whether there is in fact “the” best approach to manage multiple channels. This paper’s listed questions help to move the topic of omnichannel management forward by reducing the fuzziness of the term omnichannel management and delimiting it to multichannel and crosschannel management, by showing the state of omnichannel research and its current issues and by presenting proposals for further research based on the developed insights. Thus, we hope to reduce the gap between research and applied strategies in the real world. IS research should focus on this topic in the future. Omnichannel management must address multifaceted, technology-related, constantly developing issues and changes. Thus, the role of IT becomes even more important because it is IT that combines omnichannel management and business strategy.

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Appendix 2: Research Paper 2

Title	Transitioning to an omnichannel approach: A dynamic capability perspective
Authors	Tobias Mirsch Christiane Lehrer Reinhard Jung
Publication Type	Conference Paper
Status of Publication	Published
Reference	Mirsch, T., Lehrer, C., Jung, R. (2016). Transitioning to an omnichannel approach: A dynamic capability perspective. *In Proceedings of the 37th International Conference on Information Systems (ICIS),* Dublin, Ireland.
Access	http://aisel.aisnet.org/icis2016/ISStrategy/Presentations/20/

Transitioning to an Omnichannel Approach: A Dynamic Capability Perspective

Research-in-Progress

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Abstract

The proliferation of digital devices and services has fundamentally changed consumer behavior and needs, and thus the way consumers engage with firms. Many consumers want to engage with firms across all channels, enjoying seamless switching and simultaneous use. Within this dynamic channel environment, the omnichannel concept has been proposed as an appropriate approach to fulfill these demands. However, in practice, many firms do not yet provide an omnichannel experience and need to transform. With this research-in-progress paper, we outline our approach to investigating this phenomenon based on the concept of dynamic capabilities. With insight gained through a multiple case study approach, we hope to give practitioners decision support and researchers new stimuli for further research by identifying best practice dynamic capabilities for transitioning to omnichannel management.

Keywords: omnichannel management, dynamic capabilities, channel integration, case study

Introduction

The proliferation of digital devices and services has fundamentally changed consumer behavior and needs, and thus the way consumers engage with firms. Today, many consumers use several online and offline channels along the customer journey – that is, the consumer's decision-making process from an information search, to purchase, to after-sales service (Neslin et al. 2006; Weinberg et al. 2007). They not only switch between channels but also use multiple channels in parallel, such as a mobile phone in a physical store. 86% of consumers worldwide say that they shop in various channels and want to use them

simultaneously (McPartlin and Feigen Dugal 2012). Moreover, consumers expect a consistent experience across all channels offered by a particular firm (Mohapatra 2014; Nunes and Cespedes 2003; Van Bruggen et al. 2010). Finally, driven by technological advancements, consumers constantly adopt new channels and abandon others (Wilson and Daniel 2007). For this reason, firms must create and maintain a cohesive set of channels and touchpoints, among which each not only provides its own unique benefits but also complements and seamlessly connects to the experience as a whole. It is crucial for firms to constantly align their channel environment with consumer needs and market developments to remain competitive (Lewis et al. 2014; Payne and Frow 2004; Verhoef et al. 2015; Zhang et al. 2010).

In light of the dynamic market environment driven by technological advancements and changing consumer behavior, firms cannot necessarily rely on already established channel resources to remain competitive (D'Aveni 1994). Instead, they need to reconceive their channel offerings and management in order to provide the right channel configuration and consumer experience (Brynjolfsson et al. 2013). In recent years, the concept of omnichannel management has emerged in both practice and research as a promising approach. Omnichannel management refers to the integrated management of a firm's channels and consumer touchpoints, aimed at enhancing the consumer experience across channels and thereby maximizing the overall channel performance (Verhoef et al. 2015). If implemented well, an omnichannel approach allows consumers to use all available channels and touchpoints interchangeably and to seamlessly switch between them (Beck and Rygl 2015; Verhoef et al. 2015). This approach represents a key strategic imperative for many firms to meet the expectations of today's consumers and sustain competitive advantage (Beck and Rygl 2015; Brynjolfsson et al. 2013; Lewis et al. 2014; Verhoef et al. 2015; Zhang et al. 2010). Of globally polled retailers, 84% believe that a uniform consumer experience across channels is extremely important (Forbes 2015) to be competitive in a digitalized market environment (Piotrowicz and Cuthbertson 2014; Trunick 2015; Verhoef et al. 2015).

However, research has highlighted a gap between the vision of omnichannel management as conceived in the literature and the channel approaches currently implemented in practice (Brynjolfsson et al. 2013; Mueller-Lankenau et al. 2006; Trenz 2015). While many firms have supplemented offline channels such as the physical store and hotline by online channels such as websites and mobile apps, in most cases these channels are only partially or not at all integrated. This gap may be caused by a lack of certain capabilities necessary for the successful transition to an omnichannel approach. As mentioned above, firms must be able to react to the changing market environment and reconfigure their resource base to remain competitive (Wilson and Daniel 2007). The processes supporting the reconfiguration, integration, and creation of

resources are referred to as dynamic capabilities (Rindova and Kotha 2001; Teece et al. 1997; Wilson and Daniel 2007).

Despite the relevance of omnichannel management as a source of competitive advantage, there is a lack of research, especially empirical studies, on the topic. Particularly little is known about the capabilities necessary for firms to move toward this promising channel approach. In this paper, we address the following research question:

What types of dynamic capabilities enable firms to transition to an omnichannel approach?

In particular, we aim to use empirical data to identify specific dynamic capabilities required for this transformation. Our research is based on the concept of dynamic capabilities (e.g., Eisenhardt and Martin 2000; Teece et al. 1997), which has been applied as a theoretical framework in prior qualitative information systems (IS) research to identify transformative processes by which firms reconfigure their resource bases (e.g., Daniel et al. 2014; Kim et al. 2011; Koch 2010). The dynamic capabilities perspective allows for the investigation of firms' capacities to modify the channel resources in a changing environment. The concept of dynamic capabilities has not yet been applied to omnichannel management. Methodologically, we aim to conduct multiple case studies in the retail industry in order to identify dynamic capabilities that can be generalized across firms (Yin 2009). We have elected to conduct the case studies within the retail industry because this sector generally considers an omnichannel approach to be of high strategic importance (Beck and Rygl 2015; Verhoef et al. 2015). In particular, we plan to conduct interviews with both market and technical experts from four retailers in Germany, Switzerland, and Austria that have successfully transitioned to an omnichannel approach.

This research will make important contributions to both theory and practice. First, we will contribute to prior research by providing an empirical study in the field of dynamic capabilities, where empirical approaches are scarce (Pablo et al. 2007). In doing so we heed Ambrosini and Bowman's (2009) call for more empirical research, in particular case studies, to investigate the detailed micro-foundations of how firms deploy dynamic capabilities. Second, we will be the first to empirically examine specific dynamic capabilities driving transformation in the field of omnichannel management. We thereby contribute empirical insight to the emerging field of omnichannel management, which so far mainly consists of conceptual work and anecdotal evidence. Third, for practitioners, the identification of necessary dynamic capabilities will provide a solid basis to support decision-making when transforming channel resources into an omnichannel approach. This will counteract the trend that only a few firms have managed to successfully establish omnichannel management and remain competitive.

This paper proceeds as follows. The next section introduces the concept of omnichannel management as well as the dynamic capabilities perspective. Next, we describe the methodological approach of our multiple case studies, followed by a presentation of our expected results regarding the dynamic capabilities and implications for research and practice. The paper concludes with reflections on the planned research.

Background and Theoretical Foundation

Omnichannel Management

In recent years, the concept of omnichannel management has emerged in both practice and research as a promising approach to address changing consumer purchase behavior and needs. Verhoef et al. (2015) define omnichannel management as "the synergetic management of the numerous available channels and customer touchpoints, in such a way that the customer experience across channels and the performance over channels is optimized" (p. 176). This implies that "channels are interchangeably and seamlessly used during the search and purchase process" (Verhoef et al. 2015, p. 175). In other words, an omnichannel approach provides the consumer with a seamless and unique experience irrespective of the channel or touchpoint used or the phase of the purchase process (Brynjolfsson et al. 2013; Piotrowicz and Cuthbertson 2014; Rigby 2011; Rosenblum and Kilcourse 2013). Channels describe routes or paths through which a firm delivers products, services, or information to consumers (Mehta et al. 2002). They represent an interaction point between a firm and consumers (Neslin et al. 2006), such as physical stores, print, hotline, email, website, online chat, mobile app, or social media.

Omnichannel management builds on the related yet distinct concepts of multichannel and crosschannel management. While a multichannel approach only implies that a firm offers two or more separate channels to consumers (Beck and Rygl 2015; Verhoef et al. 2015), a crosschannel approach indicates the integration of a few selected channels, but not all channels (Beck and Rygl 2015). In case of omnichannel management, the barriers between all points of interaction are abolished. The approach envisages and supports free movement and switching between all contact points (Piotrowicz and Cuthbertson 2014; Verhoef et al. 2015). From a consumer perspective, an omnichannel approach provides several benefits. The consumer can start the customer journey with any preferred channel and then switch channels at any stage of the purchase process without losing progress. Moreover, an omnichannel approach allows the consumer to use channels and touchpoints simultaneously. For example, a consumer may be attracted to a product promoted on a billboard, which refers to the website. Later, at home, she gathers more information on the website and puts the preferred product in the shopping basket, without completing the purchase. While commuting to

work by bus, she downloads and opens the company's shopping app, where she finds the product in her shopping basket. She then completes the purchase via the app and chooses to pick up the item from the store. As a result, the consumer views all interactions with a firm as part of one large consumer experience, rather than having different experiences at each interaction (Piotrowicz and Cuthbertson 2014; Verhoef et al. 2015). By implementing an omnichannel approach, firms aim to increase customer satisfaction (Mohapatra 2014; Nunes and Cespedes 2003; Van Bruggen et al. 2010) and engage the consumer on all channels (Beck and Rygl 2015), ultimately resulting in increased sales (Aubrey and Judge 2012; Hansen and Sia 2015). Moreover, firms have recognized the opportunity to gather rich consumer data from the multiple channels, which can then be used to generate a comprehensive profile of the consumer (Brynjolfsson et al. 2013; Hansen and Sia 2014; Stone et al. 2002).

Table 1. Characteristics of Omnichannel Management

Channel integration	Seamless switching among all channels possible
Channel management	Across all channels
Goals and incentive systems	To optimize performance across all channels
Communication between consumer and firm	Unidirectional and bidirectional
Data	Data are shared across all channels

In practice, pressured by changing consumer behavior and new online competitors, traditional brick-and mortar retailers have started to expand their channel portfolio by investing in online sales and service channels (e.g., Mueller-Lankenau et al. 2006; Piotrowicz and Cuthbertson 2014; Verhoef et al. 2015). As of today, however, most retailers and firms from other industries fall short in the integration of their channels and touchpoints (Neslin et al. 2006; Verhoef et al. 2015). Previous research has identified various challenges that hamper the transition to omnichannel management. First, firms are often found to operate with a silo mentality, which prevents collaboration and the flow of information throughout the organization (Berman and Thelen 2004; Kernagham 2013; Mueller-Lankenau et al. 2004; Mueller-Lankenau et al. 2006; Tate et al. 2004). Second, data integration poses a challenge to implementing omnichannel management: advanced technological capabilities are required to gather, analyze, and process the vast amounts of data generated on all channels (Neslin et al. 2006), and up-to-date information about the consumer must be made available on all channels, ideally in real-time, to serve her in a personalized manner and enhance her experience (Brynjolfsson et al. 2013; Trenz 2015). Third, many firms lack a strong alignment between information technology (IT) and business strategy (Bharadwaj et al. 2013; Hansen and Sia 2015).

In research, omnichannel management has been addressed mainly in the marketing and IS literature. The three main topics discussed by scholars include the theoretical conceptualization of and requirements

for omnichannel management (e.g., Beck and Rygl 2015; Mueller-Lankenau et al. 2004; Tate et al. 2004), transformation into omnichannel management (e.g., Brynjolfsson et al. 2013; Hansen and Sia 2015; Piotrowicz and Cuthbertson; 2014; Verhoef et al 2015), and the obstacles and benefits of omnichannel management (e.g., Lewis et al. 2014; Neslin et al. 2006; Stone et al. 2002). Existing research is mainly theoretical, and few papers have addressed the question of how firms can successfully transition their channel resources to an omnichannel approach (Mirsch et al. 2016). For example, one of a few studies, which address this topic is provided by Hansen and Sia (2015). Based on a single case study, they noted that firms must focus on changes in their technology infrastructure and organizational practices to successfully evolve into an omnichannel strategy.

Dynamic Capabilities

The dynamic capabilities perspective is an influential theoretical framework in strategic management literature for understanding how firms generate and sustain a competitive advantage. The dynamic capabilities perspective is an extension of the resource-based view (RBV), which explains a firm's superior economic performance through its resource endowment (Barney 2001). The RBV states "that resources that are simultaneously valuable, rare, imperfectly imitable and imperfectly substitutable (VRIN) are a source of competitive advantage" (Ambrosini and Bowman 2009, p. 29). However, the possession of VRIN resources at one point in time does not suffice to sustain a competitive advantage amid changing market conditions; the RBV does not explain how valuable resources can be created or how the extant resource base can be altered over time. With this in mind, Teece et al. (1997) introduced the dynamic capabilities perspective. According to Teece et al. (1997), dynamic capabilities are a set of learned and activities that allow firms to change by enabling them to "integrate, build, and reconfigure internal and external competences" (p. 516). Based on Teece et al.'s definition, many authors have developed other definitions of dynamic capabilities (Ambrosini and Bowman 2009). According to Eisenhardt and Martin (2000), they are "the firm's processes that use resources – specifically the processes to integrate, reconfigure, gain and release resources – to match and even create market change. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die" (p. 1107). Although several definitions exist, there is consensus that dynamic capabilities are intentional, persistent, and repeatable organizational processes that alter the firm's extant resource base with the aim of creating a new set of valuable resources (Ambrosini and Bowman 2009). At the same time, dynamic capabilities do not encompass ad hoc problem solving (Winter 2003), spontaneous interventions, or disjointed reactions to market changes (Ambrosini and Bowman 2009).

To better understand the concept of dynamic capabilities, it is useful to differentiate between dynamic and organizational capabilities. Dynamic capabilities consist of a set of organizational capabilities that is routines and processes which in turn produce a dynamic capabilities. Organizational capabilities, also called operational or ordinary capabilities, refer to a firm's ability to deploy resources, usually in combination. They are rooted in processes and routines that produce outputs by combining different resources (Helfat and Peteraf 2003). Substantially, they are basic, zero-level capabilities or functional processes that turn inputs into outputs and permit the firm to earn revenue and profit in the present. These capabilities allow firms to persist (Winter 2003). While organizational capabilities support the firm's operations in the present, dynamic capabilities are change-oriented processes that impact and modify extant organizational capabilities.

Our research builds on the categorization of dynamic capabilities suggested by Koch (2010), since it provides a holistic view of the firm. With regard to the omnichannel context, Koch's categorization will help us to achieve a systematic overview and understand the origins of the dynamic capabilities. Koch (2010) differentiates between inside-out, outside-in, and spanning capabilities. The inside-out capabilities describe capabilities used within the firm that focus on internal issues such as the development of technology and recruitment. By contrast, the outside-in capabilities have an external focus. They are concerned with external relationships management and market responsiveness. Spanning capabilities integrate the inside-out and outside-in capabilities. The development of strategy and new products or services, for example, addresses both external and internal issues, requiring both inside-out and outside-in capabilities (Day 1994). Meanwhile, certain organizational units like sales and procurement require outside-in and spanning capabilities, since their tasks are cross-organizational (Koch 2010; Levina and Vaast 2005; Montealegre 2002; Sambamurthy et al. 2003). In the context of our study, the inside-out capabilities refer to the required advanced technological capabilities that enable an omnichannel approach. Additionally, they address internal personnel aspects such as the role of IT, which requires a stronger emphasis in the context of omnichannel management. Especially in the retail industry, outside-in capabilities play an important role, since external relationships such as dealer networks need to be integrated and managed appropriately (Hansen and Sia 2015). Spanning capabilities refer to the integration and strategy aspect of an omnichannel approach. As mentioned above, channel integration is crucial for an omnichannel strategy and affects firms' outside-in as well as inside-out capabilities. This is particularly relevant in light of the previously mentioned lack of IT and business alignment. Based on this categorization, we aim to identify specific dynamic capabilities – that is, transformative processes – in the context of omnichannel management. Figure 1 illustrates the categorization of dynamic capabilities suggested by Koch (2010).

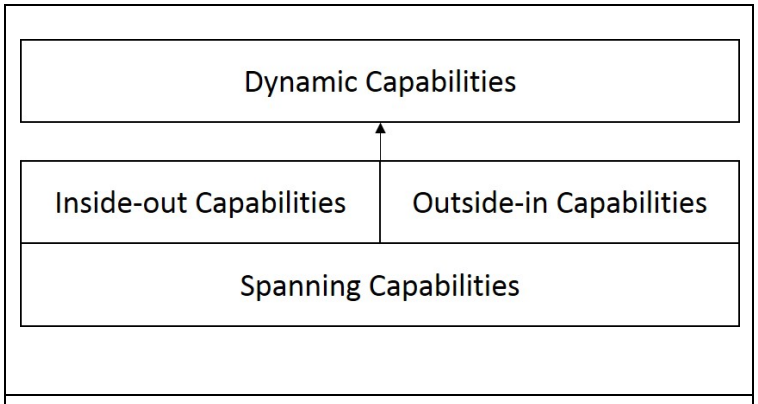

Figure 1. Categorization of Capabilities (Koch 2010)

The concept of dynamic capabilities has not yet been applied to omnichannel management. However, it is worth mentioning a study by Wilson and Daniel (2007), which identifies dynamic capabilities for multichannel transformation in business-to-business (B2B) markets and is closely related to the subject at hand. The authors conducted a study based on four cases in which they interviewed managers about the respective firm's channel strategy. More specifically, they investigated how channel strategy evolved and which capabilities were necessary for the transformation process. This led them to identify seven different dynamic capabilities, three of which were found to be necessary for transformation in all cases: (1) alignment of the route to market with different segment/product characteristics, (2) creation of innovative channel combinations, and (3) integration of processes and IT to support multiple channels (Wilson and Daniel 2007). The remaining four dynamic capabilities were found to be relevant for three of the four cases: (4) active review of the route to market in an iterative strategy/implementation cycle, (5) iterative development of the value proposition by melding planning and experience, (6) an organizational structure that balances the need for innovation and integration, and (7) metrics and rewards that reflect multi-channel customer behavior (Wilson and Daniel 2007).

This study by Wilson and Daniel (2007) provides valuable initial insights for the research here on omnichannel transformation. However, it lacks a clear conceptualization of multichannel management. Moreover, technological developments have been tremendous since the study was published in 2007. Therefore, current empirical insights are required to adequately grasp the nature of omnichannel management.

Method

In this planned study, we seek to identify types of dynamic capabilities and the underlying processes that enable firms to move toward an omnichannel approach. Moreover, we aim to identify further factors in a firm's internal and external environment that may influence the development of dynamic capabilities (Ambrosini and Bowman 2009). For this purpose we chose a case study approach, following the recommendations of Eisenhardt (1989), Paré (2004), and Yin (2009). Qualitative approaches are better suited than quantitative methods to capture the nature of dynamic capabilities, as they allow an in-depth investigation of the subject matter. The case study is undertaken within the positivist research paradigm because our aim is to generate generalizable results (Eisenhardt 1989; Paré 2004). The positivist research paradigm "represents the dominant paradigm in IS case research" (Dubé and Paré, 2003, p. 599). In the following, we describe the case study design and data collection.

Perceived as more robust than single case studies, we will conduct multiple case studies to ensure the generalizability of the constructs identified (Eisenhardt 1989, Paré 2004). Multiple case studies allow us to identify the commonalities of the underlying processes driving the transition to an omnichannel approach across firms. With this approach, we concur with Eisenhardt and Martin (2000), who argue that dynamic capabilities show identifiable commonalities across firms and do not have to be firm-specific. The authors explain that "while dynamic capabilities are certainly idiosyncratic in their details, the equally striking observation is that specific dynamic capabilities also exhibit common features that are associated with effective processes across firms" (p. 1108). They conclude that "the functionality of dynamic capabilities can be duplicated across firms" (p. 1106).

As its unit of analysis, this study will look at the transition to an omnichannel approach at the level of individual firms. We chose to conduct case studies within the retail industry, since the topic of omnichannel management has been broadly discussed in this context and research already provides a fundamental base of insight (e.g., Beck and Rygl 2015; Berman and Thelen 2004; Brynjolfsson et al. 2013; Hansen and Sia 2015; Piotrowicz and Cuthbertson 2014; Trenz 2015; Verhoef et al. 2015). The omnichannel approach has become a key strategy within the retail industry (Beck and Rygl 2015; Lewis et al. 2014; Verhoef et al. 2015; Zhang et al. 2010), lending further relevance to our research. Applying literal replication logic, we will select cases with intrinsic similarities that are expected to yield similar results (Paré 2004). The chosen cases should share a number of common characteristics with regard to business model, cultural and geographic proximity, channel setup, and maturity in omnichannel transformation. In particular, we will focus on business-to-consumer (B2C) retailers in Germany, Switzerland, and Austria. Furthermore, we

want to focus on click-and-mortar retailers because a central topic of omnichannel management is the connection between offline and online channels (e.g., Brynjolfsson et al. 2013; Verhoef et al. 2015), and many brick-and-mortar retailers are expanding their channel portfolio through online and mobile channels (e.g., Mueller-Lankenau et al. 2006; Piotrowicz and Cuthbertson 2014; Verhoef et al. 2015). To provide sufficient empirical grounding and facilitate analytical generalizability, we plan to include four cases (Eisenhardt 1989). We will select best practice cases based on industry reports, academic and practical case studies (e.g., Hansen and Sia 2015), and articles on relevant websites. We plan to select retailers that have successfully transitioned to an omnichannel approach. This means that they have integrated all of their offline (i.e., physical store) and online channels (i.e., mobile, online store) and allow consumers to switch between the channels during the customer journey. Considering that the omnichannel approach is not widely established in practice, it is possible that just a limited number of firms will be in the running. If this is the case, we will pursue a fallback plan in which we will select polar cases to investigate the extremes – successful and unsuccessful cases of omnichannel transformation (Eisenhardt 1989; Pettigrew 1990).

Data collection will be conducted as a combination of semi-structured interviews and documents, "to provide a richer picture of the events and/or issues than would any single method" (Dubé and Paré 2003; Eisenhardt 1989). Interviews represent a highly efficient method to gather rich empirical data (Eisenhardt and Graebner 2007). We aim to gather a variety of perceptions on the subject matter by approaching at least four highly knowledgeable interviewees per firm. Since omnichannel management involves multiple business units within each firm, we will deliberately interview experts from the relevant functional areas, including both market and technical experts, as well as from different hierarchical levels (Eisenhardt and Graebener 2007). With regard to market experts relevant roles are, for example, customer relationship management, sales, and marketing. Relevant roles of technical experts are, for example, IT, business processes, and data analytics. We plan to conduct interviews with open-ended questions (e.g., "What were the decisive factors motivating the transition to a new channel approach?" and "What organizational changes were necessary?"). These allow us to follow up on interesting and unexpected responses, while the interviewees are free to elaborate on their perceptions, experiences, and reflections (Paré 2004). In addition, we aim to collect secondary data in the form of publically available company information (e.g., annual reports, press releases) and internal documents (e.g., presentations, strategy papers, meeting minutes, organizational charts, training material). These documents are expected to provide valuable ancillary information on each firm's transformation process and strategy.

We will employ cross-case analysis as the study's data analysis strategy. First, the technique treats each case as a separate study (Eisenhardt 1989; Paré 2004; Yin 2009). This allows the investigator to focus on

the collected case data separately in order to become familiar with each case. In a second step, the findings of the "within-case analyses" will be aggregated to investigate whether they make sense beyond each individual case and to achieve generalizability (Eisenhardt 1989; Paré 2004).

Expected Findings and Contribution

Since the concept of omnichannel management is rather new, there is no empirical research investigating dynamic capabilities in this context, aside from the related example cited above (Wilson and Daniel 2007). Despite Wilson and Daniel's focus on multichannel management, their study provides a valuable starting point for our investigation of omnichannel management. However, since the concepts of multichannel and omnichannel management differ strongly (e.g., no switching between channels vs. seamless switching between all channels and touchpoints), it is not possible to transfer the identified dynamic capabilities. Additionally, their study was conducted in the B2B industry, which fundamentally differs from the B2C sector (e.g., complexity of products with higher demand for explanation, fewer customers, buying centers make purchasing decisions) (Kotler and Pfoertsch 2006). Finally, between the publication of that study in 2007 and today, technology has changed dramatically, resulting in many new opportunities for channel offerings. For example, today smartphones play an important role in connecting the physical (store) with digital and online channels (Brynjolfsson et al. 2013). Moreover, new data types and sensor technology complementing stores are on the rise. These developments are expected to have a strong impact on the required dynamic capabilities in comparison to the multichannel study. Therefore, it is necessary to gain new insight with an explicit focus on omnichannel management and current technological opportunities.

Dynamic capabilities might also differ between the two studies because the omnichannel approach requires more from technology due to stronger demands for channel coordination and data flow (Neslin et al. 2006). In general, we expect a high relevance of technology-based dynamic capabilities, since omnichannel management is highly technology driven. On the one hand, changes in the external market environment are strongly driven by technological advancements; on the other hand, internally, firms have advanced technology at hand that enables a seamless customer journey.

With regard to necessary inside-out capabilities, which focus on internal routines and processes, literature has highlighted the need "to build and maintain a data-rich, 360-degree profile of each customer" (Stone et al. 2002, p. 49). To build 360-degree profiles, firms require processes and technology to gather, analyze, and process the vast amounts of data generated by and about the consumer on all channels (Neslin et al. 2006). Information from web and mobile usage and transactions, as well as social media profiles and

online conversations, enrich master and transactional data. Generating and creating value from consumer profiles requires specific, technology-driven capabilities. Regarding outside-in capabilities, which have an external focus, we expect the integration and management of external partners, such as dealer networks, to be highly relevant (Hansen and Sia 2015). Furthermore, building 360-degree profiles requires data sharing and integration across channels and departments. Based on these profiles, firms must be able to provide up-to-date consumer information, ideally in real-time, to personalize the relevant channel and create a seamless customer experience across all channels. This requires the flow of information throughout the organization as well as close collaboration among different business units (Berman and Thelen 2004; Kernagham 2013; Mueller-Lankenau et al. 2004; Mueller-Lankenau et al. 2006; Tate et al. 2004). Against this backdrop, we expect spanning capabilities to be highly relevant – that is, routines and processes supporting communication and close collaboration across different functional areas.

Our intended study as outlined above makes important contributions to both theory and practice. First, there are only a few empirical studies in the field of dynamic capabilities (Pablo et al. 2007). As claimed by Ambrosini and Bowman (2009), more empirical research, especially qualitative studies, is necessary to counteract this limited support and the dominance of quantitative studies. The in-depth investigation of dynamic capabilities and how they develop, allows a better understanding of dynamic capabilities in practice and how they vary across firms, which can serve as the foundation of meaningful managerial prescriptions. Second, we will be the first to empirically examine specific dynamic capabilities that drive the transition to an omnichannel approach, and will thereby shed light on the underlying processes. To date, empirical insight in the field of omnichannel management is scarce. Most previous papers are conceptual in nature and provide only anecdotal evidence about the importance and value creation of omnichannel management. However, in recent years reports have discussed a few examples of firms that successfully transitioned to omnichannel management (e.g., Hansen and Sia 2015). Therefore, we believe it is the right time for research to move from conceptualization to empirical evidence. Building on the theoretical lens of dynamic capabilities and conducting multiple case studies will allow us to identify common transformative processes that have shown themselves to be effective across firms. Additionally, our study responds to Hansen and Sia's (2015) call to shed light on how channel integration is accomplished and to generate deeper understanding of the challenges facing implementation of an omnichannel strategy.

For practitioners, the identification of necessary dynamic capabilities will provide important decision support on transforming channel resources into an omnichannel approach. To date, few firms have managed to successfully establish omnichannel management. However, in the near future it will become crucial especially for retailers to rethink their channel strategy to meet consumers' needs and remain competitive

(Verhoef et al. 2015). Especially from the IS perspective, it is important to understand the successful management of an omnichannel strategy in detail, since it is strongly technology driven and comes along with various IT-related issues. For example, IT needs to provide the infrastructure to serve new demands and the possibility to fully integrate channels. This often means deep organizational change that requires management commitment (Hansen and Sia 2015). Bharadwaj et al. (2013), too, point out the importance of IT and argue that it might be necessary to merge IT with business strategy to receive the required commitment. This kind of commitment and consciousness within an organization is crucial for a successful venture. With our study, we aim to provide solid decision support for practitioners to successfully transform their firm's channel strategy, or more precisely, to transition their channel resources to an omnichannel approach. In light of the changing environment, it is important for practitioners to understand how to deploy dynamic capabilities; failure often happens "in the face of revolutionary technological change," and "persistence in old modes of practice led eventually to a crisis" (Rosenbloom 2000, p. 1083). A mistaken or misled move toward omnichannel management might result in "the complete breakdown of a firm's carefully crafted business strategy" (Hulland et al. 2007, p. 110). Since omnichannel management requires deep technological change and new, committed management approaches, there is a risk that mistakes will be made. The exploration of dynamic capabilities within the omnichannel context will help prevent failure by providing rich insights and an improved understanding.

Conclusion

With this planned empirical study, as outlined above, we aim to investigate what types of dynamic capabilities enable firms to transition to an omnichannel approach. Applying the theoretical lens of dynamic capabilities, we argue that specific resources and capabilities are necessary for firms to stay competitive and meet consumer needs, by successfully transforming their channel strategy into omnichannel management. The study will focus on the retail industry, specifically click-and-mortar retailers. We will gather data from semi-structured interviews with experts from four case companies in Austria, Germany, and Switzerland. Moreover, we aim to collect internal and external documents for the purpose of data triangulation. The identification of dynamic capabilities within and across cases allows us to understand how firms should be configured in order to succeed in omnichannel management and also enables us to make generalizable assumptions.

We aim to move forward with this research as follows. First, we will identify the cases for our study based on the exhibited selection criteria. The number of available cases will determine whether to follow

the replication logic or whether to select polar cases instead. After the interview guide is finalized, we will start to approach the selected case organizations. For each case we will try to establish a relationship with a C-level manager within the firm, who will act as the main point of contact and help us identify the most relevant interview partners. Simultaneously, the conducted interviews will be transcribed and coded in order to inform the further research process. After in-depth, within-case analysis, we will apply cross-case analysis to identify cross-case patterns and examine to what extent the within-case findings are applicable across the cases, permitting analytic generalizability (Eisenhardt 1989; Paré 2004).

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Appendix 3: Research Paper 3

Title	Transitioning to omnichannel business: A dynamic capabilities perspective of firms' channel integration.
Authors	Christiane Lehrer Tobias Mirsch Reinhard Jung
Publication Type	Working Paper
Status of Publication	In preparation for submission
Reference	Lehrer C., Mirsch, T., Jung, R. (2018). Transitioning to Omnichannel Business: A dynamic capabilities perspective of firms' channel integration. *Working Paper*.
Access	https://www.alexandria.unisg.ch/254888/

Transitioning to Omnichannel Business:

A Dynamic Capabilities Perspective of Firms' Channel Integration

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Abstract

The proliferation of digital devices and services has fundamentally changed customer behavior and needs and thus the manner in which customers engage with firms. Many customers want to engage with firms across both online and offline channels, enjoying seamless switching and simultaneous use. In this changing environment, the omnichannel concept has been proposed as an appropriate approach to satisfy these customer demands. In practice, however, only a few firms have successfully initiated a transition from a multichannel business to an omnichannel business by integrating channels. One major challenge associated with channel integration is that of deploying the necessary dynamic capabilities that enable management to reconfigure the organization. Against this backdrop, we draw on the dynamic capability perspective to examine how firms transitioned to omnichannel management by the combination of adaptive organization principles and omnichannel retail information systems. For this purpose, this study sheds light on the microfoundations of the firms' IT-enabled dynamic capabilities. The research is based on two qualitative case studies of a click-and-mortar retailer and an insurance firm that have transitioned to an omnichannel approach by successfully integrating their online and offline distribution channels. The findings make four primary contributions to theory and practice. First, they extend the literature on omnichannel business by discussing microfoundations related to channel integration grounded in empirical data. Second, our results provide relevant insights for information systems scholars on IT's contribution to achieving the target of an omnichannel business. Third, the study contributes to research regarding dynamic capabilities by providing empirical insights into how firms deploy dynamic capabilities in practice. Fourth, for practitioners, this

research provides valuable decision support on how to transform their organizations toward an omnichannel approach.

Keywords: omnichannel management; dynamic capabilities; microfoundations; channel integration; case study

1. Introduction

The proliferation of digital devices and services has fundamentally changed customer behavior and needs and thus the manner in which customers engage with firms. Today, many customers use several online and offline channels along the customer journey – that is, the customer's decision-making process from information search to purchase to service use (Neslin et al., 2006). They not only switch between channels but also use multiple channels in parallel, for example, a mobile phone in a physical store. Moreover, customers expect a consistent experience across all of the channels offered by a particular firm (Van Bruggen et al., 2010). Finally, driven by technological advancements, customers constantly adopt new channels and abandon others (Wilson & Daniel, 2007). For this reason, firms must create and maintain a cohesive set of channels, among which each not only provides its own unique benefits but also complements and seamlessly connects to the experience as a whole. To remain competitive, it is crucial for firms to constantly align their channel configuration with customer needs and market developments (Verhoef et al., 2015).

In recent years, the concept of omnichannel management has emerged in both research and practice as a promising approach to meeting customers' needs. Omnichannel management refers to the integrated management of a firm's channels, aimed at enhancing the customer experience across channels and thereby maximizing the overall channel performance (Verhoef et al., 2015). If implemented well, an omnichannel approach allows customers to use all available channels interchangeably and seamlessly switch between them (Beck & Rygl, 2015). This approach represents a key strategic imperative for many firms to meet the expectations of today's customers and sustain a competitive advantage (Brynjolfsson et al., 2013). Eighty-four percent of globally polled retailers believe that to remain competitive in a digitalized market environment, it is extremely important to offer a uniform customer experience across channels (Forbes, 2015).

The dynamic environment in which today's organizations operate is shaping the way they are, and especially customers, using information technology (IT) resources and capabilities. Omnichannel retail information systems (OCRIS) are emerging IT systems that can enable organizations to become more agile

and adapt to evolving market changes and customer needs. OCRIS support the diversity of digital (e.g. internet-based shops, mobile or social media commerce platforms) and offline channels (e.g. physical stores) and allow originations to consistently handle information seamlessly across different channels (Tambo, 2014). For this purpose, data and data-flows must be kept persistent in time and across channels.

Prior retail information systems (IS) usually consisted of separate IT architectures for the physical stores and e-commerce with no or only partial data integration. Physical distribution was supported by in-store systems, predominantly the point-of-sale (POS) system ("cash registers") as well as systems for supply chain management and corporate finance, while e-commerce was facilitated by web fronts, customer relationship management (CRM) and product data management (PDM) systems, a fulfilment system and the corporate finance link (Tambo, 2014). Only recently, OCRIS have achieved the integration of previously isolated systems and functionalities to provide a uniform and satisfactory customer experience across different channels.

In research, omnichannel management has been addressed mainly in the marketing and IS literature. The three main topics discussed by scholars include the theoretical conceptualization of and requirements for omnichannel management (e.g., Beck & Rygl, 2015; Mueller-Lankenau et al., 2004; Tate et al., 2004), the transition to omnichannel management (e.g., Brynjolfsson et al., 2013; Hansen & Sia, 2015; Piotrowicz & Cuthbertson, 2014; Verhoef et al., 2015), and the obstacles and benefits related to omnichannel management (e.g., Lewis et al., 2014; Neslin et al., 2006; Stone et al., 2002). Research has highlighted a gap between the vision of omnichannel management as conceived in the literature and channel approaches currently implemented in practice (Brynjolfsson et al., 2013; Mueller-Lankenau et al., 2006; Trenz, 2015). Whereas many firms have supplemented offline channels such as the physical store by online channels such as websites and mobile apps, in most cases, these channels are not integrated. Despite the relevance of the topic, only a few papers have addressed the question of how firms can successfully reconfigure their channel resources and integrate channels (e.g., Hansen & Sia, 2015; Koch, 2010; Wilson & Daniel, 2007).

The limited implementation of omnichannel management in practice can be explained by a lack of essential capabilities to alter the firm's channel resources and channel management capabilities. The processes that support the integration, creation, and reconfiguration of resources and operational capabilities are referred to as dynamic capabilities (Teece et al., 1997). They are underpinned by so-called microfoundations that describe "distinct skills, processes, procedures, organizational structures, decision rules, and disciplines" (Teece, 2007, p. 1319). The identification of microfoundations allows for an in-depth understanding of organizational transformation. To address the research gap, we aim to answer the following research question: *How do organizations achieve dynamic capabilities by using OCRIS?*

In particular, we use empirical data to identify the specific microfoundations of successful channel integration to operate a omnichannel business. Our research is based on the concept of dynamic capabilities, which has been applied as a theoretical framework in prior IS research to identify transformative processes through which firms reconfigure their resource bases (e.g., Daniel & Wilson, 2003; Koch, 2010; Liu et al., 2013). We collected data from two case organizations: one within the retail industry because this sector generally considers an omnichannel approach to be of high strategic importance and the other within the insurance sector, in which firms operate in a similar setup and also perceive omnichannel management as of equally high importance (Verhoef et al., 2015). In particular, we conducted interviews with both market and technical experts and collected documents from two firms operating in Switzerland that successfully transitioned to an omnichannel approach.

This research makes important contributions to both theory and practice. First, our study contributes to an increase understanding of omnichannel management by identifying the microfoundations of omnichannel capabilities and providing empirical insights to the emerging field of omnichannel management, which has primarily consisted of conceptual work and anecdotal evidence until now. In particular, we identify four key microfoundations supporting the creation of dynamic capabilities. Second, this study is one of first in the IS domain to examine omnichannel business, which has predominately been discussed in the field of marketing. In reality, because it is strongly driven by technology, omnichannel business is a highly relevant and emerging field of research for IS scholars. Our results underline the importance of IT and specific IS in the omnichannel context. Third, our empirical study contributes to the field of dynamic capabilities, in which empirical insights are scarce (Pablo et al., 2007). In doing so, we heed Ambrosini and Bowman's (2009) call for more empirical research, particularly case studies, to investigate the detailed microfoundations of how firms deploy dynamic capabilities. Fourth, for practitioners, the identified microfoundations provide a solid basis to support decision-making when planning to transition to an omnichannel approach by combining adaptive organization principles and OCRIS.

This paper proceeds as follows. The next section introduces channel management and integration along with the dynamic capabilities perspective and the concept of microfoundations. Additionally, the specific approach we look at the dynamic capabilities, namely the sense-and-respond-approach, is introduced. Next, we describe the methodological approach of our multiple case studies, followed by a presentation and discussion of our results regarding the microfoundations related to channel integration. Subsequently, the results are discussed and implications for research and practice are presented. The paper concludes with suggestions for further research and limitations.

2. Background and theoretical foundation

2.1 Channel management and integration

Channels describe routes or paths through which firms deliver things of value — such as products, services, or information — to customers (Mehta et al., 2002). Channels include, for example, a firm's physical stores, website, hotline, mobile app, or social media presence. To achieve commercial goals, firms must efficiently operate their channels. Channel management includes specific operational processes and routines, including not only hiring, motivating, incentivizing and assessing the performance of staff but also managing channel conflicts (Mehta et al., 2002). If performed efficiently, these operational tasks both provide the firm with value and increase its performance. Moreover, channel management encompasses strategic processes and routines such as formulating the channel strategy (i.e., the set of principles through which a firm plans to achieve commercial objectives) and implementing that strategy by (re)configuring the channel resources and capabilities. This includes, for example, the creation of new or the alteration of existing channel structures (Mehta et al., 2002).

Triggered by changing market conditions, firms have realized the need to formulate a channel strategy that fits with customers' behavior of using various channels during the customer journey. Against this background, the omnichannel approach has gained increasing attention in both research and practice (Verhoef et al., 2015). Verhoef et al. (2015) define omnichannel management as "the synergetic management of the numerous available channels and customer touchpoints, in such a way that the customer experience across channels and the performance over channels is optimized" (p. 176). This implies that "channels are interchangeably and seamlessly used during the search and purchase process" (Verhoef et al., 2015, p. 175). In other words, an omnichannel approach provides the customer with a seamless and unique experience regardless of either the channel used or the phase of the customer journey (Piotrowicz & Cuthbertson, 2014). Omnichannel management represents an evolutionary enhancement of multichannel and crosschannel management. While a multichannel approach only implies that a firm offers two or more separate channels to customers, a crosschannel approach indicates the integration of a few selected channels, but not all channels (Beck & Rygl, 2015). Crosschannel management can be seen as a transition stage between multichannel and omnichannel management ranging from low to high channel integration, with omnichannel management representing the final or ideal state of full channel integration.

From a customer perspective, an omnichannel approach provides several benefits. The customer can start the journey with any preferred channel and then switch to another channel if desired. In an ideal

scenario, for example, a customer may search for a product on the website and put it in the shopping basket without completing the purchase. While commuting to work, she opens the firm's app, where she finds the product in her shopping basket. She then completes the purchase via the app and chooses to pick up the item from the store. As a result, the customer views all interactions with a firm as part of one large customer experience, not as different experiences during each contact with the firm (Verhoef et al., 2015). By implementing an omnichannel approach, firms aim to increase customer satisfaction (Van Bruggen et al., 2010) and engage the customer on all channels (Beck & Rygl, 2015), ultimately resulting in increased sales (Aubrey & Judge, 2012). Moreover, firms have recognized the opportunity to gather rich customer data from the multiple channels, which can then be used to generate a comprehensive profile of the customer (Hansen & Sia, 2014).

In practice, innovative firms have begun their journey toward omnichannel management by increasingly integrating their online and offline channels (Verhoef et al., 2015). However, as highlighted in the literature, transitioning to an omnichannel approach requires specific capabilities to alter the existing channel structures towards stronger channel integration. Previous research has shown that many firms lack these capabilities and are confronted by various challenges that hamper the transition to omnichannel business. First, they are often found to operate with a silo mentality that prevents collaboration and the flow of information throughout the organization (Kernaghan, 2013). Second, data integration poses a challenge to implementing omnichannel management: advanced technological capabilities are required to gather, analyze, and process the vast amount of data generated on all channels (Neslin et al., 2006), and up-to-date information about the customer must be made available on all channels, ideally in real time, to serve her in a personalized manner and enhance her experience (Brynjolfsson et al., 2013). Third, many firms lack a strong alignment between information technology (IT) and business strategy (Hansen & Sia, 2015).

2.2 Dynamic capabilities and microfoundations

The dynamic capabilities perspective is an influential theoretical framework in the strategic management literature. Rooted in the resource-based view (RBV), the dynamic capabilities perspective explains how firms can alter their extant resource base over time to create or maintain a competitive advantage in changing market conditions. Dynamic capabilities refer to "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997, p. 516). More specifically, they are "the firm's processes that use resources – specifically the processes to integrate, reconfigure, gain and release resources – to match and even create market change. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource

configurations as markets emerge, collide, split, evolve, and die" (Eisenhardt & Martin, 2000, p. 1107). Although there are several definitions of the term, there is a consensus that dynamic capabilities are intentional, persistent, and repeatable organizational processes or routines developed by the firm over time that alter the firm's extant resource base or ordinary capabilities (Ambrosini & Bowman, 2009). Simultaneously, dynamic capabilities do not encompass ad hoc problem solving (Winter, 2003), spontaneous interventions, or disjointed reactions to market changes (Ambrosini & Bowman, 2009). Examples of dynamic capabilities include new product development (e.g., Danneels, 2010; Pavlou & El Sawy, 2011), alliances and acquisitions management (e.g., Zollo & Singh, 2004), and IS project portfolio management (Daniel et al., 2014). In IS research, the dynamic capabilities perspective has been applied as a theoretical framework to examine transformative processes in specific contexts such as electronic marketplaces (Koch, 2010), e-business (Daniel & Wilson, 2003) or the supply chain (Liu et al., 2013). Further studies have more generally investigated how IT enables specific capabilities that in turn create competitive advantage (Bhatt & Grover, 2005).

Dynamic capabilities must be differentiated from ordinary capabilities. Dynamic capabilities are change-oriented processes that impact and modify extant ordinary capabilities. Ordinary capabilities, also known as operational or zero-level capabilities, refer to functional processes and routines that produce outputs by combining various resources and permit the firm to earn revenue and profit in the present (Helfat & Peteraf, 2003; Winter, 2003). A firm possesses strong ordinary capabilities if it performs daily functional processes efficiently. For example, in case of a retailer, the efficient operation of current retail stores represents an ordinary capability (Daniel et al., 2014), whereas the processes supporting the rollout of new retail stores represent dynamic capabilities (Winter, 2003).

Teece (2007) differentiates between three types of dynamic capabilities: sensing (i.e., recognizing threats and opportunities), seizing (i.e., decision-making about how to make use of identified opportunities) and transforming (i.e., protecting, enhancing and, if necessary, redeploying a firm's resources and capabilities). Each of these three generic, corporate-level dynamic capabilities is underpinned by microfoundations, a term that refers to "distinct skills, processes, procedures, organizational structures, decision rules, and disciplines." (Teece, 2007, p. 1319). In this paper, we are particularly interested in the microfoundations of transforming capabilities in the context of channel integration. For this purpose, we investigate firms that have passed the stage of recognizing technology-induced changes in customer behavior (sensing) and have made the decision to implement an omnichannel approach (seizing). Although sensing and seizing point managers in the direction of spotting and acting upon a business opportunity, transforming capabilities are necessary to implement a strategy by harnessing or if necessary, improving

the firm's resource base. Transforming capabilities enable managers to (re)allocate, (re)combine and (re)configure the firm's assets and resources (Teece, 2007).

2.3 Sense-and-Respond approach

Companies often struggle with dynamic environments and their discontinuity. In order to meet this challenge and to stay competitive, Haeckel (1995, 1999) suggested the sense-and-respond approach, which was introduced as a tool for management to develop and manage dynamic capabilities. The approach explains how the overall design of an organization can support dynamic capabilities (Haeckel, 1999). Firms thinking and acting in line with the sense-and-respond approach see organizational effectiveness as responsiveness and flexibility (Haeckel, 1995). However, firms need to adapt to "a modular, fluid, organic organization to respond effectively to dynamic non-linear change" (Haeckel, 1995, p. 9). This approach represents a valuable conceptualization of the microfoundations of dynamic capabilities and has been successfully applied in the IS domain to investigate IT-enabled transformative processes (e.g. Singh et al., 2011; West et al., 2014). The sense-and-respond approach by Haeckel (1999) is consistent with the organizational and managerial processes involved in the development of dynamic capabilities suggested by Teece et al.'s (1997) (i.e. coordination, learning, reconfiguration) and with the dynamic capability model proposed by El Sawy and Pavlou's (2008) (i.e. sensing the environment, learning new skills, integrating knowledge, coordinating activities).

The sense-and-respond approach advocates that an organization's business process design needs to support the firm in sensing and responding to environmental changes and deal with discontinuity (Haeckel, 1995, 1999). The approach builds on four actionable business design principles: (1) Processes that learn enable organizations to adapt to environmental change and they are sensitive to changes and often enabled through technology, which provides the information about the environment and customers of the organization. These learning processes change over time and collecting external as well as internal signals. These signals again are used to "update" the organization and linked to its operation as well as decision-making (Haeckel, 1995; Mathiassen & Vainio, 2007), (2) Value-based governance articulates the values, defines the responsibilities, renews and embeds principles into organizational routines. This principle defines accountabilities and procedures, i.e., the outcome and how it is done. Personal accountabilities specify the outcomes but maintaining the flexibility of individuals. Accountabilities demonstrate dynamic commitments between individuals (Haeckel, 1995). (3) Dynamic commitment of resources enables models to change, such as an individual's personal mental model, a shared mental model or an institutionalized model (e.g., financial, forecasting, pricing). This, often is supported by technology, for example through

increased data gathering or processing (Haeckel, 1995). (4) Modular design enables the firm to mass customization by processes and services, which are allowed to disaggregate functions and to be recombined in order to provide a resource efficiently response to the customer (Haeckel, 1999).

Although the microfoundations of dynamic capabilities for channel integration are still underexplored, a few empirical studies in marketing and IS are closely related to the subject at hand and provide valuable insights. First, Wilson and Daniel (2007) have identified seven dynamic capabilities for multichannel transformation in business-to-business (B2B) markets. They argue that the development of e-commerce and the service demands of purchasers cause changes to firms' routes to market (i.e., channels), resulting in new combinations of channels. Against this background, the authors note that B2B firms should have the following seven dynamic capabilities: (1) an active review of the route to market (in a cycle of strategy development and implementation), (2) the ability to align the route to market with different segments and product characteristics, (3) the ability to create innovative combinations of channels, (4) the iterative development of customer value, (5) the ability to integrate processes and IT to support multichannel relationships with customers, (6) an organizational structure able to balance innovation and integration, and (7) multichannel-appropriate metrics and rewards.

Second, Hansen and Sia (2015) have conducted a single case study on Hummel, a European sports fashion firm that has transitioned to an omnichannel approach. Those authors have identified two key dynamic capabilities that enabled the firm to transition to an omnichannel approach. On the one hand, the firm reconfigured its technology infrastructure; on the other hand, the firm reconfigured its organizational practices. Changes to the technology infrastructure included the development and integration of the firm's IT systems, the firm's corresponding make-or-buy decisions and the firm's cooperation with third-party developers and vendors. The key changes to organizational practices included the coordination of cross-departmental processes, restructuring measures and adapting both the performance evaluation and job descriptions. Moreover, the transition was fostered through both top management's strong dedication to the omnichannel strategy and the recruitment of executive team members with a professional focus on the digital agenda.

Third, Koch (2010) has investigated, based on three cases, the necessary capabilities to develop successful electronic business-to-business (B2B) marketplaces. The study identified inside-out, outside-in, and spanning capabilities, which serve as the basis for creating higher-order dynamic capabilities. The results of the study show that it is important to cultivate a "trial-and-error" culture, which enables the development of capabilities. Furthermore, it is found that the successful development of an electronic B2B marketplace is supported by the dynamic capabilities of entrepreneurial alertness and customer agility.

3. Research Method

3.1 Case Selection

Perceived as more robust than a single case study, we conducted multiple case studies to ensure the generalizability of the constructs identified (Eisenhardt, 1989; Paré, 2004; Yin, 2009). Multiple case studies allow us to identify the commonalities of the underlying processes influencing omnichannel transformation across firms. With this approach, we concur with Eisenhardt and Martin (2000), who argue that dynamic capabilities show identifiable commonalities across firms and do not have to be firm-specific. The authors explain, "while dynamic capabilities are certainly idiosyncratic in their details, the equally striking observation is that specific dynamic capabilities also exhibit common features that are associated with effective processes across firms" (p. 1108). They conclude, "the functionality of dynamic capabilities can be duplicated across firms" (p. 1106). We chose a qualitative case study approach, because empirical evidence on the microfoundations of dynamic capabilities in the context of omnichannel management is scarce. The phenomenon of interest is an emergent and has previously not been subject to in-depth empirical investigation, so we sought a revelatory case. In conducting our case study, we followed established guidelines for case study research (Yin 2009).This study seeks to identify the key microfoundations for channel integration in firms. Because qualitative approaches are better suited than quantitative methods to capture the nature of dynamic capabilities, we chose a case study approach, as recommended by Eisenhardt (1989), Paré (2004), and Yin (2009).

We chose to conduct case studies within the retail and insurance industry, where the omnichannel approach has become a key strategy and research already provides a fundamental base of insight (e.g., Hansen & Sia, 2015). Applying literal replication logic, we selected two cases with intrinsic similarities to yield similar results (Paré, 2004). The chosen cases share numerous common characteristics with regard to cultural and geographic proximity, distribution channel setup, and the maturity of channel integration. In particular, we chose two business-to-consumer firms operating in Switzerland that are both leading in their own field. Furthermore, we selected so-called click-and-mortar operating firms because one central topic of omnichannel management is the integration of offline and online channels (e.g., Brynjolfsson et al., 2013; Verhoef et al., 2015). Both case organizations have successfully integrated their offline (i.e., physical retail stores or personnel) and online (i.e., e-commerce websites) channels and were striving to transform from a crosschannel to an omnichannel approach. We believe these two cases are exemplary or typical cases for firms and thus provide valuable insights. Table 1 presents an overview of the firms.

	FashionCo	InsureCo
Industry sector	Retail	Insurance
Products sold	Fashion jewelry	personal, property, casualty insurance, life insurance, and pension fund solutions
Geographic markets served	International	Switzerland
Nature of channel transformation	Large strategic omnichannel transformation program	Large strategic omnichannel transformation program
Channel integration initiatives implemented	- Click and collect - Click and reserve - Real return - Online in-store - Crosschannel loyalty program - Electronic gift cards redeemable in all channels	- Company-wide single CRM - 360-degree customer profiles - Customer assessment instructions
Goals of channel integration	- Enhance customer experience - Strengthen unified brand appearance across channels - Increase sales	- Enhance customer experience and convenience - Get closer to customers and sales force - Support sales force - Increase sales

Table 1: Overview of case organizations

3.2 Data collection

Data collection was conducted as a combination of semi-structured interviews and document analysis to provide a rich picture of the events and issues within the case organizations (Dubé & Paré, 2003; Eisenhardt, 1989). For each case, we established an initial relationship with a high-ranking manager within the firm, who acted as the main contact point to help us identify more (and the most) relevant interview partners. Because channel integration involves multiple business units within each firm, we deliberately interviewed experts from the relevant functional areas (including both market and technical experts) and from different hierarchical levels (Eisenhardt & Graebener, 2007). Participants drawn from the case firms represented four distinct organizational groupings: channel, IT, supply chain, and general business managers. All interviewees held management positions at different levels and were directly involved in the omnichannel transformation. We conducted eight interviews at FashionCo and six interviews at InsureCo.

The interviews were based on a set of open-ended questions, which allowed us to follow up on interesting and unexpected responses and allowed the participants to elaborate on their perceptions, experiences, and reflections (Paré, 2004). Prior to asking the questions, we introduced the goals of our study and the interview. The questions were guided primarily by four key issues: the current channel setup and

management, initiatives and triggers of channel integration, relevant capabilities and resources to transition to an omnichannel approach, and measures to ensure future competitiveness. Participants with specific technical backgrounds were asked more in-depth questions about their firms' IT infrastructures and processes. The Appendix shows the interview guide used for data collection. The interviews lasted between 45 and 85 minutes and were recorded and transcribed verbatim so we could analyze the resulting data in a rigorous and transparent manner. Secondary data in the form of publicly available firm information (e.g., presentations at conferences, annual reports, and press releases) and internal documents (e.g., presentations, strategy papers, and organizational charts) provided the researchers with background information on the firms' channel integration. These documents served two primary purposes: they helped us clarify the information gathered during the interviews (Paré, 2004), and provided ancillary information about the organizational context—that is, the firms' strategic objectives, customers, and competitive environments.

3.3 Data analysis

The data analysis process broadly followed the recommendations of Eisenhardt (1989), Paré (2004), and Yin (2009). First, we analyzed each case as a separate study to gain an understanding of its unique patterns. In a second step, we aggregated the findings of the within-case analyses both to determine whether they make sense beyond each individual case and to achieve generalizability (Eisenhardt, 1989; Paré, 2004).

In the initial step of the within-case analysis, we read all of the interview transcripts for each case and noted our first impressions in interview and case reflection memos. Memo-writing, which we continued throughout the entire data-analysis process, allowed us both to note reflections, comments, questions, and ideas as they occurred and to store them for further investigation and refinement. Next, we coded the data to reduce its volume and used the qualitative data analysis tool ATLAS.ti to store all case data (i.e., interview transcripts, documents, memos, field notes) in a central location, analyze our data, and maintain the traceability of the coding and its evolution. In the coding process, with each case treated as a separate study, each step was conducted independently by the authors, with regular discussions to avoid subjective interpretation and enhance validity.

In the coding process, we first openly coded the interview transcripts line by line. Despite our research interest in the microfoundations underlying channel integration, we tried to remain as open as possible to the empirical data and tried not to be constrained by prior theory, seeking instead to identify the concepts and relationships that were salient in the data. We identified processes and routines from the interviews that matched the sense-and-respond approach and assigned them to the four actionable business design principles. During the coding process, we frequently compared the interviewees' responses in an effort to

analyze different perspectives on the design principles. We inductively refined the coding scheme by adding definitions and vivid examples to each code. Pattern coding allowed us to group and integrate related codes further to derive more abstract categories

After analyzing the data in each case, we used cross-case analysis to identify cross-case patterns and determine whether the findings of the within-case analyses were applicable across the cases, thus permitting generalizability (Eisenhardt, 1989; Paré, 2004; Yin, 2009). To identify similarities and differences between the cases, we analyzed the entire collection of extracted descriptive codes and compared both within-case analysis results to examine which of those results occur in both cases. Each researcher independently reviewed the dynamic capabilities identified in the within-case analysis and noted patterns across the cases. Then, the patterns were compared between the researchers for consistency and aggregation. Conclusions were discussed and differences were solved.

4. Results

4.1 Case introduction

FashionCo is one of the largest international fashion jewelry retailers. In addition to selling its products directly via own and partner retail stores, FashionCo was one of the first among its competitors to harness the opportunities of e-commerce in an early stage of the Internet. The e-commerce website initially was only active in European markets: today, it serves up to thirty markets. In addition to retail stores and a website, the firm operates a social media presence for communication purposes, but no mobile shopping app. Until recently, in line with a multichannel approach, the management of the physical retail channels and the website was clearly separated, with no overlapping responsibilities or interaction. The channels were run as silos with their own processes and performance measures. Nevertheless, the channels were harmonized in terms of products and prices to achieve consistency across the channels.

Several years ago, top management implemented an omnichannel strategy envisioning a seamless customer experience across all available channels. The firm's goal was to place the customer at the center of an integrated shopping experience. All interviewees agreed that the decision to move towards a customer-centric, channel-agnostic model was driven by the increasingly competitive market and the recognition of changing customer behavior. The firm understood that there is no longer a store and an e-commerce customer, but a customer who uses all channels. To kick off the transformation, the firm focused on the integration of its own and partner retail stores and the website, implementing six channel integration initiatives that are regarded as a significant milestone in the omnichannel transformation. The initiatives

include the following: (1) “click and collect” (i.e., purchase online and collect in local store); (2) “click and reserve” (i.e., reserve online and try in local store); (3) “real return” (i.e., purchase online and return in local store); (4) “online in-store” (i.e., in-store purchase for home delivery); (5) a crosschannel loyalty program; and (6) electronic gift cards redeemable in all channels. By integrating its e-commerce website and retail stores, the firm aims to increase both customer experience and loyalty, ultimately resulting in increased sales. As a starting point, the initiatives were implemented in specific pilot countries and subsequently rolled out to other international markets. The driving departments behind the change were retail process management and IT ensuring end-to-end process modeling. The implementation of the channel integration initiatives required a significant transformation of the firm’s resources and capabilities. Although the channel integration initiatives represented a significant milestone, the firm views the omnichannel transformation as an ongoing process.

InsureCo is one of the leading and largest Swiss insurers offering both private and corporate customers with a comprehensive range of insurance products and operating worldwide. Their fields of insurance include personal, property and casualty insurance as well as life insurance and pension fund solutions. InsureCo employs more than 3,000 people who serve more than 1.5 million customers. InsureCo’s channel portfolio includes established direct and online sales, such as more than 200 general agencies throughout Switzerland, who employ external sales staff of around 2,500. The channels are supplemented by a call center for lead generation and cooperation partners. Additionally, to conventional communication channels such as telephone and direct mail, the firm increasingly relies on new media and applications such as social media. InsureCo operates a broad channel portfolio to establish a long-term relationship via the channel favored by the customer, placing the end customer at the center.

InsureCo’s top management implemented an omnichannel strategy in close cooperation with all departments to ensure the right adjustments for every stakeholder. Before omnichannel was implemented, a multichannel approach was followed, with no interaction between channels and silo management. Now, the omnichannel strategy is lived with the right mindset throughout the firm and ensures that all channels play seamlessly together. The omnichannel approach is seen as a team effort.

FashionCo and InsureCo provide valuable insights into firms that are transitioned to an omnichannel approach and present positive examples of the phenomenon of interest. Both firms began with a multichannel approach and recognized changes in customer behavior induced by technological advancements. Based on a clear omnichannel strategy defined by top management, both firms implemented concrete channel-integration initiatives focusing on the integration of retail stores and e-commerce. In both cases, pilot projects served as a generator for first insights in order to roll out successful test on a large

scale. Both firms see great potential in omnichannel business to provide customers with a unique shopping experience, differentiate themselves from their competitors, gain more control over channels, and ultimately increase sales.

4.2 Introduction of OCRIS in response to market change

Based on a clear omnichannel strategy defined by top management, FashionCo implemented OCRIS facilitating the integration of retail stores and e-commerce. The interviewees highlighted the central role of IT for channel integration. They underlined the need to orchestrate IT assets and capabilities to support channel integration. Implementing their channel integration initiatives required FashionCo to integrate their Enterprise Resource Planning (ERP) and e-commerce systems and create a centralized customer database. Moreover, the firm enhanced their data analytics capabilities and implemented technologies to identify the customer across channels.

FashionCo operates an ERP system supporting their core business (e.g. finance, procurement, reporting) and supply chain functions (e.g. warehousing, inventory management, fulfilment, accounting) for their retail stores, including both their own and partner stores. Moreover, they run standard e-commerce systems customized to their specific needs. FashionCo runs additional third-party solutions for content and product-data management for their online channel. The e-commerce system allows flexible front-end design with regard to content and features. Thereby, the firm can rapidly react to changing customer needs and ensure high usability.

Before channel integration, in the multichannel environment, the ERP and e-commerce systems were operated separately and were designed for scalability in terms of volume. Nevertheless, both systems were flexible enough to be integrated and could be leveraged to implement the channel integration initiatives. FashionCo made substantial efforts to build interfaces between the systems. In particular, a middleware facilitated IT integration. One key requirement for the integrated IT infrastructure was real-time capability.

FashionCo noted that the implemented interfaces created high complexity and required many workarounds. Realizing that this would restrict their channel integration capability in the future, FashionCo decided to abolish its existing e-commerce solution and switch to a system from the provider of its ERP system. Consequently, the firm expects to integrate channels with a higher degree of consistency and better cost efficiency.

Another key IT initiative was the integration of fragmented databases within the firm. Before, isolated capture of customer data occurred in channels that did not feed into a single repository. FashionCo established a CRM system to collect and store customer data from both offline and online channels, thereby

creating a single view of the customer. Although this centralized customer database facilitated data quality management, it was accompanied by higher requirements for data security, making it necessary to create new capabilities. To leverage the captured customer data, FashionCo enhanced their data analytics capabilities. According to FashionCo's director of finance and accounting, one key goal of data analytics is to better predict customer demand, thus reducing excess and to better steering crosschannel distribution: "A forecast should ensure that we do not have a surplus of products and obsolete products in the stores. And if we do, we could consider what to do with this surplus and if we market it online or offline."

Another goal is to enable a seamless and personalized customer journey without the loss of progress for the customer, as explained by FashionCo's director of customer relationship management: "When the customer is doing research at home from the desktop computer and the next day wants to continue on the mobile phone in the train, the progress she made the night before must not be lost due to the channel switch. Otherwise she is frustrated for not receiving a seamless transition."

However, this requires the identification of the customer across channels and early in an interaction. This poses a challenge, especially in the physical store. One way to identify customers in the retail store is by integrating the loyalty card early into the sales process. Based on the customer's ID, the tablet-equipped sales staff can access her personal data and purchase history and provide personalized recommendations.

Based on a clear omnichannel strategy defined by top management and aligned with other departments throughout the firm, InsureCo implemented OCRIS facilitating the bundling of most of employed channels as well as the sales force. Therefore, InsureCo invested in a trigger based-CRM platform, which serves as the central platform and consists of different modules. This CRM landscape is fed data for building 360-degree customer profiles and connected to the firm's channels to enable channel-wide communication. Within this CRM landscape, Hybris is used as campaign management tool. The campaign management tool enables among other tasks the selection and segmentation of customers in order to personalize the content communicated via the specific and matching channels. Furthermore, the CRM landscape allows data access as well as reporting. InsureCo operates the traditional channels such as email, direct mail, phone, and a customer web portal via this platform, but also their lead engine and external sales force. The lead engine for example provides the sales force staff instructions for the assessment of customers with explanations how to take care of a lead. These instructions are aimed to intelligently and efficiently convert these sales opportunities (i.e., leads) to sales. In the case, leads remain unprocessed or are not processed in a given time frame, they are transferred to the central call center, which will take care of processing the lead. The firm uses one single CRM platform, to which every relevant entity has access to the customer profiles. This allows consistency of customer profiles and it represents the backbone of their OCRIS. InsureCo. Also

makes use of a group-wide a data lake, which is accessible across all served countries. In the near future, InsureCo plans to integrate also social media, which is not the case yet. Email represents the biggest channel for InsureCo, whereas the external sales force is the second biggest, but also the one which drives the firm most. The telephone was added recently to the OCRIS and represents the third biggest channel for InsureCo.

4.3 Building dynamic capabilities

Based on Haeckel´s four adaptive organization principles we examined how FashionCo and InsureCo transitioned to omnichannel management by combining these principles and OCRIS. In the following, we present the four groups of sense-and-respond strategies used by the case firms.

Sense-and-Respond Strategy	Description
Processes that learn	Firm's ability to learn and thereby adapt to environmental change, often enabled through technology-provided information
Value-based governance	Firm's ability to create an adaptive organization through articulating values and embedding principles into organizational routines
Dynamic commitment of resources	Firm's ability to adapt to changes through the dynamic commitment of resources and reflecting accountabilities in the adapted organizational structure
Modular design	Firm's ability to design processes modularly to be quickly and easily reconfigurable

Table 2: Overview of Sense-and-Respond-Strategies

4.3.1 Processes that learn

Processes that learn enable organizations to adapt to environmental change. These processes are sensitive to changes and often enabled through technology, which provides necessary information, such as about the environment and customers (Mathiassen & Vainio, 2007).

FashionCo achieved this capability through OCRIS, which allowed the firm to learn about its customers' evolving needs quickly. OCRIS enabled the collection of information about the behaviors of customers from both digital and offline channels, storing it and compiling a rich and up-to-date customer profile. Visualization applications (i.e., dash-boards) provided insights for the sales and service employees, allowing them to cater to their customers' individual preferences when they interacted with them. Thus, OCRIS served as the backbone for dynamically attending to customers and engaging customer-serving processes accordingly.

InsureCo gathered customer data as well, such as through daily working routines like contract conclusion or customer dialogue, tracking of behavior on the online customer platform, applications, or the

general online behavior. This data was then saved and processed in an Enterprise Data Warehouse (EDWH) and the CRM system. The data was then analyzed to identify customer-specific behavior patterns, such as preferred channels, and real-time sales opportunities. The campaign management systems were fed with the EDWH and CRM data. To be more precise, data was translated to target group segmentation and individual customer profiles. The latter served the campaign management to cap the exposure of campaigns of individual customers. A central aspect of InsureCo's campaign management are customer routines, which can be used to be translated in possible triggers in order to direct and optimize the campaign accordingly. At the same time, campaigns are analyzed regarding their effectiveness. A further and extended source for learning exhibited the collaboration and exchange with third party providers such as service providers, consultancies, and external trainings. The interviewees mentioned that knowledge generation is a central aspect of the implementation of strategic initiatives. Interviewee 1[1] highlighted the importance of training, "since the omnichannel strategy is connected with a skill shift. The external sales staff, who is the expert, can provide the customer with more complex consultation."

To leverage the customer information provided by OCRIS, FashionCo redesigned its operational customer-facing processes in the retail stores to have shop assistants serve the customer accordingly. The firm made substantial efforts to enhance their shop assistants' omnichannel skills using training measures to create a convenient customer experience. For "click and collect" and "click and reserve," the staff had to be trained not only to use the systems showing customer orders and reservations and but also to react appropriately. For example, in cases involving reservations the staff had to prepare the products and ensure staff availability to consult with the customer at the agreed time. Moreover, they were trained in how to order a product from the e-commerce website and how to handle returns of online orders. To increase the acceptance of the new operational processes, FashionCo continuously gathered shop assistants' and customers´ feedback and iteratively designed and tested the processes.

FashionCo designed learning processes to sense needs and opportunities for further developing its omnichannel distribution model and practices. Before rolling out the omnichannel initiatives on a large scale, FashionCo ran pilot projects in dedicated test markets. This allowed the firm both to gain knowledge about the effectiveness of specific initiatives and to iteratively improve them. The pilot projects were prioritized and selected based on feasibility in terms of the firm´s ability to handle the technological requirements, establish processes, and roll out the initiative on a large scale. The firm appointed a specific committee that discussed possible ideas for piloting and decided which one to advance. The focus on a

[1] Due to a non disclosure agreement positions of InsureCo remain unmentioned and are replaced with Interviewee 1-6

small number of projects was necessary because the firm's capacity of running several projects in parallel was limited, as explained by FashionCo's vice president of digital business: "We wanted to have a concrete portfolio of these initiatives, which we can build technologically and provide clear support processes to roll it out globally." The pilot projects were initiated in a beta-stadium. The interviewees mentioned that the pilot projects were conducted in a trial-and-error mode, allowing the firm to quickly generate insights and implement learning to optimize the projects during the test phase. Once the firm had generated sufficient knowledge about an omnichannel initiative, that initiative was multiplied throughout the firm. This approach contrasts with the retail industry's common approach of implementing initiatives only after a long phase of precise planning and testing.

Also InsureCo designed similar learning processes. To be more precise, InsureCo implemented "test-and-learn" projects to build competencies in new channels. As soon as the new channel was tested positive, i.e., specific key performance indicators are achieved, it was integrated into the channel portfolio. "Currently, we are running some test-and-learns projects, through which we experiment and generate ideas. Then, we are connecting them to our CRM." (Interviewee 6).

4.3.2 Value-based Governance

Value-based governance provides the opportunity for creating an adaptive organization by articulating the firm´s values and embedding principles into organizational routines. FashionCo focused on establishing an integrative and customer-centered mind set in the departments to facilitate channel integration. To this end, the senior management continuously promoted and drew attention to the importance of "omnichannel thinking", for example, through face-to-face meetings with managers and influential employees, presenting studies and reports on the effectiveness of omnichannel initiatives. Moreover and as stated before, FashionCo trained its sales staff in how to leverage the online channel and therefore the resulting interplay of channels.

InsureCo also focused on establishing an integrative and customer-centered mind set within the company. This was partly achieved by the high importance of setting strategic goals in coordination with all divisions within the firm. For example, states interviewee 5 "we decide together what we are working on and how we prioritize. We are meeting up to plan and act – not solely for coordination." Operative routines foresee for example to extract and identify strategic topics from the firm's stakeholders to develop adequate initiatives (Interviewee 6). Moreover, the strategic direction was communicated throughout the firm in order to facilitate exchange and sensitize for omnichannel management as well as with external partners (Interviewees 1, 4, 6).

At FashionCo, the value-based governance was reinforced by a new an organization-wide incentive scheme, as expressed by FashionCo's vice president of digital business: "The incentive scheme is a key success factor for omnichannel integration. If the different channel teams are not incentivized correctly, it will never work." This implies that the bonus and reward incentives need to be aligned with the omnichannel approach.

Before its channel integration initiatives, FashionCo's retail and e-commerce departments were separated, each having their own sales targets. Both teams were only rewarded per sale generated in their own channel. According to this model, in case of "click and collect", the sale would be attributed to the e-commerce team despite the involvement of the store in storing and transferring the product to the customer. Because of both the lack of financial reward and the implied channel competition, shop assistants were not motivated to promote the website. To achieve channel integration, the incentive scheme needs to prevent channel conflicts and foster cultural change towards a customer-centric organization. Omnichannel management appreciates the importance of every channel playing its part in the wider customer experience. Accordingly, FashionCo shifted focus away from rewarding the channel that made the sale to a model that recognizes all aspects of the customer journey. At the company level, the retail department's overall performance is no longer assessed solely based on sales generated in-store; instead, it is also assessed based on sales generated through the website. The same is true of the e-commerce team. At the store level, parts of a sale are attributed to the store if a customer purchases online within a defined period. This motivates store assistants to promote the e-commerce web-site if a product is out of stock or the online channel adds to the customer's convenience. According to FashionCo's vice president of digital business, the new incentive scheme had a significant impact on the mind sets of the shop assistants, especially among the firm's retail partners: "This, of course, changes the mind set because the shop assistant prefers to send the customer to our website if they don't have the product she wants, rather than losing her to the competition. […] This is a real success factor, and the retail partners also realize that the Internet, the mobile website, and the social channels bring them traffic. For example, with 'click and collect' or 'click and reserve'. All of a sudden, customers come to the store, who otherwise would have never been in the store. The retails partners notice more and more that it is a win-win situation rather than a threat."

InsureCo implemented as well a new incentive scheme to further support and motivate the employees were not only the single channel's success was evaluated but the overall result and the single contributions of the channels. Interviewee 2 mentioned that "external sales staff often has the feeling leads are taken away from them, since it is not anymore the primary channel, but one of many. We have to take him his fear and prove him the opposite. For him, something has to be in it, whether it is a deal or development opportunities

in the omnichannel environment. Otherwise they are not motivated and do not participate." In addition, InsureCo operates a "super-lead" system in order to motivate the field staff to conclude contracts. This system enables to process the transferred leads in a team or individually, which supports the thinking to cooperate, which is from particular importance for OCM (Interviewee 2). This incentive scheme further promotes the abolishment of silos within the company.

4.3.3 Dynamic commitment of resources

To effectively adapt to emerging situations, organizations must dynamically commit both IT and non-IT resources. Dynamic commitment and accountabilities were reflected in the adapted organizational structure. FashionCo as well as InsureCo began to remove organizational silos both to foster collaboration, for example between the retail stores and the e-commerce website or between different departments to decrease channel conflicts. Breaking down these silo barriers also allows the customer a barrier-free switching between channels.

Recently, FashionCo placed both the retail stores and the e-commerce website under the responsibility of the central distribution management unit at company headquarters. Previously, the e-commerce website was run as a separate business unit with its own responsibility, processes and targets. The central distribution management unit manages the retail stores and ensures the alignment of the activities in the various regions while allowing a certain degree of freedom to locally adapt marketing activities. In the future, FashionCo aims to abolish organizational silos even further, as outlined by its director of customer experience, business collaboration and IT application services: "We are endeavoring to reflect the omnichannel approach organizationally in the future. When we want to be customer-centric, then we also have to reconfigure the organization, the governance, and decision making. And, ideally, dissolve silos to build an organization without them."

Whereas distribution activities are already coordinated across the retail stores and the e-commerce website, communication activities are managed by a separate business unit. This unit is responsible for marketing communication (e.g., via print, TV, social media), PR and events. To transition to an omnichannel approach, which enables a seamless experience across the entire customer journey, FashionCo must achieve an even closer alignment between its distribution and communication activities.

InsureCo strengthened the interplay of channels through the material as well as immaterial distribution of resources to projects and departments (Interviewees 4 & 6). The targeted distribution, e.g., investments, was aimed to optimize service delivery and internal processes (Interviewee 2), such as through investments in IT resources like the previously mentioned EDWH, data analytics, trigger-based CRM system, and hybris

marketing (interviewees 1, 3, 6). Interviewee 1 mentioned that “CRM, processes and systems are available at every touchpoint. This means that the CRM knows what the customer did and the customer support knows about the latest changes for the next interaction. It is something important that throughout the customer journey customer data is available. To guarantee that this overarching construct works, it needs appropriate and fast systems “. However, the management of resources was aimed to maintain and increase efficiency of the systems (Interviewee 3). Channel resources were distributed (added or removed) in order to leverage channel capacities optimally (Interviewees 2 & 4). In order to achieve an optimal distribution, InsureCo evaluated the need of all channels and the distribution regularly, based on the identification of needs through an analysis of the channels’ environment as well as a cost-benefit analysis. This evaluation enables InsureCo the needs- as well as capacity-based dynamic distribution of resources. For example, there were varying channel affinities among the customers, which have significant influence on sales processes as well as the campaign management or it is possible to group leads to optimize the sales process (Interviewee 2). As a consequence, channel structures and the interplay was modified with the aim of increasing the likelihood of the closing probability (Interviewee 2). This dynamic adjustment allows to integrate and apply the gained knowledge directly into sales processes and interaction with the customer. The focus of these dynamic optimization routines is the processing of the customer in the team (Interviewee 4 & 5). The capability, to dynamically adjust the resources enabled InsureCo to quicker adapt to current customer needs (Interviewees 1 & 5).

FashionCo’s dynamic commitment was further reflected by the strengthened interplay between business and IT functions as well as within the IT department. FashionCo’s vice president of digital business under-lines the importance of close and early alignment between business and IT: “A huge success factor for us is that we are driving the things we do together from the very beginning. Everything must come from a single source. […] Certainly, this is something where we need to get even stronger and better. Also in the sense of digital transformation. To integrate IT even more strongly as an equal partner."

IT is now regarded as more than a mere classical development and service function. In particular, FashionCo’s business departments leveraged, and will increasingly leverage, previously gained capabilities of the IT department in project, process, and demand management. Simultaneously, the IT department had to build new capabilities to enable a successful collaboration with the business side. On the one hand, IT employees had to enhance their business sense, which facilitated the translation of complex omnichannel processes into business requirements. On the other hand, the interviewees mentioned that in the course of channel integration the IT department had become more customer- and employee oriented. Informal collaboration and mutual understanding between IT and business were considered much more important

than a formal governance structure. Therefore, the firm regularly held informal meetings where both business and IT employees monitored, steered, and prioritized channel integration initiatives.

In addition to cross-functional alignment, the firm highlighted the importance of interaction between the IT teams responsible for offline and online channels. In the beginning, it was very challenging to encourage communication between the different IT teams because those teams were unaccustomed to working together. As a countermeasure, FashionCo declared an IT project manager responsible for enhancing interaction within the IT department and bringing together different perspectives and knowledge.

4.3.4 Modular design

Designing processes in a modular fashion such that they can be quickly and easily reconfigured to provide novel and customized functionalities.

FashionCo developed more agile and flexible supply chain processes to rapidly respond to customer needs. The supply chain was reconfigured in a way to deliver products to the right place and at the right time. On the one hand, the supply chain had to become more agile and responsive to deliver products in a manner that best suits the customer's needs. On the other hand, the supply chain had to be optimized to increase efficiency and reduce costs. Indeed, supply chain is a major cost factor and, therefore, must be optimized to ensure the profitability of channel integration.

Before integrating their online and offline channels FashionCo followed the traditional approach of identifying products as part of online or in-store inventory and built strong capabilities to efficiently deliver inventory to either their retail stores or customer homes. However, channel integration required real-time, channel-agnostic visibility and cross-use of inventory across channels, which was enabled by the implemented ERP systems.

With regard to product delivery, the firm could leverage both their fulfilment capabilities and the existing store network for "click and collect" and "click and reserve." Ordering or reserving via the e-commerce website allows the customer to view in real time whether a given product is available in a nearby store. To fulfil customers' high expectations with regard to delivery times (i.e., the next day or during a predefined time slot), FashionCo had to enhance their fulfilment processes. For example, as stated by FashionCo's vice president of commercial activation and business processes: "The entire supply chain had to become more flexible because the customer expects that when she sees a product online today, she will receive it tomorrow. She doesn't want to wait five days for it because fast delivery is simply the standard."

When a customer places an order online or in the store, in the background, order-processing work-flows had to be established for that route through the distribution centers to find the most effective way of

getting an item to the customer. To increase supply chain agility and efficiency, the firm re-conceived their existing warehousing network to ensure better regional coverage.

InsureCo also operates in a modular design. For example, their «test-and-learn» projects are running in parallel to the daily business of the distribution management. As soon as a project has been proven to have positive influence, it is integrated into the channel portfolio. The IT infrastructure is expanded adaptively in accordance with internal and external requirements. Additionally, to operate modular, external partners and cooperations are maintained. The campaign management and the trigger-based CRM system are the core of the omnichannel venture and represent the basis adding modules – such as new projects – for further efforts. "We invest in the trigger-based platform, that you can feed more and more data, connect more channels – to make sure you can communicate through as many channels as possible. There, we are doing a lot. With the CRM, we have begun to build a platform that makes it possible to have 360-degree view. There are two suppliers of information for the trigger-based platform. We have also a lot of information of the customer from completely different systems."

5. Discussion and Contributions

In a dynamic market environment, in which the proliferation of digital devices and services has significant influence on customer behaviour and needs, firms need to constantly align their channel configuration to the way customers want to engage with firms. To meet today's customer needs, firms aim at transitioning to omnichannel business by integrating their channels. To support this undertaking, we investigated firms' transition to omnichannel business based on the dynamic capabilities perspective. Based on a case study, we identified four distinguishable microfoundations enabling firms to build the dynamic capability to integrate their channels. This study has identified the microfoundations constituting omnichannel management and how the investigated case study firms employed those microfoundations in practice. Providing these microfoundations is an important means of achieving and operating omnichannel business. As the results show, IS represent the basis for a dynamic omnichannel venture and the fusion of IS and business knowledge is necessary. OCRIS are the tool for enabling omnichannel management, but depends on the microfoundations to achieve the necessary capabilities.

In line with previous studies, our findings show the need for capabilities to reconfigure the firm's IT resources and organizational practices (e.g., Hansen & Sia, 2015) as well as learning (Teece, 2007). Regarding the reconfiguration of IT resources, the coordination and integration of IT assets and capabilities is important for firms (Aral & Weill, 2007). Hansen and Sia (2015) as well as Wilson and Daniel (2007)

note that for channel integration, the IT infrastructure plays an important role. We found that IT assets need to be enhanced in terms of integrating systems and data. While this allows for implementing specific channel integration initiatives, firms must further advance their technological capabilities to analyze the vast amount of data generated across channels. To implement omnichannel business and provide a personalized customer experience, firms require up-to-date information about the customer and use it across channels (Brynjolfsson et al., 2013). In this context, our study found that enhancing the capability to identify the customer across channels as well as feeding the database with the customer-generated data play an important role. Additionally, IT management capability is essential to reconfigure IT assets (Aral & Weill, 2007). In line with Hansen and Sia (2015) our findings show that the role of IT becomes more relevant in the context of omnichannel business and firms must better align business and IT. In addition, the collaboration between different IT teams responsible for different channels is beneficial and supports channel integration further.

Our study shows that for channel integration to be successful organizational practices need to be reconfigured. Instead of acting in a silo mentality, firms must remove organizational barriers to foster cross-departmental collaboration and allow information to flow through the firm (Kernaghan, 2013). According to our findings the main changes of organizational practices include the design of end-to-end processes, and adapting the performance evaluation and incentive structure. The importance of aligning incentives with the overall business strategy was also highlighted by Teece (2007), Koch (2010), and Hansen and Sia (2015). Incentives can catalyze channel integration by encouraging certain actions such as motivating sales staff to promote the online or mobile channel. Thereby, channel conflicts can be avoided and the overall performance is enhanced. A good incentive design is a critical element and an important microfoundation of channel integration. Interestingly, our findings show that firms must not engage in vast restructuring measures to establish a certain range of channel integration initiatives, but rely on cross-functional alignment.

Learning in terms of integrating and applying knowledge, is a core microfoundation for transforming capabilities. In the context of channel integration, mechanisms are required to generate knowledge through pilot projects following an agile approach and apply this knowledge to constantly optimize resource configuration and processes. In accordance with Koch (2010) our study found that a trial-and-error culture is an important microfoundation for channel integration capability, because it permits to learn from errors and optimize. However, an important factor both firms highlighted the commitment of the top management, which needs to be held accountable for providing the context and basis for this omnichannel venture.

Our study makes important contributions to both theory and practice. First, the research study is the first to empirically examine specific microfoundations of the base of firms' channel integration capability for transitioning to omnichannel business. To date, there has been little empirical insight in the field of omnichannel management. Most previous papers are conceptual in nature and provide only anecdotal evidence about the importance and value creation of omnichannel management. However, in recent years, reports have discussed a few examples of firms that have successfully transitioned to omnichannel management (e.g., Hansen & Sia, 2015). Therefore, we prompt research to move from conceptualization to empirical evidence. Building on the theoretical lens of dynamic capabilities and conducting a multiple case study allowed us to identify common abilities that underlie transformative processes, which have shown themselves to be essential across firms, namely the microfoundations processes that learn, value-based governance, dynamic commitment of resources, and modular design. The microfoundations enable managers to adopt practices and processes that are most suited to their specific circumstances, the needed changes and the available resources. As evidenced through both case firms to transition to an omnichannel business, the four component microfoundations makes an important contribution to the overall successful transformation process. Our study shows by providing empirical evidence of how firms adapt their business in order to transition to omnichannel management. Additionally, our study responds to Hansen and Sia's (2015) call both to shed light on how channel integration is accomplished and to generate deeper understanding of the challenges confronting implementation of an omnichannel strategy.

Second, from an IS perspective, gaining a deeper understanding of emerging omnichannel business is highly relevant because it is a strongly IT-driven topic. On the one hand, omnichannel business is triggered by technological developments in terms of digital devices and services. On the other hand, our findings underline the important role of IT assets and their continuous reconfiguration for firms' channel-integration capability. Moreover, we shed light on the emerging role of IT in business transformation and the changing interplay between IT and business departments. Therefore, this study provides relevant and concrete insights for IS research on the contribution of IT to achieve the target of omnichannel business.

Third, our empirical study contributes to research on dynamic capabilities, where empirical insights are scarce (Pablo et al., 2007) and which is abstract and generic in nature (e.g., Ambrosini and Bowman, 2009; Easterby-Smith et al., 2009). As argued by Ambrosini and Bowman (2009), more empirical research, especially qualitative studies, is necessary to counteract this limited support and the dominance of quantitative studies. Based on empirical evidence from two case studies in the retail and insurance industry we provide an in-depth investigation of the microfoundations of firms' channel integration capability. Thereby, scholars can better understand how firms deploy dynamic capabilities in practice. Moreover, we

are the first to introduce channel integration as a dynamic capability in the context of omnichannel business, illuminating the underlying microfoundations.

Fourth, for practitioners, the identification and detailed presentation of necessary microfoundations underpinning channel integration provides important decision support on how to transition to an omnichannel approach. To date, only a few firms have successfully established omnichannel management. In light of the changing environment, it is important for practitioners to understand how to deploy dynamic capabilities. In the near future, it will become especially crucial for firms to rethink their channel strategy to meet customers' needs and remain competitive (Verhoef et al., 2015), especially in retailing and a-like operating businesses.

6. Further Research and Limitations

This study reported on the microfoundations of firms' successful channel integration. Its findings raise the question of how the microfoundations can be generated and implemented. To extend this study, further research might investigate the generation and implementation of microfoundations, for example, through a longitudinal study. Additionally, it might be worthwhile to investigate the degree to which each microfoundation contributes to firms' channel integration capability. In turn, it would be interesting to measure the relationship between firms' channel integration capability and overall firm performance through a quantitative study. Indeed, one limitation of this study is the underlying assumption that the identified microfoundations for channel integration have a positive effect on firms' performance. Although the importance of these microfoundations was emphasized by the interview partners, the qualitative case study approach did not allow us to capture the actual nature of this relationship. Furthermore, data collection of our in-depth multiple case study was limited because in practice, only a few firms have achieved channel integration with a relatively high level of maturity. Moreover, only a small number of employees within the two case firms were able to provide relevant and in-depth information about the omnichannel transition. However, we are confident both that the relatively small number of interviewees per firm does not diminish the quality of our results and that we were able to interview the most knowledgeable managers within each firm. This result was ensured by gaining access to the firms through a high-ranking manager who helped us identify the most relevant interview partners in different business units. Nevertheless, we would welcome further studies in the field of omnichannel business that extend our findings. Furthermore, the cases considered in this study were both click-and-mortar operating firms (retail and insurance), which might impede generalization to other contexts. Further studies might investigate other industries and cultural

contexts. Additionally, because of the high dynamic of emerging and disappearing channels, omnichannel business is a moving target that provides a plethora of further research opportunities. Further studies shall extend our findings, especially with respect to the increasing number of digitized objects, an issue that is expected to strongly impact customer behavior and IT requirements within the firm.

7. Conclusions

Based on the dynamic capabilities perspective, we use empirical data to investigate the microfoundations underpinning the channel integration of firms transitioning to omnichannel business. The concept of dynamic capabilities, which has been applied as a theoretical framework in prior IS research to identify transformative processes through which firms reconfigure their resource bases (e.g., Daniel & Wilson, 2003; Koch, 2010; Liu et al., 2013). In particular we answered the question of how do organizations achieve dynamic capabilities by using OCRIS. We could identify four microfoundations through our multiple-case study, which provides empirical insights to the scarce field of qualitative studies within this context and advances our understanding of firms' channel integration capability. Our research shows that both technological and organizational microfoundations are necessary for successful channel integration, namely processes that learn, value-based governance, dynamic commitment of resources and modular design. Thus, our study extends research on omnichannel business by elaborating on microfoundations related to channel integration and provides valuable insights for IS research about the role of IT. Additionally, it enriches our understanding of how firms deploy dynamic capabilities in practice and provides practitioners with valuable decision support on how to transform their organizations toward an omnichannel approach.

Appendix

Current channel setup and management
How would you describe your firm's current channel strategy?
Which channels do you maintain and do specific channels play specific roles?
Which department in your firm is responsible for channel management?
What goals do you try to achieve with your channel strategy?
Initiatives for and triggers of channel integration
How has your channel strategy and channel management developed over time?
What was decisive for the transformation toward a new channel approach?
Which influencing factors have played an important role in the transformation?
Which initiatives drove the transformation?
What are the objectives you are trying to achieve?
Relevant capabilities and resources to transition to an omnichannel approach
Which resources (both immaterial and material) and capabilities were necessary for the channel transformation?
Which stakeholders' involvement was crucial?
What organizational changes were necessary?
What role did IT play in the transformation toward a new channel approach?
What have been particular challenges and obstacles?
What could have been done better during the transformation?
Measures to ensure future competitiveness
How do you want to ensure that your firm is adequately prepared for future relevant shifts in the market, technologies, or customers?

Table A: Key interview questions

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Appendix 4: Research Paper 4

Title	Digital nudging: Altering user behavior in digital environments
Authors	Tobias Mirsch Christiane Lehrer Reinhard Jung
Publication Type	Conference Paper
Status of Publication	Published
Reference	Mirsch, T., Lehrer, C., Jung, R. (2017). Digital Nudging: Altering User Behavior in Digital Environments. *In Proceedings of the 13th International Conference on Wirtschaftsinformatik (WI 2017)*, 634–648, St.Gallen, Switzerland.
Access	https://www.alexandria.unisg.ch/publications/250315

Digital Nudging: Altering User Behavior in Digital Environments

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Abstract

Individuals make increasingly more decisions on screens, such as those on websites or mobile apps. However, the nature of screens and the vast amount of information available online make individuals particularly prone to deficient decisions. Digital nudging is an approach based on insights from behavioral economics that applies user interface (UI) design elements to affect the choices of users in digital environments. UI design elements include graphic design, specific content, wording or small features. To date, little is known about the psychological mechanisms that underlie digital nudging. To address this research gap, we conducted a systematic literature review and provide a comprehensive overview of relevant psychological effects and exemplary nudges in the physical and digital sphere. These insights serve as a valuable basis for researchers and practitioners that aim to study or design information systems and interventions that assist user decision making on screens.

Keywords: Digital Nudging, Choice Architecture, Behavioral Economics, Human-Computer Interaction, User Interface Design

1 Introduction

Human decision making is imperfect. Research in psychology and behavioral economics has shown that individuals are influenced by various psychological effects during their decision making – consciously or unconsciously [1]. In fact, decisions are highly context-dependent; that is, they are influenced by the choice environment [2]. The reliance on heuristics and the influence of psychological effects such as social norms lead individuals to make predictable mistakes and often decide to their own detriment. Against this background, Thaler and Sunstein introduced the concept of libertarian paternalism as an approach to deliberately design choice environments to affect human behavior while respecting individual freedom of choice. Libertarian paternalism aims at helping individuals make better decisions in their own interest [2]. Choice environments can be designed using so-called nudges, which are relatively minor changes to decision environments. Nudges either attempt to overcome or use specific psychological effects to guide

individuals towards a predefined choice option. Nudges refer to “any aspect of the choice architecture that alters individuals’ behavior in a predictable way without forbidding any options or significantly changing their economic incentives” [2, p. 6]. Designing choice environments through the purposeful implementation of nudges is called nudging. A prominent example for nudging in the physical sphere is the change of cafeteria design to guide students towards a healthier diet without eliminating unhealthy foods from the menu. This is achieved by positioning healthy food options at eye level, thus making them easier to reach compared to unhealthy options [2]. In research, various disciplines, such as medicine [e.g., 3], psychology [e.g., 4], and different areas from sociology [e.g., 5] have dealt with the concept of nudging. The literature mainly discusses the application of nudging in the development of policies [e.g., 6], encouraging environmentally friendly behavior [e.g., 7], and promoting healthy lifestyles [e.g., 8]. In practice, nudging has been picked up by a number of companies and governments, which increasingly try to influence individuals’ choices [9].

The concept of nudging is increasingly gaining relevance in the digital sphere, as nowadays more and more decisions are taken on screens, such as websites or mobile apps, ranging from the choice of a travel destination to purchases of all types to the right life partner, insurance, or investment. However, in the digital environment, individuals are particularly prone to making deficient decisions. Due to the vast amount of information available on the Internet, individuals often fail to process all the relevant details to reach an optimal choice. Instead, individuals often make decisions on screens in a hasty and automated manner [10]. In this context, nudging can be an effective tool to guide users’ decision making. Compared to physical contexts, digital environments provide several advantages for nudging: the implementation of digital nudges is easier, faster and cheaper; moreover, the Internet provides specific functionalities, like user tracking, which allows personalization of nudges presented to users, making them potentially more effective [11].

While nudging has gained momentum in various fields of research as well as in practice, digital nudging has not gained much attention by information systems (IS) scholars. Against this background, we present digital nudging as a relevant and fruitful research area for IS research and for human-computer interaction (HCI) research in particular. However, prior HCI research has used behavioral economics concepts that focused mainly on a few selected heuristics and biases, such as the endowment effect, loss aversion [e.g., 12], or the status quo bias [e.g., 13]. In behavioral economics, Benartzi and Lehrer [10], and in IS, Weinmann et al. [11] extend the nudging concept to the digital context. Weinmann et al. [11] define

digital nudges as user interface (UI) design elements that affect choices and propose a five-step process for developing nudges in online decision environments (see figure 1).

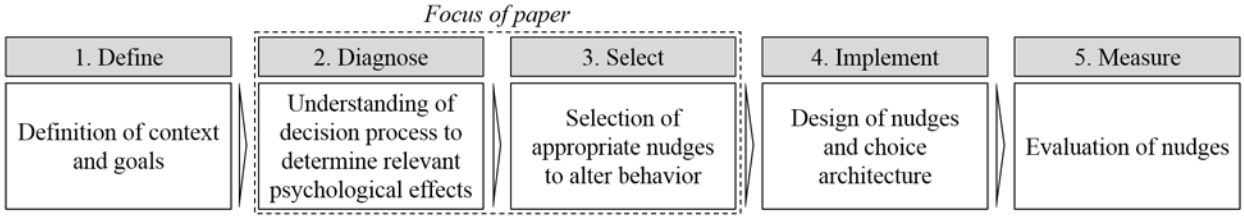

Figure 1. Nudging Development Process [11]

In the present paper, we heed the call of Weinmann et al. [11] for further research to gain a sound understanding of the mechanisms that underlie nudging. To achieve this research goal, we conducted a systematic literature review encompassing research from different disciplines. As a result, we provide an overview of relevant psychological effects that have been discussed in relation to nudging. Moreover, we present examples of digital nudges to illustrate possible approaches in practice. Thereby we address the second and third steps of the nudging development process, i.e., "Diagnose" and "Select". Based on these steps, concrete nudges and choice architecture can be developed ("Implement") and tested in lab experiments or in real world settings ("Measure"). With regard to the first step ("Define"), we do not limit our literature review, as well as the nudges presented, to a specific digital context, but provide a broad range of possible application areas.

The contribution of this paper is twofold. First, from a research perspective, we present digital nudging as a relevant and promising research area in the IS, particularly the HCI domain. In this paper, we provide an overview of the body of knowledge regarding relevant psychological effects that underlie nudges in the physical context. Thus, we illuminate the theoretical mechanisms that may also be at play in digital nudging. The psychological effects and nudges presented provide a valuable basis for behavioral researchers who aim to transfer them to the digital context and empirically examine their effects on user behavior. Moreover, our findings can guide design-oriented researchers when designing IS and interventions that assist users in making self-beneficial choices. Second, for practitioners, the concept of digital nudging provides new stimuli for UI and user experience (UX) design. A deeper understanding of the psychological effects at play in human decision making and behavior helps UI designers intentionally develop theoretically based nudges. By doing so, they can either make use of a specific psychological effect to reach a certain goal (e.g., increase sales or transaction speed) or counteract its influence. The exemplary digital nudges provide initial ideas as to how they may be implemented. Moreover, as all UI design decisions influence user

behavior, UI designers can use the knowledge about the effects to verify if the current choice environment of their IT artefacts nudges users in the intended way or not.

This paper proceeds as follows. First, we present the theoretical background of behavioral economics, nudging, and HCI. Subsequently, the methodology of the literature review and the results are presented. The paper concludes with a summary, limitations, and proposals for further research.

2 Theoretical Background

2.1 Behavioral Economics and Nudging

Traditionally, economics views the human being as homo economicus, whose decision making is fundamentally rational. However, this view disregards behavioral studies of cognitive and social psychology that have empirically shown that humans do not always behave and decide rationally [2]. Behavioral economics combines psychology and economics to investigate and model human behavior withconsideration for cognitive limitations and complications. Thereby, “behavioral economics increases the explanatory power of economics by providing it with more realistic psychological foundations” [14, p. 1].

According to dual process theories, dominant in the field of social psychology, individuals use different cognitive systems to assess information during the decision making process: on the one hand, there is intuitive System 1, which is fast, automatic, effortless and emotionally charged; and on the other hand, there is reason-based System 2, which is slower, effortful and deliberately controlled [15]. Most empirical studies in the field have concluded that everyday activities are mainly driven by System 1, making human decision making prone to heuristics and biases [15, 16]. Heuristics, i.e., simple rules of thumb, facilitate and accelerate the decision making process by reducing the amount of information processed. Moreover, the external environment, or choice context, is an important parameter in the decision making process [e.g., 17]. For example, different contexts may alter the assessment of trade-offs or comparisons between different options.

Nudging is a concept based on insights from behavioral economics aiming to alter environments in a way that would increase the likelihood of certain behaviors. A nudge is a simple intervention within the choice architecture to steer individuals by addressing specific psychological effects to make use of or overcome them. What differentiates nudges from other forms of intervention is that they are designed to preserve full freedom of choice [2]. Nudges are, for example, notifications that inform individuals of their calorie intake, nutrition labels on food or the automatic enrollment in a pension plan with an opt-out option

[18]. Stipulating a certain diet or exercise or enrolling someone without an opt-out option would not be considered a nudge. Transferred to the digital context, digital nudging refers to the "use of user-interface design elements to guide people's choices or influence users' inputs in online decision environments" [11, p. 3]. These UI design elements include graphical design, specific content, wording or small features (e.g., product ratings) [11].

2.2 UI Design in the HCI Domain

Research in the field of HCI studies and designs interfaces facilitating the interaction between users and IT artefacts, such as websites, applications, or devices. UI design aims at maximizing the usability and UX [19]. The usability of an IT artefact refers to its ease of use and efficiency. UX can be associated with various meanings, ranging from “traditional usability to beauty, hedonic, affective or experiential aspects of technology use” [20, p. 91]. According to Hassenzahl and Tractinsky, “UX is about technology that fulfils more than just instrumental needs in a way that acknowledges its use as a subjective, situated, complex and dynamic encounter” [20, p. 95]. It can be described as a consequence of the internal state of the user, including, for example, needs, motivation, expectations, or feelings.

HCI scholars have provided various principles and guidelines for good UI design [e.g., 21, 22]. Those guidelines are based on a sound understanding of individuals’ behavior and needs and acknowledge demographic diversity as a starting point for the design process (e.g., IFIP reference model [23]). Due to the heterogeneity and changes in how humans interact with IT artefacts, UI design principles do not represent ultimate laws for design. In fact, HCI research continuously tries to advance its approaches to improve interfaces and experiences in relation to technological and user development. In doing so, HCI research often leans on insights from other fields, such as ethnography or even phenomenological philosophy [24]. We claim that behavioral economic insights and the concept of nudging are inspirations for HCI research. First, research is informed by a real-world phenomenon: the imperfection of human decision making and how relatively simple it could be addressed with digital nudges. Second, through this approach, the gap between theory and practice can be bridged by providing a first analysis. Third, it can represent an approach to discover and develop new theories as well as empirical methods or an understanding of how different approaches may complement each other. Overall, a basis for further discussion of underlying issues or support to draw conclusions from experiments with empirical results can be established. Through this approach, HCI researchers may be able to provide UI designers with insights and guidelines to increase performance or user satisfaction and lower error rates [25].

3 Literature Review on Nudging

3.1 Systematic Literature Review

To provide a comprehensive overview of the existing research on nudging, the underlying psychological effects as well as related areas, such as libertarian paternalism and behavioral economics in the digital context, we conducted a literature review in April 2016. Following the methodology proposed by vom Brocke et al. [26], we performed a search spanning multidisciplinary databases providing access to academic journals and conference proceedings. We conducted four searches by applying relevant phrases (see table 1) in the fields title, keywords, and abstract.

Table 1. Results of the literature review

Search Phrase / *Database*	*Nudging / Nudge*	*Choice Architecture*	*Libertarian Paternalism*	*Behavioral Economics AND Online*
ScienceDirect	506	1232	14	13
EbscoHost	167	652	46	4
AISeL	1	21	0	2
Unfiltered results	673	1884	60	19
Sum of relevant articles	65			

From these results, we excluded duplicates and articles not published in journals or conferences. Afterwards, we screened the articles to evaluate if they contributed to this paper. During this process, we excluded articles not topic-related, for example, articles about improving ozone modelling using observational nudging in a prognostic meteorological model or articles about the impact of nudging coefficient for the initialization on the atmospheric flow field and the photochemical ozone concentration. In a last step, we selected those articles that report on concrete nudges or/and psychological effects. For example, some articles just reported on the acceptance of nudging in society but did not elaborate on the underlying psychology or exhibit examples. After this evaluation, we considered 65 articles to be relevant for this work. Table 1 provides a detailed overview of the results.

3.2 Identified Psychological Effects and Nudges

Through the literature review, we identified a total of 20 psychological effects in the context of libertarian paternalism and nudging. Most articles described the underlying psychological effects and the associated nudges as well as a concrete application or illustrated example. However, some papers only reported

psychological effects without providing examples of nudges, while others reported nudges without touching upon underlying psychological effects. In the latter case, we complemented the described nudges with the psychological effects based on gained expertise and insights. Table 2 provides an overview of the identified psychological effects based on the literature review. The frequency of appearance is higher than the number of identified papers because many papers referred to more than one psychological effect.

Table 2. Psychological effects extracted from literature

Psychological effects	*Frequency*	*Works reported on effect*
Framing	34	[4], [6-8], [18], [27-55]
Status Quo Bias	30	[3], [6-8], [18], [28], [32], [37], [42], [44], [49-65]
Social Norms	15	[5], [7], [18], [28], [37], [39], [42], [44], [64], [66-71]
Loss Aversion	13	[6], [32], [34], [35], [37], [42], [64], [66], [71-75]
Anchoring & Adjustment	7	[28], [35], [42], [50], [64], [71], [75]
Hyperbolic Discounting	7	[18], [32], [44], [64], [71], [76], [77]
Decoupling	6	[18], [32], [37-39], [77]
Priming	6	[28], [34], [64], [75], [78]
Availability Heuristic	5	[6], [44], [64], [71], [75]
Commitment	4	[6], [18], [36], [64]
Mental Accounting	4	[28], [64], [75], [79]
Optimism & Over-Confidence	4	[35], [64], [71], [77]
Attentional Collapse	3	[18], [32], [77]
Messenger Effect	3	[39], [64], [80]
Image Motivation	2	[45], [64]
Intertemporal Choice	2	[18], [71]
Representativeness & Stereotypes	2	[71], [75]
Endowment Effect	1	[75]
Spotlight Effect	1	[81]

Academic literature has mainly discussed nudging in relation to promoting healthy and environmentally friendly behavior. With regard to health, the authors discuss and empirically investigate nudges that influence food choices through framing effects such as labels, which indicate the healthiness of food [e.g., 30, 47, 48], or the positioning of healthy food options in an easily accessible way in cafeterias and/or increased visibility [e.g., 41, 53, 54]. With regard to environmentally friendly behavior, research examined nudges using social norms, such as messages that refer to the mass by stating, for example, that 70% of customers purchased at least one ecological product [5]. Furthermore, research discussed nudges based on loss aversion (e.g., subsidizing less polluting or taxing polluting travel options) [66] and anchoring and adjustment (e.g., setting reference points to evaluate eco-friendliness) [35].

The following section describes the identified psychological effects and the associated examples of nudges in more detail. Additionally, we provide examples of possible approaches for nudges in digital contexts. For this purpose, we selected well-known websites. Still, we do not claim that the examples of digital nudges are the result of a purposeful implementation by the UI designers based on the nudging concept. Nevertheless, they carry psychological effects and can be observed as nudges. These examples mainly serve to illustrate how digital nudges may appear in practice. Before providing a detailed description of every psychological effect, it must be mentioned that they partly overlap [2]. Additionally, as highlighted by Thaler and Sunstein, nudges rarely ground on only one specific psychological effect but rather on the interplay of a few different effects [2]. Furthermore, due to the length restrictions of this paper, we focused on the most frequently mentioned psychological effects (i.e., framing, status quo bias, social norms, loss aversion, anchoring & adjustment, hyperbolic discounting, decoupling, priming, and availability heuristic).

Framing. Tversky and Kahneman describe the term framing as the act of designing a decision frame in a way that the "decision-maker's conception of the acts, outcomes, and contingencies associated with a particular choice" [82, p. 453] is governed through psychological principles. By this means, shifts and outcomes of decisions are more predictable and probabilities are altered. Framing refers to a controlled presentation of a decision problem considering different framing methods regarding one decision problem. In this paper, we follow this definition but focus specifically on accentuation, orientation, and presentation of decision problems. A vivid example retrieved through the literature review shows how to reduce accidents on curvy roads by painting a series of white stripes on the streets (horizontal to the driving direction). The stripes alter the perception of speed for drivers – the driven speed was perceived as faster than it really was. Therefore, the drivers intuitively slowed down, and accidents were reduced [43]. In this example, the perception of speed was framed through a targeted accentuation and different (perceived) presentation of the environment, which altered the probability to reduce the speed. In the digital context, a practical application example can be observed on Amazon.com. On the product pages, Amazon accentuates product-related items. In doing so, the choice architecture is intervened by pulling the attention of the user to related articles. This accentuation may trigger an additional purchase, which was originally not planned by the user.

Status Quo Bias. The status quo bias describes the strong tendency of individuals to remain with the status quo as the disadvantages of leaving the current state loom larger than the advantages associated with a change. Kahneman et al. see the status quo bias as a manifestation of an asymmetry of value called loss aversion, that is, "the disutility of giving up an object is greater than the utility associated with acquiring it" [83, p. 194]. A prominent example is the Austrian organ donor system, which automatically registers

every citizen as an organ donor, while in other countries the opposite is the case. In Austria, individuals need to actively decide against organ donation, which positively influenced the participation [58]. In the digital context, many examples can be found where companies set defaults on their websites, such as insurance options on travel websites or delivery options on e-commerce sites. Another example are online configuration tools for cars (e.g., Tesla.com). The car configurator on the Tesla website is a practical application example for nudging, where a nudge in the form of default settings is implemented. When configuring a model, certain packages and options are chosen by default. This procedure is also applied for software products (e.g., pre-selected installation options).

Social Norms. Social norms influence human behavior and can be described as "rules and standards that are understood by members of a group and that guide and/or constrain social behavior without the force of laws" [84, p. 152]. Social norms emerge from "interaction with others; they may or may not be stated explicitly, and any sanctions for deviating from them come from social networks, not the legal system." [84, p. 152]. Moreover, individuals tend to orient towards the behavior of others, searching for social proof when unable to determine the appropriate mode of behavior in a given situation. An example for the application of social norms in nudging is the "most of us wear seatbelts" campaign in the USA in 2002 and 2003 by the Montana Department of Transportation, which aimed to promote safe driving behavior [85]. Amazon's product recommendation systems exhibit an example for calling upon social proof. On the page of a specific product, a recommendation for further products is given, based on what items were bought by other customers ("Customers Who Bought This Item Also Bought"). The group of other customers set a certain standard or a rule for the purchase of a specific product, which the single customer may follow, taking into account the information possessed by others.

Loss Aversion. The psychological principle of loss aversion assumes that losses and disadvantages have greater impact on preferences than gains and advantages [83]. Price benefits can be used to subsidize environmentally friendly options while taxing less environmentally friendly ones [66]. Examples for nudges on Booking.com can be found on the result page of an applied search for a hotel. There, statements such as "Booked 36 times today", "-45% TODAY!", "8 people are looking right now", or "In high demand!" are implemented to trigger the user to not "lose" the offer she found. By giving information about the popularity or limitation, these statements may shorten the purchase decision.

Anchoring and Adjustment. When individuals lack information, they tend to assess or estimate it by using an individual starting point. This initial starting point is either given by the decision frame or the result of a more or less accurate calculation. Consequently, different starting points result in different estimates and are biased toward the considered starting values. Tversky and Kahneman [86] describe this

as anchoring and adjustment. For example, the European Energy Label provides information about the energy class and water consumption as well as energy consumption. These labels are used for home electronics, such as washing machines, televisions, or fridges [42]. The exhibited values provide a reference point (anchor) and may serve for users as a tool for comparison between different choice options. Both online and offline retailers often give different (price) options for a product. Apple, for example, offers the iPhone 6s Plus in three capacity options with different prices. The options are displayed at the same moment, while the lowest and the highest price options serve as anchors. This may lead the user to assess the median option relative to the given reference points (prices) influencing her price perception.

Hyperbolic Discounting. According to the concept of hyperbolic discounting, individuals behave inconsistently in terms of time [87]. They value the present and the near-present stronger than the future. Therefore, individuals prefer options with present effects, even though future effects may be greater or better. Rewards such as direct cash payments, vouchers, or price subsidies may serve as nudges to nudge the user toward the better, yet future, choice or action. These nudges have been implemented to promote healthy activities or discourage unhealthy ones [76]. An example for the application in the online sphere can be observed on the website of Europcar, which uses immediate rewards. The result page of Europcar's rental car search displays the prices, where two prices are given for each result. One price saves 9% on the booking if the customer not only books the car but also pays online. This incentive nudges users toward immediate purchase by providing a financial benefit.

Decoupling. When individuals make a decision, they consider the costs of their choice, but this may not be straightforward. According to Prelec and Lowenstein [88], it is more difficult to evaluate the costs of purchases paid by credit card in contrast to cash, as the payment is decoupled from the consumption. As a result, the perceived costs of the decision decrease. This phenomenon is called decoupling [89]. An approach to overcoming decoupling is the disclosure of costs or effects of decisions. The disclosure of environmental costs with energy use or the full costs of credit cards help individuals to understand future costs in the current decision situation and may help to optimize individuals' choices [18]. Media Markt, Europe's market leading retailer for consumer electronics, offers financing and deferred payment for products on its German website. By this means, the retailer wants to decouple the purchase from the actual payment to lower the decision barrier and make purchase more likely.

Priming. Individuals can be prepared for a situation where a decision takes place. Before the decision is made, specific topics, moods, questions, or information can be introduced, for example, by visualizing the consequences of a decision. An example for priming is the nudge of eliciting intentions, such as "Do you plan to vote?" or "Do you plan to vaccinate your child?", before actions or decisions are taken [18].

Priming can be described as the preparation of individuals for the decision moment by gently leading them to the decision. The priming effect can also overlap with framing and other psychological principles [2]. As a result of our search for illustrative examples of priming in the online domain, we identified the Instagram account of Air France as a tool to prime users for a decision. The exhibited pictures prime the users by visualizing consequences or possible outcomes of a decision – in this case, emotional pictures of travelling and destinations. The pictures may nudge the user toward a specific destination or the decision to travel in general.

Availability Heuristic. Individuals tend to judge probabilities of events based on the ease at which they can be recalled. Easily available and often or regularly occurring events are perceived as more likely than less present events, independent from real probabilities [86]. Media campaigns, for example, can induce the imagination that specific risks are more frequent by exhibiting examples of real cases with fatal outcomes (e.g., deaths caused by smoking, plane crashes). Those visual and frequently displayed cases can alter the judgement of individuals toward vulnerability and increased sensitivity to the specific event [90]. Online banner campaigns are a vivid example of a practical implication of a digital nudge making use of the availability heuristic. In the Google Display Network, advertisers can make campaigns available to users by displaying their campaign on the specific ad spaces. Through tracking the user, they can show the ads repeatedly. In the decision moment, their campaign is at the forefront of their mind, and thus, easily available for the users. This may nudge them toward the option of the advertising firm.

4 Conclusion, Limitations, and Further Research

Given the high proliferation of technology in everyday life, more and more purchases as well as life decisions are made on screens. In digital contexts, users often engage in fast and automated decision making, making them prone to making deficient decisions. Against this background, we presented digital nudging as an effective tool to guide the users' decisions by implementing purposefully designed UI design elements. While nudging has been widely discussed outside the IS and HCI domain, little is known about the psychological mechanisms that underlie digital nudging. To address this research gap, we conducted a systematic literature review and identified twenty psychological effects that were investigated in the physical context and that may be transferred to digital environments. In this paper, we presented nine effects in detail as well as exemplary nudges in the physical and digital spheres.

Our research has several implications for theory and practice. First, by presenting the concept of digital nudging, we aim to encourage both researchers and practitioners to incorporate it into their work leveraging

the insights into decision making processes and approaches to alter it. It is our intention to inspire behavioral and design-oriented researchers to conduct further research on the effectiveness of digital nudging and thereby advance this increasingly relevant concept. Moreover, we aim to provide new stimuli to practitioners in private and public organizations to create effective UI that benefit both users and organizations. Second, the identified psychological effects and exemplary nudges contribute to HCI research. While HCI scholars are well aware of human psychology and cognitive science, these new insights enhance the theoretical basis of UI and UX design and can be used in design processes and guidelines. Design-oriented researchers can apply psychological effects and nudges when designing IT artefacts to either leverage or counteract the influence of specific psychological effects. Positioning nudges effectively on UI can increase the usability and UX of IT artefacts. Third, for practitioners, the identified psychological effects and exemplary nudges enhance the understanding of decision making and cognitive heuristics and biases at play. UI designers can use these insights to design nudges, i.e., simple interventions for a specific use context and goal. As digital nudges are small changes to an existing UI, their implementation is relatively fast and cheap. Moreover, interventions designed based on empirically validated theory may be more effective compared to a trial-and-error approach, which is often used in practice. Furthermore, our findings help practitioners to better assess whether implemented choice environments serve the intended purpose or steer the user toward an unintended behavior.

The main limitation of this work is that the examples of digital nudges were chosen based on the authors' observation of the websites. We were not able to assess whether the UI design elements were the result of a deliberate nudging development process. Furthermore, as mentioned in the literature, psychological effects partly overlap. Consequently, some of the illustrated nudging examples also overlap, and thus, the underlying psychological effects cannot be clearly differentiated.

Digital nudging unlocks a plethora of further research opportunities. As stated in the introduction, this paper addresses the second and third steps of the nudging development process. Design-oriented researchers could focus on the later steps by designing, implementing and evaluating the effectiveness of digital nudges through lab or real world experiments. From a behavioral research perspective, it would be valuable to investigate the psychological effects in digital contexts to determine whether they show similar predictable effects as in physical contexts. Moreover, it appears promising to examine the effects of specific digital nudges on individuals' decision making, in different digital contexts (e.g., PC, mobile devices, digital signage), as well as to consider different user characteristics. The results may allow for tailoring digital nudges to individual users by leveraging user data and targeting technologies, depending on their current use context and their characteristics.

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Appendix 5: Research Paper 5

Title	Making digital nudging applicable: The Digital Nudge Design method
Authors	Tobias Mirsch Christiane Lehrer Reinhard Jung
Publication Type	Conference Paper
Status of Publication	Published
Reference	Mirsch, T., Lehrer, C., Jung, R. (2018). Making digital nudging applicable: The Digital Nudge Design method, In *Proceedings of the 39th International Conference on Information Systems (ICIS),* San Francisco, CA, USA.
Access	https://aisel.aisnet.org/icis2018/design/Presentations/5/

Making Digital Nudging Applicable: The Digital Nudge Design Method

Completed Research Paper

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Abstract

The goal of digital nudging, a concept based on insights from behavioural economics, is to influence decision-making in digital choice environments. Information systems scholars increasingly see digital nudging as a promising research field, as do practitioners in the field of user interface, user experience, and digital service design. However, the use of digital nudging is not widespread because practitioners are often unaware of the concept or they do not have a systematic approach with which to apply it. Using a design science research approach, we develop the Digital Nudge Design method and evaluate its applicability and usefulness in practice. The method is based on requirements deduced from literature on digital nudging and persuasive systems and from interviews with practitioners from five case organizations. The study contributes to research that seeks to develop methods for influential user interface design, and the method supports researchers and practitioners in designing digital nudges.

Keywords: digital nudging, nudge, persuasive system, decision-making, design science

Introduction

People make a wide range of decisions using the screens of devices like PCs, laptops, tablets, smartphones, and Internet of Things (IoT) devices. Decisions range from choosing informative or entertaining content to making purchases and financial investments, and even choosing the right partner. While the vast amount of accessible information available in the age of information overload provides unprecedented numbers of alternatives, it often exceeds individuals' cognitive processing capacities (Benartzi and Lehrer 2015; Zhan and Rajamani 2008). In addition, decisions on screens are often made hastily and almost automatically,

often resulting in poor choices. For example, when individuals are presented a plethora of healthcare options on websites, their ability to choose the best option is limited (Benartzi and Lehrer 2015). Findings in psychology and behavioural economics show that such decisions depend heavily on heuristics and biases and the design of the choice environment (Thaler et al. 2013). Against this backdrop, Thaler and Sunstein (2009) introduce nudging as a concept in influencing human behaviour that relies on designing choice environments to improve human decision-making. Since then, the concept has been applied successfully in research fields like policy-making, the environment, and health and in corporate settings. In response to the growing number of decisions made in digital contexts, nudging has become a promising field of information systems (IS) research (Weinmann et al. 2016) and has gained increasing attention from scholars (e.g. Mirsch et al. 2017; Schneider et al. 2018). Digital nudging refers to the use of user interface (UI) design elements to guide people's behaviour in digital choice environments and improve their decision-making (Weinmann et al. 2016). Digital choice environments used by consumers and businesses include websites, mobile apps, games, and software (Fogg 2009a).

With digital nudging practitioners can improve their digital choice environments to support individuals in making beneficial decisions and enjoying an enhanced user experience (UX), ultimately increasing user satisfaction and retention and contributing to the firm's financial objectives. Unlike other approaches that influence decision-making, such as those used in persuasive technology research (e.g. Fogg 2009a), digital nudging relies on heuristics and biases and aims to lead the individual to beneficial decisions and to preserve his or her freedom of choice through simple modifications of the digital choice environment. Digital nudging is a powerful tool for designers of digital choice environments: because people are subconsciously influenced in their decisions, digital nudging makes UI more effective without forcing users into a certain behaviour.

However, the use of digital nudging in practice is not widespread because practitioners are often not aware of the concept or if they are aware of it they miss a systematic approach to design digital nudges. Any knowledge about digital nudging and the psychological principles that underlie the concept usually resides with certain employees on whom its application, then, depends. Moreover, digital choice environments are often designed by trial and error. Alleged best practices that are copied from competitors are often modified ineffectively to have an unintended influence on decision-making. A systematic approach to designing digital nudges gives practitioners reliable expertise about digital nudging that is readily accessible to guide them in the design of UI, UX, and digital services.

First advances have been made in support of digital nudge design (Meske and Potthoff 2017; Schneider et al. 2018), but these approaches are conceptual and not validated empirically and do not consider the

requirements of practitioners who are responsible for UI, UX, and digital service design. They also remain at least partly abstract, as they lack concrete tools and techniques that are usable during the phases of the design process, hampering their applicability. In addition, the established field of persuasive systems (PS) research offers methods for the design of persuasive IS (Fogg 2009a; Oinas-Kukkonen and Harjumaa 2009) that can provide valuable insights for digital nudge design and should be taken into account.

In this research, we attempt to close these gaps by answering the research question, *How can the systematic process of designing digital nudges, incorporating theoretical and practical requirements, be presented and guided?*

We use a design science research approach to address this question (Hevner 2007) and propose the development and evaluation of a method for digital nudge design as an artefact that allows researchers and practitioners who work in the field of UI, UX, and digital service design to design, implement, and evaluate digital nudges for UI to influence decision-making. Against this background, we developed the Digital Nudge Design (DND) method, which comprises four main phases: (1) Digital Nudge Context, (2) Digital Nudge Ideation and Design, (3) Digital Nudge Implementation, and (4) Digital Nudge Evaluation. Each phase consists of sub-phases, tools, and techniques. The DND method builds on and extends prior research in a number of ways. First, it integrates existing approaches from digital nudging and PS research. To do so, we drew from prior knowledge and distilled core communalities of extant methods. Second, we collected the requirements, experience, tools, and techniques from experts from five private-sector business-to-customer firms to ensure the developed method's applicability and usefulness for practitioners who want to expand their existing knowledge base and systematize their work practices. Third, we evaluated the DND method empirically in large insurance firm (a sixth firm) to demonstrate its applicability and usefulness in supporting the company's systematic design of digital nudges for a health-related mobile application.

The present research makes three primary contributions to theory and practice. It contributes to the literature on digital nudging by providing a method for digital nudge design grounded in both theory and practice, it contributes to the literature on PS in more general terms since the method can also be used to design digital nudges in PS development, and it provides practical guidance for practitioners in designing digital nudges and a concrete application example in an organizational setting.

The structure of this paper is similar to the structure Gregor and Hevner (2013) suggest. First, we review the extant literature on digital nudging and PS. Then we provide an overview of our design science research approach before detailing our method development, which comprises the derivation of theoretical and practical requirements and the evaluation of a prototype method. Next, we present the DND method,

followed by its application and evaluation in a field test in a real-world setting. The final section concludes and discusses the contributions, limitations, and suggestions for future work.

Theoretical Background

Our research draws on the literature on digital nudging and the related, established field of PS. Both research streams aim to explain and steer decision-making through technology. In this section, we review this literature, paying particular attention to extant methods for IS design.

Digital Nudging

Based on insights from behavioural economics, Thaler and Sunstein (2009) introduce nudging as a concept related to influencing human behaviour by deliberately designing choice environments. Nudges refer to interventions in the choice environment that either use or strive to overcome specific heuristics and biases. In line with libertarian paternalism, nudges should benefit the decision-maker, preserve the full freedom of choice, and be easily avoidable (Thaler and Sunstein 2009). Hansen (2016) provides a definition: "A nudge is a function of any attempt at influencing people's judgment, choice or behaviour in a predictable way, that is (1) made possible because of cognitive boundaries, biases, routines and habits in individual and social decision-making posing barriers for people to perform rationally in their own self-declared interests and which (2) works by making use of those boundaries, biases, routines and habits as integral parts of such attempts. Thus a nudge amongst other things works independently of: (i) forbidding or adding any rationally relevant choice options, (ii) changing incentives, whether regarded in terms of time, trouble, social sanctions, economic and so forth, or (iii) the provision of factual information and rational argumentation" (p. 174).

Nudging draws on findings from behavioural economics, which has shown empirically that individuals often decide and act irrationally because of cognitive, emotional, and social factors (Thaler and Sunstein 2009). This phenomenon can be explained by dual process theory, which suggests that people use two cognitive systems to assess information during the decision-making process—intuition and reasoning—which differ in terms of the mental effort required. In some situations, people rely on the intuitive or perceptual System 1, which is fast, automatic, effortless, and emotionally charged; in other situations, they rely on the reason-based System 2, which is slower, effortful, deliberate, and controlled (Stanovich and West 2000). Most empirical studies in the field conclude that everyday activities are mainly intuitive, that is, based on System 1 (Kahneman 2003; Kahneman 2011). System 2 is only lightly involved in everyday

activities (Kahneman 2011) because people do not ordinarily use high cognitive effort to do everyday activities like using digital services (Constantiou et al. 2014). System 1 involves heuristics (i.e. mental shortcuts) to facilitate and accelerate the decision-making process by reducing the amount of information processed (Bazerman and Moore 2008). While these "rules of thumb" are an efficient way to address simple, recurrent problems, they can lead to systematic errors (i.e. cognitive biases). Many heuristics and biases have been documented (for a comprehensive overview see Gilovich et al. 2002). Researchers also find that the decision environment or context also influences the choice made, and the way an option is presented can also cause individuals to act in a predictable manner, as they tend to construct their preferences with respect to the immediate choice situation (Thaler and Sunstein 2009).

The concept of digital nudging was introduced to IS research as the "use of user-interface design elements to guide people's behaviour in digital choice environments" (Weinmann et al. 2016, p. 433). These persuasive UI design elements include graphic design, content, wording, and other small features (e.g. user reviews and ratings). A nudge even may be a push notification on the smartphone that reminds the user to be more active (Weinmann et al. 2016). Since the definition Weinmann et al. (2016) provide could refer to any kind of persuasion or guidance in the digital sphere, we suggest connecting it to the definition Hansen (2016) provides and propose that digital nudging be defined as the attempt to influence decision-making, judgment, or behaviour in a predictable way by counteracting the cognitive boundaries, biases, routines, and habits that hinder individuals from acting to their own benefit in the digital sphere. Digital nudging does not forbid or add any rational choice option, change incentives significantly, or provide rational argumentation.

Even though research on digital nudging is still in an early stage, approaches to designing digital nudges are represented in the conceptual works of Schneider et al. (2018) and Meske and Potthoff (2017). Drawing on guidelines for implementing nudges in offline contexts (Datta and Mullainathan 2014; Ly et al. 2013), Schneider et al. (2018) propose a process that comprises four phases: (1) define the goal, (2) understand the users, (3) design the nudge, and (4) test the nudge. The first phase defines the use scenario (e.g. e-commerce or crowdfunding platform) and the overall and specific organizational goals to be achieved. In the second phase, the designer seeks to understand the users' decision process, goals, heuristics, and biases. In the third phase, a suitable intervention to influence or counter the heuristics or biases is selected, designed, and implemented in the UI. Finally, the fourth phase evaluates the nudge's effectiveness, which may vary across user groups. If the nudge does not produce the desired effect, the designers go back to the earlier phases to re-examine the nudge's implementation, the heuristics and biases, or the defined goals. The approach

Schneider et al. (2018) proposes is built on a conceptual basis without regard for practical requirements or empirical evaluation, but it serves as a valuable basis for our method development.

Meske and Potthoff (2017) present a first outline of a three-phase process model for the design of digital nudges that they derive from the literature on nudging, persuasion, and persuasive technology. The authors distinguish three generic phases: analysing, designing, and evaluating. The first phase proposes the definition of a desired behaviour for the target audience by analysing the users' goals, characteristics, and reasons for undesired behaviour (e.g. biases, cognitive limits, distraction). In the second phase the right nudging principle (e.g. anchoring or default setting) is identified, before, in the third phase, the nudge is implemented and evaluated in terms of its ability to achieve the target behaviour. This last phase includes a feedback loop back to the first phase. Like Schneider et al.'s (2018) model, Meske and Potthoff's (2017) three-phase model for the design of digital nudges provides valuable input. As this study is research-in-progress, its model is conceptual in nature and has not been evaluated.

Persuasive Systems

Persuasion is communication that is intended to influence the decisions and the behaviour of others (Simons et al. 2001) in a way that corresponds with the intended outcome (Briñol and Petty 2009). Persuasion "relies on the power of verbal and non-verbal symbols and allows people voluntary participation in the persuasion process" (Harjumaa and Oinas-Kukkonen 2007, p. 312). Oinas-Kukkonen and Harjumaa (2008) define a persuasive system as "a computerized software or information system designed to reinforce, change or shape attitudes or behaviours or both without using coercion or deception" (p. 202). PS can be found, for instance, in the healthcare sector, where it is used to promote healthful behaviour (Kraft et al. 2009; Oinas-Kukkonen 2013).

In Oinas-Kukkonen and Harjumaa (2009) and Fogg (2009a) propose process models in the context of PS. Oinas-Kukkonen and Harjumaa's (2009) framework encompasses three phases: understanding the key issues behind PS, analysing the persuasion context, and designing system qualities. After gaining an understanding of the key issues behind PS (i.e. seven postulates), the persuasion context must be analysed with the goal of defining the intent of the persuasion (i.e. who is the persuader? What type of change (e.g. attitude, behaviour) is to be achieved?), the persuasion event (i.e. what is the use context? What are the user's characteristics in terms of cognition, goals, motivations, and abilities? What are the strengths and weaknesses of the applied technology?), and the persuasion strategy (i.e. what is the right message to achieve persuasion? Should a direct persuasion route based on factual information be chosen or an indirect persuasion route based on cues that trigger heuristics?). Finally, the PS and its features are designed based

on a selection of appropriate persuasive design principles and requirements for the software are defined before the PS is implemented.

Fogg (2009a) develops an eight-step design process for creating PS. The first part of the process is comprised of four sub-phases: choosing a simple behaviour to target, choosing a receptive audience, determining what prevents the target behaviour, and choosing a familiar technology channel. The second part of the process is comprised of three sub-phases: finding relevant examples of persuasive technology, imitating successful examples, and testing and iterating. The third part expands on success. Fogg (2009a) emphasizes that the steps in the first and second part of the process are usually carried out in sequence, but the sequence can be adapted to suit the circumstances of the design project and team. Some phases may even be skipped (e.g. when a target behaviour, audience, or technology is given), conducted in parallel, or rerun.

Fogg (2009a) and Oinas-Kukkonen and Harjumaa (2009) serve as a valuable basis for the development of a method with which to design digital nudges. However, they cannot be translated directly to digital nudging since they are not limited to influencing decision-making with respect to the underlying principles of (digital) nudging and could include such PS as direct persuasion through factual argumentation (Oinas-Kukkonen and Harjumaa 2009), which does not refer to nudging.

Research Approach

Our research follows a design science approach. Design science research is “motivated by the desire to improve the environment” (Hevner 2007, p. 2). Our main goal is to develop and evaluate a method for digital nudge design as an artefact that allows researchers and practitioners who work in the fields of UI, UX, and digital service design to design, implement, and evaluate digital nudges for UI to influence decision-making. A method is a prescription of effective development practices and defined processes that provide guidance on problem-solving (Hevner et al. 2004). Since the DND method is a novel artefact, its development is conducted in an iterative manner involving its evaluation and refinement. The research approach we employ follows Hevner (2007). Figure 1 illustrates our research approach and the steps undertaken in the course of the research.

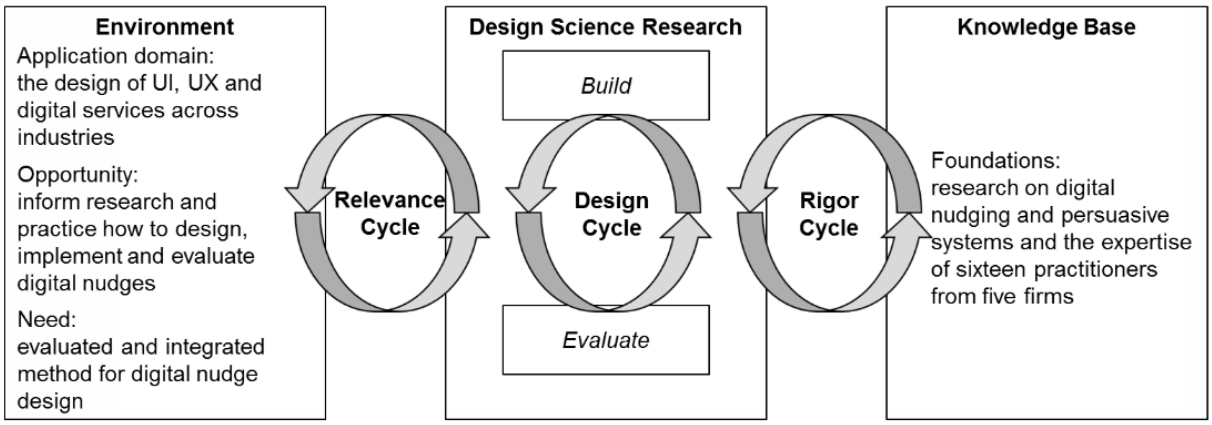

Figure 2. Design Science Research Approach (following Hevner 2007)

Our research is motivated by a need for improvement opportunities identified in the application environment (relevance cycle). Close research collaboration on digital nudging between the authors and practitioners, especially UI, UX, and digital service designers, highlighted a need for a method that informs digital nudging and guides the development process in systematically designing digital nudges. While the practitioners regarded the topic as highly relevant to their businesses, digital nudging was not anchored in their work practices, and if it was conducted, their digital nudge designs depended on the skill set of individual professionals and their knowledge about the concept and its underlying principles.

Inspired by the practitioners' interest and stated need, we turned to the academic knowledge base on digital nudging and PS with the goal of identifying extant methods (rigor cycle). We conducted a thorough literature review by searching academic databases (i.e. EBSCO, AISeL and ScienceDirect), following the approach vom Brocke et al. (2009) approach. We focused on process models for the design of digital nudges and PS and excluded other approaches for UI design, such as the standard interaction design process (ISO 9241-210) (DIS 2009), design thinking processes (Brown and Katz 2011), and even standard agile development processes (Cao et al. 2009). Some of these approaches are used in practice, so they were captured when we interviewed the practitioners on their requirements for the developed method. The literature review revealed four approaches, one each from Fogg (2009a), Oinas-Kukkonen and Harjumaa (2009), Meske and Potthoff (2017), and Schneider et al. (2018). This extant work provided a valuable basis for our method development and allowed us to infer a set of requirements for our artefact. Requirements define what the users of the method expect from the artefact and what it must do to fulfil those expectations and serve its purpose (Dick et al. 2017).

To complement the requirements that were informed by theory, we also gathered professionals' requirements to ensure that our method is firmly grounded in practice. These empirical insights were

derived from a multisite case study (Eisenhardt 1989; McLaren et al. 2011) based on interviews with UI, UX, and digital-service designers from five firms: a full-service digital consultancy, a click-and-mortar retailer, and three e-commerce firms. Incorporating direct statements from experts in a variety of positions, firms, and industries enhances the applicability and usefulness of our artefact for practice and ensures that it does not interfere with but accompanies current modi operandi. In addition to the identification and derivation of requirements, the case interviews provided information about the current work practices, tools, and methods the practitioners currently apply in designing UI, UX, and digital services. Therefore, we included in the method we developed the specific work practices, tools, and methods that practitioners deemed valuable.

In the design cycle, we iterated and evaluated the artefact (Hevner 2007). We built a prototype of the method based on the insights from theory and practice, which we then discussed with the experts in the five case firms. We used the results of these meetings to define areas for improvement, which we incorporated in a later iteration of the development process. The refined method was then tested in the field to verify that it solved the problem it was meant to solve and satisfied its users' requirements (Hevner et al. 2004; Sonnenberg and vom Brocke 2012). Thus, it was given back into the environment (Hevner 2007).

Development of the Digital Nudge Design Method

In this section, we describe how the requirements from both theory and practice informed the development of a prototype of the DND method, which was then evaluated by UI, UX, and digital service designers. Then we present the refined, unified version of the DND method. The final subsection describes the method's application and evaluation in a field test.

Conceptual Development

Requirements Deduced from Theory

We inferred a set of ten requirements (R) for our artefact by drawing on theoretical foundations in the research fields of digital nudging (Schneider et al. 2018; Meske and Potthoff 2017) and PS (Fogg 2009a; Oinas-Kukkonen and Harjumaa 2009). The ten requirements (R) and their definitions are shown in Tables 1, 2, and 3.

Analysis of the four extant design methods presented in section 2 identified three generic phases of the development process: analysis, design, and implementation and evaluation. All four of the methods start

with an analysis phase, which sets the basis for the subsequent design. This phase comprises several tasks related to the organisation, the user, and the technology, including defining the organisational goals and the desired user behaviour (Fogg 2009a; Meske and Potthoff 2017; Oinas-Kukkonen and Harjumaa 2009; Schneider et al. 2018). The user's goals, characteristics, and decision-making process should be determined, with particular attention to impediments to the user's performing the desired behaviour (Fogg 2009a; Meske and Potthoff 2017; Oinas-Kukkonen and Harjumaa 2009; Schneider et al. 2018). As for the tasks related to technology, the strengths and weaknesses of available technology channels should be determined (Oinas-Kukkonen and Harjumaa 2009) to choose an appropriate channel to carry the intervention (e.g. website or mobile app) (Fogg 2009a). Based on the insights from the knowledge base, we derived five requirements, as shown in Table 1.

Requirement	Description
R1: Definition of organisational goals	Define organisational goals to be achieved with the digital nudge.
R2: Definition of desired user behaviour	Define the behaviour the user should perform in light of the organisational goals.
R3: Analysis of user goals	Analyse the user's goals.
R4: Analysis of user characteristics and decision-making process	Analyse the user's characteristics and impediments to performing the desired behaviour, focussing on heuristics and biases.
R5: Definition of technology channel	Analyse the strengths and weaknesses of available technology channels and select the best channel to carry the intervention.

Table 1. Requirements for the analysis phase.

All four approaches also have a design phase in which, as the authors suggest, appropriate design principles to induce behaviour change and design a suitable intervention are selected (Fogg 2009a; Meske and Potthoff 2017; Oinas-Kukkonen and Harjumaa 2009; Schneider et al. 2018). To this end, Fogg (2009a) recommends identifying and imitating successful examples (i.e. best practices) of persuasive interventions. Accordingly, we deduced the three requirements shown in Table 2.

Requirement	Description
R6: Selection of design principles	Select appropriate psychological effects (i.e. heuristics and biases).
R7: Design of intervention	Design an intervention to induce the desired behaviour based on selected design principles.
R8: Identification and imitation of successful interventions	Identify relevant examples of persuasive interventions must be identified and (perhaps) imitate successful cases.

Table 2. Requirements for the design phase.

An implementation and evaluation phase to assess the intervention's effectiveness also occurred in all four extant methods (Fogg 2009a; Meske and Potthoff 2017; Schneider et al. 2018). While Oinas-Kukkonen and Harjumaa's (2009) framework does not include the evaluation of the intervention, it is mentioned implicitly. Depending on the evaluation result, returning to previous phases may be necessary (Meske and Potthoff 2017; Schneider et al. 2018). We derived two requirements for this phase (Table 3).

Requirement	Description
R9: Implementation and evaluation of intervention effectiveness	Implement the intervention in the defined technology channel and evaluate it in terms of its effectiveness in achieving the desired user behaviour.
R10: Return to previous phases	If the intervention does not produce the desired effect, repeat the previous phases.

Table 3. Requirements for the implementation and evaluation phase.

Requirements Deduced from Practice

Besides theory, a key source for design science research is practitioners' informal knowledge and experience (Gregor and Jones 2007). We employed a multisite case-study approach to gather practitioners' requirements. (For a similar approach see McLaren et al. 2011.) We selected case organisations from a variety of industries (i.e. digital consultancy, click-and-mortar retailing, and e-commerce) and that operate in Germany and/or Switzerland, each of them leaders in their fields. All case firms are medium-sized (50-249 employees) or large (250+ employees) (The European Commission, 2016) and are concerned about designing and optimising UI, UX, or digital services, although they have not yet integrated digital nudging in their design processes. We used semi-structured interviews as our primary data source and sampled three to four participants per case firm, whom we selected through purposeful sampling—that is, we chose respondents we expected would provide information that was relevant to our method development. Since various functions are involved in the design of UI, UX, and digital services, we interviewed experts from a variety of functional areas and hierarchical levels. All interviewees were directly involved in design processes. We conducted sixteen interviews, which were based on a set of open-ended questions that were guided by four key topics: the organisation's current design approach and processes, tools and techniques applied, problems faced during the design process, and current approaches to influencing users' decision-making. The interviews were recorded and transcribed verbatim so we could analyse the resulting data in a rigorous and transparent manner. Table 4 provides an overview of the case firms, including the sector, country, size, and interviewees' positions (Table 4).

Firm	Industry sector	Country	Size	Interviewee's Position
1	Digital full-service agency	Switzerland and Germany	Large	Senior Experience Consultant and Lead Interaction Design
				Principal Consultant
				Creative Director
2	Click-and-mortar retail	Switzerland	Large	Project Leader Customer Experience
				User Experience Expert
				User Experience Expert
3	Online car market	Germany	Large	Head of New Initiatives
				Senior Project Manager
				Lead User Experience Design
4	Online real estate platform	Germany	Large	Head of Product
				Product Manager
				Senior User Experience Researcher
				Senior User Experience Researcher
5	Online-shopping platform	Switzerland	Medium	Head of User Experience and Conversion Rate Optimisation
				User Experience Researcher
				User Experience Designer

Table 4. Overview of case firms and interviewees.

In the initial step of the data analysis process, we analysed each case as a separate study and extracted the requirements the interviewees mentioned. To reduce the data's volume we coded the data using the qualitative data analysis tool ATLAS.ti. After coding, we grouped and integrated the practitioners' statements about requirements to derive more abstract requirements. For example, the requirement "The user must be understood" (R15) was derived from statements like "It is important that someone is the customer´s advocate representing her perspective" and "We start with the end users by trying to understand their motivations and what is important to them." Three phases emerged from theory that were also recognisable in practice, plus an additional category that comprised overarching requirements. We used these four phases to structure the requirements. Table 5 shows the requirements identified in practice and the corresponding requirements derived from theory and details which case firm mentioned each requirement.

Phases	Requirements			Firms				
	Grouped and Integrated Requirements	R	Corresponding R from theory	1	2	3	4	5
Overarching requirements	The process must be adaptable to multiple ventures.	R11		✓	✓		✓	
	Functions must be able to work together.	R12		✓	✓			
Digital nudge context	Business goals must be defined.	R13	R1	✓	✓	✓	✓	✓
	Focus must be set at the beginning of the project.	R14	R1-R5	✓	✓	✓	✓	✓
	The user must be understood.	R15	R3, R4	✓	✓	✓	✓	✓
	Possible user problems must be identified.	R16	R4		✓		✓	✓
Digital nudge	Psychological effects (i.e. heuristics and biases) must be understood.	R17	R6-8	✓	✓	✓	✓	✓
ideation	Intervention ideas must be testable.	R18	R9		✓		✓	✓
	Evaluation must occur quickly.	R19		✓		✓	✓	
	Trial and error should be encouraged.	R20	R10	✓	✓	✓		

Table 5. Requirements deduced from practice.

Development and Evaluation of the Prototype Method

Based on the identified requirements, we developed a first prototype of the DND method that unifies the reviewed approaches with the practitioners' view. For reasons of space, we outline the key elements of the prototype method only briefly: defining the digital nudge context, which consists of defining the technology channel, the organisational goals, and the user goals; defining the digital nudge ideation and design, which consists of selecting the digital nudging principles and creating ideas for digital nudges; and implementing the digital nudge, which consists of implementing and evaluating the digital nudge.

After the development process, we follow Sonnenberg and vom Brock (2012, p. 395) to "initially demonstrate if and how well the artefact performs while interacting with organizational elements" so we can reflect on the artefact and solicit feedback on its utility to define necessary iterations (design cycle). To evaluate the prototype, we demonstrated it in an artificial setting, a simulation of using the prototype method to design a digital nudge with its potential users (Venable 2006). We approached the interviewees from the five case firms again, demonstrated and discussed the artefact (Sonnenberg and vom Brocke 2012): going through each step with the interviewees and simulating the design of digital nudges for an application in their field to determine whether the artefact was complete and the interviewees understood all parts of the method and its sequence and to collect recommendations for changes based on their expertise. Fourteen of

the sixteen interviewees participated in the evaluation through personal or virtual meetings. Each meeting was held individually, except in the case of firm 5, where we conducted a focus group with all interviewees at their request. During the demonstration, we took detailed field notes to capture qualitative feedback and check the appropriate translation of requirements. At the end of each meeting, each interviewee was asked to evaluate the artefact based on the demonstration using a set of six evaluation criteria (Sonnenberg and vom Brocke 2012) and a seven-point Likert scale. We also asked the participants explained their ratings to capture qualitative feedback that we could use to improve the artefact. Table 6 shows the average results of the prototype's evaluation across all five case firms and examples of key comments from the qualitative feedback, which guided the next iteration.

	Average quantitative evaluation (from 1: disagree fully to 7: strongly agree)							**Qualitative evaluation**
Evaluation criteria	1	2	3	4	5	6	7	Comments (examples)
Completeness						•		- Definition of KPIs in phase 1
Feasibility						•		- Phase 2 should end with prioritised ideas to channel resources. (Evaluation with high significance consumes a lot web traffic.)
Effectiveness						•		- Especially applicable in the case of conversion rate optimisation
Understandability							•	- Highly effective since the method aims at the target behaviour
Clarity							•	- Nudging principles are important for the method and need to be understood.
Operationality						•		- Given for users in the context

Table 6. Results of the prototype evaluation with case firms.

The evaluation was largely homogenous among the case firms. All criteria scored between 5 and 7, with only small deviations among the firms. Understandability and clarity were the criteria with the highest scores. Based on the feedback, we modified four key aspects of the prototype method. First, we added defining of key performance indicators (KPIs) to the first phase, defining the digital nudge context. The practitioners regarded this step as an important foundation for the later evaluation of the digital nudge's effectiveness in achieving the desired user behaviour. Second, several interviewees, especially those from the e-commerce firms, highlighted that the implementation and evaluation of digital nudges (e.g. through A/B testing) consumes significant resources in terms of time for implementation and web traffic. Therefore, we added the prioritisation of digital nudge ideas to the second phase, defining the digital nudge ideation and design, to focus on the most useful ideas. Third, we divided the joint implementation and evaluation

phase into two phases because the practitioners pointed out that the two phases are often conducted by different business functions, such as developers and an agency. Fourth, we reworded part of the second phase, defining the digital nudge ideation and design, to highlight the importance of understanding the digital nudging principles. Overall, however, the practitioners regarded the DND method as highly applicable to their needs and as having a high degree of utility.

The Digital Nudge Design Method

This section introduces the DND method, presenting a unified view of the requirements from both theory and practice after a first iteration. The method consists of four main phases: Defining the digital nudge context, digital nudge ideation and design, digital nudge implementation, and digital nudge evaluation. The goal of the method—or, more specifically, the designed nudges—is to influence decision-making and trigger the desired user behaviour. Figure 2 visualises the method.

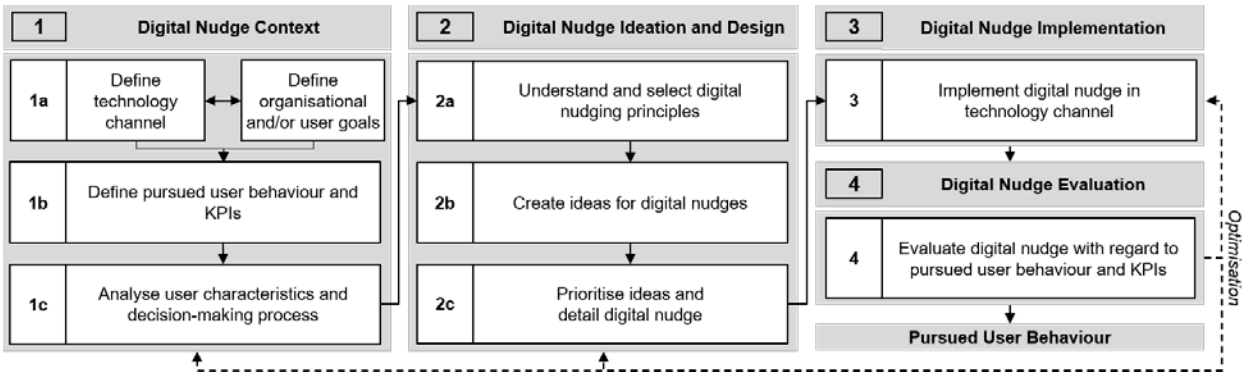

Figure 2. Digital Nudge Design Method.

We developed the DND method with a degree of abstraction to make it adaptable to a variety of ventures, allow business functions to work together, and prevent the method from interfering with current modi operandi while enhancing and supplementing (R11, R12). However, the method is still sufficiently concrete to facilitate the conduct of specific projects, and it can be applied by many business functions because the project's characteristics are defined in phase 1. The involvement of specific stakeholders in the DND depends heavily on the context for which the digital nudge is designed. Therefore, stakeholders should be involved beforehand, including all functions that should be involved (e.g. customer insights, product owners or designers). In what follows, we describe each phase and the corresponding sub-phases in more detail, including appropriate tools and techniques.

Phase 1: Digital Nudge Context (based on R1-5 and R13-16). Phase 1 sets the focus for the subsequent design process. The design process starts by defining either a specific technology channel (e.g.

website or mobile app) that carries the digital nudge or by defining a specific business and/or user goal (e.g. overcoming a certain problem) (sub-phase 1a). The definition of the technology channel depends on whether a technology channel is available to pursue a particular organizational or user goal but should be improved, or such a technology channel is not available and must be identified. Tools and techniques to identify user goals include both qualitative approaches (e.g. user labs, focus groups, user interviews, persona- and scenario-building, card-sorting, shadowing, physical in-house customer journey, field tests) and quantitative approaches (e.g. data analytics like Adobe, Google Analytics, and user surveys). These tools provide insights into, for example, optimisation potentials in the UI or reasons the user may not achieve her goals. Then the desired pursued user behaviour is defined (sub-phase 1b), which drives the specific user or organisational goals (e.g. the behaviour of 'customer orders product' drives the company's sales), and what may be preventing the user from performing the desired behaviour is defined using the qualitative or quantitative user-analysis tools (sub-phase 1c). Therefore, qualitative or quantitative user analysis tools might be used. The insights gained in phase 1 serve as basis for phase 2, the subsequent digital nudge ideation and design. In this phase, a firm's customer insights team is of great value.

Phase 2: Digital Nudge Ideation and Design (based on R6-8, R17, and R19). Phase 2 creates and prioritises ideas for digital nudges based on a thorough understanding of digital nudging and its principles. The digital nudging principles are understood by, for example, using the existing frameworks proposed by Dolan et al. (2012), Johnson et al. (2012), Michie et al. (2013), Mirsch et al. (2017) or Thaler and Sunstein (2009) (sub-phase 2a). The most common principles are provided in Table 7 (Mirsch et al. 2017):

Digital Nudging Principle	**Definition**	**Implementation Example**
Status Quo Bias	Strong tendency of individuals to remain in the current state, as potential disadvantages associated with leaving the current state are perceived to be greater than potential benefits. Correlated with loss aversion.	Often used where defaults are set, such as on e-commerce websites with pre-selected insurance or delivery options and online product-configuration tools with pre-selected packages and options (e.g. Tesla.com).
Social Norms	Rules and standards formed and understood by members of a group and that control social behaviour. These arise, for example, through interaction with others and can, but do not have to, be formulated explicitly. Divergences are not imposed by the legal system but by the social network. Individuals tend to follow others and seek approval.	Amazon uses text-based nudges that leverage social norms. Recommendations for other products are given on product pages based on items bought by other customers ("Customers who bought this item also bought…"). The reference to other customers sets a standard or a rule for the user to follow.

Loss Aversion	The losses and disadvantages that may result from a decision are weighted more heavily than are gains and benefits. Individuals tend to avoid risks, even when potential for gains is greater.	Popular digital nudges use graphics or text to trigger time pressure. For example, hotel booking websites show how often rooms are booked, how many other customers are looking at the same offer, or how a certain price is available only today.
Anchoring and Adjustment	Uninformed individuals tend to assess or estimate choices in relation to individual clues or starting points. Different starting points can lead to different assessments, thereby influencing the result of the decision.	The Economist offered several subscription options: 'Digital' for $59, 'Print + Digital' for $125 and 'Print' for $125. Adding 'Print' for $125 sold more 'Print + Digital' subscriptions than were sold when this pointless option was omitted. The 'Print' option was used as an anchor to guide the comparison of options.
Hyperbolic Discounting	Individuals behave temporally inconsistently because they value the present more than the future. Options with an outcome in the present are preferred over those with future implications, regardless of whether future outcomes are of greater value.	Retailers offer financing and deferred payment for products on their e-commerce websites, decoupling the purchase from the payment, lowering the purchase barrier, and shortening the decision-making process.

Table 7. Overview of common digital nudging principles.

Based on these common principles, an appropriate principle can be selected that serves the previously defined goals and user needs best and triggered promising ideas for a digital nudge. Ideas for digital nudges are created through, for example, brainstorming sessions (sub-phase 2b) or by finding relevant successful examples (i.e. best practices) of digital nudges. However, simply imitating digital nudges from other organisations is not recommended because their effectiveness is strongly context-dependent (Weinmann et al. 2016). Once ideas for digital nudges have been created, they are prioritised based on which ones will use resources optimally during the implementation and evaluation phases (i.e. testing capacity and available traffic to gain significant results) (sub-phase 2c). The prioritisation should also include a check on whether the idea for a digital nudge is in line with the principle of influencing decision-making while respecting freedom of choice and being beneficial. The results of the prioritisation can vary among users of the method; for example, for one user prioritising a quickly implementable digital nudge could be important and for another low implementation costs could be important. The digital nudge ideas should also correspond to the firms' internal guidelines (e.g. corporate design guidelines). Then the prioritised nudge ideas are described using, for example, prototypes ranging from lo-fidelity (e.g. sketches on paper) to hi-fidelity (e.g. clickable mock-ups). The applied tool or technique depends on the prototyping capabilities of the specific setting.

Phase 3: Digital Nudge Implementation (based on R9 and R18). Phase 3 addresses the technical implementation of the digital nudge into the technology channel (i.e. mobile app, website). The

implementation should be complete to a degree that allows a valid test. Even a minimum viable product (MVP) might be sufficient, but the implemented UI and digital nudge should reflect the organisation's existing design guidelines and consider such system aspects as responsiveness, accuracy, ease of use, and convenience (Oinas-Kukkonen and Harjumaa 2009). In this phase, an appropriate level of technical knowledge is necessary.

Phase 4: Digital Nudge Evaluation (based on R9, R10, and R20). Phase 4 is concerned with the evaluation of the digital nudge in terms of its ability to achieve the desired user behaviour based on pre-defined KPIs. A/B tests are particularly valuable for evaluating UI design elements in digital contexts. Quantitative evaluation can also be supported by web analytics tools like Adobe and Google Analytics. If the digital nudge does not produce the desired effect, the DND method recommends returning to previous phases.

Evaluation of the Digital Nudge Design Method in a Real-World Setting

Following design science research's recommended procedure, we validated the iterated DND method in an organisational environment (Pries-Heje et al. 2008; Sein et al. 2011; Sonnenberg and vom Brocke 2012) to demonstrate that the method solves the problem it was intended to solve (Hevner et al. 2004), that is, supporting practitioners in their effort to design digital nudges.

Application context

The field test was conducted with a large insurance company that was not involved in the method's development. Having another practical instance in which to evaluate the usefulness of the developed artefact is particularly valuable since it provides a neutral and unbiased perspective. The insurance firm had recently launched a mobile application that allows current and potential customers to record health-related activities like exercise, prevention examinations, and health-related education and to collect points for such activities that can be redeemed for rewards. The users can achieve different levels by collecting a necessary number of points. The app seeks to promote healthful behaviour and increase customers' loyalty.

The evaluation project had two primary goals: to test the DND method for its applicability and usefulness while collecting additional suggestions for improvement, and to design digital nudges for the insurance firm's mobile app that would influence its customers' decision-making in terms of the desired behaviour.

Application of the DND Method

The field test comprised three half-day workshops, one for each of the developed method's phases, that were conducted by the first and second author at the insurance firm. The workshop participants were six employees from the firm's marketing department, including the product owner, the experience manager, a customer researcher, and an enterprise architect. All participants were either responsible for or directly involved in the development (e.g. UI design and optimisation) of the mobile application and its operation.

The first and second workshops addressed the method's first phase, the digital nudge context. Since the technology channel was pre-set as a mobile app, we started by defining the business's and the users' goals. Based on the firm's strategy and a discussion with the workshop participants, the primary goal pursued with digital nudging was defined as increasing the interaction between the mobile app and the firms' current and potential customers. Prior to the second workshop, the first and second author conducted an in-depth analysis of the app's functionalities to identify all possible interaction-driving activities the user could perform with regard to the pursued goal. In the second workshop, the participants first defined and prioritised the user behaviours that promised the highest impact on driving the desired increased interaction (the defined goal): recording health-related activities in the app, performing healthful activities in everyday life, and trying out new healthful activities. Subsequently, we defined the appropriate KPIs as the interaction rate with the app and several conversion rates within the app. With input from participants in the firm's consumer research function, we conducted an in-depth analysis of the user and her decision-making process. We first gained a thorough understanding of the typical app user's characteristics based on personas that the firm had developed, which are user models that characterise a particular target group. Then we used the Fogg Behavioural Model (Fogg 2009b) to classify the desired behaviours and identify possible barriers to performing them. Using the model, we classified behaviours with regard to each persona's motivation and ability to perform them.

Once we understood the digital nudge context, we had a basis on which to address the second phase in the third workshop, which was dedicated to phase 2 (digital nudge ideation and design) of the DND method. To ensure that all workshop participants had a thorough understanding of the nudging principles (shown in Table 7) (sub-phase 2a), the first and second authors prepared a set of cards with brief explanations and examples of the most common nudging principles. Using the set of cards, the workshop discussed the principles until full understanding was reached. Subsequently, we brainstormed ideas for digital nudges and captured them on Post-Its® (sub-phase 2b). Since the brain-storming resulted in a large number of ideas (25), two ideas were chosen based on the two criteria that were most important to the firm: quickly implementable and high impact (sub-phase 2c). Subsequently, these two ideas were detailed on a flipchart,

supplemented by scribbles of the participants' thoughts. Against the background of the primary goal of digital nudging to increase the interaction between the mobile app and the firms' current and potential customers, two digital nudges were detailed. The first, a text-based nudge, told users who were close to reaching a point threshold that they could earn extra points if they made an effort to reach the next level. This digital nudge was intended to counteract hyperbolic discounting by calling attention to future positive implications. The second digital nudge was a personal benchmark showing graphically what the user had already achieved in terms of collected points and in relation to the next level. Based on the principle of anchoring and adjustment, this digital nudge provided a personal reference as an anchor.

The detailed digital nudge ideas were then given to an external agency for the technical implementation. The agency implemented the nudges in the mobile app and made them measurable using quantitative app analytics tools (phases 3 and 4); the actual values cannot be made available here for reasons of confidentiality. Upon completion of the field test, we requested quantitative feedback from the workshop participants using the same criteria as that used in the evaluation of the prototype method (Table 6). All workshop participants rated the criteria 6 or higher (out of a possible 7). The participants also provided qualitative feedback in the form of written statements like "With this method, we can more systematically match our customers to develop interventions that increase the efficiency and customer experience of our services" and "Being aware of the underlying principles in the course of the development process helps to generate new ideas; it supports the creation of new thinking patterns." The participants' statements did not indicate the need for another iteration, so the developed artefact can be considered to be valuable, complete, and effective in satisfying the "requirements and constraints of the problem it was meant to solve" (Hevner et al. 2004, p. 85).

In sum, the field test demonstrated that the DND method is suitable for solving the defined problem of systematically designing a digital nudge. The field test showed the method's high applicability and usefulness in an organisational setting.

Contribution, Limitations, and Future Research

This paper presents a method by which to design, implement, and evaluate digital nudges, called the Digital Nudge Design (DND) method. The present research makes three primary contributions to scholarship and practice.

First, our research contributes to the literature on digital nudging by providing a method for digital nudge design that is grounded in both theory and practice. The method can be used by practitioners and

design-oriented researchers alike to design digital nudges systematically. It unifies varied perspectives and aspects of approaches to influence individuals' decision-making, making it easier for researchers and practitioners who need a method by which to find and choose the right approach. The DND method includes practice experts' perspectives to ensure high applicability and usefulness. A multi-site case study approach provided first-hand insights from practice experts working in UI, UX, and digital service design, resulting in additional requirements that extant methods had not yet considered. In particular, practitioners require a method that is concrete and fits into their daily work practices. Therefore, the DND method comprises a set of tools and techniques that make it more applicable and operational than previous, more abstract approaches. Moreover, the method's evaluation provides an example for the application in a real-world business context, making it more tangible for its potential users.

Second, we contribute to the literature on PS in more general terms by providing researchers who work in this field with a tool to design digital nudges that they can implement in PS development to increase effectiveness. The DND method supports them in developing PS that relies on indirect persuasion, rather than using rational argumentation.

Third, our method provides guidance for practitioners who design digital nudges to influence individuals' decision-making. Today, in most firms, digital nudge design is not anchored in UI, UX, and digital service design practices. Where it is conducted, it currently exists only as an experienced-based approach that is primarily driven by the skills and knowledge of individual professionals working in the field who are knowledgeable about the concept and especially about its underlying principles. As a result, interventions for influencing decision-making are often developed without an explicit design rationale or are based on pure trial and error and incremental optimisation, which prolongs development processes. The DND method transfers unified knowledge about digital nudging and provides guidance to practitioners by suggesting a set of applicable tools and techniques along the design process that concretises and increases its practicability. Moreover, we provide insights from a concrete application example in a real-world business context to make the method more tangible. For practitioners, the DND method provides the necessary foundation for a targeted and systematic approach to designing digital nudges to increase systems' persuasiveness. Thus, practitioners can integrate the method into their daily work routines, expand their existing knowledge base, and systematise their work practices. Having a sound method provides involved functions (e.g. UI, UX and digital service designers, product managers, digital consultants) with a useful approach to influencing IS users' decision-making. If the DND method is applied in practice, it should positively affect the firm's work practices by making them more efficient. Practitioners can measure this effect by using evaluation criteria like that shown in Table 6.

Despite the careful design of our research approach, our findings are subject to two primary limitations. First, our account of the practitioners' requirements is unlikely to be exhaustive since the process of designing UI, UX, and digital services might be conducted differently in other organisations. Therefore, our results may not be generalizable beyond the investigated context. Future research might verify whether our results apply across contingency factors like other organisations and industries. Second, for reasons of confidentiality, we were unable to report concrete data that demonstrates the effectiveness of the digital nudges developed in the field test. Future research might address this limitation by applying our DND method to design a digital nudge on which they can conduct a behavioural evaluation.

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Appendix 6: Research Paper 6

Title	Ethical considerations on digital nudging – Identifying consumer concerns
Author	Tobias Mirsch
Publication Type	Working/Conference Paper
Status of Publication	Submitted to conference
Reference	Mirsch, T. (2018). Ethical considerations on digital nudging – Identifying consumer concerns. *Working Paper*.
Access	https://www.alexandria.unisg.ch/254889/

Ethical Considerations on Digital Nudging – Identifying Consumer Concerns

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Abstract. Information systems influence individuals' behavior and firms are aware of it. Therefore, they vigorously design and constantly try to improve their digital channels. To increase influence further, approaches like digital nudging, which aims to influence individuals' decision-making by using their cognitive limitations while preserving freedom of choice, and being beneficial for them, are leveraged. However, digital nudging often accompanies the question if firms are using it to take advantage by exploiting individuals' cognitive flaws for their self-interest. Despite this undisputed relevance of potential ethical implications, knowledge about the ethical perspective of digital nudging is scarce. Therefore, based on a text mining analysis, this study identifies ethical concerns consumers have about employed behavior change approaches in practice. Thereby, an indicator for the ethical acceptability of digital nudges is provided, which extends extant studies and both researchers as well as practitioners are supported in developing ethical acceptable digital nudges.

Keywords: digital nudging, ethics, text mining, topic modelling

1. Introduction

Individuals of today are exposed to and using a plethora of digital devices, such as notebooks, tablets, or smartphones [1]. This provides manifold opportunities for consumers to interact with firms at anytime, anywhere, and on their preferred channel. Therefore, firms constantly endeavor to improve their provided channels in regard of their interplay as well as the provided information in order to enhance the interaction with the consumer and the overall experience of consumers [2]. For example, firms are vigorously studying consumers in order to personalize as many aspects within their channel environment to match their specific needs and expectations [2], [3]. To provide the consumer with the right experience by designing the user interface (UI) of their digital channels, firms use beside traditional approaches, such as the standard interaction design process (ISO 9241-210) [4], the newly emerged concept of digital nudging.

Digital nudging is particularly interesting, because consumers are confronted in the digital sphere with a vast amount of accessible information, which often exceeds their cognitive processing capacities due to

an experienced information overload [1], [5]. Consequently, consumers often have fragmented attention and feel overwhelmed with decision-making processes while using digital channels resulting in stress and ultimately, in a hampered experience [6]. Information exchange rates and information access in the digital sphere are high and hold strong implications for data-based business models, since data can be collected, analyzed, and processed fast and at low costs. Thereby, consumers are provided with the choice between various services, which are competing for their attention, each of them providing even more choices.

With regard to circumstances like these, the concept of digital nudging recently gained attention from information systems (IS) scholars and practitioners working in the field of UI, user experience (UX) and digital service design. The concept of digital nudging is based on insights from behavioral economics and the original concept of nudging, introduced by Thaler and Sunstein [7]. The approach aims to subconsciously influence individuals' decision-making by counteracting or using heuristics and biases, which are present in decision-making processes, while not forbidding any choice option and resulting in for the consumer beneficial outcomes. Through relatively small changes in the choice environment (e.g., UI of a smartphone app), digital nudging is an inconspicuous and powerful approach to improve digital choice environments. For example, to shorten and simplify the buying process [8], [9].

However, to influence consumers through digital nudging during decision-making processes, such as in the context of purchasing goods and services, is a double-edged sword. Simultaneously aiming at benefits for consumers and the firm might lead to tensions in regard of ethical implications [e.g., 9]. Through its unique capabilities to take influence on decision-making, digital nudging is often accompanied by the question if it may be used by firms to exploit consumers' cognitive limitations for the firms' self-interest. In public and in research, discussions have appeared regarding ethical implications and acceptability of approaches like digital nudging [e.g., 10], [11], [12]. The concerns are that consumers might be not supported but manipulated in a way that it nudges them toward for example economic and privacy harms, disregarding their own benefit. Accordingly, digital nudging could be perceived as a threat and attack of consumers' freedom. Per definition, nudges should be used as a tool to influence decision-making in a way that is beneficial and improving the choices [7]. However, reality looks different [3]. For example, consumers are presented non-essential choice options when booking flights of low-cost airlines, what might lead consumers toward purchasing one of those options [9].

Despite this undisputed relevance and increasingly importance of ethics within IS research [13], there is scarce knowledge about the ethical perspective on digital nudging. Knowledge about how to identify ethical issues related to digital nudging do not exist and possibly, relevant stakeholders (i.e., consumers, practitioners, researchers, and governmental institutions) might not be aware of ethical implications nor are

they able to assess if a digital nudge infringes ethical principles. Research already picked up the question about ethics of nudging toward aspired choices, but mostly in the offline context [e.g., 12], [14]. IS scholars highlighted the importance of the ethical issues around information technology (IT) and IS [e.g., 13], [15] and mention, but do not further elaborate, potential ethical issues of using digital nudging [e.g., 9], [16], [17]. Against this backdrop, the ethical issues and implications digital nudging potentially comprises for the design of digital channels need to be further investigated to facilitate the ethically justifiable and harmless application of digital nudging in research and practice.

To close this research gap, this study aims to answer the following research question: What ethical concerns do consumers have in regard to digital nudging? Therefore, a text mining approach, in order to identify ethical implications (e.g., concerns, fears) of consumers when they are targeted with approaches such as digital nudging is employed. The text mining approach was employed to review and analyze user comments on articles on behavior change approaches to derive ethical concerns. Thereby, the consumer perspective on the ethics of digital behavior change approaches is illustrated and can be taken into account when employing digital nudging. This provides practitioners and researchers designing digital nudges a certain degree of guidance, beside general ethical guidelines. Through this guidance, the ethical discussion is brought to the field of digital nudging and consumers' concerns can be better respected. Thus, this study intends to initiate a dialog and debate about the ethical principles in the digital nudging domain. Thereby, this research will make three important contributions to both theory and practice. First, it will contribute to prior research on the discussion of ethics in designing digital nudges by providing a study in this specific context. In doing so, this research aims at extending the general discussion on ethics and research on digital nudging. Second, this research will disclose the consumer perspective on the ethical perspective of digital behavior change approaches. Thereby, this study contributes empirical insight to the emerging field of digital nudging. Third, for practitioners and design-oriented researchers, disclosing ethical concerns of digital nudging, provides support for development processes when designing UI, UX, and digital services, ultimately counteracting possible negative consequences of unethical digital nudges.

This paper proceeds as follows. The next section introduces the concept of digital nudging as well as ethics discussed in the IS and nudging domain. Next, the methodological approach is illustrated, followed by the presentation of results and their discussion. Finally, the paper concludes with presenting the contributions, further research opportunities, and limitations.

2. Theoretical Background

2.1 Digital Nudging

Recently, the concept of digital nudging has been introduced to IS research [9]. Digital nudging is based on research on behavioral economics and the original concept of nudging, which was introduced by Thaler and Sunstein [7]. Insights from behavioral economics show that individuals are most likely influenced by effects of cognitive, emotional, and social factors, which often make their decision-making and behavior irrational as well as predictable [7]. The foundation of this phenomenon can be found in the dual process theory, which says that individuals assess information during decision-making processes with two different cognitive systems. On one hand, there is system 1, through which individuals assess information intuitively, fast, automatic, effortless, and charged with emotions. On the other hand, there is system 2, which is reason-based, slower than system 1, effortful and controlled deliberately. System 1 is used for everyday activities, which are primarily intuitive [18], [19]. When system 1 is used, heuristics, like mental shortcuts, are simplifying the decision-making process by reducing the amount of processed information [20]. When these rules of thumb apply, they are supportive for simple and recurrent problems, but they can lead to systematic decision-making errors, i.e., cognitive biases. A comprehensive overview of these heuristics and biases is provided by for example Gilovich et al. [21]. Accordingly, the design of the choice environment in which the decision-making takes place, can strongly influence the choice, by the specific way of presenting choice options [7]. The concept of nudging builds on these insights and pursues the goal to influence individuals' decision-making by the deliberate design of choice environments. Thaler and Sunstein [7] define a nudge as an intervention within a specific choice environment, which aims to either uses or tries to overcome heuristics and biases individuals underlie during decision-making processes. Crucial for the concept of nudging is that nudges are should benefit the decision-maker while preserving the full freedom of choice [7].

Digital Nudging is defined by Weinmann et al. as the "use of user-interface design elements to guide people's behavior in digital choice environments" [9, p. 433], whereby UI design elements include for example graphical design, specific content, wording, or small features. A digital nudge can be for example a push notification of a smartphone app, serving as a reminder for the user to be physically active [9]. The behavioral economistic background and the exact mechanisms how digital nudging works, are essential to understand the concept, because it illustrates how decision-making flaws are possibly exploited, leading to ethical discussions. Weinmann et al. [9] provide a definition of digital nudging, but to capture the

background and how cognitive flaws might be used, this study proposes a more detailed definition of digital nudging, corresponding to the definition of nudging provided by Hansen [22, p. 174] and adapting it to the digital context: Digital nudging is the attempt of influencing individuals' decision-making or judgement in a predictable way by using or counteracting cognitive boundaries, biases, routines and habits, which hinder individuals to act to their own benefit in the digital sphere. These attempts of digitally nudging individuals do not forbid or add any rationally relevant choice option, change incentives significantly or provide rational argumentation.

2.2 Ethics in IS

Ethics can be described as moral principles, which govern or influence behavior and build the knowledge of moral principles or particular ethical code [23], [24]. Ethics in the business context have been discusses since a long period and play a crucial role [15]. Nowadays, this topic is of particular interest and prominent due to attempts of technological fraud, data breaches, or other scandals. Examples of such scandals include the use of a device in the diesel-cheating case of Volkswagen [25] or data flows between Facebook, the user, and third parties, like Cambridge Analytica [26]. These examples show the relevance of ethics in the IT and IS context, for practitioners and scholars, leading to disputes about codes of ethics or privacy issues [13], [15].

Several ethical principles exist, which might apply within the context of digital nudging. For example, general and fundamental principles, such as the "golden rule" [27], which basically states that you should treat others the way you want to be treated, "do not harm", or Google's "don't be evil." [13]. This study focusses on identifying ethical issues or principles in relation to digital nudging. Therefore, information and computing technology are a relevant domain for this endeavor.

Turning to IS research, different ethic categories and ethical approaches exist, such as consequentialism, deontology, and virtue ethics as well as communitarianism [15]. Mingers and Walsham [15] for example, discuss works about computer and information ethics, since they represent a relevant focus for the IS domain. They highlight for example the generally accepted ethical principles by Beauchamp and Childress [28] of non-maleficence, beneficence, autonomy, and justice. Furthermore, they mention ethics within critical IS research, where the focus lies on revealing the effects of IS and IT on individuals [29]. As another valuable work, the design methodology of Hirschheim and Klein [30] is mentioned, which represents a design methodology that embodies ethical principles. Further works of relevance depict the

definition of codes of ethics for developers of IS to support their work practices [31], [32], [33]. However, they remain rather general. Additionally, the work of Floridi [34] suggests that that information itself has an intrinsic worth and anything is evil, what harms or diminishes information. Floridi [34] describes the reality as structural (not only physical) objects, which are informational and consist as combined data structures, relatively to the context or environment of the object as well as a set of behaviors or processes. This theory is described as the "theory of everything" [15, p. 838]. However, the described approaches mostly remain rather abstract and are not explicitly aimed at the topic at hand.

Another valuable work is provided by Myers and Venable [13], who propose a set of ethical principles for design science research in IS. This is particularly interesting, because design science aims at creating artifacts, which provide an improvement in a specific context, such as increased effectiveness or efficiency, health or education, or general well-being [13]. Digital nudges could be pictured as an artifact, which does provide such an improvement (i.e., support the decision-making). From relevant research in this domain Myers and Venable [13] extracted the core statements and propose the following ethical principles. Table 1 exhibits the for this study relevant principles:

Table 2. Ethical principles for design science research in IS [13]

Ethical Principle	Description
Public interest	Identification of all stakeholders who might be affected by the actions. Critical consideration of their resulting benefits or harms.
Informed consent	All stakeholders involved in the development should obtain informed consent (rights and any risks that might be involved).
Privacy	All stakeholders involved in the development should protect privacy of those directly involved in the development and who might use or be affected by the result.
Property	Ownership of the development project should be clarified as well as about the ownership of any data collected.
Quality of the artifact	The quality of the project ensured and risks should be avoided.

2.3 Ethics of digital nudging

Since digital nudging is rather a new concept, no approaches to assess the ethical acceptability exist to the author’s best knowledge. However, turning to the general concept of nudging, Hansen and Jespersen [10] provide an approach based on the epistemic transparency of specific nudges. They suggest that assessing

transparency can be used to indicate if a specific nudge is aiming to manipulate decision-making. The authors distinguish between transparent and non-transparent nudges, based on the work of Thaler and Sunstein [7]. They base their proposal on the assumption that attempts to influence behavior might be objectionable and due to the invisibleness, it might be not possible to monitor. Therefore, the authors make the distinction between a transparent and non-transparent nudge (Table 2).

Table 2. Classification of nudges [10]

	Transparent	Non-transparent
System 2 thinking	Transparent facilitation of consistent choice	Manipulation of choice
System 1 thinking	Transparent influence (technical manipulation) of behavior	Non-transparent manipulation of behavior

Sunstein [12] provides potential objections to nudges. However, it is pointed out that these concerns are not all-purpose objections nor generalizable when designing the choice environment. It still depends on the particular nudging initiative and its characteristics, since "nudging takes many diverse forms, and the force of an ethical objection depends on the specific form" [12, p. 6]. Nevertheless, the objectives (see Table 3) provide valuable guidance, trigger thoughts, and possible questions about the ethics behind nudging (for the in-depth description please see [12]).

Table 3. Potential objections to nudges [following 12]

Objection	Possible question to ask
Paternalism	Is the nudge paternalistic and not respecting the self-determination?
Autonomy	Does the nudge intrude individuals' autonomy?
Coercion	Is the nudge coercive?
Dignity	Is the nudge insulting individuals' dignity or infantilizing?
Manipulation	Does the nudge manipulate in any form and is not sufficiently transparent?
Learning	Does the nudge promote and not discourage learning to advantage of individuals?
Biased Officials	Does the nudge focus only the own interests of the nudging executor rather than its receiver?

As this overview of ethics exhibits, a broad range in variety and depth of ethical issues, relevant to IS and digital nudging, exists. Since IS and IT have a strong impact on individuals, ethics within this context are of high relevance [15]. Especially, with regard to digital nudging ethics seem to be of high importance, where influence on individuals' decision-making happens in a subliminal manner. However, digital nudging is strongly context-depended [9]. Therefore, the application of the right principles might not be as straightforward nor possible to provide prescriptive ethical rules rather providing ethical boundaries. The ethical implications of digital nudging might be a moving target depending on each specific application of digital nudging. For example, user characteristics, like experiences, personal goals, or expectations, are significantly shaping the boundaries of ethics as well as each channel's capabilities on which the digital nudge is integrated. Therefore, insights from consumers are important to understand their point of view when dealing with digital nudging, to provide valuable guidance when conducting digital nudge design.

3. Research Approach

In this study, a text mining approach is applied, broadly following the recommendations of Debortoli et al. [35], to identify the ethical concerns of consumers in regard to digital nudging. In a first step, data was obtained from the web by identifying relevant web articles reporting and discussing behavior change approaches, where interaction in the form of user comments was available. For this purpose, the study turned to the social news aggregators Hacker News and Reddit. Reddit for example, to which is often referred as "the front page of the internet", already contains various categories (Subreddits) with varying focus, such as technology, UI design, or IS. The service is based on collected web articles through users, which are then commented by the community. To retrieve the articles, searches on the websites were conducted. Additionally, Twitter served as a source. There, relevant tweets were identified and treated as comments. Twitter can be seen as a platform capturing reactions to specific topics and therefore, profound data for the analysis.

Since, digital nudging is a newly developed approach and consumers might be not aware of the terminology, the study turned to related fields (behavior change approaches in general) in order to derive the ethical concerns. Therefore, related terms were included, resulting in the following search query: (nudg* OR (persuasive OR persuade OR persuasion) OR (motivating OR motivate OR motivation) OR (manipulative OR manipulate OR manipulation) OR (influence OR influencing) OR (deceitful OR deceptive) OR steers OR (behavior OR behavior) OR UX OR (patterns OR dark patterns)). This procedure allowed retrieving articles, such as one written by Shlomo Benartzi, the author of the book "The Smarter

Screen" [1], about digital nudging. On Twitter, it was searched for equivalent hashtags. In order to keep the study focused and current, only content dating back to 2010, concerned about the topic at hand and in English, was considered. All retrieved documents were publicly available. Metadata of each comment, such as the user name, up and down votes or number of comments, are not considered for the analysis.

The text mining analysis allows – the most fundamental task of text analysis – the categorization of text [35]. Therefore, automated text mining was employed, which supports handling the text data sets obtained, ultimately resulting in the categorization of text (i.e., user comments assigned to categories/topics). The processing of the user comments (natural language processing) and topic modelling is conducted with the cloud-based text mining tool minemytext.com. Initially, before analyzing the data in-depth the retrieved data was prepared for the analysis and a first understanding was build. Thereby, duplicates have been eliminated from the data set as well as comments not having a relevant discussion about ethical use, such as comments about the overall quality of an article. Subsequently, to understand the data at hand and to get a deeper overview of the data set, an exploratory data analysis (e.g., analyzing number of user comments (319), number of words (6253), number of unique words (578), word frequencies) was performed.

The preparation of data has a significant influence on the results [35]. To further prepare the analysis through minemytext.com, several steps were undertaken within the tool. First, noise was extracted from the comments. This step includes (1) N-gram tokenizing (splitting comments into single words (N-Gram 1) or grouping two or three successive words (N-Gram 2 or N-Gram 3)), (2) words with little meaning and value for the study but with high frequency were excluded from the data set (e.g., stop words like "and", "for", or "if"), (3) parts of speech (POS) were filtered, which means the removal of words based on their part of speech (e.g., nouns, verbs, adjectives, or adverb), (4) lemmatizing, which results in reducing words to their dictionary form, (5) removal of numbers, (6) and removal of symbols or code (e.g., HTML tags). Not performed was stemming, which reduces inflected words to their word stem because it resulted in the loss of meaning (e.g., "become" was reduced to "becom" and "people" to "peopl"). Second, the adequate number of topics to be generated from the comments, needed to be identified. This was achieved through pre-modelling cycles. Different numbers of topics (between 10 and 30) were tested through a qualitative assessment of the resulting topics. Ultimately, 15 topics were identified as an adequate number. A higher number of topics resulted in very similar topics with almost no recognizable differences and a lower number in summarizing too many different topics while lacking a clear distinction. When analysing the topics it

was checked if the topics are meaningful and interpretable in order to make use of them. In the following section, the results of this study are briefly presented and subsequently discussed.

4. Results and Discussion

With this text mining study, as outlined before, it is aimed to unfold consumers' ethical concerns when exposed to behavior change approaches in digital contexts, such as digital nudging. Table 4 shows the final topics (15) with their most probable words whereas Figure 1 exhibits the overall distribution of the topics.

Table 4. Topic model

Topic	Most probable words
1	price, company, make, people, cost, pay, illegal, customer, business
2	book, time, hotel, review, room, trust, bookingcom, small
3	email, ship, enter, info, site, people, spam, amazon
4	people, make, decision, give, default, risk, amount, set
5	ad, guess, nudge, business, blocker, unethical, newspaper, force, revenue, bag
6	test, sale, growth, download, product, fake, learn, email
7	fee, clean, pay, extra, paper, service, hotel, cheap
8	site, buy, darkpattern, sense, review, leave, bookingcom, ticket, visit
9	company, trick, insurance, flight, ryanair, book, dont, business, experience
10	unsubscribe, email, amazon, click, link, sign, screen, prime, check
11	credit, paypal, card, default, pay, bank, customer, time, account, option
12	app, phone, time, enable, upgrade, pattern, notification, facebook, update, choice
13	bill, hour, call, notice, feel, time, play, month, talk, cancel
14	pattern, dark, make, user, ux, bad, page, manipulinks, design, facebook
15	cancel, button, service, subscription, make, continue, sign, change, experience, bad

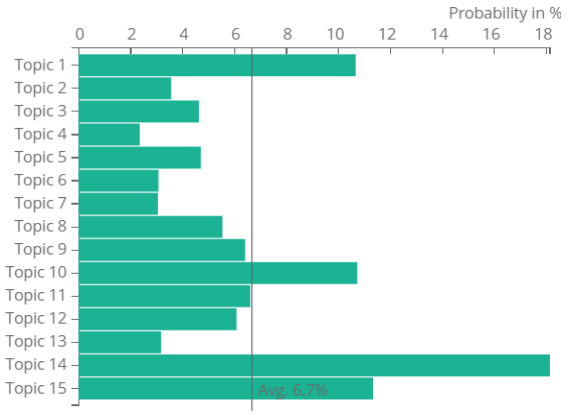

Figure 3. Topic distribution

This study's aim is to support the ethical use of digital nudging when designing UI, UX, and digital services. From the text mining 15 topic clusters have been identified, which provide a first understanding

of which ethical concerns were stated and are relevant. In order to systematize and make sense of the identified topics, the results are mapped with the identified frameworks and approaches about ethics from literature (see Table 5). The potential objections of nudges of Sunstein [12] were used to classify and map the identified topics. The objections by Sunstein provide the most valuable approach for this venture, since they provide a very precise orientation of potential ethical implications in the context of nudging, whereas the other identified approaches solely provide a general guidance, such as the "golden rule" [27] or "don't be evil." [13]. Table 5 shows the topics mapped with the objections.

Table 5. Topic mapping

Topic	Most probable words	Objection
1	price, company, make, people, cost, pay, illegal, customer, business	Autonomy, Biased Officials, Manipulation
2	book, time, hotel, review, room, trust, bookingcom, small	Biased Officials, Manipulation
3	email, ship, enter, info, site, people, spam, amazon	Biased Officials, Manipulation
4	people, make, decision, give, default, risk, amount, set	Autonomy, Biased Officials, Manipulation, Paternalism
5	ad, guess, nudge, business, blocker, unethical, newspaper, force, revenue, bag	Autonomy, Biased Officials, Coercion, Manipulation
6	test, sale, growth, download, product, fake, learn, email	Biased Officials, Manipulation
7	fee, clean, pay, extra, paper, service, hotel, cheap	Manipulation
8	site, buy, darkpattern, sense, review, leave, bookingcom, ticket, visit	Biased Officials, Manipulation
9	company, trick, insurance, flight, ryanair, book, dont, business, experience	Biased Officials, Manipulation
10	unsubscribe, email, amazon, click, link, sign, screen, prime, check	Autonomy, Biased Officials, Coercion, Manipulation, Paternalism
11	credit, paypal, card, default, pay, bank, customer, time, account, option	Autonomy, Biased Officials, Manipulation, Paternalism
12	app, phone, time, enable, upgrade, pattern, notification, facebook, update, choice	Autonomy, Biased Officials, Coercion, Manipulation, Paternalism
13	bill, hour, call, notice, feel, time, play, month, talk, cancel	Autonomy, Biased Officials, Coercion, Manipulation, Paternalism
14	pattern, dark, make, user, ux, bad, page, manipulinks, design, facebook	Autonomy, Biased Officials, Coercion, Manipulation, Paternalism
15	cancel, button, service, subscription, make, continue, sign, change, experience, bad	Autonomy, Biased Officials, Coercion, Manipulation, Paternalism

When looking at the assigned objections from Sunstein [12], one can see that Biased Officials can be mapped to every topic identified. This can be explained with the negative sentiment about behavior change approaches and the perception that for consumers the intent to influence decisions is in the interest of the influencer rather than its receiver (e.g., “It’s funny how they only want to repeatedly confirm your decision when you give the answer they don’t want.” Comment from topics 12 cluster). The objection Manipulation (which also is relatable to Hansen’s and Jespersen’s [10] classification of transparent/non-transparent nudges and revealing the effects of IS and IT on individuals as proposed by Beauchamp and Childress [29]), can also be mapped to all topics. Possibly, this can be explained with that behavior change approaches are seen per se as manipulative and unethical (e.g., “Once you ‘trick’ anyone to do anything, it is no longer ethical.” Comment from topic 8 cluster). It is also recognizable that Paternalism, Autonomy, and Coercion are often mapped together. The explanation might be that the boundaries are blurring between these objections. Employing a paternalistic nudge easily can intrude one’s autonomy and one’s autonomy is clearly intruded by being coercive. The comments within these topic clusters are not clearly separating these three objections (e.g., “To unsubscribe you need to expand every single group and check every single checkbox, there's 46 groups.” Comment from topic cluster 10; “I cannot register if I don't want to register to your newsletter!” Comment from topic 5 cluster). The objections Dignity and Learning were not relevant to be mapped.to the topics, i.e., no comments matched these objectives. In general, the discussions among consumers are turning around ‘legal aspects of employed behavior change tactics’, ‘non-transparent costs’, the ‘use of defaults’ or ‘changing customer-selected options’, ‘aggravated subscriptions’ or ‘automatic subscriptions’. Many comments refer to the need for regulations about the exploitation of online consumers and provide bad examples of firms staying in line with them. Therefore, consumers feel helpless and at their own mercy when exposed to behavior change approaches firms employ (“Ethics in design and especially web design are sorely lacking.” Comment from topic 5 cluster).

When analyzing the most probable words of the topic clusters it can be seen that certain firms are strongly connected with the discussion and concerns of consumers. Furthermore, it was stated in several comments that the unethical use of influencing consumers can lead to a bad experience, distrust, and ultimately to loss of business (e.g., “No more bookings on booking.com after a bad experience.” Comment from topic 4 cluster; “Making me fill out a 20-question survey before you let me cancel account just makes me want to cancel your service even more.” Comment from topic 15 cluster).

When turning to the ethical principles for design science research in IS, Public Interest could represent an important general guidance when designing digital nudges, because by the identification of all stakeholders who might be affected by digital nudging, all stakeholders’ specific benefits or potential harms

need to be critically considered. This possibly also leads to results, which show that different benefits or harms are relatively to each of the involved stakeholder.

5. Contributions, limitations, and further research

IT is a double-edged sword: it "can be used to enhance or destroy human dignity. IT can improve people's lives, but it also has the potential to make them much worse" [13, p. 802]. For example, IT can increase individuals' health through motivating them to healthy behavior, but also seriously violate someone's personal privacy due to its increased surveillance capabilities. Therefore, responsibility is needed when designing UI, UX, and digital services. Especially, when the aim is to influence individuals' decisions, such as through digital nudging. Ethical boundaries need to be set and more importantly, respected to preserve personal and societal interest. One could argue that as soon as ethical principles are infringed when influencing consumers, it is not digital nudging anymore, because it does not benefit them. However, the line is hard to draw since the ethicalness of a digital nudge is a moving target and needs to be assessed individually. Thus, this study focused on the main aspects consumers perceive as harming when being influenced through behavior change approaches. General and fundamental principles are undoubtedly valuable and honorable, but it is necessary that all responsible functions designing IS consider concrete ethical implications their actions have for each targeted individual and possibly, even society. Thereby, the instance nudging can fulfil the role of a sustainable and responsible member of society when using digital nudging.

This study identified ethical concerns consumers have in the context of digital nudging. By doing so, 15 topic clusters were identified, primarily showing that consumers do not want to be tricked or forced to a certain decision or behavior, which are not in line with their will and differ from the expected results. Briefly, the consumer wants to be supported during the journey. The presented results hold great value for both practitioners as well as researchers resulting in three main contributions. First, the study triggers the dialog and debate about ethical considerations on digital nudging and which implications it might holds. Furthermore, this study contributes to prior research on the ethical perspective and discussion in the design of IS by providing insights from a specific application context (i.e., digital nudging). Thereby, the general discussion on ethics in IS design is extended [e.g., 13], [15]. Additionally, this study contributes to the novel research field of digital nudging [e.g., 8], [9], [16], where insights are scarce. Laying out ethical considerations in this context is important, especially in comparison to the offline-sphere, since technology

offers a variety of features, which can have a significant influence on individuals and how digital nudges are designed (e.g., personalization capabilities through data analytics or real-time adaptation). Second, this research discloses the consumer perspective on the ethical perspective on digital nudging. Additionally, through employing a text mining approach and analyzing user comments, it is possible to capture naturally occurring text data and therefore, naturally occurring opinions [35]. Third, for practitioners and design-oriented researchers, disclosing ethical concerns in the context of digital nudging provides support for digital nudge design when designing UI, UX, and digital services. This ultimately counteracts negative consequences by implementing unethical digital nudges. Unethical digital nudges might lead to gains in the short term, but possibly have repercussions in the long-term, such as the loss of trust, negative publicity, or legal complaints [3]. Especially, when considering that it is not possible to generalize the ethical extent of a digital nudge, because it strongly depends on the individual and context in which it is applied. For example, a health insurance company aims at digitally nudging its customers to be physically more active and tracking the activity with an smartphone app, resulting in a health benefit for the customer and in lower treatment expenses for the insurance. Another company might trigger the same activities, but is just interested in collecting and selling user data.

The study also has some limitations. The identified ethical concerns individuals have, are intended to serve as guardrails for the design of UI, UX, and digital services and cannot serve as an overall prescription. An overall prescription is due to the context-dependence of digital nudging and individuals' as well as firms' specific goals, not possible. The results only allow to decide in each given situation, which ethical implications might be tapped. Therefore, someone needs to consider the receiver of the digital nudge, the context as well as estimating the consequences, i.e., the best interest for the receiver of the digital nudge and if this action exceeds ethical boundaries. Thus, it is not possible to object digital nudging in general, but specific nudges in a particular context with its specific actors and their goals. Furthermore, the mapping of topics has been done based on the opinion of the author and could possibly contradict others' opinions, resulting in a different mapping.

For future research this study provides a fruitful starting point and basis for IS scholars to refine and extend consumers' ethical concerns. Possibly, further ethical concerns could be identified through a consumer survey or to validate this study's findings. By doing so, the consumer perspective could be enriched and further established. Additionally, the insights could also serve as a basis for developing an artefact, which allows the assessment of the ethical acceptability of digital nudges. This will ultimately allow to create ethical unquestionable digital products and services.

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09/12 – 12/12 **Western Oregon University**, Monmouth, OR, USA
Semester abroad

10/07 – 06/10 **University of Applied Sciences Darmstadt**, Darmstadt, Germany
Bachelor of Engineering in Information Science & Engineering

Practical Experience

02/15 – 07/18 **Competence Center Digital Service Innovation of the University of St.Gallen (HSG)**, St.Gallen, Switzerland
Research Associate Digital Service Innovation

03/14 – 01/15 **FCA Fiat Chrysler Automobiles Switzerland SA**, Schlieren, Switzerland
Trainee Brand Marketing

12/12 – 01/13 **Mambo Media, Inc.**, Portland, OR, USA
Intern Online Marketing

10/10 – 02/11 **Kia Motors Germany GmbH**, Frankfurt, Germany
Intern Marketing

08/09 – 10/09 **Deutsche Leasing AG**, Bad Homburg, Germany
Intern Marketing and Market Research