Anywhere, Anytime, Autonomous – Meeting Customer Needs in the Digital Age through Omni-Channel and Proactive Service Management

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"Success is the ability to go from failure to failure without losing your enthusiasm."
Winston Churchill (1874 - 1965)

Für meine Familie Ludwig & Hannelore, Ina, Bernhard und Marcel.
Spezieller Dank geht an meinen Mentor Max
sowie allen Wegbegleitern während meiner Promotion.

Abstract

The increasing proliferation of digital technologies enables novel value propositions, closer customer relationships, and greater automation of customer-facing business processes, softening the boundaries between the physical and digital world. Whether it is a smart fridge informing customers when food is running low, digital fitting rooms in stores offering extensive knowledge about the garments, or the permanent availability of information through smart devices, the opportunities to provide a unique customer experience appear endless in the digital age. However, with these opportunities, customer behavior is also changing to favor empowered customers who determine how they interact with organizations. These empowered customers expect a seamless and personalized customer experience anytime, anywhere. Hence, organizations must shift their mindset from organizational-defined solutions to customer-oriented solutions to meet customer needs in the digital age. Against this backdrop, this cumulative doctoral thesis aims to identify pathways to fulfill customer needs based on omni-channel and proactive service management insights.

Considering omni-channel management, Research Article #1 presents an economic decision model that helps organizations seamlessly manage hybrid customers moving fluently between channels by evaluating omni-channel strategies that meet customers' channel preferences and can also be operated efficiently. Considering proactive service management, Research Article #2 analyses proactive service features through the empirical and conceptual design of a taxonomy and provides further a list of 45 examples. This taxonomy helps organizations and researchers understand the proactive service phenomenon and to identify valuable conceptualizations. Based on this research article, Research Article #3 shows that the implementation of certain proactive service features has the potential to delight customers. Organizations can, therefore, design appropriate services leading to higher customer satisfaction. The classification and prioritization of the features are determined by applying the well-established Kano model and the self-state importance method. Further, the popular Five Factor model allows investigating the influence of customers' personality traits on the evaluation. Finally, Research Article #4 presents a contextualized acceptance model of proactive services drawn from insights of general acceptance theory to identify antecedents influencing customers' acceptance. The results provide further indications for a tailored service design meeting customer needs.

In sum, this cumulative doctoral thesis analyzes customer needs in the digital age through different theoretical lenses by using qualitative and quantitative research methods in the research field of omni-channel and proactive service management. In this regard, the research articles build upon (i.e., Kano model, Five Factor model, taxonomy design) and extend relevant theory (i.e., contextualized UTAUT2 model) to answer the different underlying research questions, whereby providing valuable empirical evidence for researchers and practitioners.

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I. Introduction[1]

The digital age, driven primarily by digital technologies, the higher availability of data, and improved analytics capabilities, has increased the speed of market developments and transformed how organizations interact and deliver value to their customers (Hoong, 2013; Shainesh, 2019). Therefore, organizations have to change their business model and adapt to the new market situations. This forced change is not driven by organizations but by customers (Hong et al., 2014; Latinovic & Chatterjee, 2019). Digital technologies, for example, enable near-perfect transparency, allowing customers to easily compare prices, service levels, and product performance, and thus to switch with little effort among retailers, brands, and services (Hirt & Willmott, 2014; Larivière et al., 2017; Shainesh, 2019). These new opportunities for customers are causing a change in their expectations and attitudes. According to Gartner, 89 percent of organizations already believe that the most prominent digital challenge is building the best customer experience (Talin, 2021). The digital age offers organizations, therefore, both opportunities (e.g., improved customer experiences and increased customer loyalty) and challenges (e.g., fast-changing customer needs and the necessity of abandoning old ways of working with outdated infrastructures, inflexible resources, and siloed operation models) (Adkins et al., 2021). Thus, more than ever, organizations must rethink their relationship with customers and have to shift their mindset away from a technological solution ("What product or service can we provide to the market?") to a customer-oriented one ("What customer needs do we want to meet with this product or service?" (Camp et al., 2018; Kreuzer et al., 2020). Today, customers expect access to content and services anywhere and at any time (Fanderl et al., 2018; Rasool et al., 2020; Urdea et al., 2021), simple purchase processes across multiple channels and devices providing a seamless experience (Nüesch et al., 2015; Verhoef et al., 2015), use of their data to obtain personalized and innovative services (Barrett et al., 2015; Kowalkiewicz et al., 2016; Larivière et al., 2017), and convenience in consuming products or services (Bachir, 2021; Latinovic & Chatterjee, 2019). The one-size-fits-all approach is long outdated (Adkins et al., 2021). Against this backdrop, it has become

[1] This section is partly comprised of content taken from the research articles included in this thesis. To improve the readability of the text, I omit the standard labeling of these citations.

increasingly essential to meet customer needs in the digital age to have satisfied customers, leading to greater economic success for organizations (Sureshchandar et al., 2002).

Organizations like Apple, Google, or Amazon have already exemplified how to use service design and technologies to meet the needs of their customers. Customers of such organizations become accustomed to receiving orders placed online the same or the next day, getting any time support (e.g., via chatbots), or simplifying customers' lives with technology (e.g., Alexa, Google Nest). In essence, highly successful organizations realize that the boundaries between products, services, technologies, and environments are blurring. They also know that they need an integrated view to design seamless experiences that are truly valuable to customers and successful in the market, which they can achieve through optimized channel and service management.

Focusing on channel management, customers are nowadays equipped with advanced digital technologies and services which allows them to move fluently between digital and physical channels, adopt new channels, abandon others, or use them simultaneously along their customer journey (Rapp et al., 2015; Schoenbachler & Gordon, 2002). In doing so, customers define for themselves how to interact with organizations and expect an integrated and seamless experience across channels (Brynjolfsson et al., 2013; Nüesch et al., 2015). According to Hoong (2013), more than 60% of customers interact through multiple channels irrespective of time, place, and device. Additionally, different customers have different preferences, and they change them depending on the channel offers, the context of a process, location, and time (Hoong, 2013). Therefore, organizations have to offer the right channel mix to optimize customer experience (Gensler et al., 2012; Melero et al., 2016). Organizations, for example, integrate a mobile channel in a physical store to provide in-depth product information, location-based push messages with personalized offers, self-scanning services, or home delivery for products that are not available in-store (Barann et al., 2020; Grewal et al., 2017). The online retailer Amazon now invests in physical stores as Amazon recognizes the value and role of physical channels (Rahilly et al., 2017). Organizations need to align their channel offering with customer preferences, making organization-defined sequential purchase processes obsolete and leading to non-sequential customer journeys (Barwitz & Maas, 2016; Nüesch et al., 2015). To handle non-sequential customer journeys, organizations need to integrate their processes and information technology (IT) systems across channels to provide a seamless experience independent of the customers' channel choice in a particular situation or at a specific transaction step (Briel, 2018; Nüesch et al., 2015). This approach, called omni-channel management, is developed from single and multi-channel management and goes along with implementing an appropriate omni-channel strategy (Pophal, 2015).

Omni-channel management bridges the gap between the digital and physical world and changes the interaction between organizations and customers. However, these phenomena are also evident in service management, as the nature of service is also changing due to digital technologies (Barrett et al., 2015). Organizations have access to novel data sources and can advance their data analysis capabilities by using automation or artificial intelligence (AI)-driven algorithms to understand customer behavior more easily and comprehensively (Barrett et al., 2015; Larivière et al., 2017). Traditionally, services comprise interactions between customers and employees of organizations, whereby customers typically make the first move (Froehle & Roth, 2004). This logic is known as the "pull"-rationale (Leyer et al., 2017). Nowadays, digital technologies replace employees and enable services to act on behalf of customers (Alt et al., 2019; Dreyer et al., 2019; Leyer et al., 2017). This changed logic is known as the "push"-rationale where the service always makes the first move (Leyer et al., 2017). This reposition leads to digital and smart services characterized by a proactive and autonomous nature, thus called proactive (digital or smart) services. Based on personal and contextual data from heterogeneous sources, proactive services either anticipate customer needs and provide personalized decision support (i.e., recommending grocery purchases), assist in the execution of decisions or actions (i.e., proposing a budget based on prior expenditures), or even decide and act on behalf of the customer (i.e., ordering groceries based on the current contents of the refrigerator) (Hammer et al., 2015; Kabadayi et al., 2019; Leyer et al., 2017). With the aid of proactive services, organizations can create new data-based value propositions which customers demand. However, knowledge about proactive service characteristics and their design is sparse. Especially in the design of proactive services, a prioritization of the characteristics regarding their influence on customer satisfaction is missing. Customer satisfaction generated by service characteristics depends on the level of performance or functionality relative to customer expectations (Kano et al., 1984). In general, customer satisfaction affects customer retention and leads to tremendous economic success (Galbraith, 2011; Reinartz et al., 2004; Shainesh, 2019). However, customer personality traits are related to customer satisfaction and thus may influence design decisions (Xiong, 2010). A personality trait often reflects a person's preferences, motivations, and values, and remains relatively stable over an entire lifetime (Buettner, 2016, 2017). By understanding and incorporating customers' personality traits and customer satisfaction into the design approach, organizations can better provide suitable products and services (Buettner, 2017; Romero et al., 2009)

To design appropriate services, organizations should not further neglect the consideration of customer acceptance. Acceptance is a prerequisite for later use. Research notes that the biggest challenge for organizations is the gain of customer acceptance of innovative services (Wuenderlich et al., 2013; Wuenderlich et al., 2015). According to Hong et al. (2014), contextual properties are an essential component in acceptance research. However, contextual properties are often unrecognized, unmeasured, or underestimated. Thus, theory without considering contextual differences may lead to misapplication and consequently provoke improper design, customer dissatisfaction, and customer churn (Anderson et al., 2008; Hong et al., 2014). As the nature of proactive services causes a change in customer interaction, which can have far-reaching consequences in the life of customers, organizations should consider customer acceptance when designing proactive services.

Individual consideration of the two concepts (e.g., omni-channel and proactive service management) to meet customer needs can be abstracted and integrated. Omni-channel management enables organizations to have a detailed view of each customer for seamless and consistent customer interactions. Data synchronized across channels and digital technologies, channels specifically, reinforce the integration and the availability of data. From an operational perspective, the prerequisites to integrate proactive services in omni-channel management are therefore given. Organizations with digitalized and linked channels can deliver proactive, personalized services within and between channels (Barann, 2018; Lemon & Verhoef, 2016; McGliynn & Conlan, 2017). If challenges arise, these services can coordinate processes and draw attention to the customer journey and the underlying retail process (Barann, 2018; Kallinikos et al., 2013). The proactive omni-channel management approach involves the identification of customers' needs and the provision of solutions to provide a better customer experience. This approach further improves customer satisfaction via tailored solutions based on unified knowledge, AI, and analytics across all interaction channels (Buesing et al., 2018). Thereby, the proactive services should be consistent across channels to avoid discrepancy of answers and promotions leading to frustrated customers who may abandon the purchase. The following example gives a preamble of the potential of the integrated concept (Amar et al., 2020). One telecommunication organization identified that many customers reviewed their contract and cancellation terms online several weeks before canceling. Instead of passively waiting for a customer to call, the organization proactively implemented a pop-up chat feature on its website with contract and cancellation terms that connects customers directly to its customer retention team. If the customer still decided to call, they were routed directly to a customer service representative who knows about their browsing history. This targeted interaction ensured timely intervention, reduced customer turnover, and significantly increased customer satisfaction through proactive management across multiple channels (Amar et al., 2020). Against this background, the rise of digital services and channels forces organizations to understand the entire customer journey instead of individually optimizing contact points. Establishing consistent proactive cross-channel services will deliver differentiated customer experiences that build and maintain customer relationships (Hoong, 2013).

In sum, the overarching research aim of this thesis is to meet customer needs in the digital age by applying insights from channel and service management. Thereby, the doctoral thesis is cumulative and consists of four research articles which address the research aim by applying different conceptual and theoretical lenses, using qualitative and quantitative research methods, showing different forms of empirical evidence, and giving practical guidance for organizations. This doctoral thesis is relevant to researchers and practitioners, and covers theoretical and practical perspectives, particularly in omni-channel and proactive service management.

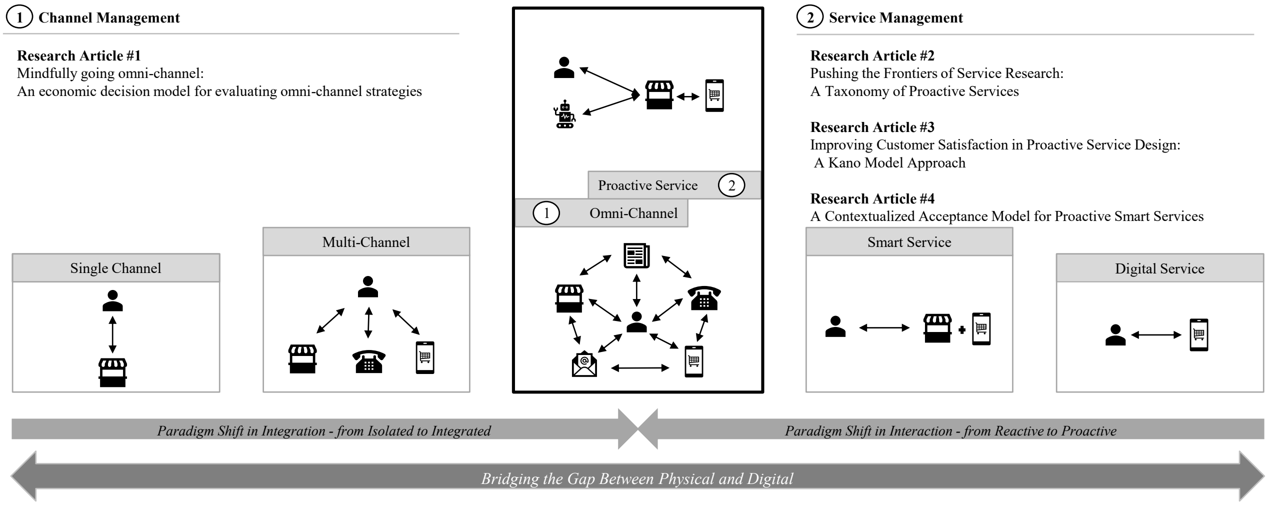

Figure 1. Assignment of the research articles to the topics structuring this doctoral thesis

Figure 1 displays how the individual research articles are assigned to the overarching topics of channel management and service management to bridge the gap between the physical and digital world and therefore meet customer needs in the digital age. The same structure can be found in Section II. The digital age, characterized by digital technologies and increased data availability, is changing customer interaction. Customers today want to interact with organizations as conveniently as possible, regardless of time and place. Accordingly, the doctoral thesis first addresses this paradigm shift in channel management from an isolated to an integrated interaction. Organizations should mindfully move from single or multi- to omni-channel management. Thus, Research Article #1 focuses on an economic decision model for evaluating omni-channel strategies to meet customers' channel preferences and to operate efficiently (Section II.1). Second, the doctoral thesis investigates the paradigm shift of customer interaction in the service field from reactive to proactive. Therefore, Research Article #2 pushes the frontiers of service research and analyzes proactive services through the development of a taxonomy, its application, and evaluation. Based on this taxonomy, Research Article #3 investigates customers' assessments of the features of proactive services to improve customer satisfaction in proactive service design. Thereby, the article uses a methodological combination of the Kano model, self-stated importance method, and the Five Factor model to further examine whether customers' assessments differ according to personality traits. To further contribute to the knowledge of the emerging concept of proactivity and autonomy in the service field, Research Article #4 examines the customers' acceptance of proactive services by applying a contextualized acceptance model (Section II.2). Finally, Section III summarizes the key insights of this thesis and provides avenues for future research. Section IV lists the publication bibliography. Section V presents an appendix including additional information on all research articles (V.1), details on my contribution to each research article (V.2), and the research articles themselves (V.3 to V.6).

II. Overview and Context of the Research Articles[2]

1 Channel Management – Customer Interaction from Isolated to Integrated

Digital technologies blur the line between the physical and digital and enable hybrid customer interactions meaning the switching between offline (e.g., physical stores) and online channels (e.g., online shop) (Brynjolfsson et al., 2013; Nüesch et al., 2015). Generally, channels can be described as an organization's contact points for interacting with customers and are the sum of routes by which organizations deliver products, services, or information (Hosseini et al., 2015; Mirsch et al., 2016).

In the early days of retailing, organizations focused on brick-and-mortar stores as a single distribution channel (Kowalkiewicz et al., 2017). Consequently, customers had to access physical stores to make purchases. Over time, organizations began to broaden their channel mix and to provide services via additional channels. In line with the pervasiveness of the Internet and the emergence of digital channels, channel management has been largely transformed over the last two decades (Verhoef et al., 2015). Channels are no longer seen solely as distribution channels but also serve as communication channels. Especially, digital channels facilitate bidirectional instead of the prevailing unidirectional communication in traditional channels. Further, purely online-based retailers like Amazon have emerged, and many traditional brick-and-mortar organizations like Walmart have expanded their channel mix to include digital channels, such as mobile channels and social media (Rigby, 2011; Verhoef et al., 2015)

With the provision of multiple channels, the concept of multi-channel management has evolved into an established discipline for managing organizations' interactions with customers via multiple channels. In the multi-channel management context, however, organizations typically treat channels as independent silos, have separated IT systems or databases, allow no switching or knowledge sharing between channels, and optimize them separately (Nüesch et al., 2015; Shen et al., 2018). As each channel has individual goals and maximizes revenue to some extent at the expense of others, organizations do not exploit the economic

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potential of customer relationships in the first place (Piotrowicz & Cuthbertson, 2014; Pophal, 2015; Ye et al., 2018). From a management viewpoint, organizations are solely investigating whether or not they should add additional channels (Geyskens et al., 2002; Mirsch et al., 2016). From a customer viewpoint, this management leads to channels not being intertwined and providing inconsistent customer experiences (e.g., prices or promotions). Thus, customers' intention of using different channels simultaneously and seamlessly is not possible (Beck & Rygl, 2015; Gu & Tayi, 2017; Juaneda-Ayensa et al., 2016).

Hence, channel management should instead remove the barriers between channels by coordinating the processes and technologies across them. Further, customers are changing the way they collect and evaluate information, how they make decisions, and how they interact with organizations in the digital age (Brynjolfsson et al., 2013; Klaus, 2013; van Bruggen et al., 2010). In fact, customers' willingness to follow organization-defined purchase decision processes has decreased significantly and has turned into non-sequential customer journeys (Barwitz & Maas, 2016; Nüesch et al., 2015). Building on these considerations, omni-channel management developed from multi-channel management attempts to consider all channels, customers' channel preferences, and channel dependencies in a holistic and integrated manner from both the customers' and organization's viewpoint (Beck & Rygl, 2015; Nüesch et al., 2015; Ye et al., 2018). As such, Verhoef et al. (2015) define omni-channel 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*" (Verhoef et al., 2015, p. 176). From a management viewpoint, organizations minimize channel competition and maximize channel synergies by having a central database (e.g., for customers, pricing, and inventory data), integrating IT systems as well as logistics across channels, and consistently sharing knowledge (Beck & Rygl, 2015). From a customer viewpoint, customers can interchangeably and seamlessly use and switch among channels during their search and purchase process without any information loss or reiteration (Piotrowicz & Cuthbertson, 2014; Shen et al., 2018; Verhoef et al., 2015). However, the transition from multi-channel to omni-channel is a gradual process, and other terms such as cross-channel (i.e., "*the possibility for a consumer to switch between certain, but not between all, available channels*" (Mirsch et al., 2016, p. 6)) refer to intermediate forms on this continuum. Because of a lack of methodical guidance in implementing omni-channel management, many organizations still struggle with their efforts (Verhoef et al., 2015). Thus, a key challenge is managing customer behavior across channels by implementing an appropriate omni-channel strategy (Pophal, 2015).

Research Article #1 addresses this challenge by proposing the following research question: How can organizations determine which channels they should offer for various purchase decision process steps when considering non-sequential customer journeys in an omni-channel environment? To answer this research question, the article builds on prescriptive knowledge guiding organizations in the valuation and selection of an appropriate omni-channel strategy. The underlying economic decision model recommends the omni-channel strategy with the highest contribution to an organization's long-term firm value by applying the principles of value-based management as an accepted paradigm of corporate decision-making. Thereby, the decision model accounts for non-sequential customer journeys covering all steps of the purchase decision process, the omni-channel environment with offline and online channels, and the possibility to open or close channels for distinct steps. Further, the model incorporates customers' channel preferences and customer churn due to enforced channel switching. To do so, the decision model comprises two central components: a customer journey analysis and an investment analysis component (see Figure 2). In the customer journey analysis, the decision model builds on Markov chains to model customer journeys based on input parameters such as the structure of the purchase decision process, available channels, and customers' channel preferences. In the investment analysis, the decision model determines the value contribution of omni-channel strategies reflecting the increased or decreased economic effect compared to the organization's current strategy. In that way, the decision model builds on the output of the customer journey analysis and input parameters such as customer demand and cash flows.

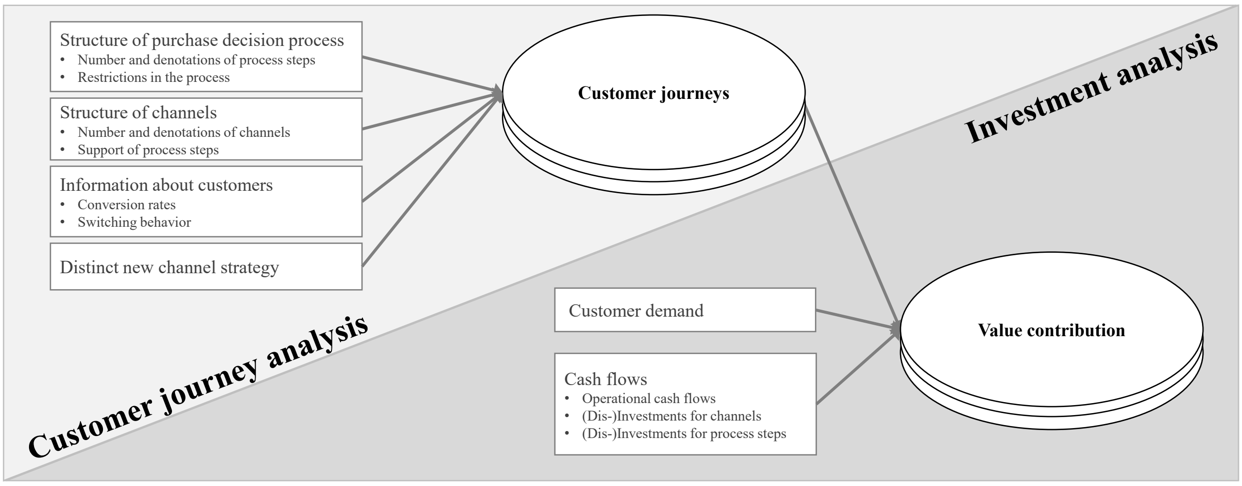


Figure 2. Structure of the decision model for a distinct new omni-channel strategy

To demonstrate the applicability and usefulness of the decision model, the authors applied and validated the decision model based on real-world data from a German bank. Thereby, they specifically investigated the bank's omni-channel strategy for its construction financing service consisting of seven process steps. Some of these process steps are mandatory or can be repeated by customers. Currently, three channels (e.g., 'Agency', 'Online', and 'Brochures') enable the process steps of the construction financing service. The bank's strategy is to reach as many customers as possible, so diverse channels are offered. The bank plans to extend the channel mix by adding an 'Online for standards' which automatically processes contracts. In addition, a 'Telephone' and a 'Video' channel should offer customers new ways of interacting with the bank. The new channels have different characteristics depending on whether customers contract personally with an agency, whether an interaction is IT-based, and whether an interaction is one-way or two-way. Due to these characteristics, not all channels support all process steps. Thus, in this case, the decision model aims to investigate the usefulness of the new channels and define which process steps should be supported by which new channel.

Following the bank's strategy and the objective function of the decision model, the authors aim to identify the omni-channel strategy with the highest value contribution to the bank's long-term firm value. Determining the optimal omni-channel strategy is complex, as it requires a complete enumeration of all possible omni-channel strategies. In this case, the authors had to calculate the value contribution of 16,384 omni-channel strategies. Thus, they implemented a software prototype to do this task. Following the optimized omni-channel strategy, the bank is advised to additionally open the ‘Online for standards’ and the ‘Telephone’ channel solely for distinct process steps (see Figure 3).

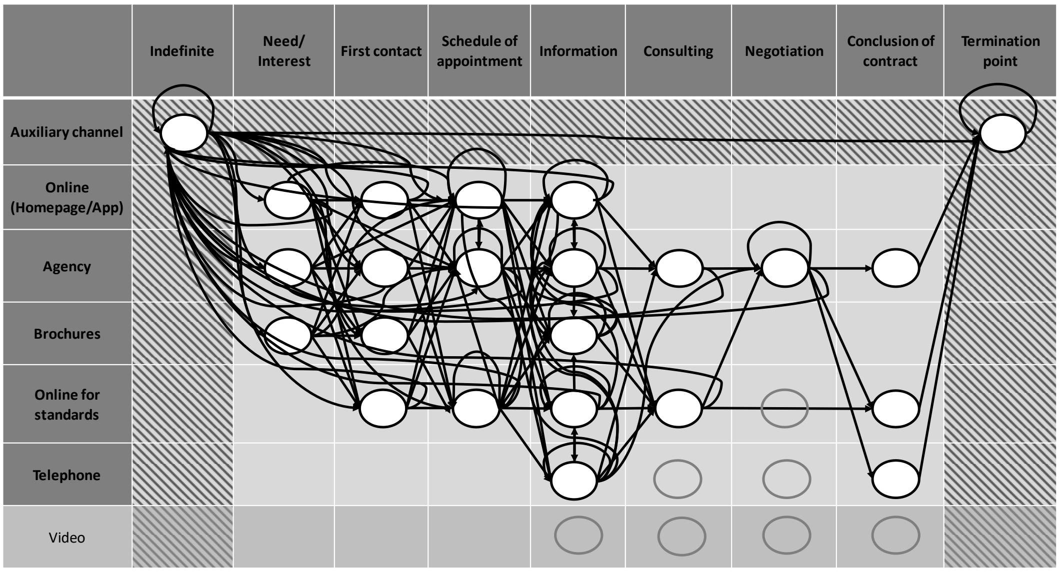


Figure 3. Omni-channel environment after implementing the optimal omni-channel strategy

The results demonstrate that changing one’s omni-channel strategy is not an either-or decision about opening or closing one or more channels. Instead, it is a matter of consciously considering how customers will behave in the event of adjustments. In addition to providing interpretable and actionable results, the decision model forces the management team of the bank to think about complex customer behavior in terms of non-sequential customer journeys, channel dependencies that influence customers’ switching behavior, and the various cash flow effects associated with changing an organization’s omni-channel strategy. In sum, this article provides well-founded guidance on determining an appropriate omni-channel strategy for a distinct organization by taking a holistic perspective.

2 Service Management – Customer Interaction from Reactive to Proactive

Service is an interdisciplinary concept that occurs in diverse contexts. Hence, no single definition has been accepted (Alter, 2012; Rai & Sambamurthy, 2006; Spohrer & Maglio, 2010). Most definitions hold that service involves at least two entities with different roles (e.g., service provider and customer) which apply and integrate resources in an interactive and collaborative process to co-create value for mutual benefit (Peters et al., 2016; Vargo & Lusch, 2016). Further, service research distinguishes between operand and operant resources. While operand resources are "passive" resources on which an act needs to be performed to produce an effect, operant resources are "active" resources employed to act on or in concert with other resources to co-create value (Vargo & Lusch, 2004). Resources can be social, material, or a mixture of both (Leonardi, 2013). IT enables a new perspective on resources, e.g., by extending the scope and functioning of services. One example is smart products equipped with sensors, actuators, computing logic, and communication technology. Smart products extend traditional ideas of material agency which only account for the way objects act when humans provoke it (Leonardi, 2013). In addition, individuals are sociomaterially entangled with IT-enabled resources (e.g., smart phones), which serve as intermediaries between humans and other material resources (Oberländer et al., 2018). While smart products are physical intermediaries, software components are digital intermediaries. Both types enable harnessing customer data and processing data from the customers' environment (i.e., contextual data) (Hammer et al., 2015; Leyer et al., 2017). These advances due to digital technologies (e.g., mobile computing, the Internet of Things, or AI) offer a new perspective on resources, enabling novel ways of value co-creation and interactions between organizations and customers (Barrett et al., 2015; Böhmann et al., 2004). Thus, the nature of service and its delivery has changed over the last decade, and novel service forms were brought to life, such as digital, smart, or proactive services.

Digital services are arranged through digital transactions and represent the application of digital competencies for the benefit of another entity (e.g., customer) or the entity itself (Beverungen et al., 2017; Beverungen, Müller, et al., 2019; Vargo & Lusch, 2007). Further, they make capabilities available to others using information technology and thus encourage value co-creation (Beverungen et al., 2017). However, customers cannot participate in digital services unaided by IT (Williams et al., 2008). Although digital services may also include physical aspects (e.g., physical delivery of an online order), they have primarily digital properties as they exclusively exist and operate in a digital environment where they collect and analyze data involving low human intervention (Beverungen, Müller, et al., 2019; European Commission, 2017). When defining digital services, the definition can be built on Williams et al. (2008), postulating that a digital service is "*an activity or benefit that one party can give to another, that is, provided by a digital transaction*" (Williams et al., 2008, p. 507).

In the last decade, IT advances have changed the nature of service in such a way that digital services are penetrating the physical world and evolving into smart services where the boundaries between the digital and physical worlds are blurring (Barrett et al., 2015; Beverungen, Breidbach, et al., 2019). Therefore, smart services were initially interpreted as digital services delivered through smart products (Beverungen, Breidbach, et al., 2019; Fischer et al., 2020). However, due to the influence of technology, availability of heterogeneous data sources, and data analytics capabilities, smart services evolved further from a physical product-dominated economy to a software and service-controlled economy (Li et al., 2020). Thereby, data usage was initially used only for transactional purposes (i.e., collection, exchange, and storage) but then evolved to use for analytical purposes (i.e., descriptive, diagnostic, predictive, and prescriptive) (Huber et al., 2019; Want et al., 2015). Based on the analytical data usages capabilities, smart services can be further equipped with basic self-x capabilities (e.g., self-monitoring and self-diagnosis) as well as with extended self x-capabilities (e.g., self-optimization, self-configuration, and self-learning) (Beverungen, Müller, et al., 2019; National Science Foundation, 2014). These capabilities enable an entirely new set of service functions. Accordingly, Porter and Heppelmann (2014) differentiate smart services by their capabilities and group them in the stages Monitoring, Control, Optimization, and Autonomy, whereby each stage builds on the preceding one. Against this background, several smart service definitions exist, dependent on their capabilities. To give an overview, Figure 4 displays the evolution of smart services following Porter and Heppelmann (2014).

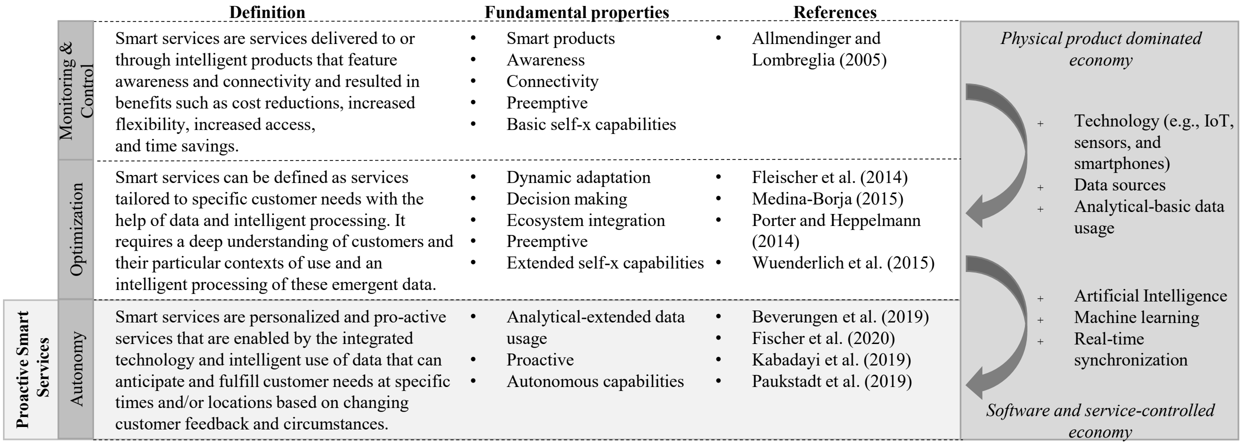


Figure 4. Evolution of smart services

In the stage Monitoring and Control, smart services are services delivered to or through intelligent products enabling monitoring of a product's condition and operation through sensors and thus creating awareness (Porter & Heppelmann, 2014). Based on the data and basic self-x capabilities, smart services can alert customers in the case of changes in circumstances or performance (Allmendinger & Lombreglia, 2005). These findings can improve the design by reducing overengineering or segmenting the market by analyzing customers' usage patterns. Further, smart services can control the connected product through algorithms due to specified changes in condition or environment. In return, the controlling function allows the customization of product performance or the personalization of interaction with the product (Porter & Heppelmann, 2014). In doing so, the underlying rationale of the smart services' action is preemptive, meaning that actions are based upon hard field intelligence to avert an undesirable event (Allmendinger & Lombreglia, 2005). Overall, smart services can help deliver benefits such as cost reductions, increased flexibility, increased access, and time savings (Allmendinger & Lombreglia, 2005; Porter & Heppelmann, 2014).

In the stage Optimization, smart service builds on the previously mentioned capabilities and allows organizations to optimize product performance in numerous ways (Porter & Heppelmann, 2014). Integrated technology facilitates and extends customer data processing and involves data from the customers' environment to tailor services to specific customer needs (Hammer et al., 2015; Kabadayi et al., 2019; Leyer et al., 2017). It requires a deep understanding of customers and their particular contexts as well as dynamic adaptation based on changing customer and situational input (Kabadayi et al., 2019; Li et al., 2020).

Adaptability encompasses a set of activities aiming to improve customer satisfaction by offering and enabling opportunities for co-creation (Kabadayi et al., 2019). Further, smart services learn from customer feedback (Porter & Heppelmann, 2014). Based on this closer relationship with the customer, smart services can make decisions enabled by extended data analysis and self-x capabilities (Barile & Polese, 2010; National Science Foundation, 2014). Besides, smart services can be integrated into ecosystems of other services via smart products to exchange information or to cooperate to benefit the value proposition towards the customers (Clarke, 2016; Wuenderlich et al., 2013; H. Yang et al., 2017).

In the stage Autonomy, smart services are highly personalized by adapting to changing customer preferences and circumstances. The goal is to anticipate and fulfill customers' needs based on specific trigger events (Kabadayi et al., 2019). Triggers refer to internal and external stimuli identified through the continuous analysis of customers' activities and data that initiate a service-related action (Leyer et al., 2017). These trigger events can be of any nature and are not bound to specific times or locations (Kabadayi et al., 2019). Thereby, the underlying rationale changes from preemptive to proactive (e.g., actions are based on predicting future desires that customers do not even realize they might enjoy or to solve problems before they occur) and is enabled through AI, machine learning, and real-time synchronization (Allmendinger & Lombreglia, 2005; Leyer & Schneider, 2019; Paukstadt et al., 2019). The proactivity and anticipatory component enable smart services to act with little or no input from the customer or the service provider (Kabadayi et al., 2019). Accordingly, the interaction between the customer and the organization changes from reactive to proactive as smart service always makes the first move, known as the "push"- rationale (Leyer et al., 2017). Thus, smart services not only predict future needs, they also seamlessly provide decision support just-in-time, assist in the execution of a decision, or even decide and act on behalf of the customer (Leyer et al., 2017).

Against this background, proactive services do not represent a new service type but are a subgroup of either smart or digital services describing the highest evolution stage of these types. Thereby, proactive services build on the properties of existing digital and smart services but differentiate themselves by the fundamental properties' proactivity (e.g., "push"- rationale) and autonomy. The remarkable thing about proactive services is not that they identify trigger events based on different sources of personal data (e.g., needs, preferences, or life events) and contextual data (e.g., circumstances, locations), but that they also derive information from everyday routines (Leyer et al., 2017). According to the heterogeneous data sources and the autonomous capabilities, customers have to configure proactive services before the first usage by determining the use of data sources, the purposes of data usage, and the scope of action (Lee et al., 2012). As a result, three different archetypes of proactive services exist depending on the degree of autonomy: recommender (e.g., suggesting a product based on previous purchases and preferences), assistant (e.g., supporting the customer in the execution of an order, payment, or delivery), and autopilot (e.g., deciding on behalf of the customer).

In practice, organizations and customers already use proactive services. Organizations, for example, rely on data collection and pre-processing to detect faults or upcoming maintenance work on machines at an early stage, thus minimizing downtimes and optimizing resource management. Customers already receive personalized recommendations representing a low maturity level of proactive services. However, proactive services with a high maturity level (e.g., archetype autopilot) have not yet materialized. Further, literature on proactive services, especially in the business-to-consumer context, is still low on theoretical insights. Academic articles have recently developed a proactive mobile recommendation system (Woerndl et al., 2011), identified characteristics to become a proactive organization (Kowalkiewicz et al., 2016), or investigated the acceptance of proactive services (Leyer et al., 2017). In sum, a comprehensive overview of relevant characteristics acquiring a profound understanding, differentiating proactive services, and helping to create a value proposition is still missing. Thus, Research Article #2 addresses this gap by proposing the following research question: What are the differentiating characteristics of proactive services in the business-to-consumer context? To answer the research question, the authors propose a literature-based and empirically validated multi-layer taxonomy. In that way, the authors follow a three-phased approach.

In the first phase, the authors collected relevant data about proactive services through a structured literature review of the top information system (IS) journals, major IS conferences, and practitioner-oriented journals. By applying the guidelines of Webster and Watson (2002) and vom Brocke et al. (2015), the literature review initially identified 426 academic articles. On this basis, the authors screened these articles' abstracts and excluded contributions that did not explicitly discuss the proactive service phenomena or service-related aspects of proactivity, present a service taxonomy, or report real-world examples of proactive services. In the end, the analysis yielded 45 examples of proactive services and 37 academic articles. In the second phase, the authors developed the taxonomy in three iterations following the well-established method by Nickerson et al. (2013). Thereby, the input from the first phase is used to deductively (i.e., starting from the academic articles) and inductively (i.e., starting from the examples of proactive services) develop the taxonomy for both researchers and practitioners. Overall, a meta-characteristic (e.g., the differentiating characteristics of proactive services related to consumer, data, and interaction in the business-to-consumer context) guides the development process from the beginning, and predefined subjective and objective ending conditions terminate the iterative method. In the third phase, the authors demonstrated and evaluated the taxonomy in terms of understandability and applicability by illustrating proactive service scenarios and semi-structured interviews with experts. The fulfillment of both evaluation criteria is a prerequisite for a taxonomy's usefulness. Within three illustrative scenarios, the authors described, classified, and analyzed the proactive service phenomenon as well as the commonalities and differences along with the taxonomy. The seven expert interviews confirm the fulfillment of the evaluation criteria. Additionally, the interviews yielded further outcomes resulting in taxonomy operations (e.g., renaming or swapping characteristics and dimensions), a targeted refinement of the descriptions of characteristics and dimensions, and slight revisions of the three illustrative proactive service example scenarios.

The execution of all three phases finally leads to a proactive service taxonomy comprising nine dimensions and 23 characteristics along with the three layers: consumer, data, and interaction. Thereby, the dimensions are either exclusive (i.e., only one characteristic of the dimension can be observed for a specific proactive service) or non-exclusive (i.e., more than one characteristic can be observed for a specific proactive service at the same time). Exclusive characteristics follow an ordinal scale and are arranged accordingly. The final taxonomy is displayed in Table 1 and does not include constitutive characteristics like the "push"-rationale, as these characteristics are a prerequisite for every proactive service.

Layer	Dimension	Characteristics				Exclusivity
Consumer	Consumer Relief	Consideration	Consideration & Enactment	Consideration, Decision & Enactment		Exclusive
	Consumer Benefit	Time	Money	Flexibility	Quality	Non-exclusive
	Consumer Risk	Limited		Substantial		Exclusive
Data	Data Source	Personal Data		Contextual Data		Non-exclusive
	Data Analysis	Basic		Extended		Exclusive
	Smartness	Self-Controlled		Self-Learning		Exclusive
Interaction	Trigger	Time	Location	Social	Event	Non-exclusive
	Representation	Digital		Digital & Physical		Exclusive
	Integration	Stand-Alone		Ecosystem		Exclusive

Table 1. Taxonomy of proactive services

With the help of the taxonomy, organizations can identify new configurations, reveal 'blind spots,' cluster frequent configurations, and develop existing services into proactive ones. Thus, the taxonomy provides a profound understanding of proactive services and un-black boxes hype topics transparently by balancing benefits, required inputs, and the inherent risks. From a theoretical perspective, the taxonomy is among the first steps to conceptualizing proactive services and is the basis for further theoretical work.

The taxonomy enables both researchers and practitioners a better understanding of proactive services. However, it offers little guidance for the design of proactive services due to the missing prioritization of features from a customer's point of view. When designing services, organizations should generally ensure that they aim for higher customer satisfaction, which leads to greater economic success for the organization. In doing so, it is important to consider that the classification of service features based on customer satisfaction is likely to vary depending on the customer's personality traits. Therefore, it is challenging to understand the influence of personality traits in order to achieve higher customer satisfaction with a service design. Thus, Research Article #3 builds on Research Article #2 and addresses the following research question: How do customers assess the features of proactive services? To answer the research question, the authors assess customer perception of the features, incorporate a prioritization of the features, and determine the potential moderating effect of customer personality traits on customer satisfaction. Therefore, they used a methodological combination of the Kano model, self-stated importance method, and the Five Factor model.

To the best of their knowledge, this study is the first to investigate customer satisfaction in the context of proactive services by using a design-oriented approach that explicitly considers the features of the services and customers' personality traits.

In that way, the underlying research method is divided into three steps. First, the authors developed items for every questionnaire (i.e., Kano model, self-stated importance, Five Factor model). Second, they implemented and conducted a survey to measure all items. Third, they evaluated the survey responses by initially analyzing each questionnaire separately, followed by the combination of the questionnaire for an integrated analysis. Thereby, they divided the sample into five segments by using the Five Factor model. Every segment expresses the most prevalent personality trait of one customer. Afterward, they applied the Kano model and calculated the self-stated importance of every feature in each segment. The comparison of the results with and without segmentation analyzes whether personality traits influence customer satisfaction by implementing individual features of proactive services.

In the first step, the authors converted every taxonomy characteristic into a Kano item. The Kano model describes customer satisfaction based on the degree of implementation or availability of products or service features in relation to customer expectations (Kano et al., 1984; Matzler et al., 1996). Thereby a feature can be classified into five qualities (e.g., attractive, one-dimensional, must-be, indifferent, reverse) to guide the service design of proactive services. Customers do not expect features classified as attractive, thus having a substantial impact on customer satisfaction but which do not lead to dissatisfaction if the features are not implemented. Features classified as one-dimensional have a linear impact on customer satisfaction – both when implemented (satisfaction) and not (dissatisfaction). Customers reject reverse qualities, thus having an impact both when implemented (dissatisfaction) and not (satisfaction). Finally, must-be qualities are a necessary evil and do not increase satisfaction if implemented but will decrease satisfaction if not implemented. However, the classification power based on the Kano model has limits when two features cannot be implemented simultaneously for technical or financial reasons (Matzler et al., 1996). Therefore, C. C. Yang (2005) refined the Kano model by incorporating the customers' self-stated importance of features to prioritize the features. Thereby, the refined Kano model better describes whether a classification of the feature lies at the upper or lower end of the value range of a quality Thus, more precise statements are possible. Features, for example, classified as indifferent but with high importance have still the potential to satisfy customers, whereas features classified as indifferent but with low importance are considered care-free. Accordingly, the authors further developed items to measure the self-stated importance of features and applied the refined Kano model.

To measure the customers' personality traits, the authors applied the Five Factor model developed by Goldberg (1990) and Costa Jr and McCrae (1992), which comprises Agreeableness, Conscientiousness, Extraversion, Neuroticism, and Openness as underlying factors. This model is a standard method for measuring personality dimensions manifested in longitudinal and cross-observer studies (Buettner, 2016; Matzler & Renzl, 2007; McCrae & Costa Jr, 2004; Oliveira et al., 2013). A personality trait often reflects a person's preferences, motivations, and values and remains relatively stable over an entire lifetime (Buettner, 2016, 2017). For operationalization, the authors used the standard set of items provided by the NEO Five-Factor Inventory-3. This questionnaire offers a quick, reliable, and accurate measurement of the five factors.

In the second step, the authors conducted an online survey to assess the features of proactive services. The survey example is based on a smart fridge, which is a realistic example and ensures the comprehensibility of the proactive service concept: only participants who own smart kitchen appliances or buy groceries with internet-enabled devices were invited. The survey yielded 259 valid responses after conducting a pre-test.

In the third step, the authors evaluated the responses of the survey. The first analysis (e.g., application of the Kano model and the self-stated importance method) reveals that customers classified most features of proactive services as indifferent qualities. As indifferent qualities do not influence customer satisfaction, organizations cannot draw distinctive interpretations for the design of proactive services. Table 2 outlines the assignment of all features to their respective Kano model qualities sorted by descending self-stated importance.

	#	Feature	Self-stated Importance Rank	Mean	A [%]	O [%]	M [%]	I [%]	Q [%]	R [%]	Category Strength [%]	Classification Kano	Refined Kano
High Importance	F5	Money Benefit	1	4.80	33.2	32.05	10.42	21.24	0.39	2.7	1.16 [a]	Mixed (A, O)	Highly Attractive, High Value-Added
	F1	Consideration	2	4.71	27.8	22.01	15.06	31.66	0.77	2.7	3.86 [b]	A	Highly Attractive
	F4	Time Benefit	3	4.69	43.24	20.85	9.65	24.32	-	1.93	18.92*	A	Highly Attractive
	F8	More than one Benefit	4	4.62	37.84	19.69	16.99	24.71	0.39	0.39	13.13*	A	Highly Attractive
	F7	Better Quality	5	4.61	29.34	26.64	15.83	27.8	-	0.39	1.54 [b]	A	Highly Attractive
	F2	Consideration & Enactment	6	4.61	26.64	30.5	18.92	20.08	0.39	3.47	3.86 [a]	Mixed (O, A)	High Value-Added, Highly Attractive
	F11	Reversibility	7	4.52	7.72	40.15	39.38	12.36	-	0.39	0.77 [a]	Mixed (O, M)	Highly Value-Added, Critical
	F6	More Flexibility	8	4.41	30.89	16.99	12.74	37.84	0.39	1.16	6.95*	I	Potential
	F17	Self-Learning Ability	9	4.19	26.25	23.17	18.53	25.87	0.77	5.41	0.39 [b]	A	Highly Attractive
	F23	Digital Representation	10	4.12	28.57	23.17	8.88	37.45	-	1.93	8.88*	I	Potential
	F25	Integration into Ecosystem	11	4.01	27.41	18.53	8.49	38.22	0.39	6.95	10.81*	I	Potential
Low Importance	F24	Physical & Digital Representation	12	3.81	27.41	20.08	4.63	45.95	-	1.93	18.53*	I	Care-free
	F20	Time Trigger	13	3.8	22.39	9.65	7.34	54.44	0.77	5.41	32.05*	I	Care-free
	F15	Basic Data Analysis	14	3.77	32.43	15.44	10.42	37.07	0.39	4.25	4.63 [b]	A	Less Attractive
	F16	Extended Data Analysis	15	3.73	28.96	13.9	6.95	43.24	-	6.95	14.29*	I	Care-free
	F10	Limited Customer Risk	16	3.60	29.34	13.13	8.88	38.22	0.39	10.04	8.88*	I	Care-free
	F22	More than one Trigger	17	3.59	25.48	12.74	8.49	49.03	1.54	2.70	23.55*	I	Care-free
	F12	Personal Data	18	3.57	22.39	16.22	5.41	31.27	0.77	23.94	7.34*	I	Care-free
	F18	Event Trigger	19	3.47	23.17	11.58	10.81	48.26	-	6.18	25.10*	I	Care-free
	F19	Location Trigger	20	3.28	24.32	5.02	2.32	57.92	0.77	9.65	33.59*	I	Care-free
	F13	Contextual Data	21	3.27	25.87	10.04	3.86	46.33	0.77	13.13	20.46*	I	Care-free
	F9	Substantial Customer Risk	22	3.17	9.65	0.00	2.32	41.70	0.39	45.95	4.25 [a]	Mixed (R, I)	Reverse. Care-free
	F21	Social Trigger	23	3.16	29.73	13.51	8.11	35.14	0.77	12.74	5.41 [b]	A	Less Attractive
	F14	Personal & Contextual Data	24	2.42	18.92	10.81	3.09	44.02	0.39	22.78	21.24*	I	Care-free
	F3	Consideration, Decision & Enactment	25	2.04	13.13	6.95	3.09	30.89	-	45.95	15.06*	R	Reverse

*Classification significant at the 6% level
[a] (O + A + M) < > (I + R + Q) rule non-applicable
[b] (O + A + M) < > (I + R + Q) rule applicable
A = Attractive Quality; O = One-dimensional Quality; M = Must-be Quality; I = Indifferent Quality; R = Reverse Quality; Q = Questionable Result

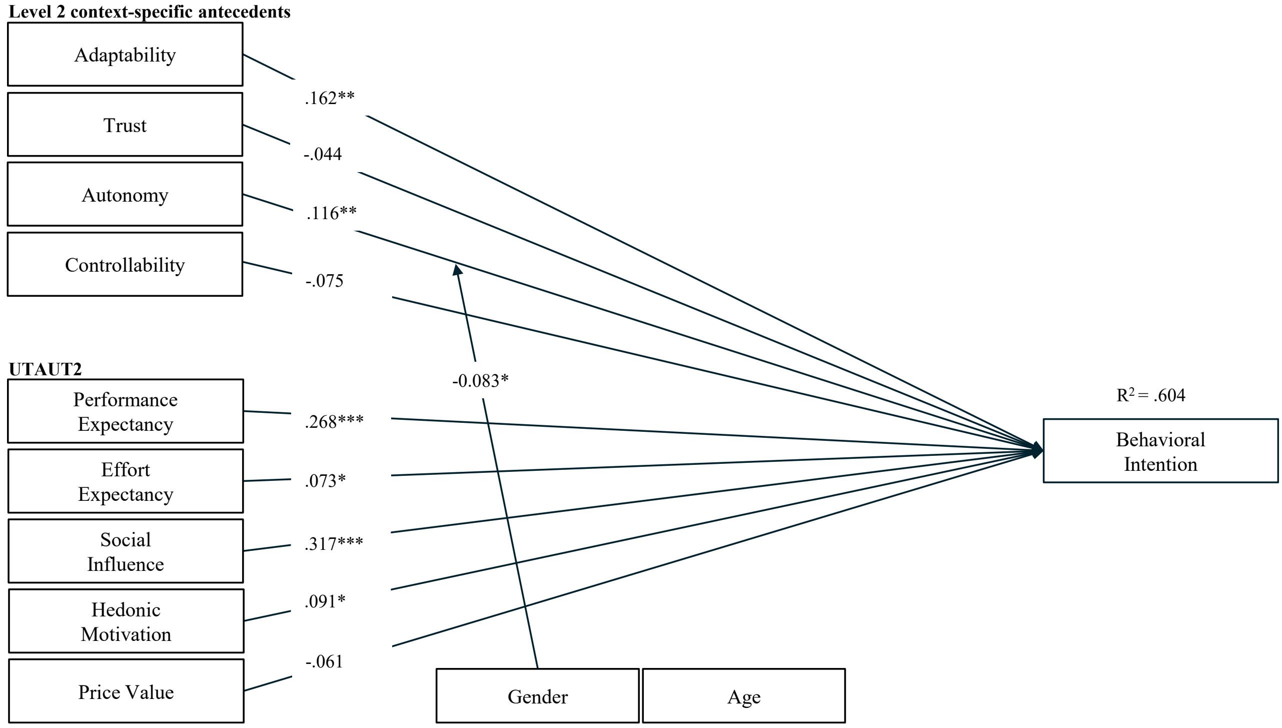
Table 2. Empirical results of the Kano model analysis of the features of proactive services

The second analysis (e.g., combination of the Kano model and the Five Factor model) allowed for a more detailed interpretation (e.g., clearer statements for up to 50%) of the features previously classified as indifferent. Further, the results reveal that customers highly value the benefits and the proactive behavior of the service, as these features are classified as attractive qualities. However, customers currently avoid using features giving proactive services autonomy over decisions (classified as reverse qualities) and behave paradoxically regarding risk-benefit trade-offs. On the one hand, customers appreciate reversibility options of decisions and prefer that proactive services not be involved in high-impact decisions (F11, F9). On the other hand, they seem careless in providing their personal data and consider it less important to reduce the risk involved when using proactive services (F10, F12, F14). Overall, the results demonstrate the applicability of the taxonomy and support organizations in developing recommendations for service design at a feature level aiming at high customer satisfaction.

A prerequisite for designing services that aim to increase customer satisfaction is that customers first accept the service. In particular, the change in customer interaction (e.g., services acting on behalf of customers and through the service-initiated interaction), which can have far-reaching consequences in customers' lives, is worth investigating further in terms of customer acceptance. The literature also points out that it is difficult for organizations to achieve customer acceptance of innovative services such as proactive services (Wuenderlich et al., 2013; Wuenderlich et al., 2015). Regarding proactive services, only Leyer et al. (2017) approach the topic from a customer perspective to identify antecedents explaining customer acceptance. Thereby, they used a general theory and either added or removed core antecedents that are context-specific but not directly connected to the properties of proactive services. However, contextual properties are often unrecognized, unmeasured, or underappreciated. Theory without accounting for contextual differences reduces explanatory power, may lead to misapplication (e.g., improper design), and consequently to customer dissatisfaction or churn (Anderson et al., 2008; Hong et al., 2014). Thus, Research Article #4 addresses this gap by proposing the following research question: Which antecedents – especially proactive service specific antecedents – drive the acceptance of proactive services in customer contexts? To answer the research question, the authors drew on the general theory of technology acceptance and developed a contextualized acceptance model for proactive service following Hong et al. (2014) guidelines. Further, they compared the explanatory power of the contextualized model with an established yet uncontextualized model.

To develop a context-specific proactive service acceptance model, the authors conducted the theory contextualization approach developed by Hong et al. (2014), comprising the identification of a general theory and two levels of contextualization. Therefore, the authors conducted a structured literature review of the top IS journals and major IS conferences to identify a general theory following the guidelines of Webster and Watson (2002) and vom Brocke et al. (2015). From the resulting 358 scientific research articles, the authors selected articles that explicitly report antecedents contributing to the acceptance of digital, smart, or proactive services or employ an acceptance theory in the customer context. The screening process finally yielded 35 scientific research articles which indicate that the Unified Theory of Acceptance and Use of Technology (UTAUT) is a frequently employed model in the service field (Venkatesh et al., 2012, 2016). Based on UTAUT2 as a general theory, especially in the customer context, the authors conducted two contextualization levels by following the six guidelines of Hong et al. (2014). Level 1 contextualizes the general theory by adding or removing core antecedents to capture the context's facets (Hong et al., 2014). Level 2 contextualizes the general theory further by incorporating context-specific antecedents of dependent variables that are directly relevant to the properties of technologies, users, and the contexts of use (Hong et al., 2014; Whetten, 2009).

After applying all guidelines to develop a contextualized acceptance model for proactive services, Figure 5 displays the final model, including the results. In total, two antecedents were removed from the general theory (Level 1), and four context-specific antecedents were added (Level 2). Thereby, the two context-specific antecedents (e.g., Adaptability and Autonomy) and four antecedents from the general theory (e.g., Performance Expectancy, Effort Expectancy, Social Influence, and Hedonic Motivation) reflect a model fit of 60.4% (i.e., explained variance). Further, the authors performed a robustness check by validating the original UTAUT2 in the context of proactive services. This comparison helped the authors to understand better the value and importance of the finer contextualization approach. When comparing the results of these two models, the author identified no contradictions but similarities in the significance of antecedents and an affirmation of the eliminated antecedents. However, the explanatory power of the contextualized model is much higher than that of the original model (i.e., 35.7 % of the variance is explained) due to the context-specific antecedents. Hence, the authors could demonstrate that their model is not a simple extension of UTAUT2 but an appropriate contextualized acceptance model regarding the acceptance of proactive services.



Notes:

1. ***$p < .01$: **$p < .05$; *$p < .1$.
2. For the sake of clarity, we omit insignificant path coefficients of moderators *Age* and *Gender*

Figure 5. Results of the contextualized UTAUT2 for proactive services

With its detailed analysis, Research Article #4 contributes to a deeper understanding of proactive services. Organizations gain an improved understanding of the salient (and contextualized) antecedents affecting customers' acceptance of proactive services and can incorporate this knowledge in the design of proactive services. Further, the contextualized model for proactive services will likely inspire research on other services featuring a "push-" rationale and autonomy.

III. Summary and Future Research[3]

1 Summary

Digital technologies transform the way customers interact nowadays with organizations. Customers expect anywhere and anytime access to content and services and demand a seamless experience when interacting with organizations. Therefore, organizations must shift their mindset from technological solutions to customer-oriented solutions to meet customer needs in the digital age. Given this context, this doctoral thesis analyzes how customer needs in the digital age can be met using channel management and service management concepts. These concepts deal with the shift in customer interaction from isolated to integrated (e.g., omni-channel management) and the shift from reactive to proactive (e.g., proactive services) and further point to bridge the gap between the physical and digital world.

Concerning *Channel Management,* Section II.1 highlights the importance of managing hybrid customers who move fluently between physical and digital channels or even use both simultaneously. Thus, organizations need to manage their channels' integration by aligning their processes, data, and IT systems across channels and pursuing an omni-channel strategy. Research Article #1 presents an economic decision model that identifies an appropriate omni-channel strategy by considering all channels (e.g., offline and online), different purchase decision process steps (e.g., pre-sale, purchase, and post-sale), non-sequential customer journeys, and customers' channel preferences. Drawing from value-based management principles, the decision model selects a strategy with the highest contribution to an organization's long-term firm value. The decision model was validated based on real-world data from a German bank to demonstrate the applicability.

Concerning *Service Management*, Section II.2 highlights the importance of proactivity as an emerging concept which enables services to act on behalf of customers and to initiate the customer interaction, thereby providing convenience to customers. The increasing presence of proactive services in the real-world emphasizes the need for an in-depth study of this phenomenon. Research Article #2 presents a taxonomy of proactive services by

[3] This section is partly comprised of content taken from the research articles included in this thesis. To improve the readability of the text, I omit the standard labeling of these citations.

applying the well-established taxonomy development method of Nickerson et al. (2013). This method incorporates both deductive (e.g., information from academic articles) and inductive (e.g., information from real-world insights) approaches. The taxonomy was applied and evaluated in three illustrative scenarios to demonstrate its understandability and applicability. Further, expert interviews refined the taxonomy so that it can be used to classify objects based on their characteristics (i.e., similarities and differences) and thus support researchers and practitioners in understanding novel phenomena.

Research Article #3 complements the theory-focused approach of Research Article #2 by providing insights on concrete design decisions for proactive services aiming at higher customer satisfaction. Based on the proactive service taxonomy, customers evaluated the features of proactive services in an online survey. An analysis, with its methodological foundation in the Kano model (Kano et al., 1984) and the refined Kano model (C. C. Yang, 2005), showed that implementing specific features enables organizations to delight or even lose customers. Further, the methodological integration of the Five factor model (Costa Jr & McCrae, 1992), investigating the influence of customers' personality traits on customer satisfaction, allows for a more detailed interpretation (e.g., clearer statements for up to 50%) of the features being previously classified as indifferent. These results may help organizations design appropriate proactive services valued by customers and, therefore, be able to meet customer needs in the digital age.

Finally, Research Article #4 presents a contextualized acceptance model for proactive service, as the change in customer interaction (e.g., services acting on behalf of customers) can have far-reaching consequences in customers' lives and should therefore be studied in terms of customer acceptance. The acceptance model for proactive services drew from general theory and was further contextualized following the guidelines of Hong et al. (2014). Contextual properties are often unrecognized, unmeasured, or underappreciated and therefore lead to models with decreased explanatory power and improper designs. This fact, in return, creates customer dissatisfaction or even increases customer churn rates. The results of the acceptance model help organizations to further understand the proactive phenomenon and incorporate this knowledge in the design of their respective services.

2 Future Research

As with any research endeavor, this doctoral thesis is subject to limitations that may serve as starting points for future research. The following section provides an aggregated overview of these limitations and highlights ideas for future research advancing the knowledge to meet customer needs in the digital age, especially in the field of omni-channel management, proactive service management, and the intersection of these two concepts. Furthermore, the individual research articles provide detailed perspectives on their specific limitations (see Appendix).

First, omni-channel management is confronted with continuous technological innovations such as voice assistants, smart assistant technologies, or prediction tools based on AI, which will further transform the way organizations interact with their customers and how organizations integrate them effectively in their channel portfolio. Due to these innovations, organizations have easier access to data and more data about channel preferences and customer journeys. Nowadays, organizations use these innovations and the resulting benefits to primarily optimize the omni-channel management within an organization. However, there are increasing collaborations between traditional offline and online organizations to provide a seamless customer experience. Amazon, for example, already corporates with traditional retailers as pickup stations for online orders. This fact results in more complex markets and provides a scattered competitive landscape that demands a deeper understanding of when, how, and with whom omni-channel services are useful. Therefore, future research on omni-channel strategies aiming at meeting customer needs should investigate inter-organizational collaboration and incorporate different contexts (e.g., industries, products, and services) to identify omni-channel strategies that involve the ongoing changes from different perspectives (Wiener et al., 2018).

Second, Research Articles #2, #3, and #4 present descriptive and prescriptive insights into understanding the proactive service phenomenon. These research articles are among the first steps to conceptualize proactive services and to give insights into the design from a literature-backed and empirically validated perspective. However, the concept of proactive services is still evolving and emerging. In practice, the adoption has just begun, and this is why the results will not be stable over the long run. The doctoral thesis, for example, has shown that customers are still reclusive about using autonomous behavior. However, this circumstance will change when customers experience the convenience of autonomy and get used to proactive services, as autonomy will meet customer needs in the digital age (e.g., anywhere, anytime). Hence, future research should assess the evolution of proactive services in practice and use these insights to revise and extend the theoretical body of knowledge.

Third, this doctoral thesis only sketches the possible intersection of omni-channel management and proactive service management. Thus, the individual research articles only belong to one concept (e.g., omni-channel or proactive service management) at a time. However, omni-channel management should provide customers with personalized services (e.g., proactive services) tailored to customers' preferences and situational context across and within each channel based on the data from heterogeneous sources (Briel, 2018). Thereby, organizations should balance personalization and customers' concerns regarding privacy and data security (Karwatzki et al., 2017). A study of the clear dependence on seamless omni-channel behavior and purchases can support the assumption that a proactively supported seamless transition between channels leads to better customer experiences and an increased purchase volume. Building on these insights, future research should investigate the intersection of the two concepts to advance theory and practice.

Despite its limitations, this doctoral thesis advances a theoretical understanding and gives recommendations for action to meet customer needs in the digital age. Due to technological developments, research and practitioners should keep pace with changing conditions. Even if the future is uncertain, they should have in mind that they can also learn from failure to failure to be successful in the long run. In doing so, they should not lose their enthusiasm.

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V. Appendix

1 Index of Research Articles

Research Article #1: Mindfully going omni-channel: An economic decision model for evaluating omni-channel strategies

Hosseini, S., Merz, M., Röglinger, M., & Wenninger, A. (2018): Mindfully going omni-channel: An economic decision model for evaluating omni-channel strategies. *Decision Support Systems*, 109, pp. 74-88.

(VHB-JOURQUAL 3: Category B)

Research Article #2: Pushing the Frontiers of Service Research: A Taxonomy of Proactive Services

Rau, D., Perlitt, L.-H., Röglinger, M., & Wenninger, A. (2020). Pushing the frontiers of service research: A taxonomy of proactive services. In *Proceedings of the 41st International Conference on Information Systems (ICIS),* Hyderabad, India.

(VHB-JOURQUAL 3: Category A)

Research Article #3: Improving Customer Satisfaction in Proactive Service Design: A Kano Model Approach

Wenninger, A., Rau, D., & Röglinger M. (2022). Improving Customer Satisfaction in Proactive Service Design: A Kano Model Approach. Accepted (with minor revisions) in *Electronic Markets.*

(VHB-JOURQUAL 3: Category B)

Research Article #4: A Contextualized Acceptance Model for Proactive Smart Services

Graf-Drasch, V., Röglinger M., Wenninger, A. & Hosseini, S. (2021). A Contextualized Acceptance Model for Proactive Smart Services. Submitted to: *Schmalenbach Journal of Business Research (SBUR).*

(VHB-JOURQUAL 3: Category B)

2 Individual Contribution to the Included Research Articles

This cumulative thesis consists of four research articles that build the main body of this work. All included research articles were written in teams with multiple co-authors. Thus, this section details the respective project settings and my individual contribution to each research article.

Research article #1 (Hosseini et al. 2018) was written with three co-authors. All co-authors equally contributed to the content of the research article. Personally, I had a main role in gathering the theoretical foundation to highlight the extent of the research gap and to develop the research method. Further, I was responsible for developing the decision model that accounts for non-sequential customer journeys in omnichannel management and its application to real-world data from a German bank. To visualize our key artifacts, I further designed figures and set up tables included in the main part of the research article. In sum, I was substantially involved in each part of the project.

Research article #2 (Rau et al. 2020) was written with three co-authors. A previous version of this paper was submitted but not published to the 28th European Conference on Information System, where all co-authors jointly developed the basic concept for the paper and elaborated the paper's content. I have a minor role in the developed and published version of the research paper. But like all other co-authors, I engaged in the search and review of relevant academic literature and empirical real-world examples that both served as an input to the taxonomy design. Further, I contributed my knowledge of service science, especially proactive services, to the theoretical foundation and taxonomy development. I conducted seven expert interviews with researchers and practitioners for application and evaluation and was mainly responsible for documentation.

Research article #3 (Wenninger et al. 2022) was written with two co-authors, with me being the lead author also coordinating the team of authors throughout the entire research project. The paper's main idea builds on one of my previous research projects, which develops a multi-layer taxonomy of proactive services (Rau et al. 2020) and is also part of this thesis. The taxonomy presented in this previous paper was intended to describe, classify, analyze, identify, and cluster proactive services based on their features. However, it provides only little guidance on how to design proactive services. Research paper #3 addresses this limitation by allowing for a precise classification and prioritization of the features of proactive services tuned to the customer's most prevalent personality trait. I had a main role in the design, conduction, and evaluation of the research method. Although the research article represents, to a large extent, my work, the two co-authors were involved in all parts of the project and helped to advance our contribution.

Research article #4 (Graf-Drasch et al.) was developed with a team of three co-authors. As the paper was written in the early stages of my doctoral study and had the purpose of bringing me closer to scientific work, it was my task to drive the whole research project in its first version. After the joint development of the paper's main idea, I was primarily responsible for collecting relevant literature, the formulation of an appropriate research question, the identification of a comprehensive research approach, the development of the results, and their following evaluation. Regarding the research method, I conducted several surveys to determine the antecedents which drive customer acceptance of proactive services. During the whole research process and the following revisions, the paper benefitted significantly from the feedback of the experienced co-authors. Further, the co-authors equally contributed to the content in several revisions of the research articles. In sum, I was substantially involved in each part of the project, including the revisions.

3 Research Article #1:
Mindfully going omni-channel: An economic decision model for evaluating omni-channel strategies

Authors: Hosseini, S., Merz, M., Röglinger, M., Wenninger, A.

Published in: Decision Support Systems, 2018, 109, 74-88

Abstract: In the digital age, customers want to define on their own how to interact with organizations during their customer journeys. Thus, many organizations struggle to implement an omni-channel strategy (OCS) that meets their customers' channel preferences and can be operated efficiently. Despite this high practical need, research on omni-channel management predominantly takes a descriptive perspective. What is missing is prescriptive knowledge that guides organizations in the valuation and selection of an appropriate OCS. Most existing studies investigate single facets of omni-channel management in detail while neglecting the big picture. They also require customer journeys to follow sequential and organization-defined purchase decision processes. To address this research gap, we propose an economic decision model that considers online and offline channels, the opening and closing of channels, non-sequential customer journeys, and customers' channel preferences. Drawing from the principles of value-based management, the decision model recommends choosing the OCS with the highest contribution to an organization's long-term firm value. We applied and validated the decision model based on real-world data from a German bank

Keywords: Channel Switching, Customer Journey Analytics, Decision Model, Markov Chain, Omni-channel Management, Value-based Management

4 Research Article #2: Pushing the Frontiers of Service Research: A Taxonomy of Proactive Services

Authors: Rau, D., Perlitt, L.-H., Röglinger, M., Wenninger, A.

Published in: Proceedings of the 41st International Conference on Information Systems (ICIS 2020), Hyderabad, India

Abstract: Rapid advancements in digital technologies and data analysis led to a new service type. With their push-rationale, proactive services (PAS) are pushing the frontiers of traditional and even digital or smart services. Such PAS anticipate consumer needs and address them proactively. For instance, a smart fridge replenishes groceries in line with the consumer's preferences, based on anticipated demand, and without the consumer's intervention. In this paper, we contribute to a better understanding of the PAS phenomenon. Therefore, we propose a literature-backed and empirically validated multilayer taxonomy of PAS along the layers consumer, data, and interaction. Further, we compile a list of 45 PAS examples, demonstrate our taxonomy with three illustrative scenarios, and evaluate their understandability and applicability in seven interviews with domain and method experts. Based on gained insights on this rapidly emerging and important phenomenon, we highlight implications for both researchers and practitioners, and suggest future research directions.

Keywords: Taxonomy, Proactive Services, Digital Services, Smart Services

5 Research Article #3: Improving Customer Satisfaction in Proactive Service Design - A Kano Model Approach

Authors: Wenninger, A., Rau, D., Röglinger M.

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Extended Abstract:

As an emergent variant of digital and smart services, proactive services (PAS) do not wait for customers to make the first move, but proactively participate in customers' lives and make decisions on their behalf (Leyer et al., 2017; Rau et al., 2020). Due to their novelty, the literature on PAS is in its infancy. For example, Rau et al. (2020) developed a multi-layer taxonomy of the features of PAS and conducted an empirical assessment of PAS examples in the business-to-consumer context. With this PAS taxonomy, researchers and practitioners can describe, classify, analyze, identify, and cluster PAS based on their features. However, it provides only little guidance on designing PAS, as it lacks a prioritization of features from a customer perspective. Hence, in this research article, we examined how customers assess specific features of PAS and whether their assessments differ according to personality traits. We based our research on Rau et al.'s (2020) taxonomy by designing an online survey with the taxonomy's features and used a methodological combination of the Kano model, self-stated importance method, and the Five Factor Model (FFM) (Kano et al., 1984; McCrae & Costa Jr, 2004; Yang, 2005). Therefore, we followed a three-step approach. First, we developed the items for the survey, which were three questionnaires: the Kano questionnaire, the self-stated importance questionnaire, and the FFM questionnaire. Second, we implemented and conducted the survey. We decided to use a smart fridge as a specific, well-known, and simple scenario for the survey to provide participants with a realistic example and to ensure the understandability of the PAS concept. The survey yielded 259 valid responses. Third, we assessed responses to the questionnaires to answer our research question. Following the approaches of Anderson et al. (2008), Cooil et al. (2008), and Siddiqui (2012), we assigned each participant to one segment (i.e., subsample) based on their most prevalent personality trait (e.g., Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism) according to the FFM. For instance, a participant with openness as the most prevalent personality trait was grouped into the 'Openness' segment. We then applied the Kano model to each segment by classifying each feature to one or more Kano qualities (Attractive, One-Dimensional, Must-Be, Indifferent, Reverse, or Questionable Result).

	#	Feature	Classification - Segmented Kano				
			Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
High Importance	F5	Money Benefit	A	A	O	O	O
	F1	Consideration	A	A	O	A	A
	F4	Time Benefit	A	A	A	A	A
	F8	More than one Benefit	A	A	Mixed (O, A, I)	A	A
	F7	Better Quality	A	A	O	O	M
	F2	Consideration & Enactment	Mixed (O, A)	Mixed (A, O, M, I)	O	O	A
	F11	Reversibility	Mixed (O, M)	M	O	O	M
	F6	More Flexibility	I	A	I	I	I
	F17	Self-learning Ability	M	Mixed (A, O, M, I)	Mixed (A, O, I)	A	A
	F23	Digital Representation	A	A	I	O	I
	F25	Integration into Ecosystem	I	A	A	I	I
Low Importance	F24	Physical & Digital Representation	I	A	I	I	I
	F20	Time Trigger	I	I	I	I	I
	F15	Basic Data Analysis	A	Mixed (A, O, I)	I	A	I
	F16	Extended Data Analysis	A	I	I	I	I
	F10	Limited Customer Risk	I	A	I	A	I
	F22	More than one Trigger	I	A	I	I	I
	F12	Personal Data	I	A	I	I	R
	F18	Event Trigger	I	I	I	I	I
	F19	Location Trigger	I	I	I	I	I
	F13	Contextual Data	I	I	I	I	I
	F9	Substantial Customer Risk	R	R	R	I	R
	F21	Social Trigger	I	A	A	A	A
	F14	Personal & Contextual Data	I	I	I	I	I
	F3	Consideration, Decision & Enactment	Mixed (R, I)	R	R	R	R

A = Attractive Quality; O = One-dimensional Quality; M = Must-be Quality; I = Indifferent Quality;
R = Reverse Quality; Q = Questionable Result

Table 1. Empirical Results of the Kano Model Analysis Segmented by the Most Prevalent Personality Traits

Table 1 shows the final classifications of all features of PAS in each segment (i.e., the Kano model classifications based on the most prevalent personality trait of the customers) sorted by descending self-stated importance. Overall, we found that customers are still skeptical of PAS with high levels of autonomy, and that customers behave paradoxically in risk-benefit trade-offs created by PAS. Further, the results allow for a more precise classification and prioritization of the features of PAS based on customers' primary personality traits. In particular, the incorporation of the FFM provided us with the additional benefit of being able to make clearer statements for up to 50% of the features that would otherwise be classified as indifferent. In sum, the results provide service providers with insights into the configuration of PAS associated with high customer satisfaction. Such specific guidance on a feature level is helpful to service designers, especially when introducing new or reconfiguring existing PAS. Thus, our work may increase the adoption rates of existing and future PAS. In this way, our research provides insights for service providers aiming to design PAS with high customer satisfaction and can be seen as a blueprint for further conceptual developments of the Kano model.

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Keywords: Customer Satisfaction, Kano Model, Proactive Services, Personality Traits, Service Design

6 Research Article #4: A Contextualized Acceptance Model for Proactive Smart Services

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Working Paper

Extended Abstract:
Traditionally, service has been an interaction among customers and employees of service providers (Froehle and Roth 2004). In such interactions, customers typically make the first move, e.g., visiting a lawyer. Leyer, et al. (2017) conceptualized this logic as "pull-" rationale. Thanks to digital technologies, information about customer needs and contexts is becoming accessible ever more easily and service providers are more closely connected to customers. Yet, the nature of service is changing in a manner that digital technologies replace service providers' employees (Froehle and Roth 2004; Larivière, et al. 2017). Thus, services do not depend anymore on the customer to make the first move. Instead, they follow a "push-" rationale, where service providers leverage data on customer needs, daily routines, situational contexts, preferences, life events, as well as locations (Leyer, et al. 2017; Linders, et al. 2015). This development further enables services to serve customer needs in an anticipatory and target-oriented manner through decision support and the performance of tasks on customers' behalf. Such services, addressing the change in customer interaction, are so-called proactive smart services (PASS). PASS are a subgroup of smart services especially describing the autonomous and proactive behavior of smart services (Rau, et al. 2020; Kabadayi, et al. 2019; Porter and Heppelmann 2014).

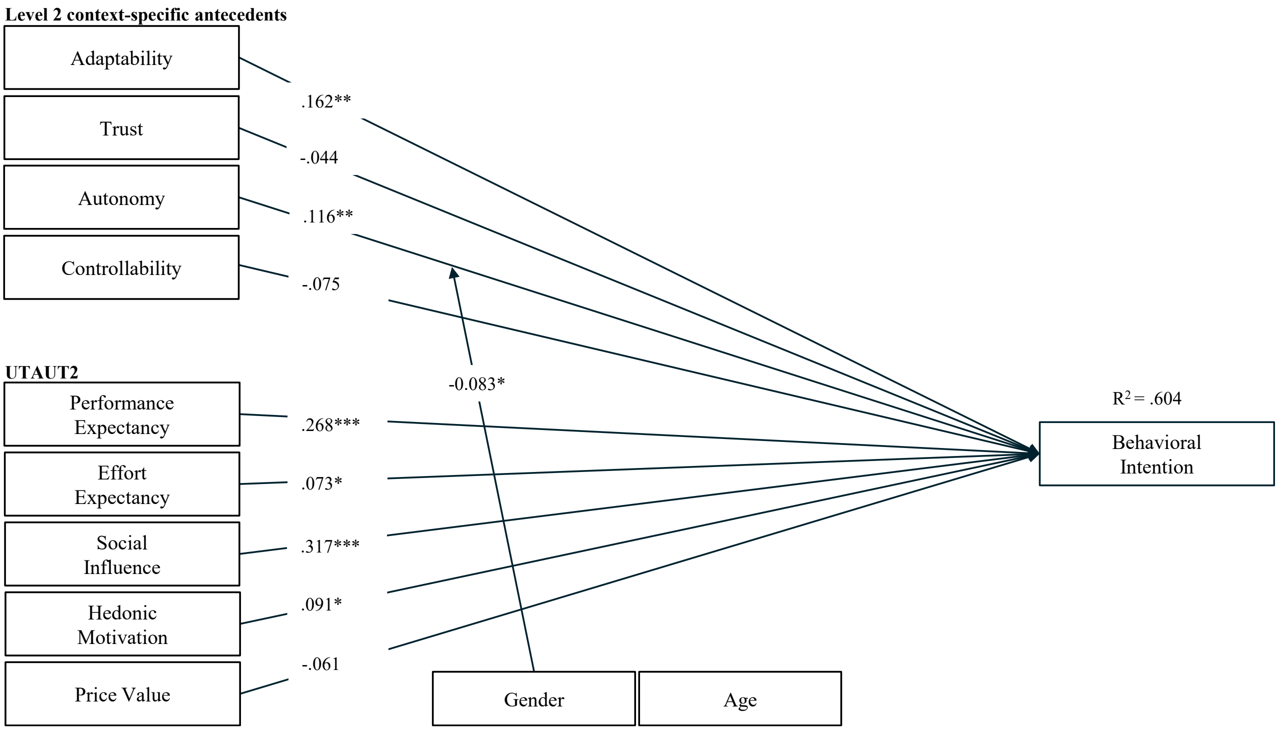
Research suggests that service providers often face the challenge to gain customers' acceptance of such innovative services. In response to this call for action and the change in customer interaction, which can have far-reaching consequences in the lives of customers, we examined the antecedents that explain customers' acceptance of PASS using a contextualized approach. Regarding customers' acceptance of PASS, only Leyer, et al. (2017) approached the topic from a customer perspective so far, testing the Reasoned Action Approach to identify antecedents explaining customers' digital PASS acceptance. Although their model fits the PASS context, Leyer, et al. (2017) conducted a so-called "Level 1 contextualization" (Hong, et al. 2014),

contextualizing a general theory by adding or removing core antecedents that are context-specific but not directly connected to the properties of PASS. We argue that antecedents reflecting key properties of PASS enrich the understanding of PASS acceptance. Contextual properties are often unrecognized, unmeasured, or underappreciated, and thus, theory without accounting for contextual differences may lead to misapplication and reduce explanatory power (Hong, et al. 2014). Missing contextualized insights into PASS acceptance may engender an improper design, customer dissatisfaction, and customer churn (Anderson, et al. 2008). Thus, we investigated context-specific antecedents of PASS by following the guidelines of theory contextualization of Hong, et al. (2014), yielding a "Level 2 contextualization" (see Table 1).

Guideline	**Description**	**Operationalization**
1. Ground in a general theory	A general model relevant to the domain of interest should be selected to guide the contextualization efforts.	We adopt the Unified theory of acceptance and use of technology 2 (UTAUT2) from Venkatesh, et al. (2012) to guide the development of a context-specific PASS model.
2. Contextualizing and refining general theory	A general model needs to be contextualized to the specific research domain.	We refine the original UTUAT2 model to the PASS context via conducting exploratory factor analysis (EFA).
3. Identify context specific antecedents	Context-specific antecedents can be identified based on past research, or in-depth analysis of technology of investigation using qualitative methods such as interviews or focus groups.	We apply an in-depth analysis and employ a focus-group to examine salient contextual antecedents to be added to the refined general model (i.e., UTAUT 2).
4. Model context specific antecedents	Context-specific antecedents are modeled.	We conducted EFA to model context-specific antecedents.
5. Examination of the interplay between the IT artifact and other antecedents	Context-specific antecedents are included in the refined general model.	We included the context-specific antecedents as direct predictors in the refined UTAUT2 model.
6. Examine alternative models	Different alternative models may be examined to gain a greater understanding of the phenomenon.	Not applied

Table 1. Guidelines for single-context theory contextualization operationalized for our research

Following the guidelines of Hong, et al. (2014), we identified PASS-specific antecedents (i.e., *Adaptability*, *Autonomy*, *Reversibility*, and *Trust*), developed a contextualized acceptance model based on UTAUT2 while drawing from general acceptance theory, and validated it empirically. Further, we compared the results with UTAUT2, an established yet uncontextualized model.



<u>*Notes*</u>:

1. ****p < .01: **p < .05; *p < .1.*
2. For the sake of clarity, we omit insignificant path coefficients of moderators *Age* and *Gender*

Figure 1. Results of the UTAUT2-PASS

As illustrated in Figure 1, our findings confirmed the antecedents based on traditional technology acceptance models (i.e., *Performance Expectancy*, *Effort Expectancy*, *Social Influence*, and *Hedonic Motivation*) and context-specific antecedents (i.e., *Adaptability* and *Autonomy*). When we included interaction terms, we also found a significant path coefficient with higher-order interaction terms, such as *Autonomy* x *Gender*, when we predicted customers' intention towards using PASS. Moreover, UTAUT2-PASS explains significant variance (Adjusted R^2) in *Behavioral Intention* of 60.4%. Overall, the results support our antecedents' applicability and validity or determining customers' behavioral intentions for PASS. To better interpret and discuss our contextualized model results, we further conduct a survey validating the original UTAUT2 (Level 1 contextualization) applied in the PASS context and compare the results with those of our UTAUT2-PASS model (Level 2 contextualization). This robustness check highlights the relevance of our contextualized UTAUT2-PASS model and its outperformance, since UTAUT2 only explains 35.7% of the variance. In conclusion, the comparison attests that our contextualized model is more appropriate regarding the acceptance of PASS than an established general theory (i.e., UTAUT2). Therefore, our work contributes to service research by advancing the academic understanding of PASS and helping service providers specify the design of PASS for customer acceptance.

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Keywords: Proactive Smart Services, Technology Acceptance, Factor Analysis, Contextualization