Multi-Channel Technologies
in the Context of Consumers' Risk Perceptions

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Alena Ortlinghaus, M.Sc.

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First Supervisor: Prof. Dr. Stephan Zielke

Second Supervisor: Prof. Dr. Ina Garnefeld

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1 Introduction

1.1 Relevance for retail practice and research

Over the last two decades, the importance and omnipresence of the internet have increased dramatically (see Initiative D21, 2022; Salahuddin & Gow, 2016). In line with this, retail has also changed fundamentally (e.g., Gao, Agrawal, & Cui, 2022; Hübner, Wollenburg, & Holzapfel, 2016; Kim, Park, & Lee, 2017; Rodríguez-Torrico et al., 2020), as online retailing is now almost an essential requirement for the competitiveness and survival of retailers (Akturk & Ketzenberg, 2022). A current study shows that sales in B2C online retail in Germany have increased enormously from 1.3 billion euros in 2000 to 72.8 billion euros in 2020. This results in a market share of online retail in the total German retail trade[1] in 2020 of 12.6% overall and 18.4% in the non-food sector (HDE, 2021). Conversely, the popularity of using the offline channel for making purchases is decreasing. A current study reveals that while 56% of consumers still preferred the offline channel for shopping in 2017, only 43% still indicated this preference in 2020 (Rudolph, Kleinlercher, & Kralle, 2021). Nevertheless, consumers do not want to renounce offline shopping entirely. As another study suggests, a large majority of German consumers (81%) use both channels for their purchases (YouGov, 2021). In line with this behavior, retailers are increasingly offering both online and offline channels to search for and purchase their products, thus becoming multi-channel retailers (Arora & Sahney, 2017; Gao et al., 2022; Mahar & Wright, 2017). In turn, this has enabled and encouraged customers' channel-switching behavior, that is, searching for a product via one channel but then purchasing it via another (Arora & Sahney, 2017; Gao & Su, 2017b; Verhoef, Neslin, & Vroomen, 2007). Consequently, consumers now expect retailers to offer convenient channel-switching opportunities, allowing them to choose freely which channel to use for a specific stage of their purchase process and to switch easily between channels according to their preferences (Chatterjee, 2010; Gao et al., 2022; Kim et al., 2017). It is therefore crucial for retailers today to integrate their channels properly and thereby meet these new customer demands and expectations (Akturk & Ketzenberg, 2022; Forrester, 2014; Gallino & Moreno, 2014; Jones et al., 2022).

In order to combine their distribution channels in a value-creating manner, retailers introduce multi-channel technologies (MCTs; see Forrester, 2014). This dissertation defines these MCTs 'as technologies that intend to integrate the online and offline channels of multi-channel retailers and aim to

1 This study considers German retail in a narrower sense, including only institutional retail formats and excluding pharmacies, motor vehicle, fuel, and gasoline retailers.

create a seamless buying experience for the customer' (Ortlinghaus, Zielke, & Dobbelstein, 2019, p.263). Literature shows that consumers mostly switch from the online to the offline channel, also known as webrooming or ROPO (research-online-purchase-offline) behavior (Alexander & Kent, 2020; Bell, Gallino, & Moreno, 2014; Flavian, Gurrea, & Orus, 2019, 2020; Rudolph et al., 2021). Thus, it is particularly relevant for retailers to enable and support this direction of channel-switching behavior to meet customers' requirements (Arora & Sahney, 2017; Forrester, 2014). Retailers, therefore, increasingly offer so-called web-to-store MCTs that lead the customer from the online to the offline channel (Picot-Coupey, Huré, & Piveteau, 2016). One of the most important and popular technologies in this context is click and collect (Forrester, 2014; Hübner, Wollenburg, & Holzapfel, 2016; Jin, Li, & Cheng, 2018; Kim et al., 2017; Ma, Su, & Oh, 2014), which means to buy a product online but pick it up at a local store (Gallino & Moreno, 2014; Jara et al., 2018; Kim et al., 2017). However, further web-to-store MCTs are similar but still have individual characteristics, namely check and reserve and the online availability check. Check and reserve includes searching for a product and reserving it online and then purchasing and picking it up at a selected offline store (e.g., Hübner, Holzapfel, & Kuhn, 2016; Jin et al., 2018; Wollenburg et al., 2018), while the online availability check means to check offline product availability online (e.g., Herhausen et al., 2015; Oh & Teo, 2010; Wollenburg et al., 2018).

Even though the fulfillment of consumer expectations is an essential reason for offering MCTs, retailers can also benefit from further advantages related to these technologies. MCTs can be an effective tool to prevent consumers from switching retailers while switching channels and hence, to keep customers in their own channels during the whole purchase process (see Bell et al., 2014; Chatterjee, 2010). Moreover, web-to-store MCTs have the potential to increase the traffic in a retailer's offline store (Akturk & Ketzenberg, 2022; Gallino & Moreno, 2014; Hübner, Holzapfel, & Kuhn, 2016; Mahar & Wright, 2017). Additionally, when offering these MCTs, the sales staff has the opportunity to cross- or up-sell further products if customers visit the store in person to pick up items which they have found, reserved, or ordered online via web-to-store technologies previously (Gallino & Moreno, 2014; Ma et al., 2014; Wollenburg et al., 2018). This can lead to higher sales volumes and additionally save packaging and shipping costs (Forrester, 2014; Gallino & Moreno, 2014; Gao & Su, 2017a; Mahar & Wright, 2017; Mahar et al., 2014). Furthermore, from the perspective of entire cities or communities, it is also beneficial to promote web-to-store technologies and the associated webrooming behavior, as they have the ability to revive or at least support local offline retailing (Forrester, 2014; Gallino & Moreno, 2014; Mahar & Wright, 2017; Wollenburg et al., 2018), which increasingly suffers from pure online retailers in terms of customer patronization and sales volume (see Bollweg et al., 2015; Herhausen et al., 2015). Taken together, these aspects underline the high relevance of a

successful implementation and operation of web-to-store technologies for retailers as well as for cities or communities as a whole. Simultaneously, this demonstrates how the increase in online retailing can be used as an opportunity for offline retailers rather than just being seen as a threat to it.

Despite the number of potential opportunities provided by the selected MCTs, these technologies are still relatively new, and only a minority of retailers offer them so far (see e.g., Alexander & Kent, 2020; Jin et al., 2018; Kim et al., 2017). This leads to difficulties on both the retailers' side as well as the customers'. Many, notably smaller, retailers have limited experience with the selected MCTs in terms of how to implement them in the most efficient way and how to design them, in particular, to offer a high customer value while simultaneously keeping costs low (see Gallino & Moreno, 2014; Mahar & Wright, 2017; Mahar et al., 2014; Melacini et al., 2018). Since the implementation and the successful operation and management of these technologies is generally costly and associated with high effort (Forrester, 2014; Gallino & Moreno, 2014; Hübner, Holzapfel, & Kuhn, 2016; Wollenburg et al., 2018), it is crucial for retailers to find out how best to invest in this area. Moreover, due to the relative novelty of these MCTs (Jin et al., 2018; Kim et al., 2017) and the combination of different channels caused by them, problems and failures in their operation often occur (see Jin et al., 2018; Rosenmayer et al., 2018), especially in the launch phase. This can, in turn, reduce the attractiveness of the MCTs and worsen specific customer-related targets from a retailer's perspective or the overall image of the retailer (see e.g., Mattila, 1999; Maxham, 2001; McCollough, Berry, & Yadav, 2000; Sajtos, Brodie, & Whittome, 2010).

With regard to the customer's perspective, even though many consumers are already familiar with the selected MCTs, many have not yet used all of them. As an own investigation in Germany (2018; n=440)[2] shows, consumers' familiarity (i.e., whether they know the MCT) with the availability check is 87.0%, for check and reserve 70.8%, and for click and collect is 80.2%. 73.9% of the respondents have already used the availability check. Regarding check and reserve, the usage is 29.4% and for click and collect 41.1% (see figure 1). A recent study from Rudolph et al. (2021) also reveals that most consumers use the availability check, followed by click and collect, and finally check and reserve.

[2] The questions regarding consumers' familiarity with and previous usage of the MCTs (both binary: yes/no) were included in the survey from the second research project (see Ortlinghaus & Zielke, 2019). However, the resulting data of the latter one has not been used for the paper.

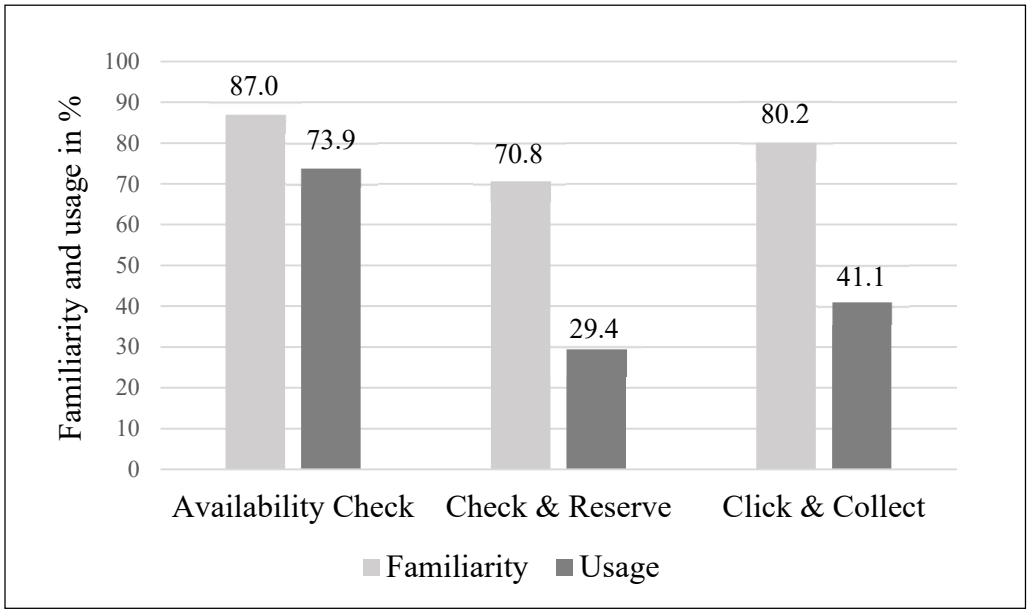

Figure 1. Consumers' familiarity with and usage of the selected MCTs.

These partly relatively low percentages regarding the MCTs' usage may be related to concern or skepticism toward the MCTs themselves, which may lead to a lower intention to use, or in case of use, to a higher failure sensitivity. Furthermore, if customers do not know how these technologies work or do not receive enough information on their particular functionalities, they may perceive specific risks regarding these technologies. This may be supported by general risks associated with online purchases or purchases via multiple channels (see Katta & Patro, 2017). Since purchase risks generally influence consumers' purchase behavior and their attitude toward it (see e.g., Derbaix, 1983; Mitchell, 1992; Roselius, 1971), the question arises as to how such risks affect these variables in the particular context of MCTs, which types of risks are especially relevant here, and how retailers can counteract or reduce them.

In order to cope with these difficulties, it should be an essential objective in retailing research and practice to analyze factors influencing the evaluation and use of MCTs and corresponding consequences as well as offering explanations for the occurrence of such effects. Based on such findings, retailers can effectively manage channel integration and better meet customers' expectations in order to remain competitive and enable or support the potential benefits of MCTs outlined previously (see Forrester, 2014; Mahar & Wright, 2017). However, prior research on this topic is still relatively sparse (Jin et al., 2018; Kim et al., 2017; Ma et al., 2014; Mahar & Wright, 2017; Melacini et al., 2018; Wollenburg et al., 2018). In recent years, studies have spent much effort investigating multi-channeling and channel integration on a more general level. In doing so, researchers mainly examine the consequences of channel integration as such without considering any particular technologies (e.g., Frasquet & Miquel, 2017; Herhausen et al., 2015; Li et al., 2018; Yang et al., 2017; Zhang et al.,

2018). Nevertheless, some studies analyze the effects of the implementation or operation of specific MCTs compared to not offering them (e.g., Gallino & Moreno, 2014; Gao & Su, 2017a; Mahar et al., 2014) or examine what affects consumers' use intention for particular MCTs (e.g., Chatterjee, 2010; Kim et al., 2017). However, extant literature does not give much information about what generally influences consumers' evaluations of the selected MCTs, which precedes their use intention (according to, e.g., the extensively proven Technology Acceptance Model by Davis, Bagozzi, & Warshaw, 1989). Moreover, most research in the MCT context deals with click and collect (see e.g., Chatterjee, 2010; Gallino & Moreno, 2014; Gao & Su, 2017a; Kim et al., 2017; Ma et al., 2014; Mahar et al., 2014), since this is regarded as one of the most widespread and popular MCTs (Forrester, 2014; Hübner, Wollenburg, & Holzapfel, 2016; Jin et al., 2018; Kim et al., 2017; Ma et al., 2014). Thus, there are hardly any studies regarding check and reserve and the availability check (see Hübner, Holzapfel, & Kuhn, 2016; Jin et al., 2018; Wollenburg et al., 2018). In relation to the pre-purchase stage in the context of MCTs, literature mainly investigates how exogenous impact factors, independent of the particular MCTs, influence their use intention or customer satisfaction (e.g., Chatterjee, 2010; Kim et al., 2017). However, retailers may not always have the opportunity to change exogenous factors, and are therefore obliged to focus their efforts on changing the MCT itself. Still, there is very little research on these adjustable aspects, such as how retailers can design the selected MCTs most efficiently. Few studies analyze the impact of MCT design factors of particular MCTs on customer-related targets or retailer profits (e.g., Jara et al., 2018; Jin et al., 2018; Murfield et al., 2017), but they miss the investigation of their influence on consumers' perceived usefulness of the specific MCTs themselves and potential underlying reasons. Another widely neglected aspect in the context of MCTs is their performance in the purchase stage, that is, when it actually comes to their use. As outlined, MCTs are fairly error-prone, which may lead to service failures in their operation. However, literature examines this topic mainly in pure offline (e.g., Maxham & Netemeyer, 2002a; Smith, Bolton, & Wagner, 1999; Tax, Brown, & Chandrashekaran, 1998) or pure online situations (e.g., Bijmolt, Huizingh, & Krawczyk, 2014; Holloway & Beatty, 2003; Sousa & Voss, 2009; Wang et al., 2011). Therefore, research on the consequences of service failures and subsequent recoveries in an MCT context is still needed.

Notably, apart from the research gaps concerning the MCTs themselves, there is little research on consumers' perceived risk in this context. As pointed out earlier, risk may play a crucial role here, since the combination of channels and the MCTs' relative novelty may increase consumers' risk perceptions. Extant studies mainly examine perceived risk either in the pure offline (e.g., Derbaix, 1983; Dowling & Staelin, 1994; Roselius, 1971) or in the pure online context (e.g., Arora & Kaur, 2018; Katta & Patro, 2017). A few studies address the effect of the provision of MCTs on consumers' risk

perceptions (e.g., Gallino & Moreno, 2014; Gao & Su, 2017a) and the impact of consumers' general perceived online risk on the intention to use click and collect (Kim et al., 2017). Yet, the relevance of perceived risk in an MCT context is still insufficiently studied. In particular, there is a research gap regarding the influence of different specific types of risk perceptions on technologies that integrate the offline and online channels and with regard to the role perceived risk plays in the specific stages of a consumer's purchase process when using MCTs.

1.2 Research objectives and framework

The overall objective of this dissertation is to fill the previously outlined research gaps by analyzing the selected MCTs both in general and in the relevant specific stages of the purchase process, thereby identifying the role of consumers' perceived risk in this regard. To this end, the following superordinate research question guides the dissertation*: How can retailers best implement, design, and operate the selected MCTs from the customer's perspective against the background of consumers' perceived risk?*

This dissertation examines the selected MCTs from different perspectives in order to answer this question. Therefore, it includes three separate and independent research projects, each of which makes an individual contribution to answering the superordinate research question. The first research project investigates in general whether consumers' risk perceptions play a role in the assessment of the selected MCTs at all. It thereby seeks to determine which particular types of risk perceptions may be relevant when implementing and operating MCTs and to what extent. Based on this general examination of consumers' risk perceptions in the context of MCTs, research projects 2 and 3 give more detailed insights into the relevant specific stages of the purchase process, that is, the pre-purchase (research project 2) and the purchase stage (research project 3). In doing so, the second research project sheds light on the design-related preconditions for a high perceived usefulness of the MCTs from the customer's perspective and demonstrates how the reduction of consumers' perceived risk can contribute to this. Finally, research project 3 shows how retailers should deal with situations where consumers are already using MCTs but where the technologies do not work correctly. For this context of service recovery, the study again investigates the extent to which perceived risk is of importance, to be able to explain potential effects. Due to the differentiated approach with three differently focused research projects, this dissertation offers the opportunity to derive comprehensive implications for retailers and extend the theory in multiple ways. The following section briefly presents the particular research projects' contents and addressed research gaps, their respective specific research questions, and their basic results and contributions.

The first research project, '*The impact of perceived risk on consumers' MCT evaluations*', aims to identify how different types of consumers' perceived risk influence consumers' attitudes toward the selected MCTs. Moreover, it seeks to examine the extent to which these effects differ between the three MCTs and to point out the role of the consumers' general purchase channel preference in this context. The project thereby specifically addresses the following three main research gaps mentioned in the beginning. Firstly, it sheds light on the so far neglected research field of factors influencing the evaluation of MCTs, which is an important first step toward their potential use (see, e.g., the extensively proven relationship between attitude and intention to use according to the Technology Acceptance Model by Davis et al., 1989). Existing studies instead concentrate on the consequences of introducing particular MCTs (e.g., Gallino & Moreno, 2014) or on factors influencing consumers' use intentions for specific MCTs (e.g., Chatterjee, 2010; Kim et al., 2017). Secondly, there is not much research on the availability check and check and reserve (see Hübner, Holzapfel, & Kuhn, 2016; Jin et al., 2018; Wollenburg et al., 2018). In the web-to-store MCT context, studies mainly concentrate on click and collect (see e.g., Chatterjee, 2010; Gallino & Moreno, 2014; Gao & Su, 2017a; Kim et al., 2017; Ma et al., 2014; Mahar et al., 2014). Therefore, this research project adds knowledge on alternative similar (but nevertheless specific) web-to-store MCTs and hence enables a comparison of these technologies. Thirdly, literature until now mainly examines perceived risk related to purchases either via the offline (e.g., Dowling & Staelin, 1994; Roselius, 1971) or online channels (e.g., Arora & Kaur, 2018; Katta & Patro, 2017). However, the combination of several channels, in particular, can lead to certain types of risk playing an even more significant role when shopping (see Katta & Patro, 2017). Few studies thus investigate the impact of the provision of MCTs on consumers' risk perceptions (Gallino & Moreno, 2014; Gao & Su, 2017a) and the influence of consumers' general perceived online risk on the intention to use particular MCTs (Kim et al., 2017). The first research project presented here goes into further detail by examining the impact of different specific risk perceptions on technologies integrating the offline and online channels. Since customers exhibit diverse habits when using the internet for shopping, we cannot expect the selected MCTs to be evaluated in the same way by all customer groups as risk perceptions may be dealt with differently depending on consumers' purchase channel preferences. Therefore, this research project additionally considers the role of consumers' purchase channel preferences in this context. In particular, it answers the following research questions:

(1) How do different risk perceptions influence consumers' attitudes toward specific MCTs (availability check, check and reserve, click and collect)?

(2) How do these effects differ between the particular MCTs?

(3) Does the customer's general channel preference moderate these effects?

Using an online survey in a within-subjects design, we asked 1110 respondents about their perceptions regarding four different types of risk (product quality, product availability, payment data, personal data), their attitudes toward the three selected MCTs, and their general channel preference. Based on a factor analysis the two data-related types of risk are merged into one data risk. Subsequent moderated multiple regressions for each of the three MCTs show significant impacts of the three types of risk on the attitudes toward the MCTs. These effects are generally worst for click and collect. Additionally, results reveal a significant moderating effect of the consumers' channel preference. The research project thus provides implications on how to improve different customer groups' (online vs. offline preference) attitudes toward the selected MCTs by considering their perceptions of different types of risk.

The second research project, '*The role of perceived risk in MCT design*', has a more practical focus and deals with the pre-purchase stage by examining the specific design of the selected MCTs. In particular, its objective is to investigate how differently designed functions or characteristics of the MCTs (i.e., high vs. low displayed product availability, immediate vs. delayed product reservation confirmation, and specified vs. unspecified product pick-up time) affect consumers' perceived usefulness of the respective technologies before they actually use them. Since the first research project revealed that risks play a relevant role in the context of MCTs, the second research project moreover analyzes the extent to which consumers' risk perceptions explain these effects. It thereby extends the current literature in two regards. Firstly, in the current literature, some studies examine exogenous impact factors on consumers' intention to use particular MCTs (e.g., Chatterjee, 2010; Kim et al., 2017). Extant research on MCTs moreover deals with the consequences of the provision of individual MCTs as such (e.g., Gallino & Moreno, 2014; Gao & Su, 2017a; Kleinlercher et al., 2018; Oh & Teo, 2010; Wollenburg et al., 2018). A few studies analyze in more detail the effects of individual MCTs' design factors on customer-related targets or profits, such as the design of the click and collect service area (Jin et al., 2018), the timeliness of a click and collect order (Murfield et al., 2017), or characteristics of the website and the pick-up station (Jara et al., 2018). However, no existing investigations refer to the combination of the research streams on impact factors on the use intention or perceived usefulness of MCTs and MCT design factors. Hence, the second research project presented here investigates how retailers can increase their MCTs' usefulness to customers by influencing the design of the corresponding technologies. This is the basic prerequisite for customers to use the MCTs and consequently make them potentially beneficial for the retailer. Secondly, similar to the first research project, research project 2 also addresses the research gap on consumers' risk perceptions within a

multi-channel context (referring specifically to the MCT design). Existing studies sporadically identify the impact of the provision of MCTs as such on consumers' risk perceptions (Gallino & Moreno, 2014; Gao & Su, 2017a) but neglect the particular risk-related effects of the MCTs' individual design characteristics. Thus, the research project answers the following research questions:

(4) How do different characteristics of MCT designs (i.e., product pick-up time, confirmation date of product reservations, displayed product availability) affect consumers' perceived usefulness of the selected MCTs?

(5) Do consumers' risk perceptions mediate these effects?

In a scenario-based online experiment with a 2×2×2 between-subjects design, we manipulated the displayed product availability at the availability check (high vs. low), the time when the customer receives a product reservation confirmation when using check and reserve (immediate vs. delayed), and the indicated pick-up time for a reserved or already paid product when using check and reserve or click and collect (specified vs. unspecified). We use three-way ANOVAs in SPSS and mediation analyses via PROCESS for the data analysis. Based on the data of 440 respondents, the results show that some MCT design characteristics exhibit the assumed positive impacts on consumers' perceived usefulness of the MCTs, while others seem to be less relevant and even counterproductive. In particular, a specified (vs. unspecified) product pick-up time and a high (vs. low) displayed inventory status lead to a higher perceived usefulness of the MCTs via consumers' perceived time and product availability risk. However, the immediate (vs. delayed) confirmation of product reservations does not have any positive effects. In fact, it even decreases the perceived usefulness of click and collect. Hence, the research project identifies specific design factors that retailers can use to make the selected MCTs more useful to consumers by reducing their perceptions of risk.

Finally, the third research project, '*The role of perceived risk in recovering from MCT failures*', focuses on the purchase stage within the context of MCT usage. Employing check and reserve as an example, the research project investigates the consequences of service failures in the use of this technology, as this MCT is particularly prone to failures. Specifically, the research project seeks to determine whether the failure, if caused by various different sources (i.e., system, personnel, or random circumstances), has a different impact on customer satisfaction. In addition, the project includes an examination of the effectiveness of alternative service recovery approaches in response to such a failure (i.e., correction, compensation, or combination of both). Based on the highlighted relevance of perceived risk in the MCT context, the research project introduces perceived risk as a new mediator in the service failure and recovery research field in addition to the frequently investigated perceived

justice. Furthermore, it aims to identify whether a recovery paradox occurs in this context, and the extent to which perceived risk contributes to this.

Against this background, the third research project addresses a number of research gaps. Firstly, previous literature has exhaustively investigated service failures and recoveries pertaining to offline services (e.g., Maxham & Netemeyer, 2002a; Smith et al., 1999; Tax et al., 1998) and increasingly also with regard to services within the online channel (e.g., Bijmolt et al., 2014; Holloway & Beatty, 2003; Sousa & Voss, 2009; Wang et al., 2011). However, there is very little research on this topic in a multichannel context. As outlined previously, the combination of channels, nonetheless, may lead to a higher susceptibility to service failures and consequently, a more increased need for recovery. Therefore, this research project focuses on service failures and recoveries in the specific context of MCTs. Secondly, studies dealing with service failures and recoveries include a variety of different mediators to explain the effects on customer-related targets and/or the occurrence or hindrance of a recovery paradox (for an overview, see for example De Matos, Henrique, & Rossi, 2007). Nevertheless, until now, literature has almost entirely neglected the consideration of consumers' perceived risk in this context. Merely one existing study (Chang & Hsiao, 2008) shows that service recovery reduces consumers' perceived risk while simultaneously increasing perceived justice. However, the authors consider perceived risk in an aggregated way in their measurement model. Moreover, they do not include the impact of the service failure which precedes recovery, and they do not empirically examine risk as a mediator in the relationship between service recovery and consumer outcomes. This research project thus sheds light on the potentially explaining role of perceived risk in this context. Thirdly, extant research mainly investigates service failures and recoveries pertaining to core services (e.g., Hess, Ganesan, & Klein, 2003; Hocutt, Bowers, & Donovan, 2006; McCollough et al., 2000). However, studies on supplementary services (such as MCTs) in this research area are still sparse. The same applies to investigations of service failures and recoveries regarding technology-based services since most prior studies have focused more on service failures in the context of human failure (e.g., Brown, Cowles, & Tuten, 1996; Hocutt et al., 2006) or external circumstances (e.g., Mattila & Patterson, 2004). The third research project, therefore, answers the following research questions:

(6) Which source of service failure do consumers perceive as most negative in the context of MCTs?

(7) What is the most effective way for retailers to recover from service failures when using MCTs?

(8) To what extent do perceived justice and perceived functional risk mediate the effects of different sources of service failure and types of service recovery on the satisfaction with a retailer?

(9) To what extent does a service recovery paradox (not) occur in an MCT context, and which role does consumers' perceived risk play in this regard?

The main study comprises a scenario-based online experiment with 551 test subjects in a 3×3 between-subjects design with a control group. We manipulated the source of the service failure (system, personnel, random circumstances) and the type of service recovery (correction, compensation, combination of both). In the control group, there is no service failure and no recovery. For the data analyses, we use a two-way ANOVA with LSD posthoc tests in SPSS, structural equation modeling with smartPLS, and a mediation analysis via PROCESS. The results reveal significant differences in customer satisfaction based on the source of the failure as well as the type of recovery. These are mostly mediated by the two commonly mentioned dimensions of consumers' perceived risk, that is: the perceived probability of an additional failure and the perceived magnitude of the failure's negative consequences, as well as by consumers' perceived justice regarding the impact of the recovery. Furthermore, there is no empirical evidence for a recovery paradox, which can also be explained by both dimensions of consumers' perceived risk. Two supplementary experiments check the robustness of the findings and address some shortcomings of the main study. Overall, the third research project provides crucial theoretical contributions referring to the consideration of perceived risk in the relationship between service failures and recoveries and customer satisfaction, which is of particular relevance in the context of MCTs. Moreover, from a practical perspective, it supports retailers in making targeted investments in relevant failure prevention and effective recovery approaches. The research project also provides guidance on how retailers should communicate failures and design recoveries in order to reduce consumers' risk perceptions while creating a high level of perceived justice; ultimately resulting in higher customer satisfaction.

Figure 2 provides a summarized overview of the three research projects and the research gaps they each address.

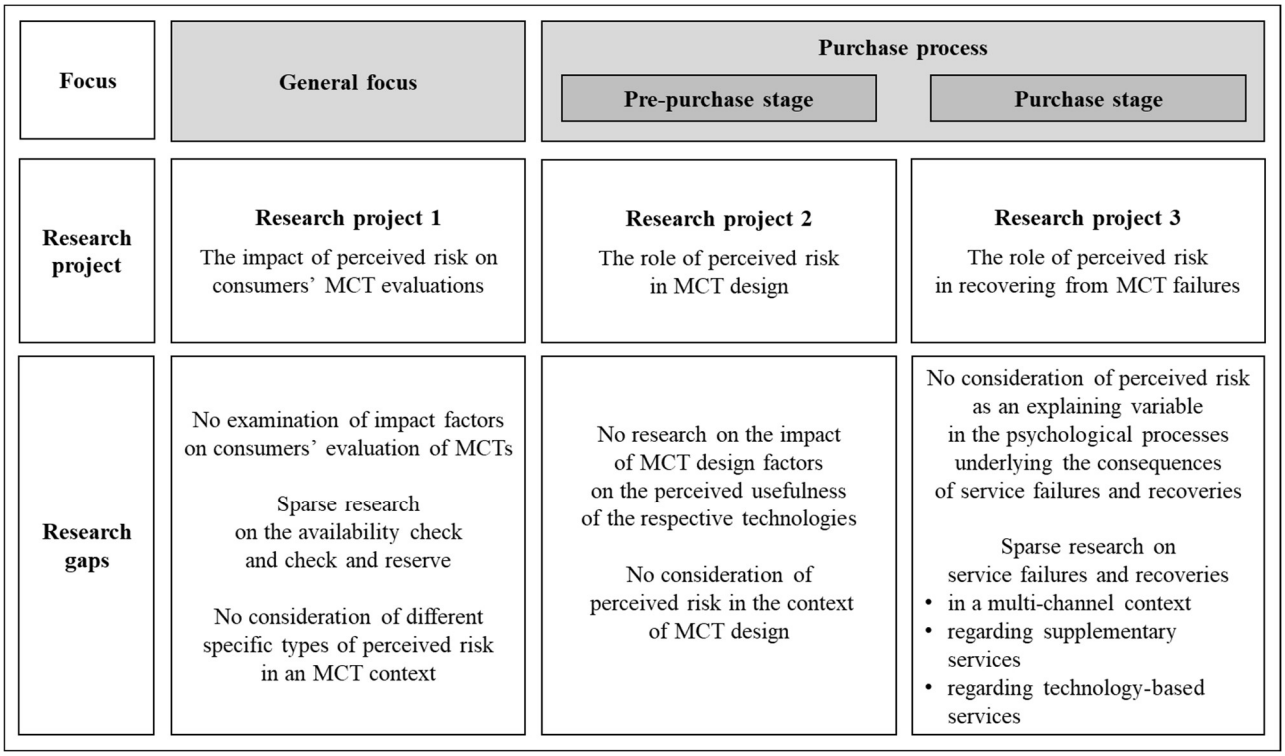

Figure 2. Overview of research projects with corresponding research gaps.

Overall, the three research projects identify how different types of perceived risk can influence the assessment and perception of MCTs, both in general and within specific stages of the purchase process and highlight which role risks play in MCT management. With the outlined investigations, this dissertation thus provides a crucial contribution to both retail practice and theory. For retailers, it offers practical guidance on how they should implement, design, and operate the selected MCTs and demonstrates to what extent they should pay attention to consumers' perceived risk in this regard. In particular, this research identifies potential psychological barriers that reduce the attractiveness of the MCTs from the customer's perspective. The findings, moreover, enable retailers to invest efficiently in their MCT design and consequently provide a high usefulness of their technologies, which may attract consumers to use them. Further, retailers gain insights on the effective management of service failures in an MCT context, which helps them to avoid or at least reduce customer dissatisfaction due to inappropriate operation of MCTs. Based on theoretical considerations regarding consumers' perceptions of risk, this dissertation finally contributes to explaining and thus better understanding the psychological processes involved in consumers' perceptions and evaluations of MCTs, their design, and their operation.

1.3 Structure of the dissertation

The present dissertation comprises five chapters, the structure of which is shown in figure 3.

Chapter 1 introduces the general topic and points out the fundamental relevance of the examination of web-to-store MCTs in general, and with particular reference to consumers' perceived risk. Moreover, this chapter clarifies the research objectives and framework of the dissertation and provides a brief overview of the three research projects included.

Chapters 2, 3, and 4 embrace the three research projects, which are all self-contained in content and can thus be read separately. In chapter 2, the first research project shows how different types of risk affect customers' attitudes toward the three selected MCTs and identifies how a consumer's general channel preference moderates these effects. Chapter 3 contains the second research project, which deals with the impact of different MCT design elements on consumers' perceived usefulness of these MCTs via consumers' risk perceptions. Chapter 4 comprises the third research project, which addresses the handling of service failures and recoveries when using MCTs. Chapter 5 completes the dissertation with a general discussion based on the results of the three research projects. To this end, it summarizes the results and points out their contribution to the superordinate research question formulated in the introduction. Subsequently, higher-level implications for the retail practice and theory are pointed out, followed by an overview of the limitations and further research perspectives. The dissertation ends with an overall conclusion and outlook.

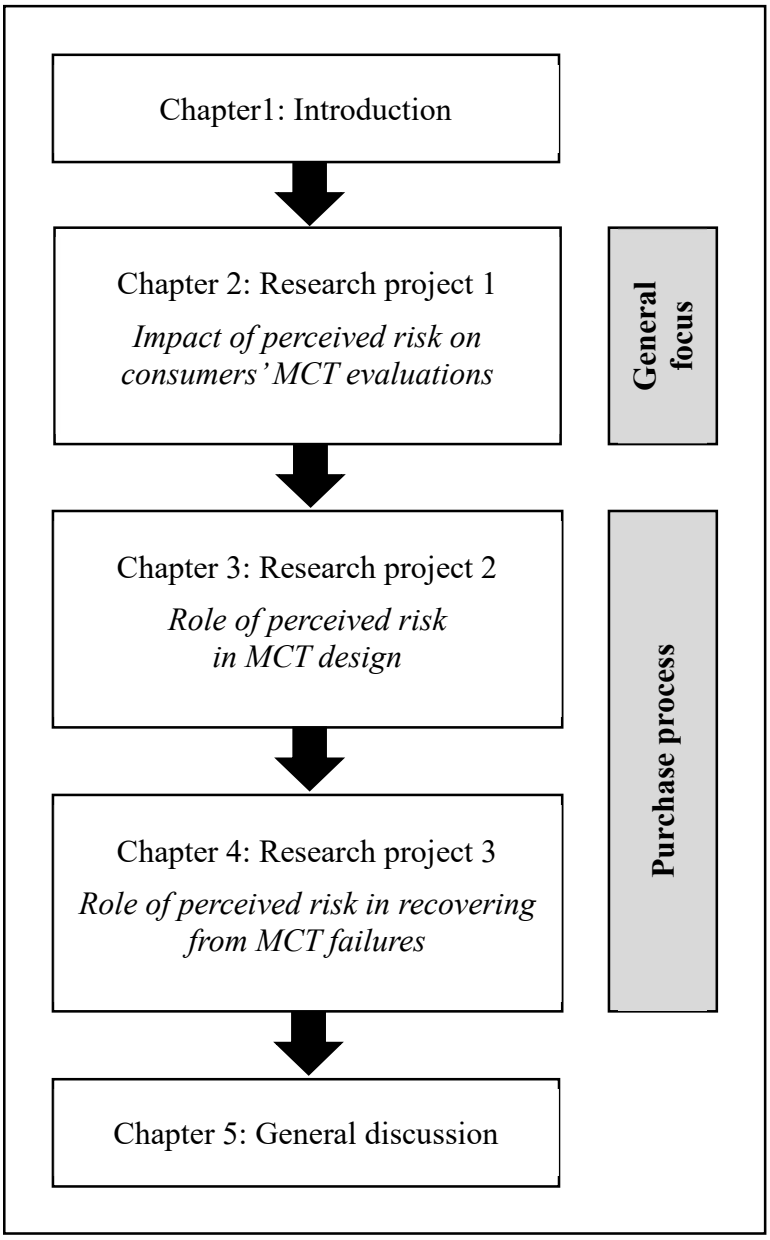

Figure 3. Structure of the dissertation.

2 The impact of perceived risk on consumers' MCT evaluations[3]

Several studies indicate that retailers experience favorable outcomes if consumers use multiple channels. Thus, retailers aim to encourage consumers to do so conveniently by offering multi-channel technologies. However, not much is known about what affects a positive attitude toward such technologies. Our study investigates how different risk perceptions influence the attitude toward specific MCTs in comparison to each other (availability check, check and reserve, click and collect). Moreover, we examine whether the customer's general purchase channel preference moderates these effects. Results show that three types of risk significantly impact on the attitude toward MCTs. These effects are generally worst for click and collect, as the negative effects (product quality and data risk) are highest, while the positive effect (product availability risk) is lowest, compared to the other two MCTs. Additionally, we generally find that the more a customer prefers buying via the online channel, the weaker the effects of the types of risk on the attitudes are. Our findings provide implications on how to improve consumers' attitudes toward the selected MCTs by influencing their perceptions of different types of risk.

Co-authors: *Stephan Zielke (University of Wuppertal)*
Thomas Dobbelstein (Baden-Wuerttemberg Cooperative State University)

[3] Chapter 2 is based on the article "The impact of risk perceptions on the attitude toward multi-channel technologies", published in *The International Review of Retail, Distribution and Consumer Research* (2019, Vol. 29 No. 3).

2.1 Introduction

Along with the growing importance of e-commerce, more and more retailers are adding new sales channels and becoming multi-channel retailers to meet the rising expectations of consumers (Arora & Sahney, 2017). In recent years, it is not simply the addition of channels that has become an essential topic in practice and research, but beyond: the integration of channels is also becoming increasingly crucial for retailers to remain competitive, leading to omni-channel retailing (Chatterjee, 2010; Frasquet & Miquel, 2017; Gallino & Moreno, 2014). Verhoef, Kannan, and Inman (2015, p.176) define omni-channel retailing 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'. Thus, through integration, omni-channel retailing offers consumers a seamless shopping experience across all of the retailer's available channels (Verhoef et al., 2015). With integrated channels, consumers are therefore free to use a channel of their choice to research and purchase products (Kim et al., 2017), as well as being able to easily switch between channels throughout the whole purchase process (Chatterjee, 2010). A number of studies have shown that retailers achieve favorable outcomes when consumers use multiple channels, such as positive effects on perceived service quality (Herhausen et al., 2015), image (Schramm-Klein et al., 2011), trust (Schramm-Klein et al., 2011; Zhang et al., 2018), satisfaction (Frasquet & Miquel, 2017; Yang et al., 2017; Zhang et al., 2018), willingness to pay (Herhausen et al., 2015), sales growth (Cao & Li, 2015), and customer retention and loyalty (Bendoly et al., 2005; Frasquet & Miquel, 2017; Lee & Kim, 2010; Li et al., 2018; Schramm-Klein et al., 2011). Therefore, retailers are trying to encourage consumers to do so in a convenient way by offering MCTs. We generally define such MCTs as technologies that intend to integrate the online and offline channels of multi-channel retailers and aim to create a seamless buying experience for the customer. Thus, they provide 'opportunities for transactions associated with the other channel' (Bendoly et al., 2005, p.317).

Depending on the direction of channel integration, researchers distinguish between different general types of MCTs, such as web-to-store technologies, supporting online-offline integration, and store-to-web technologies, enhancing offline-online integration (Picot-Coupey et al., 2016). As brick-and-mortar retailers increasingly face declining sales growth due to a general shift of purchases to online retail (PwC, 2016), our study focuses on web-to-store technologies as a way to re-increase traffic in a retailer's offline store (Gallino & Moreno, 2014; Hübner, Holzapfel, & Kuhn, 2016; Mahar & Wright, 2017). Through online-offline integration, employees have the opportunity to cross- or up-sell products when customers pick up products in-store that they have searched for or already ordered online (Gallino & Moreno, 2014; Ma et al., 2014). Consequently, retailers can achieve higher sales volume and save on packaging and shipping costs (Gallino & Moreno, 2014; Gao & Su, 2017a; Mahar

et al., 2014). Hence, it is worth considering factors that may influence a consumer's attitude toward the selected MCTs.

However, research on online-offline integration and, in particular, corresponding MCTs is sparse (Herhausen et al., 2015; Jin et al., 2018; Kim et al., 2017; Ma et al., 2014; Mahar & Wright, 2017). Only a limited number of previous studies examine these issues (e.g., Bendoly et al., 2005; Cao & Li, 2015; Chatterjee, 2010; Gallino & Moreno, 2014; Gao & Su, 2017a; Herhausen et al., 2015; Kim et al., 2017). These studies mainly focus on click and collect, that is, buying a product online and picking it up at a local store (Chatterjee, 2010; Gallino & Moreno, 2014; Gao & Su, 2017a; Kim et al., 2017; Ma et al., 2014), as this MCT is regarded as the most important and popular in the context of online-offline integration (Forrester, 2014; Jin et al., 2018). However, the use of multiple channels can also be encouraged by other MCTs, such as check and reserve, that is, reserving a product online and then purchasing and picking it up at the store (e.g., Hübner, Holzapfel, & Kuhn, 2016; Jin et al., 2018), or the option to check in-store product availability online (e.g., Bendoly et al., 2005; Gallino & Moreno, 2014; Herhausen et al., 2015). These three MCTs are similar but have different individual characteristics. Thus, we analyze separately factors that potentially influence customers' attitudes toward these MCTs, defined as MCTs' positive or negative evaluation (Ajzen, 1991).

Existing literature suggests that certain risks experienced during shopping affect customers' shopping behavior (Park & Jun, 2003). In the context of MCTs, data and payment risks may negatively influence attitudes toward technologies that require customers to reveal their personal and payment data online (e.g., click and collect). Product quality risks may lead to more positive attitudes toward technologies that allow customers to physically inspect products before purchase (e.g., check and reserve). Product availability risks may positively influence attitudes toward technologies where customers purchase or reserve products via the online channel. These risks may also increase the usefulness of availability checks and thus improve attitudes toward this MCT. However, there is no existing empirical study on how different risk perceptions of consumers influence the evaluation of the selected MCTs. Addressing this research gap, the objective of our study is to investigate the impact of the aforementioned types of risk on attitudes toward MCTs.

Customers also exhibit diverse habits when using the internet for shopping. Depending on their channel preference in the context of purchasing, they may deal with risk perceptions differently, since they are more or less familiar with the internet as a purchase channel and associated risks. Therefore, we cannot expect the selected MCTs to be evaluated in the same way by all customer groups (i.e., rather online or offline purchase channel preference). In order to consider this aspect in our study, and at the same time keep the focus on the main effects of the consumers' risk perceptions, we analyze this

moderation effect in a general and aggregated way. Thus, we address the following research questions:

- How do different risk perceptions influence consumers' attitudes toward specific MCTs (availability check, check and reserve, click and collect)?
- How do these effects differ between the particular MCTs?
- Does the customer's general channel preference moderate these effects?

By answering these questions, we are able to shed some light on the (so far entirely neglected) research field of factors influencing the evaluation of MCTs. Existing research on channel integration mainly focuses on its outcomes (e.g., Frasquet & Miquel, 2017; Herhausen et al., 2015; Li et al., 2018; Yang et al., 2017; Zhang et al., 2018). Individual studies analyze the consequences of introducing particular MCTs (e.g., Gallino & Moreno, 2014) or factors that influence use intentions for specific MCTs (e.g., Chatterjee, 2010; Kim et al., 2017). However, to our knowledge, there is no prior study examining factors that influence attitudes toward different MCTs in a comparative study.

Another research stream analyzes perceived shopping risks associated with purchases in either the offline (e.g., Dowling & Staelin, 1994; Roselius, 1971) or online channels (e.g., Arora & Kaur, 2018; Katta & Patro, 2017). A few studies examine the impact of providing MCTs on consumers' risk perceptions (Gallino & Moreno, 2014; Gao & Su, 2017a) and the influence of consumers' general perceived online risk on their intention to use click and collect (Kim et al., 2017). However, our study is among the first to investigate the impact of different specific risk perceptions on technologies that integrate both the offline and online channels.

This study is also of high practical relevance, as many retailers offer MCTs without being aware of what influences customers' attitudes toward them. This investigation, therefore, provides important implications for guiding a retailer's marketing strategy, as the findings reveal which aspects of perceived risks retailers need to pay attention to when implementing the particular MCTs in order to improve consumers' attitudes toward each of them. Through analyzing the moderating role of customers' general channel preferences, we simultaneously examine for which customer groups the impact of the different types of risk are particularly important. With this knowledge, retailers can address customers' potential risk perceptions tailored to the target group's specific requirements.

2.2 Literature review and research hypotheses

2.2.1 Perceived risk

The existing literature offers various approaches to the understanding of risk. For the present study, we draw on Bauer's (1960) frequently cited definition of risk, which states that risk involves the consequences of a consumer's behavior that s/he considers negative and that s/he cannot foresee with certainty. We focus here on the risk that a consumer subjectively perceives, referred to as perceived risk (Mitchell, 1999).

In the context of purchasing situations, risk refers to the shopping risk during a purchase process. Past research has distinguished several types of risk[4], each relating to different aspects of loss (Dowling, 1986). The most prevalent distinctions include functional or performance risk, financial, physical, psychological, social, and time or convenience risk (e.g., Bearden & Mason, 1978; Dowling & Staelin, 1994; Festervand, Snyder, & Tsalikis, 1986; Gemünden, 1985; Peter & Ryan, 1976; Pi & Sangruang, 2011; Roselius, 1971; Stone & Mason, 1995). Forsythe and Shi (2003) identify product performance, financial, psychological, and time or convenience risk as the main types of risk associated with online retailing. Thakur and Srivastava (2015) refer to these risks as performance, security, privacy, and time risk. Since the online channel is the starting point and an essential part of MCTs, we focus on analyzing the influence of these four types of risk.

In our study, we evaluate risks in the specific purchase context involving the use of the selected MCTs. Therefore, we derive context-sensitive types of risk from the previously mentioned general purchase risks. Functional or performance risk generally refers to the risk that a product will not have the expected or desired characteristics, functions, or performance (Horton, 1976; Huang, Schrank, & Dubinsky, 2004; Pi & Sangruang, 2011). In the context of MCTs, product quality risk reflects the functional risk, as product quality often includes the risk that a customer's initial expectations will not be met when purchasing a product via the online channel (Pi & Sangruang, 2011).

There is a general time or convenience risk when a customer is uncertain about the (temporal) effort involved in purchasing or using the product or any repair or replacement that may be necessary (Derbaix, 1983; Pi & Sangruang, 2011; Roselius, 1971; Stone & Mason, 1995). In the context of MCTs, this type of risk can be transferred to product availability risk, meaning the risk that the product is not

[4] Some authors refer to these *risk types* as *risk dimensions*. In this dissertation, however, we use the term *risk types* in this context, as the term *risk dimensions* refers to the two components of probability and magnitude of the negative consequences an action may entail (see research project 3). This is in line with the common differentiation of risk into the two dimensions mentioned, which can be applied to each risk type.

available at the retailer's offline store (Gallino & Moreno, 2014). In particular, we are addressing the risk of consumers having to spend time and effort visiting other stores to check if the product is available elsewhere, if the desired product is not in stock when they want to buy it in their selected store (Bendoly et al., 2005).

In terms of the general purchase risks, financial risk refers to a customer's perceived uncertainty regarding financial losses resulting from a purchase (Derbaix, 1983; Horton, 1976; Huang et al., 2004; Roselius, 1971; Stone & Mason, 1995). In addition to functional risk, the literature regards financial risk as one of the most relevant types of risk in multi-channel contexts, as it is a significant barrier in online retailing (Liebermann & Stashevsky, 2002; Miyazaki & Fernandez, 2001; Yang & Jun, 2002; Zhao et al., 2008). Thakur and Srivastava (2015) also refer to financial risk as security risk (in terms of payment data security). Despite the fact that online payments have been available for quite some time now, many customers still fear that their payment data is not secure during online purchases and is at risk of being stolen or misused (Miyazaki & Fernandez, 2001; Sreya & Raveendran, 2016; Swinyard & Smith, 2003), resulting in a possible loss of money (Thakur & Srivastava, 2015). Therefore, we refer to financial risk as payment data risk.

In general, there is a psychological risk when consumers are unsure whether the product truly fits their personality or self-image, or when they fear that it will make them uncomfortable (Dowling & Staelin, 1994; Horton, 1976; Huang et al., 2004; Peter & Tarpey, 1975; Stone & Mason, 1995). This type of risk can be transferred to personal data risk when using MCTs, as customers may feel disappointment, frustration, or shame, if the personal data they entered is revealed to an unauthorized person, thus violating their privacy (Forsythe & Shi, 2003; Pi & Sangruang, 2011). In this context, personal data refers to the privacy of the consumer in terms of, for example, name, address, contact information, or data related to the consumer's online usage behavior or habits (Thakur & Srivastava, 2015). Figure 4 graphically summarizes the four general types of risk considered here, and the corresponding derived context-sensitive types of risk related to the use of MCTs.

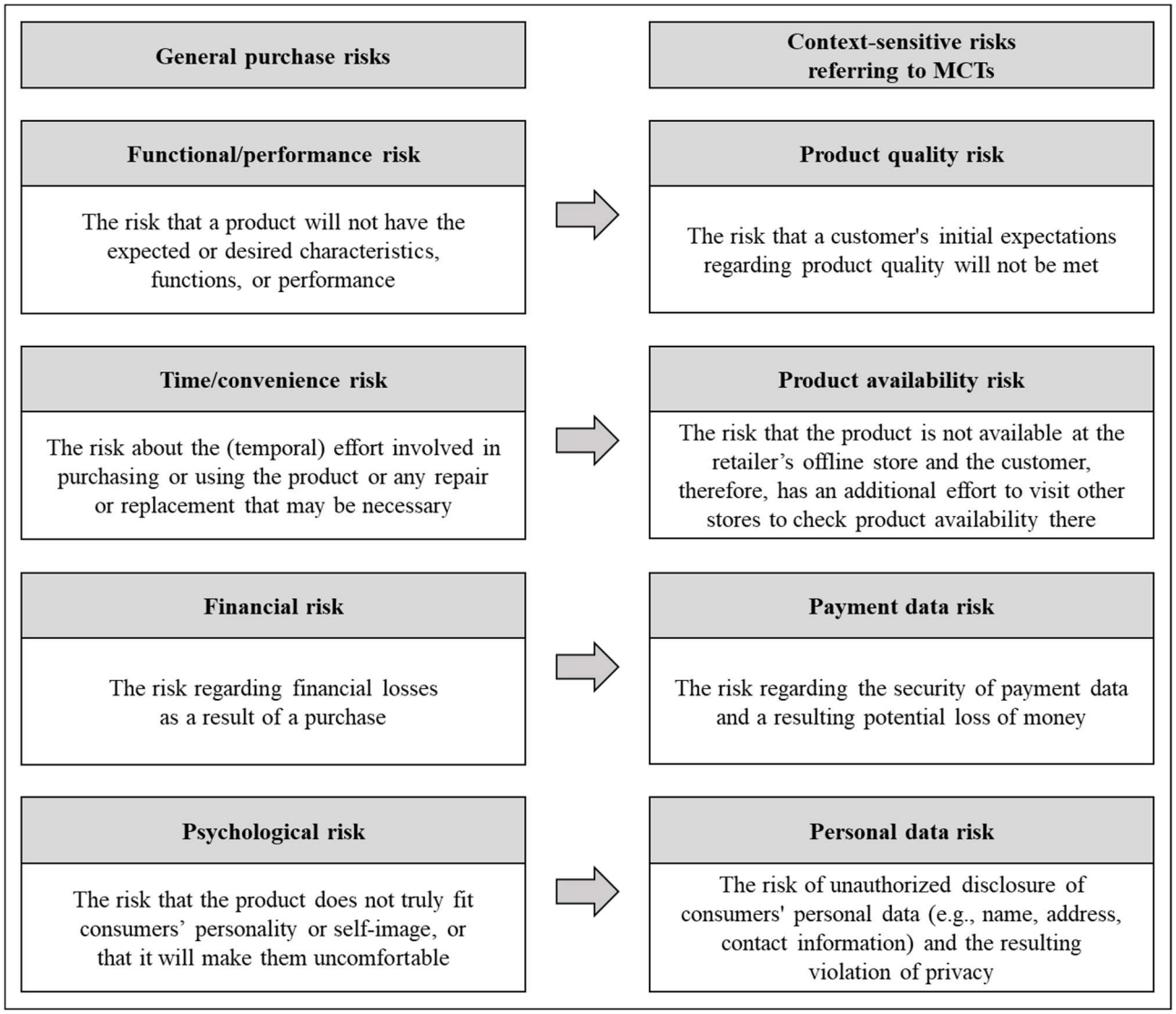

Figure 4. General and context-sensitive types of risk.

2.2.2 Influence of perceived risk on the attitudes toward the MCTs

According to the theory of perceived risk, based on Bauer (1960), general perceived purchase risk can affect a consumer's behavior. Since behavior is usually determined by the attitude toward it (Fishbein & Ajzen, 1975; Wang et al., 2016), we assume that purchase risk also influences the attitude toward MCTs. Several studies demonstrate that the involvement of the online channel increases perceived shopping risk and that this shopping risk may be associated with specific additional risks compared to offline channels, for example, related to data protection (Katta & Patro, 2017). Thus, risk plays a significant role in online and, subsequently, also in multi-channel shopping contexts (see, e.g., Bezes, 2016; Doolin et al., 2005; Forsythe & Shi, 2003; Kuhlmeier & Knight, 2005; McCole, Ramsey, & Williams, 2010; Thakur & Srivastava, 2015; Wang et al., 2016). As McKnight, Choudhury, and Kacmar (2002a) or Miyazaki and Fernandez (2001) point out, perceived purchase risks can constrain the use of the online channel in the context of shopping. Several studies support this, indicating

a negative relationship between perceived shopping risk or particular types of risk and consumers' attitudes, intention to use, and actual use of the online channel (e.g., Aldás-Manzano et al., 2009; Bianchi & Andrews, 2012; Chang & Wu, 2012; Coker, Ashill, & Hope, 2011; Forsythe & Shi, 2003; Herhausen et al., 2015; Miyazaki & Fernandez, 2001; Montoya-Weiss, Voss, & Grewal, 2003; Pi & Sangruang, 2011; Thakur & Srivastava, 2015; Wang et al., 2016; Wu & Ke, 2015). Building on the extensive literature concerning the impact of risk perceptions on online shopping, we assume that the aforementioned types of risk also influence attitudes toward the selected MCTs, as these MCTs inevitably revolve around the use of the online channel, as well as being the starting point of the consumer's multi-channel shopping process.

2.2.2.1 Impact of product quality risk

Particularly in an online purchase context, the risk of not meeting the consumer's expectations is problematic since the consumer cannot touch, feel, or try the desired product before buying it (Forsythe & Shi, 2003; Sreya & Raveendran, 2016). This is one of the most critical shortcomings of the online channel (Thakur & Srivastava, 2015), as consumers can only get clues about product quality through pictures, descriptions, or sometimes videos, which cannot substitute for actual product inspection in terms of product quality (Shim & Lee, 2011). Thus, consumers are unable to accurately evaluate the product before purchase (Forsythe & Shi, 2003; Li & Huang, 2009). Consequently, customers perceive a higher quality risk when buying via the internet than when purchasing offline (Laroche et al., 2005; Li & Huang, 2009; Shim & Lee, 2011). Drawing on the theory of perceived risk, people strive to reduce perceived risk by, for example, seeking further risk-related information (Chaudhuri, 2000; Cunningham, Gerlach, & Harper, 2005; Dowling, 1986; Dowling & Staelin, 1994; Gemünden, 1985; Mitchell, 1992; San Martin & Camarero, 2009). The principal-agent theory (see Ross, 1973) leads to the same conclusion: Due to the asymmetric information concerning product quality between the better-informed party (in this case the retailer) and the less-informed party (the customer), the latter will perceive a higher risk (San Martin & Camarero, 2009). Therefore, the consumer will try to compensate for the information asymmetry by acquiring information. Using the online channel in the product research stage allows the consumer to obtain detailed information about the product but not the relevant haptic information, which avoids a comprehensive impression of the product quality (Forsythe & Shi, 2003). Since s/he prefers to have all possible information and thus a minimal level of uncertainty, according to the assumptions of the theory of perceived risk and principal-agent theory, we expect product quality risk to have a negative effect on the attitude toward click and collect, as the customer purchases the product based solely on the information gathered online. Conversely, product quality risks can lead to positive attitudes toward technologies that allow

customers to obtain detailed information online and additionally physically inspect products prior to purchase, as is the case with the availability check and check and reserve. Thus, we conclude:

H1: The higher the perceived product quality risk, a) the more negative the attitude toward click and collect and the more positive the attitude toward b) the availability check and c) check and reserve.

2.2.2.2 Impact of product availability risk

According to the theory of perceived risk, we assume that high perceived product availability risk will positively affect consumers' attitudes toward the chosen MCTs, as these MCTs have the ability to reduce this risk (Bendoly et al., 2005; Gallino & Moreno, 2014). Thereby, the higher the probability that the product is actually available after the MCT has indicated so, the further product availability risk may positively influence attitudes toward corresponding technologies (see Su & Zhang, 2009). Consequently, the attitude will be most positive for click and collect, as the customer already owns the product when visiting the store to collect it (Gallino & Moreno, 2014). For check and reserve, the probability of product availability is still high as the retailer should have reserved the product for the consumer prior to them arriving at the store. Therefore, product availability risk should affect the attitude positively. Since the probability that the product is obtainable offline when the availability check indicates this is still higher than without using the availability check, availability risk may also increase the usefulness of the availability check and, thus, the attitude toward this MCT, even if the actual availability is not as certain as for the other two MCTs. Consequently, we derive:

H2: The higher the perceived product availability risk, the more positive the attitude toward a) the availability check, b) check and reserve, and c) click and collect. d) This effect is strongest for click and collect, followed by check and reserve and the availability check.

2.2.2.3 Impact of payment data risk

Following the theory of perceived risk, customers who perceive a high level of payment data risk may search online but will avoid purchasing via the internet to decrease this risk (Frasquet, Mollá, & Ruiz, 2015). Referring to the selected MCTs, perceived payment data risk will therefore have a negative effect on click and collect, since the purchase occurs online, and customers are forced to enter their payment data on the internet. Conversely, check and reserve as well as the availability check allow consumers to take advantage of the online channel without having to be concerned about their payment data, as they are buying offline. Therefore, we hypothesize:

H3: a) The higher the payment data risk, the more negative the attitude toward click and collect. Payment data risk has no effect on the attitude toward b) check and reserve or c) the availability check.

2.2.2.4 Impact of personal data risk

The customer's lack of control over unauthorized access to personal data, and the perceived risk resulting from which, deters many customers from revealing their data in online processes (Hoffmann, Novak, & Peralta, 1999). Therefore, personal data risk may negatively influence the attitude toward technologies that require customers to reveal their personal data online, which is the case for all three MCTs. Here, we expect a clear order: Since click and collect requires customers to disclose the most data, we assume that the negative impact is strongest for this MCT. This is supposed to be followed by check and reserve, where the consumer still has to actively enter data. For the availability check, consumers do not have to enter any personal data. However, consumers may perceive a risk in terms of their personal data, as retailers can track their product preferences and search behavior or their approximate location, which is presumably close to the store selected by the consumer for the availability check. Thus, we conclude:

H4: The higher the personal data risk, the more negative the attitude toward a) the availability check, b) check and reserve, and c) click and collect. d) This effect is strongest for click and collect, followed by check and reserve and the availability check.

2.2.3 Moderating role of channel preference

Beyond these basic relationships, we analyze the moderating role of channel preference, that is, to what extent a consumer generally prefers to buy via the online or the offline channel. This preference may significantly influence the consumer's familiarity with the online channel and associated risks. As this study primarily focuses on the main effects of the four types of risk on the attitudes toward the MCTs, we examine this moderation effect in an aggregated way, as specified in the following.

Generally, the more customers´ preference for and use of the online channel for their purchases increases, the less risk they should perceive when buying via this channel (Ko et al., 2004; Montoya-Weiss et al., 2003). Thereby, the inherent risk of the online channel, which is in general latently inherent in a specific product class or, in this case, a channel (Bettman, 1973), should be the same for all customers. However, the individually handled risk, that is, the risk that the selection of a specific product or, in this case, channel factually elicits in the customer (Bettman, 1973), presumably differs depending on the channel preference, leading to different effects of risk on the attitudes toward the MCTs.

As mentioned previously, one of the main problems with online purchasing is the limited ability to accurately assess product quality due to the lack of haptic information. However, we assume that this is less problematic the more a consumer generally prefers the online channel for purchasing, as here,

the quality risk may be perceived as lower and/or better handled due to the customer's habituation toward it (Doolin et al., 2005; Kuhlmeier & Knight, 2005). The more this applies to a consumer, the more the advantages of the online channel will prevail to him or her, leading to a mitigation of the negative influence of product quality risk on click and collect. Analogously, the positive effect of quality risk on the other two MCTs also becomes weaker the more customers prefer the online channel, as physical product inspection prior to purchase is less important for these customers. The same argumentation applies to moderating the impact of payment and personal data risks. Thus, we assume that the more customers prefer the online channel for purchasing, the better they can cope with the perceived payment and personal data risk, as they are more used to these risks. Besides, if they continuously prefer the online channel for purchasing, they are likely to have had good experiences with revealing their data, which further reduces the negative impact of data risk perceptions on the attitudes toward the MCTs (see also Doolin et al., 2005). Regarding product availability risk, we argue that the positive effect is stronger the more a customer prefers the offline channel, as offline customers face a greater loss of time or extension of effort if the product is not available as they are obliged to visit other physical stores (Su & Zhang, 2009). Customers using the online channel can simply switch to an alternative provider with one click and buy the product from another website. Consumers in the offline channel require a much higher effort to visit another retailer and, in some cases, cannot purchase the product at all, as no accessible physical store has the item in stock. Thus, the MCTs provide a greater value for these customers. Therefore, availability risk has a more positive impact on the attitudes toward the MCTs the more customers usually prefer the offline channel for shopping and the less they prefer the online channel.

Overall, the moderating effect of a consumer's general channel preference shows the same presumed effect for the impacts of all the types of risk. Therefore, we hypothesize:

H5: The more a customer generally prefers to purchase via the online channel, the weaker the effects of the types of risk on the attitude toward the selected MCTs.

2.2.4 Research model

The following research model summarizes the previously developed hypotheses (Figure 5).

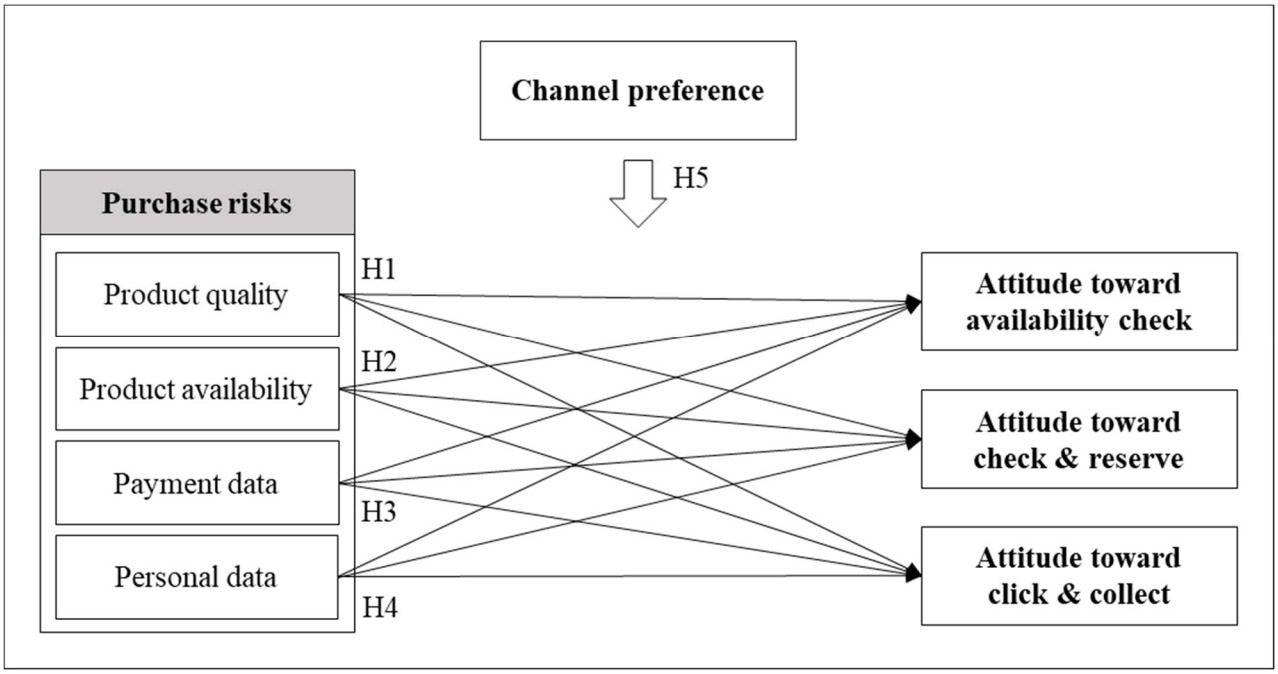

Figure 5. Research model.

2.3 Empirical study

2.3.1 Data collection and sample

To test our hypotheses, we analyzed our framework by conducting an online survey. In the questionnaire, we first asked respondents about their general channel preference (online vs. offline) for buying products. Subsequently, we measured personal characteristics (innovativeness and time pressure[5]) as control variables. Afterward, each of the three MCTs was explained briefly to the respondents before measuring the participants' attitudes toward them. Then, we asked about their subjective risk perceptions regarding the four types of risk. Finally, we measured demographics. Respondents had to answer most of the questions with reference either to electronics or to clothing in order to additionally control for the product class.

We pretested the questionnaire with eight respondents and made minor adjustments. Subsequently, during a five-week period between October and November 2017, students collected the data in Germany by distributing an online link via social media or private communication. Additionally, they surveyed test persons without internet access face-to-face and completed the questionnaire for them. The online survey yielded 1110 valid questionnaires. The respondents adequately represent the pop-

[5] Time pressure refers to whether consumers generally have little time to get things done.

ulation in terms of age and gender quotas. The average age is about 44 years, and the gender distribution is balanced (51.6% male, 48.4% female). 551 respondents answered the questions with reference to electronics, and 559 with regard to clothing.

2.3.2 Measures

We mainly used items from the literature to measure constructs. The four types of risk were measured using seven-point Likert scales ranging from *totally disagree* (1) to *totally agree* (7). All these scales contained three items, except the scale for the availability risk, which consisted of four items. The items for the two data risks were based on McKnight, Choudhury, and Kacmar (2002b) and Toufaily, Souiden, and Ladhari (2013). Product quality risk was measured by items similar to Forsythe and Shi (2003) and Verhoef et al. (2007). Since, to the best of our knowledge, no adequate items for the availability risk exist in the literature, we created our own items. We, therefore, asked experts to evaluate several possible items regarding their suitability for the desired scale, resulting in four items. Attitude was measured with a semantic differential seven-point scale, ranging between -3 and +3, involving three items taken from Gardner (1985). To measure general channel preference, we used a seven-point single-item semantic differential scale ranging from *in the store* to *via the internet* based on Shim et al. (2001). The scale for innovativeness is based on Goldsmith and Hofacker (1991), Konus, Verhoef, and Neslin (2008), and Königstorfer and Gröppel-Klein (2012), and the scale for time pressure is taken from Konus et al. (2008). Each scale consists of three items and had to be answered on a seven-point Likert scale ranging from *totally disagree* (1) to *totally agree* (7). All items are listed in appendix A.

2.3.3 Method

For data analysis, we used IBM's statistical software SPSS. We first conducted a factor analysis to assess the discriminant validity of the four types of risk. Subsequently, we mean-centered variables in order to employ moderated multiple regressions to test the hypotheses (Cohen et al., 2003). Moderated multiple regressions were conducted for each MCT separately.

2.4 Results

2.4.1 Measurement model evaluation

We first checked reliability to evaluate the internal consistency of the scales. Cronbach's alpha exceeded the recommended threshold of .70 for all constructs, indicating adequate reliability (Nunnally, 1978; see appendix A for detailed values). We then conducted a factor analysis for the four types of risk. The analysis resulted in three factors with eigenvalues larger than one. Thereby, results indicate

that respondents only differentiate between three types of risk, as all six items of the two data risks show loadings near .70 or larger for the first factor. The second factor loads highly on the four items measuring the availability risk, and the third factor loads on the three product quality risk items. The exact values of factor loadings can be found in appendix A. As this analysis did not clearly separate personal data and payment data risk, we merged these two types of risk for subsequent analyses. Hence, for the remaining three types of risk, the factor analysis provides support for an appropriate convergent and discriminant validity of the constructs (see Hair et al., 2014b). The Cronbach's alpha value of this new data risk construct is also larger than .70. We calculated sum scores for the construct variables for the subsequent moderated multiple regressions.

2.4.2 Testing of hypotheses

2.4.2.1 Impact of the types of risk on the attitude

We find a negative impact on the attitude toward two of the three MCTs for product quality risk. In particular, the negative effect is stronger for click and collect (ß=-.161; p<.001) but also significantly negative for the availability check (ß=-.078; p=.015). Product quality risk has no impact on the attitude toward check and reserve (ß=-.047; p=.144). Thus, results support H1a, while it is necessary to reject H1b and c. Conversely, availability risk has a significant positive effect on the attitude toward all three MCTs. This impact is strongest for the availability check (ß=.162; p<.001), followed by check and reserve (ß=.156; p<.001) and click and collect (ß=.092; p=.002). Therefore, H2a, b, and c find support. It is necessary to reject H2d as the order concerning the strength of the positive impact on the single MCTs shows the opposite effect of what we expected. Data risk only negatively influences the attitude toward click and collect (ß=-.131; p<.001). We cannot test H3 and H4 separately, though their combined risk type shows the hypothesized effects for click and collect, supporting H3a and H4c. The same applies to H3b and c, as there is no significant effect of data risk on check and reserve (ß=-.044; p=.194) and the availability check (ß=-.023; p=.498). This means at the same time that we have to reject H4a and b, which assumed a significant negative effect. Regarding H4d, the tendency of the order concerning the strength of the negative impact of data risk on the individual MCTs is as expected. Still, due to the non-significant effect on check and reserve and the availability check, we must reject H4d.

2.4.2.2 Moderating effect of channel preference

The results predominantly reveal a significant moderating effect of the consumer's general channel preference on the relationships between product availability and data risk and the attitudes toward the MCTs. In both cases, the relationship between risk and attitude generally becomes weaker the

stronger a customer prefers purchasing via the online channel. For availability risk, this effect is strongest for check and reserve (ß=-.111; p<.001), followed by the availability check (ß=-.079; p=.005) and click and collect (ß=-.075; p=.008). Regarding data risk, the moderation effect is also strongest for check and reserve (ß=.117; p<.001), followed by the availability check (ß=.101; p=.001). For the attitude toward click and collect, the general channel preference has no significant effect on the impact of data risk (ß=.047; p=.123). The same applies to the influence of product quality risk on the attitude in all cases (availability check: ß=-.003; p=.911; check and reserve: ß=-.002; p=.936; click and collect: ß=.022; p=.458). Thus, for availability risk, we can fully support H5. We also find support for H5 regarding data risk, except for the impact of data risk on the attitude toward click and collect. However, due to the missing significance in moderating the relationships between product quality risk and the attitudes, we have to reject H5 for this type of risk regarding all three MCTs. Table 1 summarizes the standardized beta coefficients with the corresponding significance levels, the testing results of the hypotheses, and the adjusted R^2 values for the three regression models.

Table 1. Standardized beta coefficients and significance levels of constructs.

Construct	Availability check	Check & reserve	Click & collect	Hypotheses testing			
Quality risk	-.078*	-.047	-.161***	H1a	✓	H1b,c	×
Availability risk	.162***	.156***	.092**	H2a,b,c	✓	H2d	×
Data risk	-.023	-.044	-.131***	H3a,b,c, 4c	✓	H4a,b,d	×
Channel preference	.143***	.116**	.074*	-		-	
Channel preference * quality risk	-.003	-.002	.022			H5	×
Channel preference * availability risk	-.079**	-.111***	-.075**	H5	✓		
Channel preference * data risk	.101**	.117***	.047	H5 ✓ (except click & collect)			
Adjusted R^2	.199	.197	.210				

Note: ***= p<.001; **= p<.01; *= p<.05; ✓=hypothesis supported; ×=hypothesis rejected
Channel preference with higher values indicating a preference for purchasing via the online channel.

2.4.3 Additional analyses

After testing hypotheses, we present some additional analyses that provide further insight. Generally, the attitude toward the MCTs is most favorable for the availability check (M=1.19; SD=1.66 on a scale ranging between -3 and +3), followed by check and reserve (M=0.88; SD=1.71) and click and collect (M=-0.03; SD=1.78), as shown in Figure 6.

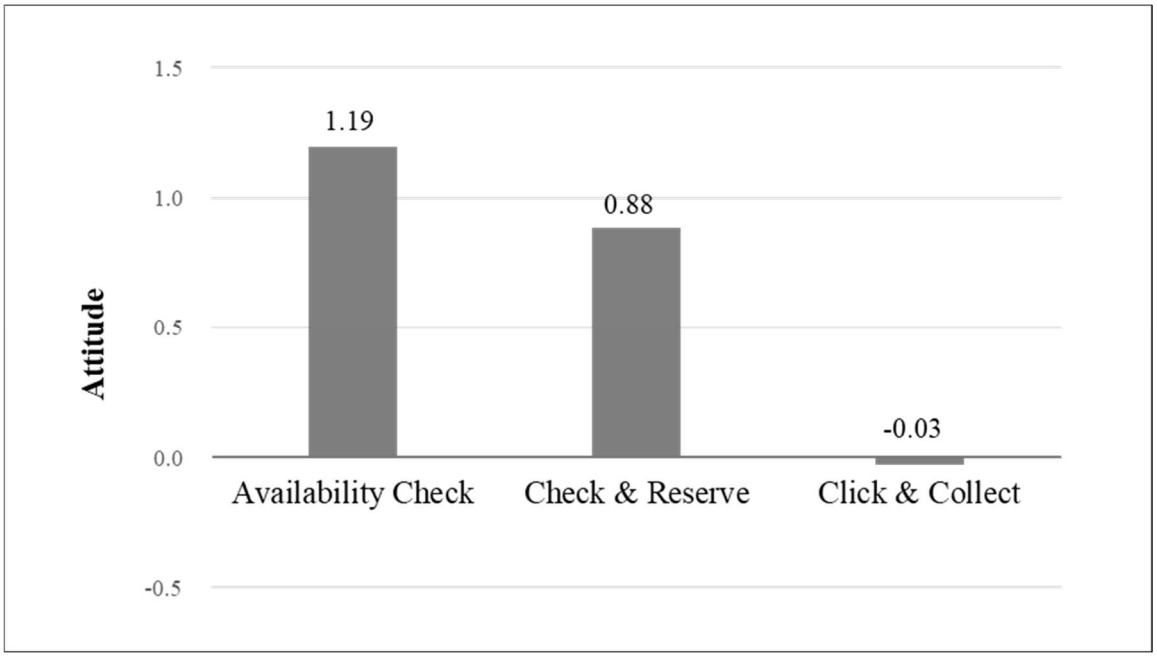

Figure 6. Mean differences of the attitudes toward the MCTs.

Furthermore, we found significant direct effects of the channel preference on the attitudes toward the MCTs, with the strongest effect for the availability check (ß=.143; p<.001), followed by check and reserve (ß=.116; p=.001) and click and collect (ß=.074; p=.025). Thus, the more a customer prefers the online channel for purchasing, the more positive his/her attitudes are toward the MCTs. Furthermore, we controlled for the product category. Results indicate that the attitude toward the MCTs is significantly more positive for electronics than for clothing in all cases (all p<.01). Additionally, we find significant positive impacts of innovativeness and time pressure (all p<.01) on the attitude toward each MCT, except for the effect of time pressure on the attitude toward click and collect, which is not significant (p=.193). Table 2 summarizes the exact values.

Table 2. Standardized beta coefficients and significance levels of control variables.

Construct	Availability check	Check & reserve	Click & collect
Product category	.110***	.153***	.097**
Innovativeness	.178***	.173***	.208***
Time pressure	.097**	.097**	.039

Note: ***= p<.001; **= p<.01; *= p<.05. Product category coded 0 = clothing, 1 = electronics.

2.5 Discussion

As only very limited research has investigated MCTs, our study is among the first to uncover the effects of particular types of perceived risk on the attitudes toward specific MCTs. Thereby, the results reveal that risks significantly influence the attitudes toward the chosen MCTs and thus play an

essential role in the formation of a positive attitude. Firstly, the study shows that consumers do not distinguish between payment and personal data risk. Consequently, these types of risk need to be considered as one risk type concerning customer data in general.

Secondly, predominantly in line with our expectations, all remaining three types of risk have significant impacts on the attitudes toward the MCTs. Thereby, product quality risk and data risk exert negative effects, while product availability risk positively influences attitudes. Thus, these results reveal that certain risk perceptions may deteriorate the attitudes toward the MCTs, while others have the potential to improve them. Therefore, not all risk perceptions are negative in terms of their effect on the attitudes toward MCTs.

Thirdly, the analyses show differences in the impact of the types of risk on the attitude between the three selected MCTs. Generally, the effects of the different types of risk are worst for click and collect, as the negative effects (product quality and data risk) are highest, while the positive effect (product availability risk) is lowest compared to the other two MCTs. Regarding the impact of product quality risk, we find a negative effect on the availability check attitude and no significant impact on the attitude toward check and reserve. This confutation of the expected positive influence may occur as even though the consumer does not actually purchase the product on the internet, s/he at least decides on a particular product online when using these two MCTs. The physical inspection of the product is thus not possible in the product selection process, which prevents a positive effect of product quality risk on the availability check and check and reserve. Regarding the impact of product availability risk, the order concerning the strength of the impact on the individual MCTs shows exactly the opposite of what we expected (i.e., we observed the strongest effect for the availability check and the smallest effect for click and collect). A possible explanation could be that the fact the customer has already purchased the product mitigates the positive impact of product availability risk on the attitude toward click and collect. On the one hand, it may indeed be more assured that the product is available when the customer wants to pick it up. Still, on the other hand, the consumer would feel worse if the product was not available even though s/he has already paid for it. Thus, the impact of product availability risk is less positive for click and collect, while it is almost equally favorable for the other two MCTs.

Fourthly, we find a moderating effect of a consumer's general channel preference on the relationships between product availability and data risks and the attitudes toward the MCTs. The results reveal that the more a customer prefers buying via the online channel, the weaker the effects of the different types of risk on the attitude are. As this does not apply to product quality risk, it emphasizes the great importance of paying particular attention to this type of risk, as it has an equally negative impact for

all customer groups and cannot be mitigated by frequent usage or preference for the online channel. A possible explanation for this result is that it is most difficult for a consumer to become accustomed to product quality risk or benefit from positive prior experiences since s/he must evaluate a new product with individual characteristics every time s/he makes a purchase, even in the same product category. Consequently, the assessment does not become more accessible with the experience of having evaluated other products previously. Thus, a habituation effect can only occur to a very limited extent compared to, for example, data risk, where the revealing of data is always approximately the same and customers, therefore, develop more trust the more often they use the online channel and disclose their data (Doolin et al., 2005). Moreover, only for the relationship between data risk and the attitude toward click and collect, there is no moderating effect of channel preference, which can be explained by the fact that this technology requires consumers to disclose the largest amount and most sensitive data, causing a negative effect on the attitude regardless of the channel preference.

Fifthly, descriptive results reveal that consumers have the most negative attitude toward click and collect, while they evaluate the online availability check most positively. This is remarkable as many retailers regard click and collect to be the most important omni-channel technology (Forrester, 2014; Kim et al., 2017) and Ma et al. (2014) state that it is among the most popular MCTs offered by multi-channel retailers (see also Hübner, Wollenburg, & Holzapfel, 2016; Jin et al., 2018). A possible explanation for this result is that click and collect is less used than, for example, the online availability check (Accenture, 2012). This may lead to a less positive attitude, as people often evaluate things they do not know well less favorably than things they are familiar with (Zajonc, 1968). Apart from that, however, it is also possible that the explanation for this lies in the most negative influence of the considered risk types on click and collect. This may cause a generally more negative basic attitude toward click and collect compared to the other two MCTs.

Sixthly, additional analyses also show significant main effects of channel preference on the attitude toward the particular MCTs, insofar as the more customers prefer the online channel for purchasing, the more positively they evaluate all selected MCTs. Since consumers, who prefer the online channel are likely to value its benefits more than customers who buy offline instead, it is likely that this positive evaluation of the internet may also carry over to online elements of the chosen MCTs.

Seventhly, we find that the attitudes toward the MCTs are generally more positive for electronics than for clothing. This can be explained by the individual characteristics of these two product categories. Electronics are search goods, which means that consumers can adequately evaluate their quality prior to purchase, without the need of a physical inspection of the product. Therefore, for electronics, the selected MCTs can benefit consumers as they allow more convenience and freedom of choice when

purchasing the product without evoking a greater risk regardless of the purchase channel. Clothing ranks among search goods, as well, when purchased in the store. However, when offered online, clothing becomes an experience good, that is, customers can adequately evaluate its quality, for example, the actual color or haptic aspects, only after purchase (see Frasquet et al., 2015). Thus, for clothing, consumers presumably do not evaluate the MCTs as positively as they do for electronics, as they are more likely to decide on a particular product offline, where they can incorporate haptic information in their decision (see also Gehrt & Yan, 2004).

2.5.1 Management implications

In general, multi-channel retailers should try to improve consumers' attitudes toward the selected MCTs by considering the outlined effects of the different types of risk and by influencing the consumers' risk perceptions accordingly. Firstly, as quality risk exerts a significant negative impact on the availability check and click and collect, it is crucial for retailers to reduce this risk perception, for example, by providing as realistic images as possible, additional product videos, opportunities for virtual fitting, or authentic customer reviews. Since the consumer's channel preference does not moderate these effects, reducing the perceived quality risk in this regard is equally important for all customer groups. Conversely, multi-channel retailers can use availability risk as an opportunity to ensure more positive attitudes toward their MCTs, especially when consumers rather prefer the offline channel for purchasing. Therefore, retailers should, for example, advertise the opportunity to check in-store product availability via the internet in their store or recommend the MCTs especially to offline consumers, who cannot buy their preferred product as it is out of stock.

Secondly, as data risk perceptions negatively impact the attitude toward click and collect, retailers should only collect data that is absolutely necessary. Also, they should reassure their customers that they are well protecting the data collected when offering this technology. They could, for instance, highlight data security activities they undertake. Further, as consumers apparently do not distinguish between different types of data, retailers should not do so either. They should reassure consumers that all kinds of data are equally well protected, thereby minimizing risk perceptions to ensure more positive attitudes toward the MCTs.

Thirdly, retailers should consider that the risk perceptions selected in this study most negatively affect click and collect, as the negative influences are the highest, while the positive effect is the lowest for this MCT. In addition, consumers generally have the most negative attitude toward click and collect. Nevertheless, click and collect is among the most popular MCTs offered by multi-channel retailers (Jin et al., 2018; Kim et al., 2017; Ma et al., 2014), despite it being presumably the most expensive of the three selected MCTs due to it having the highest complexity. Taking this, as well as the results

of our study into account, it does not seem advisable for retailers to focus that strongly, or even exclusively on click and collect. Besides the presumably higher costs, consumers evaluate it the worst, and the examined types of risk most negatively affect it. Consequently, retailers should instead think about supplementing click and collect with the availability check and check and reserve or focusing more on these MCTs, as here, both attitudes and the impacts of the different types of risk are more positive, while additionally costs may be lower. However, as this is among the first empirical studies to compare the evaluation of the selected MCTs, further research is needed to validate the results to give reliable implications for a retailer's MCT offering, especially as this study does not consider any other outcomes that may be more positive for click and collect.

Fourthly, as additional analyses reveal that consumers evaluate the selected MCTs more positively, the more they generally prefer the online channel for purchasing, retailers should promote the MCTs especially to offline customers visiting their store. In doing so, they should point out the advantages of the MCTs and actively seek to minimize the consumer's perceived quality and data risks.

2.5.2 Theoretical contribution

Given the relatively sparse research on MCTs, our study extends existing literature in several ways. Firstly, our study is among the first to empirically investigate factors that influence attitudes toward MCTs. Existing omni-channel literature instead analyzes several outcomes of channel integration or individual MCTs (e.g., Frasquet & Miquel, 2017; Gallino & Moreno, 2014; Li et al., 2018; Yang et al., 2017; Zhang et al., 2018) or factors influencing the intention to use particular MCTs (e.g., Chatterjee, 2010; Kim et al., 2017). Our findings provide further insight into how the actual usage of the selected MCTs occurs, and demonstrates that researchers should consider risk perceptions when analyzing MCTs.

Secondly, we examine the impact of risk perceptions on three different web-to-store MCTs in comparison to each other. Prior studies focus on MCTs in general by examining overall channel integration (e.g., Herhausen et al., 2015; Yang et al., 2017) or by solely investigating single MCTs, mostly click and collect, in comparison to pure online shopping (e.g., Kim et al., 2017). Thus, the separate and comparing consideration of three specific MCTs contributes to the multi-channel literature by providing detailed information on individual technologies. The consideration of check and reserve in particular, reveals new insights, as almost no studies have empirically analyzed this technology so far (Jin et al., 2018).

Thirdly, we provide insights into how consumers' channel preferences moderate the proposed effects of the different types of risk. Thus, our study provides information about customer groups that researchers should pay particular attention to when investigating consumers' risk perceptions in a multichannel context.

Fourthly, we analyze the outcomes of different specific risk perceptions not only with regard to the use of either the offline (e.g., Derbaix, 1983; Dowling & Staelin, 1994; Roselius, 1971) or online channel (e.g., Arora & Kaur, 2018; Katta & Patro, 2017), but to technologies supporting their combined use. Hence, our study extends current research by showing that risk perceptions may have different consequences in the interplay between online and offline channels compared to a single-channel perspective.

2.5.3 Limitations and future research

When interpreting the results of this study, certain limitations have to be taken into account. Firstly, we did not conduct the study in an actual purchase setting. Thus, the responses may not fully reflect authentic consumer evaluations of MCTs in such settings. Future studies should attempt to include real customers and existing retailers (who already offer the chosen MCTs).

Secondly, the study only focuses on three types of web-to-store technologies. Consequently, conclusions can only be drawn on a limited number and kind of MCT, which could be expanded in future research by, for example, also examining store-to-web technologies.

Thirdly, the research model used does not include all possible factors influencing the attitudes toward the selected MCTs. Future studies may therefore include additional influencing factors, since risk perceptions and their effects may differ, for example, depending on the culture (Zhao et al., 2008) or distance to the retailer's store (Chocarro, Cortiñas, & Villanueva, 2013; Gallino, Moreno, & Stamatopoulos, 2017; Jin et al., 2018).

2.6 Conclusion

The study has revealed that product quality and data risks negatively influence attitudes toward the MCTs, while product availability risk demonstrates a positive impact and that these effects depend on the type of MCT as well as customers' general channel preferences. In particular, the attitude toward click and collect suffers the most from data and product quality risks, while it benefits the least from availability risk. Therefore, retailers should focus more on technologies that suffer less and benefit more from the different types of risks. Furthermore, they should seek to minimize quality and data risks. As results also show that product availability and data risks become more important the

more customers prefer the offline channel for purchasing, retailers should consider such risks predominantly for this customer segment.

3 The role of perceived risk in MCT design[6]

The integration of online and offline distribution channels has become a major topic in practice and research. Several studies reveal beneficial outcomes for retailers if consumers use multiple channels. Therefore, many retailers offer multi-channel technologies, that is, click and collect, check and reserve, and the availability check, which encourage this behavior. However, research is still sparse on how retailers should design these MCTs to provide the highest usefulness for consumers. Our study thus analyzes the impact of different MCT design characteristics on consumers' perceived usefulness of these MCTs. Moreover, we examine how consumers' perceived time and product availability risk mediate these effects. The results show that some MCT design characteristics exhibit the expected positive impacts on consumers' perceived usefulness of the MCTs, while others seem to be less relevant and even counterproductive. In particular, a specified (vs. unspecified) product pick-up time and a high (vs. low) displayed inventory status lead to a higher perceived usefulness of the MCTs via the two types of risk. However, the immediate (vs. delayed) confirmation of product reservations does not have any positive effects. In fact, it even decreases the perceived usefulness of click and collect. These findings provide implications for the design of MCTs.

Co-author: *Stephan Zielke (University of Wuppertal)*

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3.1 Introduction

Due to the rapid growth of multi- and omni-channel retailing in recent years, customer needs and expectations regarding the opportunity of seamless channel switching are growing (Forrester, 2014). Consequently, retailers necessarily need to combine their channels to stay competitive (Forrester, 2014; Mahar & Wright, 2017). Hence, they introduce so-called MCTs, which we define as 'technologies that intend to integrate the online and offline channels of multi-channel retailers and aim to create a seamless buying experience for the customer' (Ortlinghaus et al., 2019, p.263).

In this paper, we focus on web-to-store technologies, which lead customers from the online to the offline channel (Picot-Coupey et al., 2016). They represent a means to re-increase in-store-traffic in times in which traditional physical stores are struggling to survive in the competition of the online pure players (Gallino & Moreno, 2014; Mahar & Wright, 2017; Wollenburg et al., 2018). Besides simply inducing channel-switching behavior, web-to-store technologies may additionally prevent consumers from also switching retailers when they switch channels (see Bell et al., 2014). When consumers visit the retailer's store to pick up products, they have searched for or already ordered on the same retailer's website, employees are given the opportunity to cross- or up-sell further products (Gallino & Moreno, 2014; Ma et al., 2014). This may lead to higher sales volumes and the saving of packaging or shipping costs (Forrester, 2014; Gallino & Moreno, 2014; Gao & Su, 2017a; Mahar et al., 2014). Moreover, several studies reveal that consumers' use of multiple integrated channels is generally associated with a number of favorable outcomes for retailers (Herhausen et al., 2015; Zhang et al., 2018). Hence, it seems worthwhile for retailers to encourage consumers to use multiple channels by using such MCTs when purchasing their products.

However, research on web-to-store MCTs is still sparse (Herhausen et al., 2015; Mahar & Wright, 2017; Melacini et al., 2018; Wollenburg et al., 2018). Only a limited number of previous studies examine specific MCTs (Jin et al., 2018). Some authors already analyzed web-to-store technologies, predominantly click and collect, that is, buying a product online and picking it up at a local store (Chatterjee, 2010; Gallino & Moreno, 2014; Gao & Su, 2017a; Jara et al., 2018; Kim et al., 2017; Ma et al., 2014). However, recent literature also examines similar MCTs, such as check and reserve, that is, reserving a product online and purchasing and picking it up at the store (e.g., Hübner, Holzapfel, & Kuhn, 2016; Jin et al., 2018; Wollenburg et al., 2018), or the opportunity to check in-store product availability online, referred to as availability check (e.g., Bendoly et al., 2005; Herhausen et al., 2015; Oh & Teo, 2010; Wollenburg et al., 2018).

Even though past literature examines the outcomes of the introduction of such MCTs, these studies mainly focus on the consequences of offering MCTs compared to not offering them (e.g., Herhausen

et al., 2015). However, many retailers have already implemented the selected MCTs (Hübner, Holzapfel, & Kuhn, 2016) and consumers increasingly expect them to do so (Forrester, 2014; Melacini et al., 2018). Therefore, the question may no longer be whether to offer MCTs or not (Gallino & Moreno, 2014). Rather, research has to analyze the selected MCTs in more detail (see also Bell et al., 2014; Picot-Coupey et al., 2016). As the implementation of MCTs can be very costly and complex (Bendoly et al., 2005; Forrester, 2014; Gallino & Moreno, 2014; Hübner, Holzapfel, & Kuhn, 2016; Wollenburg et al., 2018), retailers have to decide in which way to design their MCTs to offer a high customer value while minimizing costs and effort (Mahar & Wright, 2017; Melacini et al., 2018).

Against this background, retailers have to consider different aspects. Generally, consumers may perceive risk when purchasing products via multiple channels, as existing MCTs often include a specific uncertainty. This uncertainty refers to, for example, an imprecise or uncertain specification of the time when consumers can pick up products ordered or purchased online in the store (Park & Kim, 2007), which can lead to time risk. In practice, this pick-up duration strongly varies from store to store (Mahar et al., 2014). Moreover, retailers often do not confirm online product reservations immediately, which may enhance consumers' perception of product availability risk. Additionally, when offering the opportunity to check in-store product availability, the displayed number of products available may significantly influence consumers' perceived availability risk as well (Wollenburg et al., 2018).

To address these problems, our study investigates how characteristics of MCT design elements influence consumers' perceived usefulness of these technologies via specific risks they may perceive. In doing so, we intend to find out which investments in MCT design may be rewarding for retailers, as a higher perceived usefulness through risk reduction may in turn increase consumers' MCT use intention. However, we focus on the effects on perceived usefulness, which precedes the use intention (according to, e.g., the extensively proven Technology Acceptance Model by Davis, Bagozzi, & Warshaw, 1989). Thus, we investigate the following research questions:

- How do different characteristics of MCT designs (i.e., product pick-up time, confirmation date of product reservations, displayed product availability) affect consumers' perceived usefulness of the selected MCTs?
- Do consumers' risk perceptions (i.e., time and product availability risk) mediate these effects?

By answering these research questions, this paper extends the current literature, which mostly focuses on the outcomes of individual MCTs as such (e.g., Gallino & Moreno, 2014) or investigates exogenous impact factors on consumers' use intention for particular MCTs (e.g., Kim et al., 2017). Our study goes more into detail by examining the effects of specific design elements of MCTs. Thereby,

we also extend a second research stream that deals with perceived risk. Prior studies mainly analyze perceived risk either in the online (e.g., Katta & Patro, 2017) or offline channel (e.g., Stone & Mason, 1995). In particularly investigating the uncertainty in specific MCT design elements, we show how the interplay of the two channels may jointly affect consumers' risk perceptions.

Our study is also practically relevant, as it aims to identify which MCT design characteristics consumers perceive as most useful and, consequently, which of them deliver the highest value for them, which is a crucial consideration in omni-channel retailing (Melacini et al., 2018; Weber & Badenhorst-Weiss, 2018). Moreover, recent studies reveal that retailers regard the management of order fulfillment and stock availability (Weber & Badenhorst-Weiss, 2018) or of inventory transparency concerning availability and delivery time (Hübner, Holzapfel, & Kuhn, 2016) as main challenges in multi-channel retailing, making it worthwhile to examine these issues in a more detailed way. The results will help retailers to decide whether to invest money and effort in reducing specific uncertainties in their MCTs.

3.2 Theoretical background

3.2.1 Multi-channel technologies

As omni-channel retailing and corresponding channel integration activities are increasingly gaining attention in theory and practice (Gao & Su, 2017a; Jin et al., 2018), a growing number of studies deals with particular MCTs. However, these studies mainly concentrate on external impact factors on the intention to use MCTs. For example, Chatterjee (2010) reveals a positive effect of high waiting-time costs on the intention to use click and collect. Further impact factors on the intention to use click and collect are the perceived characteristics of innovation (i.e., relative advantage, compatibility, and complexity) and consumers' perceived online risk, which are moderated by situational factors and the product type (Kim et al., 2017). Moreover, Ma et al. (2014) find a positive influence of customers' need for control on their expectations regarding four different dimensions of service convenience when using click and collect. Other studies concentrate on outcomes of the MCTs as such. For example, Wollenburg et al. (2018) and Kleinlercher et al. (2018) indicate that the selected MCTs can steer customers from the online toward the offline channel, thus generally influencing consumers' channel choice and switching behavior. Regarding the availability check, researchers show that it can contribute to higher perceived information quality (Oh & Teo, 2010). Gao and Su (2017a) reveal that click and collect enhances the convenience of offline shopping, as employees already gather the selected products and provide them to the customer at a pick-up point. In line with this, Chatterjee (2010) identifies that consumers' retailer satisfaction is higher when click and collect is available and

that consumers make additional store purchases when using this MCT. Gallino and Moreno (2014) and Gao and Su (2017a) show in more detail that click and collect can lead to higher in-store traffic and sales by making product availability information more reliable. Investigations that are more specific even already examine some practical design factors of single MCTs and their outcomes. Jin et al. (2018) analyze the optimal design of the click and collect service area and the most suitable product type for this MCT. Additionally, they compare the profitability of click and collect and check and reserve, showing that under specific conditions, check and reserve can be more profitable for retailers than click and collect. Murfield et al. (2017) reveal a positive effect of the timeliness of a click and collect order on consumer satisfaction, which in turn positively affects consumer loyalty. Results from Jara et al. (2018) show that click and collect can create long-term customer value, which is mainly influenced by characteristics of the website and the pick-up station. However, to our knowledge, no detailed studies exist on how specifically to design MCTs to increase their perceived usefulness from a customers' perspective.

3.2.2 Perceived risk

For consumers' perceived risk, we follow Bauer's (1960) general definition of risk, which implies that risk comprises the consequences of a consumer's behavior that s/he cannot foresee with certainty and that s/he considers negative. In doing so, we focus on the perceived risk, that is, the risk that a consumer subjectively perceives (Mitchell, 1999). Past literature divided this risk into several types of risk, which each refer to a different aspect of loss or uncertainty, depending on the particular reference object (Dowling, 1986). Thereby, the most common types of risk in the context of purchase decisions are functional or performance risk, financial, physical, psychological, social, and time or convenience risk (e.g., Bearden & Mason, 1978; Festervand et al., 1986; Peter & Ryan, 1976; Pi & Sangruang, 2011; Roselius, 1971; Stone & Mason, 1995).

In the present study, especially time risk may play a role regarding the effects of differing displayed pick-up times for check and reserve and click and collect. Time risk generally exists if a consumer is uncertain about the temporal effort, which the purchase or use of a product or a potential repair or replacement may entail (Featherman & Pavlou, 2003; Pi & Sangruang, 2011; Roselius, 1971; Stone & Mason, 1995). In our study context, time risk refers to the waiting time before a customer can pick up a product at the local store. Regarding the general time risk, Park and Kim (2007) find that stock availability information for a pure online purchase influences consumers' perceived time risk. They likewise show that consumers' perceived consumption delay increases perceived time risk. Researchers also examine different outcome factors of perceived time risk. Bezes (2016) shows that it has a higher impact on offline purchases than on purchases via the internet. However, Thakur and

Srivastava (2015) find that time risk is one of the most influencing types of risk regarding the intention to shop online. According to Park and Kim (2007), perceived time risk exerts a negative effect on a customer's attitude toward the corresponding website, which in turn affects the purchase intention. Moreover, researchers identify a negative impact of time risk on the adoption intention of e-services (Featherman & Pavlou, 2003).

As we examine risks in the particular context of purchasing using the selected MCTs, we additionally include a more specific type of risk, namely availability risk. Availability risk is the risk of a desired product not being available at the retailer's offline store (Gallino & Moreno, 2014). This type of risk is closely related to time risk, as the customer may have to invest time to visit alternative stores to check if the desired product is available elsewhere if the selected store does not have it in stock (Bendoly et al., 2005; Su & Zhang, 2009). However, this temporal effort is merely a consequence of the actual risk of an unavailable product, whereas time risk directly refers to a possible time loss, for example, caused by waiting time. Prior studies also address availability risk sporadically, mainly in the specific context of MCTs. Gao and Su (2017a) find that online availability information diminishes or eliminates availability risk, leading to more offline store visits. Analogously, Gallino and Moreno (2014) identify the same effect for click and collect, where this effect is even stronger as availability information becomes more credible. Results from Bendoly et al. (2005) indicate that channel integration via the provision of the availability check reduces consumers' perceived availability risk. Moreover, Su and Zhang (2009) show that committing to a definitely available product inventory or offering availability guarantees can also decrease availability risk.

To examine the research questions outlined in the introduction, we mainly build on the results of existing literature and on the theory of perceived risk, which generally states that if consumers perceive risk, they will seek to reduce it (Bauer, 1960). In doing so, consumers will primarily seek further information to diminish existing uncertainties (Dowling, 1986; Gao & Su, 2017b) and thus reduce the perceived risk (Mitchell et al., 1999; Montoya-Weiss et al., 2003). Perceived risk in turn often exerts a negative impact on perceived usefulness (Biucky, Abdolvand, & Harandi, 2017; Falk et al., 2007; Featherman & Pavlou, 2003). Moreover, extant research has proved a significant positive impact of informational aspects on the perceived usefulness of a website (e.g., Azam, 2017). Conversely, we generally expect a negative impact of little or inappropriate information and resulting uncertainty in the selected MCTs on consumers' perceived usefulness of these technologies, mediated by consumers' perceived risk.

3.3 Development of research hypotheses

3.3.1 Influence of product pick-up time on perceived usefulness

When retailers do not specify the product pick-up time for click and collect or check and reserve on their website, the time it takes for the product to be received becomes uncertain for consumers (Park & Kim, 2007). Following the line of thoughts mentioned earlier, this will lead to increased perceived time risk due to the uncertain waiting time (Park & Kim, 2007; see also Montoya-Weiss et al., 2003). Consequently, according to the theory of perceived risk and the results from prior studies, customers will perceive click and collect or check and reserve with an unspecified pick-up time as not very useful, as MCTs with this design cannot reduce their perceived time risk, or even increase it (see also Falk et al., 2007). Conversely, if the retailer specifies a precise pick-up time for the MCTs, time risk will decrease when using them, leading to a higher perceived usefulness. Montoya-Weiss et al. (2003) come to a similar conclusion, showing that online information availability is very important for consumers to switch from the online to the offline channel. This indicates that consumers will perceive the selected MCTs as more useful when they provide precise information (assuming the pick-up time is within an acceptable or usual time window, which in practice is usually the same day). Researchers, moreover, show a negative relationship between the uncertainty regarding waiting times and consumers' service or website evaluation (Hui & Tse, 1996; Park & Kim, 2007), which also supports our assumptions. Thus, we hypothesize:

H1: If the product pick-up time is specified, consumers' perceived usefulness of a) check and reserve and b) click and collect is higher than if the product pick-up time is unspecified. c) These relationships are mediated by consumers' perceived time risk.

Regarding the perceived usefulness of the availability check (when offered together with check and reserve or click and collect), we expect a different effect based on the implications of the signaling theory (Spence, 1973). When the product pick-up time is unspecified and consequently, consumers' perceived time risk increases, the availability check may provide a signal by which consumers can better assess when the desired product may be ready for pick-up, as they are informed about the current inventory status in-store (see also San Martin & Camarero, 2009). Hence, the availability check has the potential to decrease perceived time risk, leading to a higher perceived usefulness of this technology, when pick-up times are unspecified. When the product pick-up time for check and reserve or click and collect is specified, though, the availability check may be less useful to customers, because they already know when they will receive the product. Therefore, time risk is likely to be rather low, so that risk mitigation through an availability check is superfluous. We conclude:

H2: a) If the product pick-up time is unspecified, consumers' perceived usefulness of the availability check is higher than if the product pick-up time is specified. b) This relationship is mediated by consumers' perceived time risk.

3.3.2 Influence of confirmation date of product reservations on perceived usefulness

We differentiate between an immediate confirmation of an online product reservation and a confirmation within the next hour after placing the reservation request, as these are common designs in practice. In the former case, consumers can be relatively sure that the selected product is available for pick-up at the retailer's store (see Gallino & Moreno, 2014). However, in the latter case, uncertainty may arise regarding the effective availability of the product. Attribution theory suggests that consumers will search for a plausible explanation as to why the retailer cannot immediately confirm the reservation (Heider, 1958; Kelley, 1967). Thus, the assumption is likely that the desired product may no longer be available at the store or the retailer is at least not sure that it is, as otherwise, the reservation could have been confirmed immediately. Moreover, if the confirmation takes some time, the selected product may be sold out in the meantime between the request and confirmation of the reservation. This in turn may lead to an increasing product availability risk, which consequently decreases consumers' perceived usefulness of check and reserve. This is also consistent with the mentioned relationships between risk and usefulness as well as with the theory of perceived risk. We propose:

H3: a) If the confirmation of a product reservation happens immediately, consumers' perceived usefulness of check and reserve is higher than if the product reservation is confirmed with a temporal delay. b) This relationship is mediated by consumers' perceived product availability risk.

While check and reserve, in the event of a delayed reservation confirmation, cannot immediately assure product availability, click and collect can because when using this MCT the customer already buys the product (Gao & Su, 2017a). Consequently, customers can be sure to receive the product, as the retailer is legally obligated to provide it for them, leading to a decreased availability risk (see Gallino & Moreno, 2014; Su & Zhang, 2009). Additionally, the availability check may also reduce availability risk resulting from a delayed reservation confirmation, as consumers can check, whether indeed low availability is causing this delay or not. As explained, this will lead to a higher perceived usefulness of click and collect and the availability check. We hypothesize:

H4: If the product reservation is confirmed with a temporal delay, consumers' perceived usefulness of a) click and collect and b) the availability check is higher than if the confirmation of a product reservation happens immediately. c) This relationship is mediated by consumers' perceived product availability risk.

3.3.3 Influence of displayed product availability on perceived usefulness

The availability check generally has the potential to reduce consumers' product availability risk by informing them, whether and how many products are still available in the offline store (Gao & Su, 2017b). This may hold true for a high displayed availability. However, if the website shows a low availability, even a slight discrepancy regarding the actual inventory can result in a situation where the selected product is no longer available when the customer visits the store. This may occur because retailers are often unable to display accurate availability data (DeHoratius & Raman, 2008; ECC Köln, 2020) or because other customers purchase the focal product in the time period between the consumer's availability check and his or her visit at the retailer's store. Consequently, availability risk increases (Wollenburg et al., 2018). Conversely, when the displayed product availability is high, slight discrepancies still result in a product being available, leading to a lower perceived availability risk (Su & Zhang, 2009). This in turn positively affects the perceived usefulness of the availability check. We thus conclude:

H5: a) If the displayed product availability is high, consumers' perceived usefulness of the availability check is higher than if the displayed product availability is low. b) This relationship is mediated by consumers' perceived product availability risk.

Due to the presumably low availability risk when the displayed availability is high, an online product reservation or purchase prior to the pick-up in the offline store will not provide an additional benefit to the customer in terms of an intended availability risk reduction. Conversely, if the displayed product availability is low and consumers' perceived availability risk increases, a prior online product reservation or purchase may constitute beneficial opportunities to reduce this risk, as offline product availability will then become more assured (Gao & Su, 2017a; Gallino & Moreno, 2014). As, according to the theory of perceived risk, consumers will strive for this risk reduction, we hypothesize:

H6: If the displayed product availability is low, consumers' perceived usefulness of a) check and reserve and b) click and collect is higher than if the displayed product availability is high. c) These relationships are mediated by consumers' perceived product availability risk.

Additionally, we propose a positive impact of the perceived usefulness on consumers' use intentions of the MCTs. As this is not the focus of our study, we do not put these assumptions into formal hypotheses, but mention that extant literature extensively proves this relationship, according to the Technology Acceptance Model by Davis et al. (1989; e.g., Biucky et al., 2017; Featherman & Pavlou, 2003). Moreover, we analyze interaction effects without proposing formal hypotheses. Figure 7 graphically summarizes our research model.

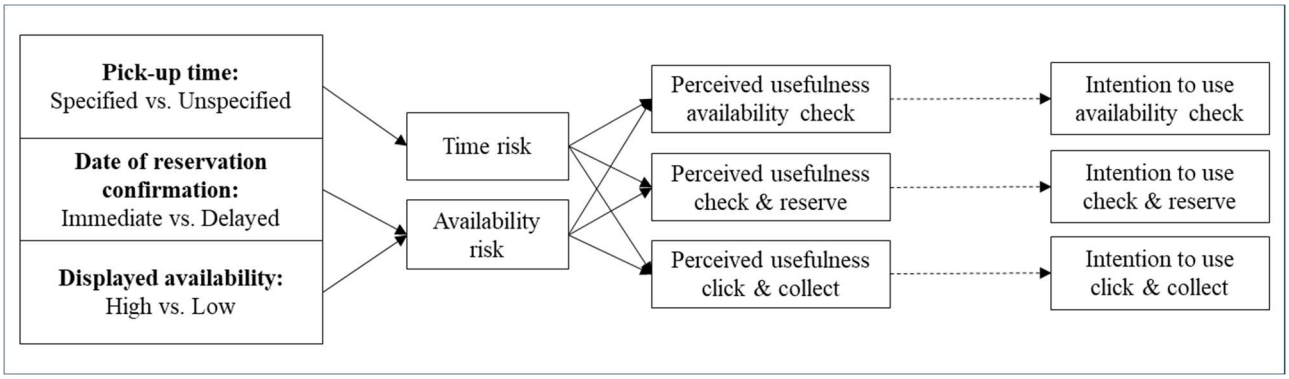


Figure 7. Research model.

3.4 Empirical study

3.4.1 Data collection and sample

We conducted a scenario-based online experiment with a 2 (displayed availability: high, low) × 2 (date of reservation confirmation: immediate, delayed) × 2 (pick-up time: specified, unspecified) between-subjects design. Participants were randomly assigned to one of the eight treatment groups, shown in table 3.

Table 3. Overview of scenarios.

Scenario	Product pick-up time (check & reserve + click & collect)	Date of reservation confirmation (check & reserve)	Product availability (availability check)
1	Specified *(same-day: in 4 hours)*	Immediate	High *(10 items)*
2	Unspecified *(after e-mail notification)*	Immediate	High *(10 items)*
3	Specified *(same-day: in 4 hours)*	Delayed *(within one hour)*	High *(10 items)*
4	Unspecified *(after e-mail notification)*	Delayed *(within one hour)*	High *(10 items)*
5	Specified *(same-day: in 4 hours)*	Immediate	Low *(less than 3 items)*
6	Unspecified *(after e-mail notification)*	Immediate	Low *(less than 3 items)*
7	Specified *(same-day: in 4 hours)*	Delayed *(within one hour)*	Low *(less than 3 items)*
8	Unspecified *(after e-mail notification)*	Delayed *(within one hour)*	Low *(less than 3 items)*

All respondents were asked to imagine purchasing new sports shoes. According to the scenario, they had enthusiastically signed up for a new running group, but their current sports shoes were worn-out. Participants were instructed that they visit the website of a familiar multi-channel sports retailer who runs an online shop as well as physical stores in the respondent's hometown. With this information, we controlled for a high product involvement, moderate time pressure, and a rather short distance from the participants home to the retailer's next store. We provided a fictitious website with product information and pictures of the shoes (see appendix B) and asked the participants to imagine that they liked the shoes and wanted to purchase them. Afterwards, we instructed the respondents to carefully view the sports shoes' offline availability information and the different purchase options with the

corresponding information on the presented website, depending on the treatment group. In the following questionnaire, participants had to respond to manipulation and realism checks and answer questions pertaining to their perceived time and product availability risk, their perceived usefulness of the selected MCTs, and their intention to use them. Additionally, we asked for consumers' familiarity with the selected MCTs (binary: yes/no). Finally, we measured the demographics.

We pretested the questionnaire with 19 German graduate students and adjusted it accordingly. Subsequently, during a three-week period between April and May 2018, students collected the data by distributing the final online link via social media or private communication in Germany. The online survey yielded 440 valid questionnaires. The average age is about 31 years and the gender distribution is fairly balanced with 45.1% male and 54.9% female respondents. For each scenario, we generated between 48 and 60 completed questionnaires. Most of the respondents had already been familiar with the selected MCTs prior to the survey (availability check: 87.0%, check and reserve: 70.8%, click and collect: 80.2%).

3.4.2 Measures

All items were measured on seven-point Likert scales, mainly ranging from *totally disagree* (1) to *totally agree* (7). The two risk scales each contained four items referring to perceived situational risks. For time risk, we built on a similar scale from Stone and Mason (1995). The items for product availability risk are based on Ortlinghaus et al. (2019) and verbalized analogously to the items measuring time risk. We measured the perceived usefulness of the selected MCTs with a single item for each MCT, similar to items from Ashraf, Thongpapanl, and Auh (2014) and Wu, Jayawardhena, and Hamilton (2014). For the intention to use the MCTs, we used a single-item seven-point semantic differential for each MCT based on Herhausen et al. (2015), ranging from *very unlikely* (1) to *very likely* (7). The realism check regarding the scenarios contained three items on a seven-point Likert scale from Emrich, Paul, and Rudolph (2015), ranging from *totally disagree* (1) to *totally agree* (7). Moreover, we employed the same scale format for the manipulation checks, using our own single-items.

3.4.3 Method

For the data analysis, we used IBM's statistical software SPSS and Hayes' SPSS macro PROCESS with 10,000 bootstrapping samples (see Hayes, 2018). To assess the discriminant validity of the two types of risk, we first conducted a factor analysis. Subsequently, we executed three-way ANOVAs for the perceived usefulness of each of the three MCTs and mediation analyses via PROCESS to analyze the proposed hypotheses and possible additional interaction effects between the independent variables. As there is heterogeneity of variances in the ANOVAs for the perceived usefulness of check

and reserve and click and collect (Levene test p<.001), we additionally conducted separate t-tests for the impact of each of the independent variables on the respective perceived usefulness of these two MCTs to check, whether results are valid nevertheless. The t-tests confirmed the robustness of the ANOVA results. Regarding the mediation analyses via PROCESS, we conducted separate analyses for each of the proposed mediation effects. In each of these analyses, we controlled for the two independent variables that were not part of the current mediation analysis by including them as covariates.

3.5 Results

3.5.1 Measurement model evaluation, manipulation, and realism checks

Reliability analysis reveals that Cronbach's alpha exceeds the recommended threshold of .70 for all constructs, indicating an appropriate reliability (Nunnally, 1978; see appendix C for detailed values). A factor analysis supports the constructs' convergent and discriminant validity, as respondents properly distinguish between the two requested types of risk with factor loadings above the recommended threshold of .70 (Hair et al., 2014b; see appendix C for details). For the subsequent analyses, we calculated sum scores for the construct variables.

We did manipulation checks to test, whether respondents effectively realized the manipulations between the different scenarios. Therefore, we conducted t-tests for the particular manipulations, which revealed that all of them show significant differences equivalent to the corresponding manipulations (all p<.001). We also controlled for a high situational product involvement regarding sports shoes (referring to the scenario) and a realistic scenario perception with one-sample t-tests. With regard to the involvement, the mean value of 6.28 is significantly higher than the scale's midpoint of 4 (p<.001). The same applies to the included realism check (M=5.99; p<.001), indicating that the participants perceived the described scenario as mostly realistic.

3.5.2 Testing of hypotheses

For the product pick-up time, we find significant main effects on the perceived usefulness of check and reserve (F(1,432)=8.229; p=.004), click and collect (F(1,432)=5.309; p=.022), and the availability check (F(1,432)=5.686; p=.018). Regarding check and reserve, the results confirm H1a, showing a higher perceived usefulness for a specified (M=6.05; SD=1.24) than for an unspecified pick-up time (M=5.66; SD=1.63). The same is true for H1b, as a specified pick-up time (M=5.80; SD=1.52) leads to a higher perceived usefulness of click and collect than an unspecified pick-up time (M=5.43; SD=1.73). These relationships are partially mediated by the perceived time risk with significant par-

tially standardized indirect effects (coding specified=0 vs. unspecified=1) of ß=-.061 for the perceived usefulness of check and reserve (95% CI: -.117 to -.017) and ß=-.048 for click and collect (95% CI: -.103 to -.007). Thus, we can also confirm H1c. For the perceived usefulness of the availability check, we find the same pattern (specified: M=6.34; SD=1.13 vs. unspecified pick-up time: M=6.06; SD=1.39), leading to lacking support for H2a, as the results show the exact opposite of the hypothesis. However, this relationship is also partially mediated by time risk, with a significant partially standardized indirect effect of ß=-.060 (95% CI: -.118 to -.017). Hence, we find support for H2b, even though we expected the mediation in the opposite direction. Table 4 gives an overview of the detailed values of the mediation analysis with PROCESS.

Table 4. Total, direct, and indirect effects of the product pick-up time on perceived usefulness.

Effect paths	Estimated effects	t	p-values/CI
Total effects			
Unspecified vs. specified → perceived usefulness AC	-.228	-2.408	.016
Unspecified vs. specified → perceived usefulness CR	-.274	-2.910	.004
Unspecified vs. specified → perceived usefulness CC	-.223	-2.362	.019
Direct effects			
Unspecified vs. specified → time risk	.374	4.001	.000
Unspecified vs. specified → perceived usefulness AC	-.168	-1.764	.078
Unspecified vs. specified → perceived usefulness CR	-.213	-2.246	.025
Unspecified vs. specified → perceived usefulness CC	-.175	-1.832	.068
Time risk → perceived usefulness AC	-.160	-3.335	.000
Time risk → perceived usefulness CR	-.164	-3.437	.000
Time risk → perceived usefulness CC	-.129	-2.676	.008
Indirect effects			
Unspecified vs. specified → time risk → perceived usefulness AC	-.060		95% CI [-.118; -.017]
Unspecified vs. specified → time risk → perceived usefulness CR	-.061		95% CI [-.117; -.017]
Unspecified vs. specified → time risk → perceived usefulness CC	-.048		95% CI [-.103; -.007]

Note: "vs." indicates the effect of the group mentioned firstly compared to the group mentioned secondly.
AC = availability check, CR = check and reserve, CC = click and collect. All effects are partially standardized.

Regarding the confirmation date of product reservations, we neither find a significant effect on the perceived usefulness of check and reserve (p=.988) nor a mediation by availability risk (95% CI: -.048 to .004). Hence, we cannot support H3. The same is true for the perceived usefulness of the availability check (p=.807; 95% CI: -.046 to .004). Thus, we find no support for H4b. However, we reveal a significant impact of the reservation confirmation date on the perceived usefulness of click and collect (F(1,432)=4.039; p=.045). In line with H4a, the perceived usefulness of click and collect is higher for a delayed (M=5.78; SD=1.38) than for an immediate (M=5.46; SD=1.83) reservation confirmation. Nevertheless, the mediation by availability risk is also not significant (95% CI: -.043

to .006), providing no support for H4c. Table 5 provides an overview of the detailed values of the mediation analysis with PROCESS.

Table 5. Total, direct, and indirect effects of the reservation confirmation date on perceived usefulness.

Effect paths	Estimated effects	t	p-values/CI
Total effects			
Delayed vs. immediate → perceived usefulness AC	-.026	-.280	.780
Delayed vs. immediate → perceived usefulness CR	.005	.057	.945
Delayed vs. immediate → perceived usefulness CC	.191	2.022	.044
Direct effects			
Delayed vs. immediate → availability risk	.158	1.684	.093
Delayed vs. immediate → perceived usefulness AC	-.012	-.126	.900
Delayed vs. immediate → perceived usefulness CR	.021	.221	.825
Delayed vs. immediate → perceived usefulness CC	.204	2.160	.031
Availability risk → perceived usefulness AC	-.092	-1.917	.056
Availability risk → perceived usefulness CR	-.098	-2.034	.043
Availability risk → perceived usefulness CC	-.084	-1.743	.082
Indirect effects			
Delayed vs. immediate → availability risk → perceived usefulness AC	-.015		95% CI [-.046; .004]
Delayed vs. immediate → availability risk → perceived usefulness CR	-.015		95% CI [-.048; .004]
Delayed vs. immediate → availability risk → perceived usefulness CC	-.013		95% CI [-.043; .006]

Note: "vs." indicates the effect of the group mentioned firstly compared to the group mentioned secondly.
AC = availability check, CR = check and reserve, CC = click and collect. All effects are partially standardized.

With regard to the displayed product availability, we reveal significant effects on the perceived usefulness of the availability check ($F(1,432)=5.696$; $p=.017$) and check and reserve ($F(1,432)=6.267$; $p=.013$). Analogous to H5a, the perceived usefulness of the availability check is higher for high displayed availability ($M=6.34$; $SD=1.19$) than for low displayed availability ($M=6.06$; $SD=1.34$). Thus, the findings support H5a. Moreover, we find a partial mediation of this relationship through availability risk with a marginally significant partially standardized indirect effect (coding 0=high vs. 1=low) of ß=-.034 (90% CI: -.071 to -.002), leading to the confirmation of H5b. The perceived usefulness of check and reserve is also higher for high ($M=6.02$; $SD=1.23$) than for low displayed availability ($M=5.69$; $SD=1.65$). As this result is exactly the opposite of the assumptions in H6a, we cannot support this hypothesis. There is also no support for H6b because we find no significant impact of the displayed product availability on the perceived usefulness of click and collect ($p=.148$). The mediation effect of availability risk for this relationship is not significant, either (95% CI: -.079 to .009). However, availability risk partially mediates the impact of the displayed product availability on the perceived usefulness of check and reserve, with a marginally significant partially standardized indirect effect of ß=-.036 (90% CI: -.077 to -.002). Hence, we can partly support H6c, even though the

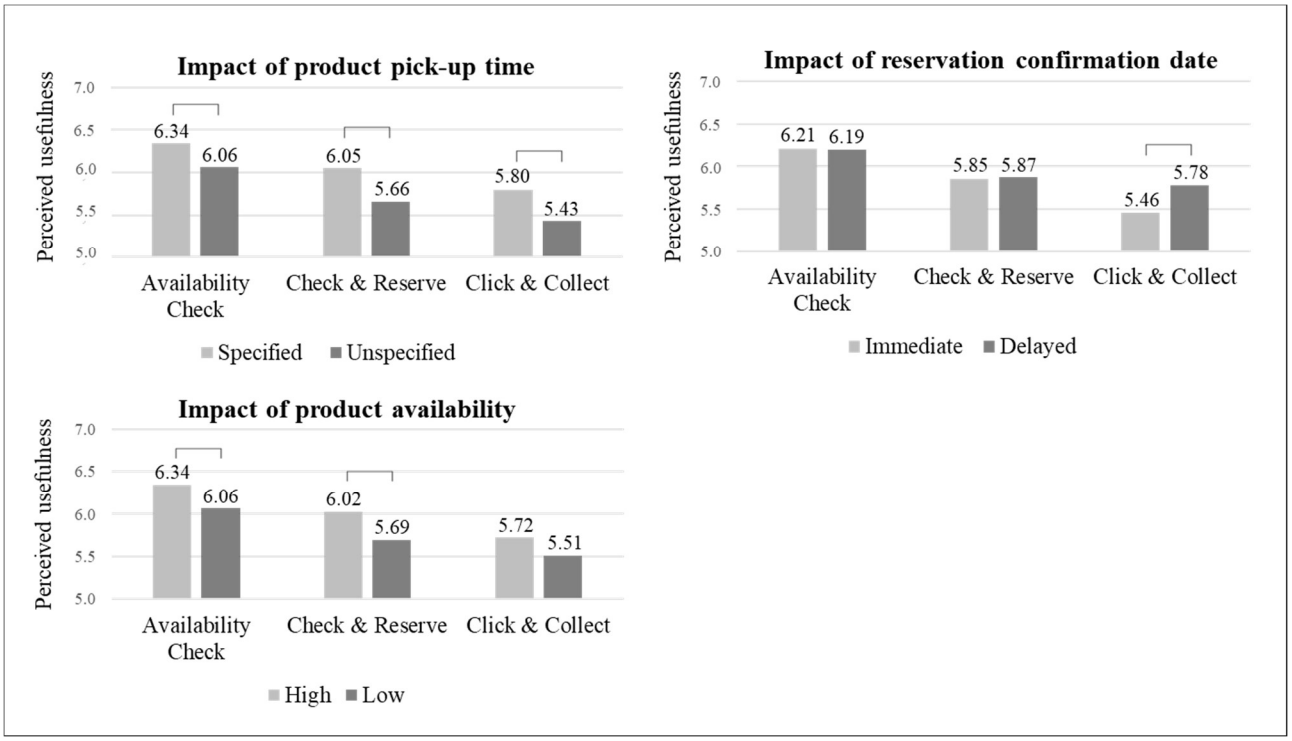
mediation effect shows an unexpected direction. Table 6 gives an overview of the detailed values of the mediation analysis with PROCESS.

Table 6. Total, direct, and indirect effects of the displayed product availability on perceived usefulness.

Effect paths	Estimated effects	t	p-values/CI
Total effects			
Low vs. high → perceived usefulness AC	-.226	-2.390	.017
Low vs. high → perceived usefulness CR	-.233	-2.476	.014
Low vs. high → perceived usefulness CC	-.137	-1.451	.147
Direct effects			
Low vs. high → availability risk	.367	3.910	.000
Low vs. high → perceived usefulness AC	-.192	-2.003	.046
Low vs. high → perceived usefulness CR	-.198	-2.068	.039
Low vs. high → perceived usefulness CC	-.106	-1.109	.268
Availability risk → perceived usefulness AC	-.092	-1.917	.056
Availability risk → perceived usefulness CR	-.098	-2.034	.043
Availability risk → perceived usefulness CC	-.084	-1.743	.082
Indirect effects			
Low vs. high → availability risk → perceived usefulness AC	-.034		90% CI [-.071; -.002]
Low vs. high → availability risk → perceived usefulness CR	-.036		90% CI [-.077; -.002]
Low vs. high → availability risk → perceived usefulness CC	-.031		95% CI [-.079; .009]

Note: "vs." indicates the effect of the group mentioned firstly compared to the group mentioned secondly.
AC = availability check, CR = check and reserve, CC = click and collect. All effects are partially standardized.

Figure 8 graphically shows the differences in mean values for the perceived usefulness of the selected MCTs, depending on the treatments. Table 7 additionally summarizes the evaluation of hypotheses testing.



Note: Brackets indicate significant mean differences.

Figure 8. Impact of MCT design manipulations on perceived usefulness of the selected MCTs.

Table 7. Evaluation of hypotheses testing.

Hypothesis	Relationship	Evaluation
H1a	Pick-up time → perceived usefulness CR	Supported
H1b	Pick-up time → perceived usefulness CC	Supported
H1c	Pick-up time → time risk → perceived usefulness CR/CC	Supported
H2a	Pick-up time → perceived usefulness AC	Rejected
H2b	Pick-up time → time risk → perceived usefulness AC	Supported
H3a	Reservation confirmation date → perceived usefulness CR	Rejected
H3b	Reservation confirmation date → availability risk → perceived usefulness CR	Rejected
H4a	Reservation confirmation date → perceived usefulness CC	Supported
H4b	Reservation confirmation date → perceived usefulness AC	Rejected
H4c	Reservation confirmation date → availability risk → perceived usefulness CC/AC	Rejected
H5a	Displayed product availability → perceived usefulness AC	Supported
H5b	Displayed product availability → availability risk → perceived usefulness AC	Supported
H6a	Displayed product availability → perceived usefulness CR	Rejected
H6b	Displayed product availability → perceived usefulness CC	Rejected
H6c	Displayed product availability → availability risk → perceived usefulness CR/CC	(Supported for CR)

Note: AC = availability check, CR = check and reserve, CC = click and collect.

3.5.3 Additional analyses

Besides the proposed relationships, we find two marginally significant interaction effects. The first effect reveals that the negative impact of an unspecified product pick-up time on consumers' perceived usefulness of check and reserve tends to be higher for a low than for a high displayed product availability ($F(1,432)=3.047$; $p=.082$). The second interaction shows that the negative impact of an unspecified product pick-up time on consumers' perceived usefulness of check and reserve tends to be higher if the confirmation of a product reservation happens immediately than if the product reservation is confirmed with a temporal delay ($F(1,432)=2.732$; $p=.099$). Moreover, the results reveal significant positive impacts of the perceived usefulness of the MCTs on the respondents' intention to use the corresponding technologies (all $p<.001$). The standardized beta coefficients are largest for check and reserve (ß=.406), followed by click and collect (ß=.376) and the availability check (ß=.216). Furthermore, descriptive results show a clear order regarding the mean values of perceived usefulness of the three selected MCTs. We find the highest perceived usefulness for the availability check ($M=6.20$), followed by check and reserve ($M=5.86$) and lastly click and collect ($M=5.61$). This order exists independent of the treatment, as it also applies to the mean values in all treatment groups.

3.6 Discussion

As the research on the selected MCTs and especially their design is very sparse, our study is among the first to uncover the impact of different MCT design characteristics on consumers' perceived usefulness of these MCTs and thus may contribute to a successful MCT strategy.

Firstly, our study shows that a specified product pick-up time on the same day leads to a higher perceived usefulness of all three MCTs than an unspecified pick-up time. These effects are mediated by consumers' perceived time risk. This confirms our expectations regarding check and reserve and click and collect. However, this is quite the opposite of what we expected concerning the availability check. A possible explanation for this is that the specified same-day pick-up time makes the availability check more credible for consumers (see Gallino & Moreno, 2014). If the pick-up time is unspecified, customers may worry that the displayed product availability may not be up-to-date as, otherwise, the product should be ready for pick-up shortly after the reservation or purchase. Consumers may then become skeptical about the accuracy of the availability check and perceive it as less useful when the pick-up time is unspecified. Conversely, a specified pick-up time leads to a higher perceived usefulness of the availability check.

Secondly, we find no significant impact of the confirmation date for product reservations on the perceived usefulness of check and reserve, showing that if consumers want to use check and reserve,

they do not care whether retailers confirm the reservation immediately or with a temporal delay. As availability risk does not play a role here, consumers may find it self-evident that making a reservation means having reserved the product even without a confirmation of it or find it reasonable for a confirmation of a reservation to take some time so that they do not think about the unavailability of the product as possible reason for the delay. Hence, there is no difference in their perceived usefulness of check and reserve. However, consumers perceive click and collect as significantly more useful when reservation confirmations are delayed. As availability risk is not relevant here, as well, they may simply find it cumbersome or inconvenient to wait for the confirmation when using check and reserve, making click and collect a more useful alternative.

Thirdly, the results show that a higher displayed product availability increases the perceived usefulness of the availability check, partly through a lower availability risk. The same applies to the perceived usefulness of check and reserve, which supports exactly the opposite of our expectations. A possible explanation may be that consumers are more confident that the retailer can really reserve the desired product when product availability is high. Nevertheless, this effect is quite surprising, as a more detailed analysis of the mediation effect shows that a low displayed availability leads to higher perceived availability risk (ß=.367; p<.001), as expected. However, this in turn decreases the perceived usefulness of check and reserve (ß=-.098; p=.043), instead of increasing it. Possibly, consumers do not perceive check and reserve as an effectively reliable opportunity to decrease their availability risk, maybe because a reservation is not as binding as an online purchase and thus may not guarantee product availability when consumers visit the store to purchase it. Thus, especially if there are only a few items left in stock, check and reserve has no potential to reduce availability risk. Regarding the perceived usefulness of click and collect, the displayed product availability risk has no significant effect. Continuing the previous argumentation, as long as consumers generally have the opportunity to buy the desired product via this MCT, there must be enough products left in stock (Gao & Su, 2017a). Therefore, consumers have a binding opportunity to ensure their availability when they visit the store and do not care about the displayed product availability at all.

Fourthly, we find two marginally significant interaction effects. The first interaction shows that the negative impact of an unspecified product pick-up time on consumers' perceived usefulness of check and reserve tends to be higher for a low than for a high displayed product availability. This can be explained by the idea that a high displayed availability signals that the product can be picked up quickly and therefore the specification of the pick-up time is less important. The second interaction reveals that the negative impact of an unspecified product pick-up time on consumers' perceived usefulness of check and reserve tends to be higher for an immediate product reservation confirmation than for a delayed one. A possible explanation is that consumers may assume that the product is

indeed already available in the store after an immediate reservation confirmation, and thus expect the product to be ready for pick-up immediately upon confirmation. Consequently, customers may not understand why the website does not show an exact pick-up time. As both interaction effects are merely weak and not significant at the .05 level, and their interpretation is speculative, we do not discuss them in more detail here so as not to overinterpret them. However, we suggest examining these effects further with larger samples.

Fifthly, as expected, the perceived usefulness of the MCTs is positively related to consumers' intention to use these MCTs, which is in line with the assumptions of the Technology Acceptance Model. Hence, our results indicate that improvements in the MCTs' usefulness via specific designs can lead to a higher usage of these MCTs, making their provision more successful.

Finally, we find that generally the perceived usefulness is highest for the availability check, followed by check and reserve and lastly click and collect. This supports the prior research, showing that consumers also have the most positive attitude toward the availability check and the least positive toward click and collect (Ortlinghaus et al., 2019). However, this is remarkable, as retailers often regard click and collect to be the most important and popular MCT (Forrester, 2014; Jin et al., 2018; Kim et al., 2017; Ma et al., 2014), which does not seem to be the case in our sample.

3.6.1 Management implications

Based on the results outlined, retailers have the opportunity to improve the consumers' perceived usefulness of the selected MCTs by aligning their MCT design. Firstly, retailers should assure a certain pick-up time for consumers when offering check and reserve and/or click and collect, as our study results show a higher perceived usefulness of all three MCTs for a specified compared to an unspecified pick-up time. As the consumers' perceived time risk mediates these effects, retailers should, if possible, assure same-day pick-ups. Even if this is not realizable for retailers, they should indicate a precise pick-up time on their website, as an unspecified pick-up time could lead to an even higher perceived waiting time than it would actually be. Regarding the perceived usefulness of check and reserve, this is especially important for products with a low displayed product availability, as the negative impact of an unspecified pick-up time tends to be even higher in this case.

Secondly, regarding check and reserve, it is neither necessary, nor profitable for retailers to invest in an immediate product reservation confirmation, as our results reveal that the confirmation date has no impact on consumers' perceived usefulness of check and reserve. This is highly relevant, as retailers can save considerable implementation costs for an immediate confirmation. The results even reveal a positive impact of a delayed reservation confirmation on the perceived usefulness of click and collect. Thus, if retailers prefer consumers to use click and collect rather than check and reserve, such

as for operative reasons, a delayed reservation confirmation can even be an advantage, as it increases the perceived usefulness of click and collect while not having any negative effects on the perceived usefulness of check and reserve at the same time. However, the perceived usefulness of check and reserve is still higher than that of click and collect in either case.

Thirdly, retailers should make sure that they display a high offline product availability on their website because our study shows a higher perceived usefulness for the availability check and check and reserve in this case. Therefore, retailers should generally seek to hold a rather high inventory of products. Moreover, they should display the effective number of all products that are in stock and should not indicate a lower item number to attain scarcity effects (see e.g., Yin et al., 2009), as these effects work counterproductive in this context. Conversely, especially retailers that generally hold a high product inventory should offer the availability check and check and reserve, as in this case these MCTs provide a higher usefulness for consumers.

Finally, retailers should invest in generally improving the perceived usefulness of the selected MCTs, as our study reveals that a higher perceived usefulness is positively related to a higher use intention for these MCTs. The proposed MCT design elements can play a crucial role in doing so.

3.6.2 Theoretical contribution

Owing to the relatively limited amount of research on MCTs, our study extends the existing literature in multiple ways. Firstly, our study is among the first studies to empirically analyze MCTs in detail. The current literature on MCTs rather examines outcomes relating to particular MCTs as such (e.g., Gallino & Moreno, 2014), for example, by focusing on comparisons between the presence and absence of MCTs at a retailer (e.g., Herhausen et al., 2015; Mahar et al., 2014). Our study goes more into detail by examining the effects of specific design elements of MCTs. We consider alternative ways of designing web-to-store technologies and thus provide a more detailed analysis of the outcomes of MCTs than the extant research.

Secondly, our study is one of the first investigations that examine what affects consumers' perceived usefulness of MCTs. Existing research, for example, analyzes factors influencing the customers' attitude (Ortlinghaus et al., 2019) or the use intention for particular MCTs (e.g., Chatterjee, 2010; Kim et al., 2017). However, these studies skip the variable of perceived usefulness that, according to the Technology Acceptance Model, precedes these constructs. Thus, our study considers an important parameter for the usage of MCTs that can be practically influenced by MCT design elements.

Thirdly, we also extend the research stream on perceived risk. Prior studies mainly analyze perceived risks either in the online (e.g., Arora & Kaur, 2018; Katta & Patro, 2017) or in the offline channel

(e.g., Dowling & Staelin, 1994; Roselius, 1971; Stone & Mason, 1995), but they hardly reveal any insights into risk perceptions pertaining to both of them in combination. In particularly investigating the uncertainty resulting from specific MCT design elements, we show how the interplay of the two channels may jointly affect consumers' risk perceptions and by that in turn the perceived usefulness of the selected MCTs.

3.6.3 Limitations and future research

When interpreting our findings, we have to consider specific limitations. Firstly, we conducted an experimental study with an artificially created website. Thus, our study cannot entirely depict real consumer behavior, as scenarios always have shortcomings compared to a real purchase situation. In particular, consumers may, for example, pay less attention to the specific characteristics of purchase options. Furthermore, the scenarios described a purchase merely in one selected product group and one specific context. Future studies should therefore analyze the robustness of our findings in real purchase settings and different product groups and contexts, such as, for example, situations where the time pressure or the relevance to receive a product is higher or lower than in the described purchase situation.

Secondly, we merely focused on the consumers' perspective. Future investigations should supplement our results by analyzing the retailers' perspective. In particular, researchers should contrast consumers' benefits with retailers' costs and examine, whether specific MCT design improvements really pay off (see e.g., Mahar & Wright, 2017).

Thirdly, since we focused primarily on the perceived usefulness as outcome variable, we merely additionally analyzed the impact of the perceived usefulness of the MCTs on MCT use intentions as separate regressions. Hence, we did not conduct serial mediation analyses regarding the impact of the MCT design elements on consumers' MCT use intentions via the perceived types of risk and the perceived usefulness of the MCTs. Future investigations could examine these relationships in more holistic research models.

Fourthly, we set the pick-up time when using check and reserve or click and collect in the "specified" condition to "at the same day". The results could vary if a different time was chosen for this. Further research should therefore analyze whether under certain conditions (i.e., other specified pick-up times) an unspecified pick-up might be more favorable compared to a specified pick-up time.

4 The role of perceived risk in recovering from MCT failures[7]

Multi-channel technologies which combine retailers' online and offline channels are prone to various failures. Therefore, this paper investigates the consequences of service failures and recoveries in a multi-channel context, as research in this area is still sparse. More importantly, it introduces consumers' perceived risk (probability and magnitude dimension) as a new mediator in this research field, in addition to the frequently analyzed perceived justice. In a scenario-based online survey experiment with a 3×3 between-subjects design plus a control group, the paper examines the impact of different sources of failure (system, personnel, and random circumstances) on customer satisfaction and investigates the effectiveness of alternative service recovery approaches (correction, compensation, and combination of both) in response to such failures. Two supplementary experiments analyze alternative types of a compensating recovery and the impact of the failure source on consumers' failure attributions.

Results show that personnel failures reduce customer satisfaction least (via risk probability). Furthermore, recovery types differ in their effectiveness (via perceived justice and risk magnitude). Moreover, there is no recovery paradox, which can be explained via both risk dimensions. The paper highlights the effects of specific service failures and recoveries in a multi-channel context and identifies consumers' perceived risk as an essential new mediator in the relationship between service failures and recoveries and customer satisfaction. It hence demonstrates that the commonly used attribution and equity theories alone are not sufficient to explain the underlying psychological processes in this regard but need to be complemented by perceived risk.

Co-author: *Stephan Zielke (University of Wuppertal)*

[7] Chapter 4 is based on the article "When multi-channel technologies fail – Restoring customer satisfaction through source communication and recovery strategies based on the theory of perceived risk", which has been submitted to a scientific journal in the retailing and service area.

4.1 Introduction

In line with recent developments in retailing, consumers' behavior is becoming increasingly multi-channel (Kim et al., 2017; Zhang et al., 2018). This leads to a rise in channel switching behavior, that is, using several distribution channels to achieve shopping goals in a beneficial way (Arora & Sahney, 2017; Gao & Su, 2017b). In this context, studies show that the so-called webrooming behavior (i.e., online search followed by offline purchase) has become the predominant channel switching pattern (Alexander & Kent, 2020; Flavian et al., 2019, 2020). Thus, retailers try to simplify this behavior for their customers in order to meet their needs and expectations (Arora & Sahney, 2017). To this end, they have started to offer so-called MCTs, which we generally define as 'technologies that intend to integrate the online and offline channels of multi-channel retailers and aim to create a seamless buying experience for the customer' (Ortlinghaus et al., 2019, p.263). With the objective of supporting consumers' webrooming behavior, and at the same time avoiding a substitution of the retailer when switching channels (see Bell et al., 2014), retailers focus primarily on web-to-store technologies, which lead customers from retailers' online to their offline channels (Picot-Coupey et al., 2016). Common MCTs in this context are, for example, click and collect or check and reserve. Click and collect includes searching and buying a product online but then picking it up at a local store of choice (Gallino & Moreno, 2014; Kim et al., 2017), while check and reserve implies that consumers can search for and reserve a product online, but then proceed to pick it up and pay at the store (e.g., Jin et al., 2018; Wollenburg et al., 2018). Through these MCTs, new services are emerging in the retail sector. Since the mentioned technologies have not been used for very long, the associated services often do not yet work as they should (see Alexander & Kent, 2020; Michel, 2001; Rosenmayer et al., 2018). In this context, the use of check and reserve, in particular, is very error-prone. There may be system failures during the reservation process, the sales staff may reserve the wrong product or no product at all, or a customer may try (on) and purchase an item at the shop while another customer simultaneously reserves the same item online. Thus, check and reserve involves a number of failure sources that all lead to the same resulting service failure: a product reserved online not being available at the store when the customer wishes to pick it up there. As consumers can perceive service failures differently, depending on their cause or source (Matikiti, Roberts-Lombard, & Mpinganjira, 2019; Nikbin et al., 2014), our first research question is:

- Which source of service failure do consumers perceive as most negative in the context of MCTs?

Service failures can hardly be avoided altogether (Andreassen, 2000; Betts, Wood, & Tadisina, 2011; Bitner, Brown, & Meuter, 2000; Hess et al., 2003; Maxham, 2001). As a result, retailers offering

check and reserve or comparable MCTs increasingly have to deal with the question of how to respond to service failures, which is vital to make customers satisfied again and prevent customer churn (Choi & Choi, 2014; Chuang et al., 2009). A large number of studies have, therefore, already addressed the topic of service recovery, that is, 'fixing or compensating for service failure' (Brown et al., 1996, p.32). Service recovery can occur in different forms, which are not necessarily equally effective in restoring customer satisfaction. We, therefore, raise the following second research question:

- What is the most effective way for retailers to recover from service failures when using MCTs?

In the literature, there is widespread consensus that consumers' perceived justice mediates the effects of service recovery on customer perceptions and behavior (e.g., Gelbrich, Gaethke, & Gregoire, 2015; Gelbrich & Roschk, 2011; Karande, Magnini, & Tam, 2007). In this context, research regards a consumer's satisfaction with a retailer as the most relevant target variable (e.g., Churchill & Surprenant, 1982; Jin et al., 2019; Kau & Loh, 2006; Wirtz & Mattila, 2004), as satisfaction, in turn, further affects important consumer behaviors, such as loyalty or repurchase intention and positive word of mouth (e.g., Andreassen, 1999; Bearden & Teel, 1983; De Matos et al., 2009; Gelbrich & Roschk, 2011; Maxham & Netemeyer, 2002b; Smith & Bolton, 1998; Spreng, Harrell, & Mackoy, 1995; Wirtz & Mattila, 2004). However, Albrecht et al. (2018) and van Vaerenbergh and Orsingher (2016) call for research on additional mediators or theoretical frameworks, respectively, which may be relevant in explaining the effects of service failure and recovery on customer satisfaction. In a multi-channel context, Ortlinghaus et al. (2019) show that the use of MCTs is generally related to consumers' perceptions of risk. If customers experience a failure in using an MCT, this may further increase their perceived risk that the focal technology may not work as expected in the future (see Betts et al., 2011); that is, the perceived functional risk increases. However, this influence may depend on the particular source of the experienced service failure. Conversely, service recovery may have the ability to reduce consumers' risk perceptions (Chang & Hsiao, 2008; Krishna, Dangayach, & Jain, 2011; Rasoulian et al., 2017), although this effect may depend on the type of recovery that the customer subsequently receives. Thus, we address the following third research question:

- To what extent do perceived justice and perceived functional risk mediate the effects of different sources of service failure and types of service recovery on the satisfaction with a retailer?

In the context of service recovery, past research disagrees on the existence of the so-called service recovery paradox, that is, that consumers who experience a service failure followed by a very well carried out recovery are more satisfied than or just as satisfied as consumers who do not experience

a failure and recovery (McCollough & Bharadwaj, 1992). A large number of studies do not support the existence of the paradox (e.g., Andreassen, 2001; Bolton, 1998; Halstead & Page, 1992; Hocutt, Chakraborty, & Mowen, 1997; Mattila, 1999; Maxham, 2001; McCollough et al., 2000; Priluck & Lala, 2009), whereas another large part does (e.g., De Matos et al., 2007; Hocutt et al., 2006; Magnini et al., 2007; McCollough, 2000; Michel, 2001; Smith & Bolton, 1998). Due to this inconsistency, we intend to find out which factors – apart from the service failure or recovery themselves – may play a role in creating or preventing a recovery paradox, which is answering the call for research raised by Magnini et al. (2007). Therefore, we aim to examine the extent to which consumers' perceived risk is relevant to the emergence or rather the hindrance of the paradox in the specific context of MCTs. Consequently, our fourth research question is:

- To what extent does a service recovery paradox (not) occur in an MCT context, and what role does consumers' perceived risk play in this regard?

By answering the proposed research questions, we extend the literature on service failure and recovery by investigating this field of research in the particular context of MCTs. Research until now has exhaustively investigated this topic pertaining to offline services (e.g., Maxham & Netemeyer, 2002a; Smith et al., 1999; Tax et al., 1998) and increasingly also with regard to services in the online channel (e.g., Bijmolt et al., 2014; Holloway & Beatty, 2003; Sousa & Voss, 2009; Wang et al., 2011). However, there are hardly any studies in a multi-channel context. This may be of particular relevance since the involvement of two channels presumably makes the considered services more susceptible to failures and thus increases the need of an effective service recovery (Rosenmayer et al., 2018). More importantly, our study intends to introduce a new theoretical approach to how the effects of service failure and recovery on customer satisfaction with a retailer come about and how the recovery paradox arises or does not. In doing so, we combine the research streams on service failure and recovery with perceived risk. Simultaneously, we show that the widely used attribution and equity theories may not be entirely sufficient to adequately explain the psychological processes that lead to customer reactions to service failures and recoveries, respectively. To this end, we combine and extend these two theories with the theory of perceived risk.

Our study is also practically relevant. It highlights which failure sources retailers must avoid as a priority, and how retailers can communicate the reason for a failure in the least harmful way possible. Similarly, our study helps retailers decide on the most effective type of service recovery, thus avoiding unnecessary investments. Furthermore, we provide advice on how to communicate failures and design recoveries by referring not merely to consumers' perceived justice but also to their risk perceptions. This constitutes a new practical starting point to restore satisfaction following a failure.

4.2 Theoretical background

4.2.1 Service failure and recovery

Literature defines service failures as 'any service-related mishaps or problems (real and/or perceived) that occur during a consumer's experience with a firm' (Maxham, 2001, p.11). When analyzing these failures, research often distinguishes between outcome failures, that is, failures regarding the expected outcome of a service, and process failures, that is, problems in the way a service is provided (e.g., Komunda & Osarenkhoe, 2012; Smith et al., 1999). Our study focuses on outcome failures that occur due to different reasons, as consumers usually do not notice much of the underlying processes when using MCTs. Moreover, prior research based on attribution theory states that consumers perceive failures differently depending on their perceptions of the failures' locus (where the cause of the failure lies), their stability (will the failure persist over time), and their controllability (can the company prevent the failure; Folkes, 1984; Weiner, 1979). This may be especially relevant in view of different failure sources. However, irrespective of the perception of the mentioned attributions, there is a consensus in research that failures generally have a negative impact on customer satisfaction (e.g., De Matos et al., 2009; Magnini et al., 2007; Michel, 2001; Smith & Bolton, 2002).

With the intention of restoring satisfaction after a failure, companies try to offer effective service recovery (Andreassen, 2001). In doing so, they make use of numerous different response activities or recovery strategies. In the literature, researchers have categorized them in different ways. For example, Miller, Craighead, and Karwan (2000) distinguish between psychological and tangible recovery. Bambauer-Sachse and Rabeson (2014) differentiate between monetary and non-monetary recovery. We extend these categorizations by distinguishing between failure-related and failure-independent recoveries in the form of a correction of the failed service and compensation for it. A correction means bringing the customer to a state similar to the situation without the failure. A compensation refers to an alternative output the customer receives from the retailer (instead of the actual service output). The investigation of this differentiation is of particular relevance, as it allows retailers to find out whether they can generally apply a blanket recovery strategy (failure-independent) or whether it is worthwhile to react specifically to concrete failure situations (failure-dependent). Depending on the type of service recovery, prior research based on equity theory extensively proves that a recovery strongly impacts consumers' perceived justice and, via this, customer satisfaction (e.g., Gelbrich et al., 2015; Gelbrich & Roschk, 2011; Karande et al., 2007). Perceived justice involves different dimensions, not all of which are equally important in each failure and recovery situation. For the most part, justice is conceptualized as comprising an interactional, a procedural, and a distributive dimension (Tax et al., 1998). Interactional justice refers to justice in the way the sales staff treats the customer during service

recovery. Procedural justice relates to the fairness of the recovery process. Distributive justice applies when consumers feel that they received a fair outcome from the recovery (Blodgett, Hill, & Tax, 1997; DeWitt, Nguyen, & Marshall, 2008; McColl-Kennedy & Sparks, 2003). Since several failure and recovery studies regard the latter dimension as the most important one (e.g., Kau & Loh, 2006; Mostafa et al., 2015; Smith & Bolton, 2002), and since we deal with outcome failures, we merely include distributive justice in our study.

4.2.2 Perceived risk

For consumers' perceived risk, we follow Bauer's (1960) general definition of risk, which implies that risk comprises the consequences of a consumer's behavior that s/he cannot foresee with certainty and that s/he considers negative. In doing so, we focus on perceived risk, meaning the risk that a consumer subjectively perceives (Mitchell, 1999). There is a common consensus in the literature that risk generally involves two components or dimensions. On the one hand, risk comprises a probability dimension, which researchers refer to as uncertainty regarding negative consequences, or the probability of negative consequences following an action. On the other hand, risk includes a dimension relating to the magnitude of these negative consequences, which the literature considers as the danger, severity, or importance of the negative consequences an action may entail (e.g., Cox, Cox, & Mantel, 2010; Cunningham, 1967; Derbaix, 1983; Dowling & Staelin, 1994; Peter & Tarpey, 1975; Taylor, 1994). Apart from the subdivision according to the probability and magnitude of negative consequences, which we adapt in our study (perceived $risk_{probability}$ and perceived $risk_{magnitude}$), past literature divides risk into several types of risk, all of which refer to a different aspect of negative consequences, depending on the particular reference object (e.g., Dowling, 1986; Festervand et al., 1986). In the context of MCTs, the functional or performance risk is of particular relevance. Functional risk generally exists when a product does not perform as it is supposed to or does not provide the expected characteristics, function, or benefits (Horton, 1976; Pi & Sangruang, 2011). In our study, this risk type refers to a situation where an MCT, in this case check and reserve, does not work properly.

In the prior literature, only a few studies consider risk in the context of service failure and recovery. Due to potential service failures, consumers generally perceive functional risk as regarding how a service will actually perform (Krishna et al., 2011; Turley & LeBlanc, 1993). Betts et al. (2011) imply that consumers' perceived $risk_{probability}$ is higher for a customer who has already experienced a prior failure than for a consumer who has not. Several studies reveal that service guarantees or warranties are effective in reducing these risk perceptions (e.g., Bearden & Shimp, 1982; Boshoff, 2002; Lei, De Ruyter, & Wetzels, 2008; Roselius, 1971). In line with this, Boshoff (1997) argues that service recovery can, likewise, reduce functional risk perceptions pertaining to services since it may create

some kind of service guarantee image, as the involved company will make up for potentially (re-)occurring failures. In doing so, service providers can diminish the magnitude of a failure's negative consequences for the customer (Boshoff, 2002; Grewal, Roggeveen, & Tsiros, 2008; Komunda & Osarenkhoe, 2012). Chang and Hsiao (2008) empirically show that service recovery reduces consumers' perceived risk while simultaneously increasing perceived justice. However, they aggregate risk perceptions over the two dimensions (probability and magnitude) and over six different types of risk in their measurement model. Moreover, they do not include the impact of the service failure which precedes the recovery, neither do they empirically examine risk as a mediator in the relationship between service recovery and consumer outcomes.

Our study intends to show how service failures and recoveries influence the two risk dimensions, and how these risk dimensions mediate the impact on customer satisfaction. In doing so, we focus on perceived risk as the central mediating variable of our investigation. In this regard, we extend and complement established theories in the context of service failures and recoveries (attribution and equity theory) with the theory of perceived risk as a central part of our theoretical framework, which we will develop in detail in the next chapter.

4.3 Development of research hypotheses

4.3.1 Influence of the source of failure on customer satisfaction

Attribution theory states that if a service failure occurs, consumers want to know why and thus, begin to search for the causes of the respective incident (Callan & Moore, 1998; Folkes, 1984; Hocutt et al., 1997; McColl-Kennedy & Sparks, 2003; Tax et al., 1998; Van Vaerenbergh et al., 2014; Weiner, 2000). The theory is widely used in explaining the impact of service failures on customer perceptions and behavior (e.g., Matikiti et al., 2019; McCollough, 2000; Van Vaerenbergh et al., 2014). In line with this, prior research proves that the explanation for a service failure has a significant impact on customer satisfaction (e.g., Baker & Meyer, 2014; Bradley & Sparks, 2012; Conlon & Murray, 1996; Sparks & Fredline, 2007; Tarofder et al., 2016; Wang & Mattila, 2011). However, we argue that the theory of perceived risk should supplement the attribution theory to adequately explain the psychological process which leads to customer reactions to service failures. Thus, we combine these two theoretical approaches.

According to the attribution theory and prior literature, the given explanation or the assumed reasons for the failure can be categorized by consumers' failure attributions relating to three dimensions, that are, failure stability, controllability, and locus of control or rather of causality (Folkes, 1984, 1988;

Weiner, 1979, 1985). As we point out in the following, stability and controllability should be particularly relevant with regard to consumers' perceived risk. We suggest that a failure is perceived to be the most stable, and simultaneously the least controllable, if it occurs due to random circumstances (see Callan & Moore, 1998). For instance, suppose a customer tries (on) and purchases an item at a shop, meanwhile another customer simultaneously reserves the same item online. This we would class as a failure due to random circumstances ($failure_{random\_circ.}$), since such a random event may repeat itself at any time, without anyone really being able to influence it. For system failures ($failure_{system}$), stability should be perceived as lower and controllability as higher, as customers assume that companies will attempt to repair or correct their system after such failures so that a system failure is less likely to reoccur. However, companies have only a limited influence on eliminating system failures, therefore failures can continue to happen in the future. In the case of failures caused by personnel ($failure_{personnel}$), we suppose that the stability is perceived lowest and the controllability highest (see Callan & Moore, 1998; Folkes, Koletsky, & Graham, 1987) since staff may feel uncomfortable with a self-inflicted failure and consequently, take care to avoid a repetition of the failure in the future. Additionally, personnel can learn from their mistakes, and the retailer can train them to prevent failures. According to past literature, perceived failure stability is positively related to consumers' expectations or perceived probability that the same failure will reoccur (Blodgett, Granbois, & Walters, 1993; Folkes, 1984; Magnini et al., 2007; Nikbin et al., 2014; Tsiros, Mittal, & Ross, 2004; Weiner, 1985), that is, consumers' perceived $risk_{probability}$. We argue that the opposite applies to controllability since the more a failure can be controlled, the more probable it is that a retailer can prevent the same failure in the future. Thus, the higher the controllability, the lower the probability of negative consequences, that is, another failure. Following this argumentation, perceived $risk_{probability}$ will be highest for a $failure_{random\_circ.}$, followed by a $failure_{system}$, and finally a $failure_{personnel}$.

According to the theory of perceived risk, grounded on Bauer (1960), consumers generally seek to reduce or avoid perceived risk. Hence, consumers should be least satisfied with a retailer when stability is high, and controllability is low, and consequently, the perceived $risk_{probability}$ of a service failure is high since, in such a situation, the retailer does not seem to be capable of preventing the customer from a similar failure in the future. As the retailer, in this case, does not fulfill the customer's expectations, satisfaction with the retailer decreases (Boshoff, 1997; Churchill & Surprenant, 1982). This is supported by the confirmation/disconfirmation paradigm, which states that consumers become dissatisfied if a retailer does not meet their expectations (Churchill & Surprenant, 1982; Oliver, 1980), and by empirical results which show that perceived risk negatively affects customer satisfaction

(Johnson, Sivadas, & Garbarino, 2008). Building on customers' perceived $risk_{probability}$ due to the various failure sources, we therefore assume customer satisfaction to be least reduced after a $failure_{personnel}$, followed by a $failure_{system}$ and finally a $failure_{random\_circ.}$. We hypothesize:

H1: The satisfaction with the retailer is higher

a) for a $failure_{personnel}$ than for a $failure_{system}$.

b) for a $failure_{personnel}$ than for a $failure_{random\_circ.}$.

c) for a $failure_{system}$ than for a $failure_{random\_circ.}$.

H2: The relationship between the source of failure and the satisfaction with the retailer is mediated by the perceived $risk_{probability}$.

4.3.2 Influence of the type of service recovery on customer satisfaction

The majority of past research suggests that the impact of different service recovery approaches on customer satisfaction is achieved through perceived justice (e.g., Andreassen, 2000; Bitner et al., 2000; Ellyawati, Purwanto, & Dharmmesta, 2012; McCollough et al., 2000; Smith et al., 1999; Tax et al., 1998). Several prior studies thus refer to equity theory to predict this relationship (e.g., Andreassen, 2000; Goodwin & Ross, 1992; Kau & Loh, 2006; McCollough et al., 2000; Smith et al., 1999). Although we agree with this view, we nonetheless suggest that the mediation effect mentioned should be supplemented by consumers' perceptions of the magnitude of potential negative consequences in a future failure situation (i.e., perceived $risk_{magnitude}$) since prior research proves a negative impact of justice on perceived risk (Chang & Hsiao, 2008). Therefore, we combine equity theory with the theory of perceived risk to explain consumers' reactions to different types of service recovery.

Equity theory basically states that individuals perceive equity, also referred to as fairness or justice, if their own input-output-ratio is equivalent to the input-output-ratio of an exchange partner (Adams, 1963). Consumers' inputs for check and reserve are, for example, the time and effort to reserve a product as well as visiting the store, and their output is what they receive from the retailer, in other words, the product (see De Ruyter & Wetzels, 2000; Goodwin & Ross, 1992; Swan & Oliver, 1989). The retailer's inputs are, for instance, time and effort to provide the product, and the output is a (potential) customer or the revenue that the retailer generates from him/her, respectively (see De Ruyter & Wetzels, 2000). If a service failure occurs, that is, the retailer does not provide the reserved product, inequity emerges (Maxham, 2001; Smith et al., 1999), as the consumer's output decreases while the consumer may simultaneously presume a lower input by the retailer (Adams, 1963; Hess et al., 2003). When the retailer offers a service recovery, the ratio between the two parties becomes more balanced again (Grewal et al., 2008; Smith et al., 1999) since the retailer's inputs increase as do the consumer's outputs (Adams, 1963; Hess et al., 2003). However, the degree of mutual alignment in

terms of equity depends on the type of recovery. The retailer has different options regarding the recovery, as he can correct or compensate for the failure or offer a combined approach. When the retailer provides a combined recovery, we assume perceived equity to be highest, as – regarding the product reservation – the retailer attempts to bring the consumer to a state similar to a no-failure situation. Moreover, he compensates the consumer for the incurred loss in terms of, for example, additional time and effort, or psychological costs resulting from the failure (see Hoffman & Kelley, 2000). Regarding the differential impact of a correction and a compensation, we additionally draw on resource exchange theory (Foa & Foa, 1974, 1976) and prior literature, which suggest that service recovery works best when the type of recovery matches the type of corresponding failure (Chuang et al., 2009; Roschk & Gelbrich, 2014; Smith et al., 1999). Since the failure involves non-availability of the reserved product, a correction would be the more efficient type of recovery, as correction attempts to provide the focal product as soon as possible and thus offsets the actual loss, while a compensation does not. A compensation merely represents an alternative outcome, which the consumer does not necessarily appreciate as much (see Smith et al., 1999). Therefore, we assume that a combined recovery leads to the highest justice, followed by a correction, and finally a compensation.

Perceived justice may, in turn, negatively influence consumers' perceived magnitude of negative consequences in case of a reoccurring service failure, that is, perceived $risk_{magnitude}$ (see Chang & Hsiao, 2008; Nikbin et al., 2014). If a consumer perceives a retailer to respond to the service failure equitably, this means that s/he experiences the retailer's willingness to rebalance the input-output ratio, which has shifted to negative for him/her due to the failure. In other words, the consumer knows that the retailer attempts to reduce the consumer's magnitude of negative consequences in a failure situation, as equity implies that the loss due to a failure will be equalized (Nikbin et al., 2014). Therefore, the consumer can assume that the retailer will – regardless of the particular recovery – generally seek to mitigate the consumer's negative consequences in case of a reoccurring service failure, no matter what specific type or severity of failure occurs in the future. Signaling theory (Spence, 1973) also supports this relationship since consumers can regard perceived justice as a signal for a retailer's general intention to reduce negative consequences for the consumer after a service failure. Therefore, higher perceived justice should lead to a lower $risk_{magnitude}$ perception.

When the consumer, in turn, considers the focal retailer to be able to mitigate his/her $risk_{magnitude}$ perceptions, satisfaction with the retailer increases, which is in line with the theory of perceived risk and prior research (e.g., Johnson et al., 2008). We hence hypothesize:

H3: The satisfaction with the retailer is higher

a) for a combined than for a correcting service recovery.

b) for a combined than for a compensating service recovery.

c) for a correcting than for a compensating service recovery.

H4: The relationship between the type of service recovery and the satisfaction with the retailer is serially mediated by the perceived (distributive) justice and the perceived $risk_{magnitude}$.

4.3.3 Service recovery paradox

As mentioned in the introduction, a service recovery paradox may occur if retailers provide a very good recovery after a service failure (McCollough & Bharadwaj, 1992). However, we generally suggest that both perceived risk dimensions mediate the impact of the comparison between a failure and recovery condition and the situation without failure and recovery, and hence prevent a service recovery paradox, as we will point out in the following.

Prior literature shows that consumers' past experience with a retailer influences their expectations regarding the focal retailer's future service performance (Cadotte, Woodruff, & Jenkins, 1987; Parasuraman, Zeithaml, & Berry, 1985). Thus, if a consumer experiences a service failure, we assume that s/he has a higher expectation of another failure in the future. This may particularly be the case in the context of MCTs, where customers already perceive an enhanced risk, as they are often less familiar with these technologies. In line with this, the consumer's perceived probability of negative consequences, that is, the perceived $risk_{probability}$, will be higher for a customer who has already experienced a prior failure than for a consumer who has not (Betts et al., 2011), since the latter has no reason to expect a failure (Smith et al., 1999), except for the general risk relating to services (see Murray, 1991). As mentioned previously, according to the theory of perceived risk and prior research, the higher perceived $risk_{probability}$ should, in turn, lead to a lower satisfaction with the retailer.

In accordance with prior literature, negative experiences generally weigh more heavily mentally than the equivalent positive experiences (for an overview see Baumeister et al., 2001), which is also supported by prospect theory (see Kahneman & Tversky, 1979). Thus, we assume that when a service failure and a recovery occur, consumers should perceive the overall shopping experience as negative rather than neutral or positive since the favorable event (i.e., the recovery) may not be able to outweigh the unfavorable event (i.e., the failure) (Chuang et al., 2009; Smith et al., 1999). As consumers tend to remember negative issues particularly well (see Pratto & John, 1991; Robinson-Riegler & Winton, 1996), we suppose that consumers who experience a service failure, and subsequent recovery, will also expect a less positive, or conversely, a more negative, overall experience regarding future transactions with the retailer (compared to customers who have not experienced a failure and

recovery). Consequently, their expected magnitude of negative consequences from an additional purchase at the focal retailer, that is, perceived $risk_{magnitude}$, should be higher than that for consumers who did not experience a failure and recovery, and thus, have a more neutral or even positive expectation (see Smith et al., 1999). Again, the theory of perceived risk predicts a higher satisfaction with the retailer for consumers who did not experience failure and recovery than for those who did. We thus hypothesize:

H5: a) The satisfaction with the retailer is higher if no failure and no service recovery occur than if it comes to failure and recovery. This relationship is mediated by b) the perceived $risk_{probability}$ and c) the perceived $risk_{magnitude}$.

For the sake of clarity, we divide the research model into two sub-models that graphically summarize our hypotheses (see Figures 9 and 10).

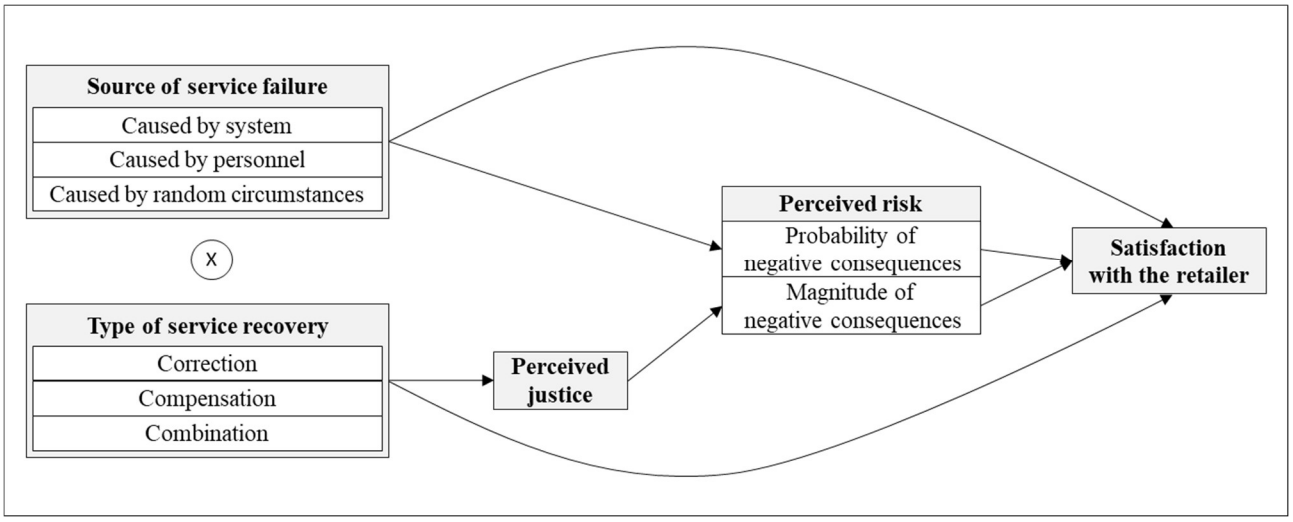


Figure 9. Research model H1-H4.

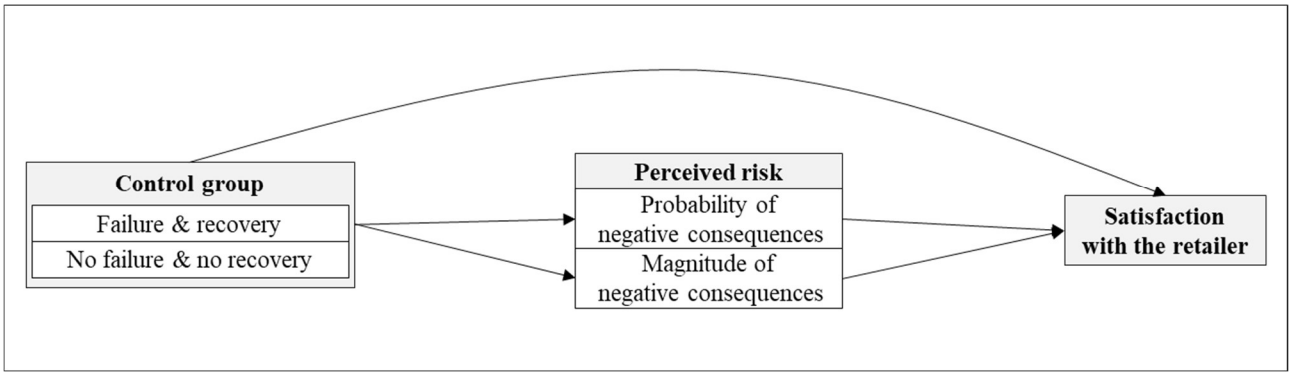


Figure 10. Research model H5.

Since we assume that both the source of failure and the type of recovery affect customer satisfaction independently, we do not propose any hypotheses in this regard. Nevertheless, we test for potential interaction effects to check whether or not any non-hypothesized interactions exist.

4.4 Empirical study

4.4.1 Data collection and sample

To test our hypotheses, we conducted a scenario-based online experiment with a 3 (source of failure: system, personnel, random circumstances) × 3 (type of recovery: correction, compensation, combination) between-subjects design with a control group (no failure, no recovery). Participants were randomly assigned to either one of the nine treatment groups or the control group.

All participants were asked to imagine the purchase of new sports shoes. According to the scenario (see appendix D), they had enthusiastically subscribed to a new running group, but their current sports shoes were worn out. Respondents were therefore instructed to visit the website of a familiar multichannel sports retailer who runs an online shop as well as physical stores in the participant's hometown to search for new sports shoes. With this information, we controlled for a high product involvement, moderate time pressure, and a relatively short distance from the respondent's home to the retailer's nearest store. The scenario further describes participants finding a pair of sports shoes they like but worrying about whether they will fit. Thus, they are instructed to reserve the focal shoes using the retailer's free-of-charge check and reserve function since they want to try them on in the nearest store but simultaneously avoid a stock-out of the shoes. According to the scenario, respondents receive a reservation confirmation and visit the store. The shoes are sold out in all treatment groups when the participants ask for them at the pick-up counter. Depending on the treatment group, the salesperson provides a different explanation regarding the source of the failure and immediately offers an alternative recovery. We operationalized the failure source in such a way that the failure appears due to system failures during the reservation process, due to the fact that the sales staff has not reserved the desired shoes, or that another customer has simultaneously tried on and purchased the sports shoes at the shop while the test person reserved the same shoes online (= random circumstances). Regarding the operationalization of the type of recovery, the correction implies that the retailer offers a free-of-charge same-day delivery with a free return option. A compensation means that the test person receives a 20% discount voucher for the next purchase from the focal retailer, since a previous literature review has shown that 20% is a common average recovery discount in the product category of sports shoes. In the control group, no failure or recovery occurred in order for the

respondents to be able to pick up the reserved sports shoes. In the following questionnaire, participants had to respond to realism and manipulation checks and answer questions pertaining to their perceived functional risk, perceived distributive justice, and satisfaction with the retailer. Moreover, we asked respondents whether they were familiar with check and reserve and whether they had used this MCT before (binary: yes/no). Finally, we measured demographics.

We pretested the questionnaire with 14 respondents and adjusted it accordingly. Subsequently, during a three-week period in May 2019, we collected the data by distributing the link to the final online questionnaire via email and social media in Germany. The survey yielded 551 valid completed questionnaires, with participants showing an average age of about 31 years and a gender distribution of 67.5% female, 32.0% male, and 0.5% diverse respondents. For each scenario, we generated between 47 and 66 participants (see table 8). The majority of respondents were already familiar with check and reserve prior to the study (80.9%) and 40.7% had already used check and reserve before.

Table 8. Overview of scenarios with corresponding group sizes.

Source of failure / Type of recovery	**System**	**Personnel**	**Random circumstances**
Correction	n=53	n=66	n=55
Compensation	n=47	n=53	n=51
Combination	n=57	n=55	n=52
Control group (no failure & no recovery): n=62			

4.4.2 Measures

Unless stated otherwise, we measured all items on seven-point Likert scales ranging from *totally disagree* (1) to *totally agree* (7). For perceived distributive justice, we used five items similar to Albrecht et al. (2018) and Blodgett et al. (1997). The scale for the perceived $risk_{probability}$ contained three items from Laroche et al. (2004), and we measured the perceived $risk_{magnitude}$ with three seven-point semantic differential items based on Maxham and Netemeyer (2002a). For satisfaction with the retailer, we used three items from Wangenheim and Bayón (2007). The manipulation check for the source of service failure was verbalized analogously to the locus of control scale from Tsiros et al. (2004) and contained one item for each failure source, resulting in three items. Moreover, we used one own manipulation check item for each of the three types of recovery and one single-item for the manipulation check referring to the situational product involvement. Additionally, we included a realism check regarding the scenarios based on a scale from Emrich et al. (2015) which consists of three items. An overview of the particular items used can be found in appendix E.

4.4.3 Method

For the data analysis, we applied IBM's statistical software SPSS, Hayes' SPSS macro PROCESS (see Hayes, 2018), and smartPLS. After analyzing the constructs' scale reliability as well as convergent and discriminant validity, we executed a two-way ANOVA with LSD posthoc tests to examine potential interaction effects between the independent variables and their main effects. To test the proposed mediation hypotheses regarding the differences between the failure source and the type of recovery, we calculated a structural equation model with smartPLS. Finally, we compared the most favorable treatment with the control group regarding customer satisfaction with a t-test and conducted a mediation analysis via PROCESS (10,000 bootstrapping samples) to analyze the recovery paradox.

4.5 Results

4.5.1 Measurement model evaluation

Reliability analysis reveals that Cronbach's alpha exceeds the recommended threshold of .70 for all constructs, indicating appropriate reliability (Nunnally, 1978). A factor analysis provides support for the convergent and discriminant validity of the scales as respondents properly distinguish between the two requested risk dimensions as well as justice and satisfaction, with factor loadings above the critical value of .70 (Hair et al., 2014b; see appendix E for details). For the SPSS and process analyses, we hence calculated corresponding sum scores for the construct variables. The subsequent data analysis with smartPLS reveals that the composite reliability values exceed the recommended value of .70 (Hair et al., 2014a). As additional support for the convergent validity of the constructs, the average variance extracted values of all constructs are higher than the recommended benchmark of .50 (Hair et al., 2014b). Exact values can be found in appendix E. Finally, table 9 shows that all values regarding the square root of the average variance extracted are greater than the pairwise correlations among the constructs, which supports their discriminant validity (Fornell & Larcker, 1981).

Table 9. Discriminant validity of constructs according to the Fornell-Larcker criterion.

Variable	(1)	(2)	(3)	(4)
(1) Perceived risk (probability)	**.861**			
(2) Perceived risk (magnitude)	.461	**.867**		
(3) Perceived justice	-.206	-.196	**.789**	
(4) Satisfaction	-.406	-.371	.548	**.872**

Note: Values in the diagonal (in bold) show the square root of the average variance extracted; values below the diagonal display the pairwise correlations among the constructs.

4.5.2 Manipulation and realism checks

We carried out manipulation checks to test, whether respondents effectively realized the manipulations between the different scenarios. Therefore, we conducted one-way ANOVAs or Brown Forsythe tests with Tukey-HSD or Games Howell posthoc tests (depending on the homogeneity of variances) for the particular manipulations. They all show significant differences equivalent to the corresponding manipulations (all $p<.05$). The only exception is the manipulation check between a combination and a correction in terms of agreement with the statement reflecting the correction ($p=.198$). However, this is plausible and hence not problematic since consumers in the combination treatment also received a correction, representing a part of the combined recovery. We also controlled for a high situational product involvement regarding sports shoes and a realistic scenario perception with one-sample t-tests. With regard to the involvement, the mean value of 5.73 is significantly higher than the scale's midpoint of 4 ($p<.001$). The included realism check indicates that the participants perceived the described scenario as mostly realistic with a mean value of 6.08, which is also significantly higher than the scale's midpoint of 4 ($p<.001$).

4.5.3 Testing of hypotheses

Prior to the actual testing of the proposed hypotheses, we evaluate the structural equation model by examining R^2 and the cross-validated redundancy for Q^2. For customer satisfaction, the R^2 is .240, which can be considered as good for studies aiming at explaining customer satisfaction (Hair et al., 2014a). Q^2 is larger than zero for all constructs, indicating the model's predictive relevance for these variables (Hair et al., 2014b).

The ANOVA reveals an adjusted R^2 of .047. Results show no significant interactions between the source of the service failure and the type of recovery ($p=.217$). However, we find a significant main effect of the failure source on the satisfaction with the retailer ($F(2,480)=4.352$; $p=.013$). The results confirm H1a and b, showing a (marginally) significantly higher satisfaction for a $failure_{personnel}$ ($M=4.35$; $SD=1.45$) than for a $failure_{system}$ ($M=3.92$; $SD=1.41$; $p=.004$) and for a $failure_{random\_circ.}$ ($M=4.10$; $SD=1.34$; $p=.095$). However, there is no significant difference between a $failure_{system}$ and a $failure_{random\_circ.}$ ($p=.242$), leading to lacking support for H1c. The perceived $risk_{probability}$ partially mediates the relationship between the failure source and the satisfaction for the comparison between personnel and system failures with a standardized indirect effect of ß=.048 ($p=.007$). For the other two comparisons, the mediation effect of perceived $risk_{probability}$ is not significant ($failure_{personnel}$ vs. $failure_{random\_circ.}$: $p=.192$ and $failure_{system}$ vs. $failure_{random\_circ.}$: $p=.108$). Hence, we can only partly confirm H2. Table 10 gives an overview of the detailed values.

Table 10. Total, direct, and indirect effects of the failure source on customer satisfaction.

Effect paths	Estimated effects	t	p-values
Total effects			
Personnel vs. system → satisfaction	.152	3.014	.003
Random circ. vs. system → satisfaction	.060	1.209	.227
Random circ. vs. personnel → satisfaction	-.088	1.773	.076
Direct effects			
Personnel vs. system → risk probability	-.179	3.360	.001
Random circ. vs. system → risk probability	-.097	1.795	.073
Random circ. vs. personnel → risk probability	.078	1.383	.167
Personnel vs. system → satisfaction	.104	2.077	.038
Random circ. vs. system → satisfaction	.034	.707	.479
Random circ. vs. personnel → satisfaction	-.068	1.402	.161
Risk probability → satisfaction	-.268	4.571	.000
Indirect effects			
Personnel vs. system → risk probability → satisfaction	.048	2.683	.007
Random circ. vs. system → risk probability → satisfaction	.026	1.609	.108
Random circ. vs. personnel → risk probability → satisfaction	-.021	1.306	.192

Note: "vs." indicates the effect of the group mentioned firstly compared to the group mentioned secondly. All effects are standardized.

With regard to the impact of the type of recovery on satisfaction, we also find a significant main effect ($F(2,480)=8.873$; $p<.001$). In line with H3a and b, the satisfaction is significantly higher for a combined recovery ($M=4.46$; $SD=1.38$) than for a correction ($M=4.11$; $SD=1.41$; $p=.020$) and also significantly higher than for a compensation ($M=3.81$; $SD=1.38$; $p<.001$). Consequently, results support these hypotheses. The same is true for H3c, as the satisfaction for a correction is marginally significantly higher than for a compensation ($p=.053$). All three comparisons are partially serially mediated by the perceived distributive justice and the perceived $risk_{magnitude}$, with standardized indirect effects of ß=.013 ($p=.024$) for a combination compared to a correction, ß=.021 ($p=.013$) for a combination compared to a compensation, and ß=-.008 ($p=.036$) for a compensation compared to a correction. Thus, results fully support H4. Table 11 gives an overview of the detailed values.

Table 11. Total, direct, and indirect effects of the type of recovery on customer satisfaction.

Effect paths	Estimated effects	t	p-values
Total effects			
Comp. vs. correct. → satisfaction	-.108	2.163	.031
Combi. vs. correct. → satisfaction	.098	1.997	.046
Combi. vs. comp. → satisfaction	.208	3.984	.000
Direct effects			
Comp. vs. correct. → justice	-.178	3.051	.002
Combi. vs. correct. → justice	.267	5.863	.000
Combi. vs. comp. → justice	.449	9.311	.000
Comp. vs. correct. → satisfaction	-.100	2.046	.041
Combi. vs. correct. → satisfaction	.085	1.773	.076
Combi. vs. comp. → satisfaction	.187	3.667	.000
Justice → risk magnitude	-.196	4.162	.000
Risk magnitude → satisfaction	-.238	4.440	.000
Indirect effects			
Comp. vs. correct. → justice → risk magnitude → satisfaction	-.008	2.097	.036
Combi. vs. correct. → justice → risk magnitude → satisfaction	.013	2.262	.024
Combi. vs. comp. → justice → risk magnitude → satisfaction	.021	2.492	.013

Note: "vs." indicates the effect of the group mentioned firstly compared to the group mentioned secondly.
All effects are standardized.

To analyze the recovery paradox, we merely consider the most favorable treatment group for comparison with the control group, as the paradox is most likely to occur under these circumstances. Regarding mean values in the nine treatments, respondents confronted with a $failure_{personnel}$ and a combined recovery show the highest satisfaction (M=4.73; SD=1.48). However, the t-test reveals that this value is significantly lower than the satisfaction for the control group with no failure and no recovery (M=5.80; SD=1.41; t=3.990; p<.001). Therefore, results confirm H5a. As hypothesized, both risk dimensions fully mediate this effect, with partially standardized indirect effects of ß=-.369 (95% CI: -.667 to -.144) for perceived $risk_{probability}$ and ß=-.180 (95% CI: -.355 to -.031) for perceived $risk_{magnitude}$, providing support for H5b and c. Table 12 gives an overview of the detailed values.

Table 12. Total, direct, and indirect effects of the treatment vs. control group on customer satisfaction.

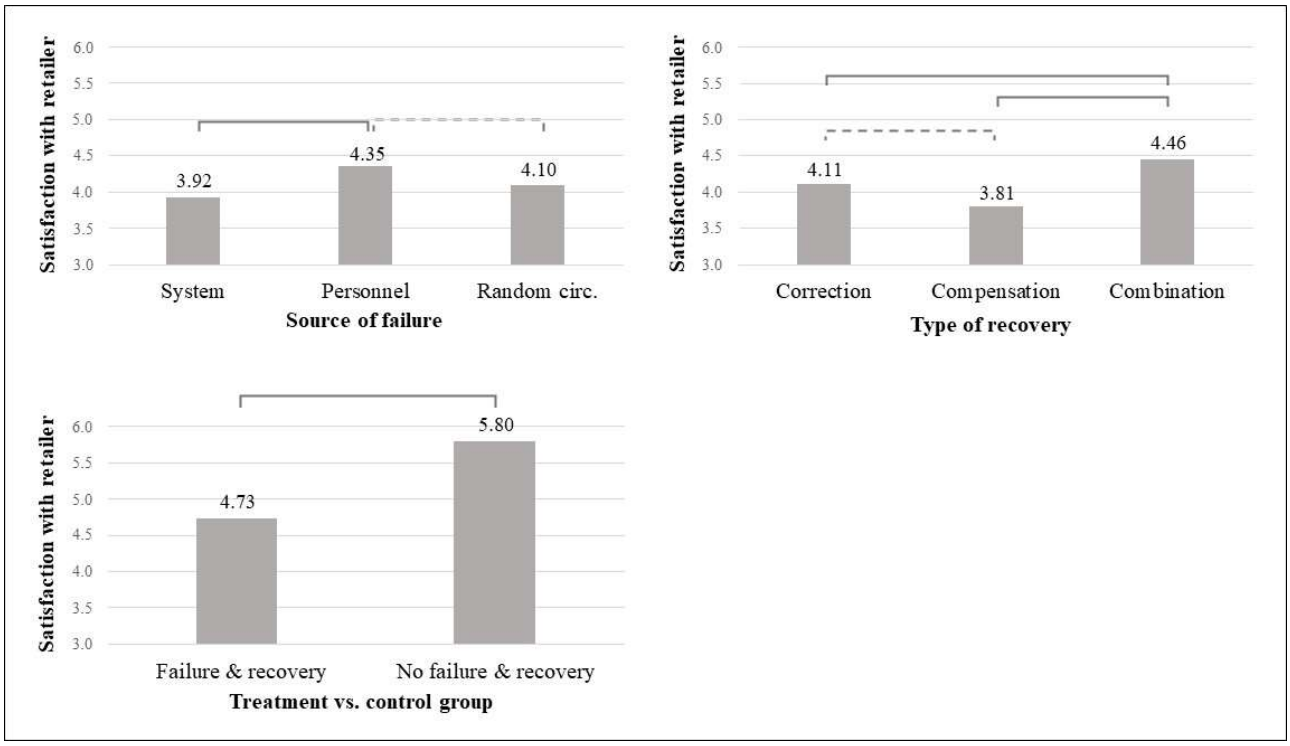
Effect paths	Estimated effects	t	p-values
Total effect			
Treatment vs. control → satisfaction	-.698	-3.990	.000
Direct effects			
Treatment vs. control → risk prob.	1.083	6.906	.000
Treatment vs. control → risk magnitude	.808	4.733	.000
Treatment vs. control → satisfaction	-.150	-.774	.441
Risk probability → satisfaction	-.340	-3.372	.001
Risk magnitude → satisfaction	-.222	-2.397	.018
Indirect effects			
Treatment vs. control → risk probability → satisfaction	-.369		95% CI [-.667, -.144]
Treatment vs. control → risk magnitude → satisfaction	-.180		95% CI [-.355, -.031]

Note: "vs." indicates the effect of the group mentioned firstly compared to the group mentioned secondly. All effects are partially standardized.

Table 13 gives an overview of the evaluation of hypotheses testing and in addition, figure 11 graphically summarizes all main effects.

Table 13. Evaluation of hypotheses testing.

Hypothesis	Relationship	Evaluation
H1a	Failure (personnel) vs. failure (system) → satisfaction	Supported
H1b	Failure (personnel) vs. failure (random circumstances) → satisfaction	Supported
H1c	Failure (system) vs. failure (random circumstances) → satisfaction	Rejected
H2	Failure source → risk probability → satisfaction	Partly supported
H3a	Recovery (combination) vs. recovery (correction) → satisfaction	Supported
H3b	Recovery (combination) vs. recovery (compensation) → satisfaction	Supported
H3c	Recovery (correction) vs. recovery (compensation) → satisfaction	Supported
H4	Recovery → justice → risk magnitude → satisfaction	Supported
H5a	Control vs. treatment → satisfaction	Supported
H5b	Control vs. treatment → risk probability → satisfaction	Supported
H5c	Control vs. treatment → risk magnitude → satisfaction	Supported



Note: (Dashed) brackets indicate (marginally) significant mean differences.

Figure 11. Main effects in study 1.

4.6 Additional analyses

To check the robustness of our findings and to address some shortcomings of our main study, we conducted two small follow-up studies.

4.6.1 Study 2

Study 2 aimed to check whether the lowest level of customer satisfaction after a compensatory recovery may result from the customer having to engage in a new transaction with the retailer to redeem the discount voucher. However, since the customer has experienced a service failure at the focal retailer, it may well be that s/he is no longer interested in making any further purchases from the retailer. Consequently, a discount voucher as compensation ($compensation_{discount}$) would have no use for the customer. Thus, we formulated the questionnaire analogous to study 1 but added one treatment group with an alternative compensation (without discount): the immediate provision of the same sports shoes in a different color ($compensation_{product}$). This compensation does not require any further transaction with the retailer to take effect. Moreover, we kept the failure source constant (without specifying it) and did not integrate a combined recovery and perceived $risk_{probability}$. Hence, we conducted a scenario-based online experiment in a between-subjects design with three treatment groups referring to the different types of recovery, namely correction, $compensation_{discount}$ (discount voucher), and

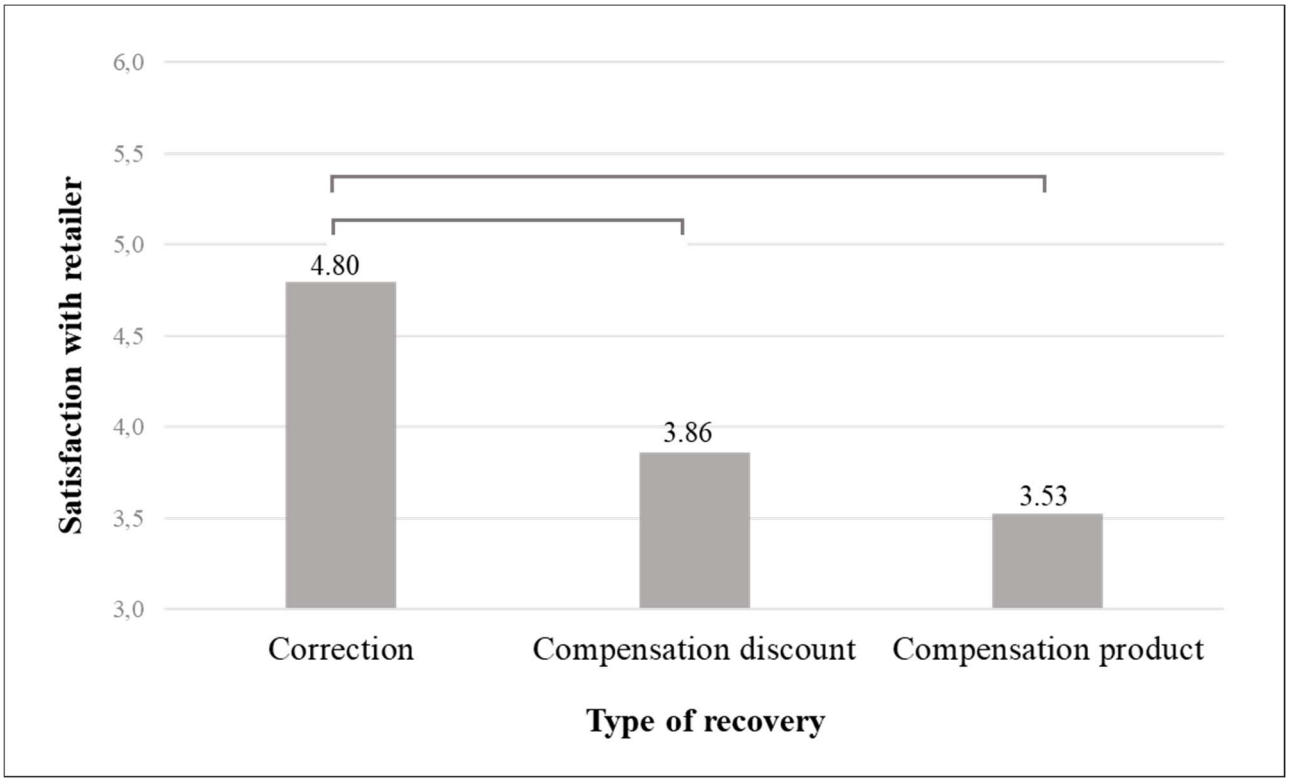
$compensation_{product}$ (sports shoes in a different color). The online survey yielded a sample of 161 respondents (Ø age approx. 34 years; 71.4% female, 28.0% male, 0.6% diverse).

After analyzing the constructs' scale reliability and convergent and discriminant validity, we executed a Brown-Forsythe test with Games-Howell posthoc tests (due to heterogeneity of variances) in SPSS to examine the main effect. Subsequently, we conducted a serial mediation analysis via PROCESS to analyze the mediation effects of perceived justice and perceived $risk_{magnitude}$.

Reliability analysis reveals Cronbach's alpha values above .70 for all constructs, indicating an appropriate internal consistency. A factor analysis shows that not all five items of perceived justice exceed the critical threshold of .70 for an adequate convergent validity. Therefore, we deleted items 2 and 5. All remaining factor loadings lay above .70 and load on the corresponding factor, indicating appropriate convergent and discriminant validity of the constructs. Exact values can be found in appendix F.

We did a manipulation check with a one-way ANOVA or Brown Forsythe test and Tukey-HSD or Games-Howell posthoc tests (depending on the homogeneity of variances) for the particular manipulations, which reveals that participants effectively realized the manipulations between the different scenarios (all $p<.01$). We also controlled for a high situational product involvement regarding sports shoes and a realistic scenario perception with one-sample t-tests. The mean value of 5.63 regarding the involvement is significantly higher than the scale's midpoint of 4 ($p<.001$). The realism check indicates that the participants could well imagine the described situation, since the mean value of 5.97 is also significantly higher than the scale's midpoint of 4 ($p<.001$).

The Brown Forsythe test reveals a significant main effect of the type of recovery on customer satisfaction ($F(2,139.984)= 8.686$; $p<.001$). The results replicate the findings of study 1 in that the correction ($M=4.80$; $SD=1.34$) leads to a significantly higher satisfaction than the $compensation_{discount}$ ($M=3.86$; $SD=1.89$; $p=.012$). The same applies to the comparison of the correction and the $compensation_{product}$ ($M=3.53$; $SD=1.72$; $p<.001$). However, there is no significant difference in satisfaction between the two types of compensation ($p=.620$). Figure 12 visualizes the main effect.



Note: Brackets indicate significant mean differences.

Figure 12. Main effect in study 2.

For the serial mediation model, PROCESS reveals an R^2 of .102. Analogous to the findings in the main study, the results show that the difference in satisfaction between the correction and the compensation$_{discount}$ is partially serially mediated by perceived justice and perceived risk$_{magnitude}$ with a partially standardized indirect effect of ß=-.032 (95% CI: -.075 to -.006; partially standardized direct effect: ß=-.271; p=.047). For the difference between the correction and the compensation$_{product}$, there is even a full serial mediation by perceived justice and perceived risk$_{magnitude}$ with a partially standardized indirect effect of ß=-.053 (95% CI: -.111 to -.014; partially standardized direct effect: ß=-.195; p=.161). There is no mediating effect regarding the comparison of the two compensations (95% CI: -.061 to .004). Exact values can be found in appendix G.

4.6.2 Study 3

Study 3 aimed to check whether indeed the failure source treatments have the assumed impacts on the failure stability and controllability attributions mentioned in our development of the hypotheses. Therefore, we formulated the scenarios analogous to study 1, but kept the type of recovery constant (correction). Subsequently, we asked respondents about their attributions regarding failure stability, controllability, and locus of causality (for completeness regarding the attributional dimensions of the attribution theory). Hence, we conducted a scenario-based online experiment in a between-subjects

design with three treatment groups referring to the already known sources of the service failure (system, personnel, random circumstances). For failure stability, we used three seven-point semantic differential items and for failure controllability two items on a scale ranging from *not at all* (1) to *very well* (7), both based on Hess et al. (2003). The scale for locus of causality contained three seven-point semantic differential items similar to Russel (1982), with higher values indicating an attribution to random circumstances and lower values an attribution to the retailer. Appendix H gives an overview of the particular items used. The online survey yielded a sample of 469 respondents (Ø age approx. 35 years; 51.4% female, 47.8% male, 0.9% diverse).

After analyzing scale reliability, convergent and discriminant validity of the constructs, we executed one-way ANOVAs and a Brown-Forsythe test with Tukey-HSD and Games-Howell posthoc tests, respectively (due to heterogeneity of variances) in SPSS to examine the influence of the failure source on the three attributions. Reliability analysis reveals Cronbach's alpha values above .70 for all constructs, indicating an appropriate internal consistency. A factor analysis shows that all items load on the corresponding factor with factor loadings above the critical threshold of .70, implying adequate discriminant and convergent validity of the constructs.

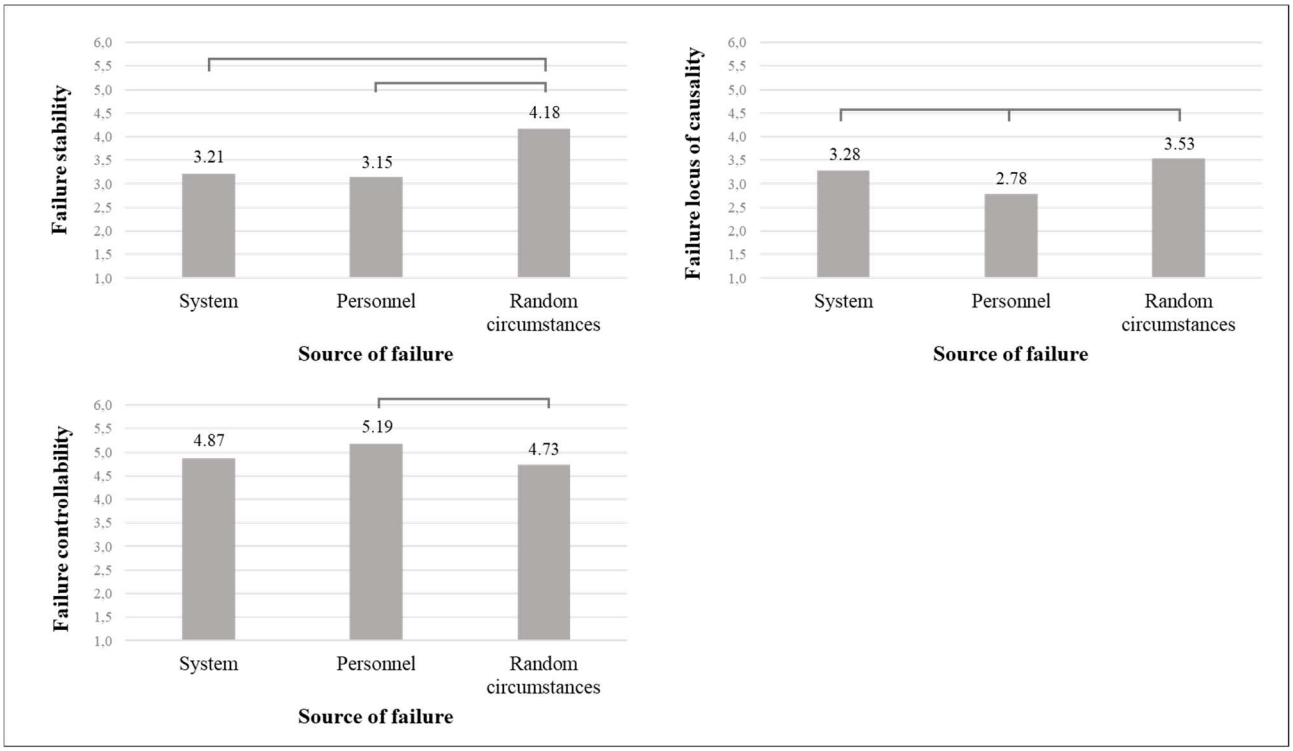
We did a manipulation check with a one-way ANOVA or Brown Forsythe test and Tukey-HSD or Games-Howell posthoc tests (depending on the homogeneity of variances) for each of the three manipulations of the failure source. Results reveal that respondents properly distinguish between the three failure sources (all $p<.01$). We also controlled for a high situational product involvement regarding sports shoes and a realistic scenario perception with one-sample t-tests. With regard to the involvement, the mean value of 5.62 is significantly higher that the scale's midpoint of 4 ($p<.001$). The same applies to the realism check ($M=5.96$; $p<.001$), indicating that respondents could well imagine the described situation.

The ANOVA referring to failure stability reveals an adjusted R^2 of .104. Results show that there is a significant main effect of the failure source on failure stability ($F(2,464)= 27.912$; $p<.001$). As assumed, for a $failure_{random\_circ.}$ ($M=4.18$; $SD=1.43$) the failure stability is significantly higher than for a $failure_{system}$ ($M=3.21$; $SD=1.39$; $p<.001$) and for a $failure_{personnel}$ ($M=3.15$; $SD=1.28$; $p<.001$). However, there is no significant difference in the failure stability attribution between system and personnel failures. Nevertheless, the mean values tend in the assumed direction, in that personnel failures tend to have the lowest attributed failure stability.

For failure controllability, the ANOVA reveals an adjusted R^2 of .012. Results show a significant main effect of the failure source ($F(2,466)= 3.730$; $p=.025$). Just as for the failure stability, the mean

values of the failure controllability support our assumptions regarding the order of attributed controllability for the three failure sources, in that controllability is perceived as highest for a $failure_{personnel}$ (M=5.19; SD=1.40), followed by a $failure_{system}$ (M=4.87; SD=1.45), and finally a $failure_{random\_circ.}$ (M=4.73; SD=1.65). However, merely the difference between a $failure_{personnel}$ and a $failure_{random\_circ.}$ is significant (p=.021). The differences between a $failure_{personnel}$ and a $failure_{system}$ (p=.166) and between a $failure_{system}$ and a $failure_{random\_circ.}$ (p=.675) only tend in the assumed direction.

Regarding the impact of the failure source on the locus of causality (higher values indicating an attribution to random circumstances and lower values an attribution to the retailer), the adjusted R^2 is .031. The Brown Forsythe test indicates a significant main effect (F(2,459.05)= 8.485; p<.001). Results show that consumers are significantly more likely to attribute a failure to the retailer when it is a $failure_{personnel}$ (M=2.78; SD=1.58) than when it is a $failure_{random\_circ.}$ (M=3.53; SD=1.81; p<.001) or a $failure_{system}$ (M=3.28; SD=1.54; p=.015). There is no significant difference in the attributed locus of causality between a $failure_{random\_circ.}$ and a $failure_{system}$ (p=.370). Figure 13 graphically summarizes the main effects.



Note: Brackets indicate significant mean differences. Higher values for the locus of causality indicate an attribution to random circumstances, and lower values an attribution to the retailer.

Figure 13. Main effects in study 3.

4.7 General discussion

As research on service failure and recovery in a multi-channel context is sparse, and we are analyzing a new mediating variable, our study is among the first to uncover and psychologically explain the effects of different failure sources and types of recoveries connected to the usage of MCTs on consumers' satisfaction with a retailer.

Firstly, we show that a $failure_{personnel}$ reduces the satisfaction with the retailer least, confirming our expectations. However, there is no significant difference between a $failure_{system}$ and a $failure_{random\_circ.}$. This contradicts our assumptions that consumers perceive a $failure_{random\_circ.}$ as worst due to the highest stability and lowest controllability attributions (which we suggested in our argumentation and which findings from study 3 support). A possible explanation for this may lie in the neglected third dimension of the attribution theory, that is, the locus of causality, meaning where the cause for the failure lies (Weiner, 2000). During the formulation of our hypotheses, we argue that the stability and controllability dimensions of this theory, in particular, are relevant in our study context since they may lead to a higher or lower perceived $risk_{probability}$, that is, a higher or lower future failure probability. This seems to be true regarding the significant difference between a $failure_{personnel}$ and a $failure_{system}$, as results show that consumers' perceived $risk_{probability}$ mediates this effect. However, there is no mediation via perceived $risk_{probability}$ in the context of a $failure_{random\_circ.}$. Thus, there should be an alternative explanation here. Literature implies that consumers perceive failures more positively if they are not the retailer's fault (see Bambauer-Sachse & Rabeson, 2014; Ellyawati, 2017). As study 3 shows, consumers are less likely to attribute the failure to the retailer when they experience a $failure_{random\_circ}$ than when they experience a $failure_{personnel}$ or a $failure_{system}$ (the latter merely in tendency though). Thus, customers may perceive $failures_{random\_circ.}$ as more positive than we expected based on stability and controllability attributions, due to a more favorable locus of causality attribution (in terms of satisfaction).

Secondly, as assumed, we find that a combined recovery leads to the highest customer satisfaction with the retailer, followed by a correction, and finally a compensation. This implies a clear order of different types of recovery regarding their effectiveness. Study 2 moreover reveals that consumers perceive a compensation as least favorable, independent of the kind of compensation. In line with our hypothesis, these effects are serially mediated by consumers' perceived justice and their perceived $risk_{magnitude}$.

Thirdly, we find no support for a recovery paradox. This confirms our expectations, since consumers are more satisfied if they do not experience a failure and a recovery than if they do so. Moreover, the non-occurrence of the paradox can be explained by the two risk dimensions, as they fully mediate

this effect. Hence, the service failure weights more heavily than any recovery due to higher risk perceptions in case of failure and recovery compared to no failure and no recovery.

4.7.1 Management implications

Based on the outlined results, multi-channel retailers have the opportunity to better handle service failure and recovery situations. Firstly, as the non-occurrence of the paradox implies, retailers should generally seek to avoid service failures of any type since none of the examined recoveries is able to fully make up for the failure. However, it is highly unrealistic to expect a retailer to actually be able to avoid any failure at all. As the non-existence of the paradox is fully mediated by consumers' perceived risk, retailers should thus at least seek to reduce consumers' risk perceptions when a failure occurs, since this may make it more likely that the recovery can compensate or even outweigh the failure. To this end, they can either reduce the customers' perceived $risk_{probability}$, for example, by only sending a reservation confirmation when the product has, in fact, been reserved. Alternatively, they can reduce consumers' perceived $risk_{magnitude}$ by, for example, taking care of the affected customer and asking him/her what they can do to make up for the failure.

Secondly, as retailers cannot avoid service failures completely, they should prioritize focusing their attention and resources on preventing specific failure sources more than on others. Following our results, retailers should in particular ensure that their MCT system works properly by investing time and money in system failure prevention, since consumers tend to perceive these failures as the worst. If a system failure occurs, nonetheless, retailers should immediately rectify the failure source – if possible – and prioritize communicating this, as it may lower consumers' perceived probability of another system failure, which mediates this effect. Since customers perceive $failures_{personnel}$ as least negative, retailers should train their staff to profess their failures to the customer. In practice, many employees try to hide their own failures and blame them on other things, such as the system or random circumstances (see Bitner, Booms, & Mohr, 1994; Hart, Heskett, & Sasser, 1990). However, this has a negative impact on customer satisfaction.

Thirdly, our main study suggests that when a failure happens, retailers are best advised to respond to a such with a combined recovery, as this leads to the highest customer satisfaction. However, many retailers do not have the recovery budget to offer such a comprehensive recovery. In this case, retailers should at least provide a failure-related recovery (i.e., a correction) rather than a failure-independent recovery (i.e., a compensation) to enhance customer satisfaction. This means that, where possible, retailers should refrain from a blanket recovery strategy and instead respond specifically to particular failure situations. However, if retailers nevertheless want to offer a compensation-based recovery, study 2 implies that it is not essential for them to invest money to do so (a discount voucher, for

example), since there is no indication that consumers actually prefer a monetary to non-monetary compensation, such as the mere provision of a similar alternative product (the same product in a different color, for example). Due to the serial mediation via perceived justice and perceived $risk_{magnitude}$ for all types of recovery, we advise retailers in any case to stress that they endeavor to act fairly, and to reduce consumers' negative consequences in the case of a reoccurring failure when providing their recovery.

4.7.2 Theoretical contribution

As research on the effects of service failures and recoveries on customer satisfaction in an MCT context is very sparse, our study extends prior literature in several ways. Examining the two dimensions of consumers' perceived risk, we introduce and analyze a new mediator in the relationship between service failure and recovery and customer satisfaction with a retailer. Prior studies investigate several different mediators (for an overview see De Matos et al., 2007), though to the best of our knowledge, our study is the first to empirically include perceived risk in this context. The same applies to the service recovery paradox. Its non-occurrence can also be explained by consumers' perceived risk. Past research attempts to identify relevant factors that either favor or avoid this paradox, though there still seems to be missing information on this aspect. Thus, our study provides a new theoretical approach to explain the underlying psychological processes of consumers in the context of service failures, recoveries, and the recovery paradox.

Additionally, we demonstrate that the widely used attribution and equity theories are not entirely sufficient to adequately explain the psychological processes that lead to customer reactions to service failures and recoveries, respectively. Based on our results, we conclude that they should each be linked to the theory of perceived risk to be able to map the psychological processes in this context more holistically. Our study, moreover, suggests that there may be two alternative approaches to explain the effect of the source of a service failure on customer satisfaction based on the attribution theory. On the one hand, a failure may influence the consumers' perceived $risk_{probability}$ and via this, also affect the customer satisfaction due to stability and controllability attributions. On the other hand, there seems to be a parallel psychological process based on locus of causality attributions, which do not seem to have any relationship to risk perceptions, but directly affect customer satisfaction. Therefore, different sources of a service failure appear to initiate different attributional processes, which influence customer satisfaction in alternative ways. However, more research is required to validate these assumptions.

Finally, our results provide new insights in three respects. First, this is one of the first studies on service failure and recovery in a multi-channel context. Prior research extensively analyzes this topic

in the offline channel (e.g., Maxham & Netemeyer, 2002a; Smith et al., 1999; Tax et al., 1998) and increasingly also in the online channel (e.g., Holloway & Beatty, 2003; Sousa & Voss, 2009; Wang et al., 2011). However, investigations in this area in a multi-channel setting are still sparse. Nonetheless the integration of several channels should increase a service's proneness to failures and thus make it all the more crucial to conduct research in this context. Second, past studies mainly focus on core services when examining service failure and recovery (e.g., Hess et al., 2003; Hocutt et al., 2006; McCollough et al., 2000). Our results show, however, that failures in a supplementary service, such as an MCT which is not working, also have a detrimental effect on customer satisfaction, and should therefore not be neglected in research. Third, we add knowledge on the impact of service failures and recoveries regarding technology-based services. Many prior studies instead focus on service failures in the context of human failure (e.g., Brown et al., 1996; Hocutt et al., 2006) or external circumstances (e.g., Mattila & Patterson, 2004). Nevertheless, our results indicate that failures due to technological problems in particular (i.e., system failures in our study), cause customer dissatisfaction, which supports the high relevance to examining these types of failures in more detail.

4.7.3 Limitations and future research

To interpret our findings, it is necessary to consider certain limitations. Firstly, due to the scenario experiment, we merely analyzed an artificially created purchase situation, and only considered one specific product group and technology. However, the results may also be applicable to other MCTs, such as click and collect, since they may have very similar failure sources. Nevertheless, future research should validate the results in an actual purchase setting and extend this study context to different product groups and MCTs.

Secondly, in our scenario, we have set the discount amount for the compensatory recovery at 20%. A higher or lower discount may lead to different results (see Gelbrich et al., 2015). Furthermore, we did not ask whether the respondents have already experienced such a check and reserve service failure, which could also impact the results (see Betts et al., 2011). Future studies should attempt to vary the discount, and include the respondents' prior experience.

Thirdly, with study 3, we empirically analyzed the relationship between the failure source and the three attributions. Still, our assumptions regarding the potential mediating role of these attributions in the overall model are merely theoretical in nature. Future research could further analyze the role of attributions in empirical studies.

5 General discussion

5.1 Summary of results

This dissertation focuses on examining selected web-to-store MCTs (availability check, check and reserve, click and collect) and the role of consumers' perceived risk within this context. Besides simply adding purchase and marketing channels, multi-channel retailers nowadays need to effectively integrate these channels to meet heightened consumer expectations, and thus, remain competitive (see Jones et al., 2022). Due to the increasing dominance of online retailing, originally pure offline retailers, in particular, are seeking to re-increase in-store traffic in order to benefit from the online channel rather than suffer from it. To this end, they implement web-to-store MCTs. These technologies, however, also offer benefits to multi-channel retailers that do not originate in the offline channel, such as avoiding a substitution of the retailer when consumers switch channels or the ability to sell additional products when the customer visits the store (cross-selling or up-selling). However, due to the combination of multiple channels and the relative novelty of MCTs, many consumers perceive specific risks in this context that may prevent a positive evaluation of these technologies or their usage, and lead to a higher failure sensitivity toward them. Yet, prior literature provides little insight into either the factors that contribute to a positive evaluation of these MCTs, or the most beneficial way for their design and operation. In particular, research on the role of consumers' perceived risk in this context is relatively sparse.

Against this background, the overall objective of this dissertation was to identify factors relevant to the selected MCTs in terms of their general evaluation and beneficial design and operation, with specific consideration of consumers' perceived risk. In particular, this research project aimed to present answers to the following superordinate research question: *How can retailers best implement, design, and operate the selected MCTs from the customer's perspective against the background of consumers' perceived risk?*

To provide a differentiated and comprehensive answer to this question, three independent research projects both focused on, and empirically analyzed the proposed research question. In doing so, each of the projects contributed individually to closing the research gaps pointed out in the introduction, offering specific managerial and theoretical implications. The following section summarizes the results of the three research projects, revealing their respective contribution to answering the superordinate research question, and explaining their interplay.

The *first research project* in this dissertation addressed the research gap on which factors influence consumers' attitudes toward the selected web-to-store MCTs to be able to improve customers' general

evaluations of these technologies. To this end, it investigated the impacts consumers' various types of perceived risk have on the particular MCTs in comparison to each other since particularly within a multi-channel context, risk may play a significant role in both consumers' perceptions and behavior. In doing so, the research project has also extended the literature in the sparsely researched area of perceived risk against the background of multi-channeling. Additionally, it addressed the research gap on alternative web-to-store MCTs to the predominantly analyzed click and collect, that is, the availability check and check and reserve, which have been little studied so far. Moreover, it analyzed the relevance of consumers' general channel preference in this context. In particular, the research project presents answers to the following subordinated research questions:

(1) How do different risk perceptions influence consumers' attitudes toward specific MCTs (availability check, check and reserve, click and collect)?

(2) How do these effects differ between the particular MCTs?

(3) Does the customer's general channel preference moderate these effects?

Based on an online survey in a within-subjects design, the research project outlines the significant impacts of different types of perceived risk on consumers' attitudes toward the specific MCTs. In particular, the results indicate that three types of risk significantly affect these attitudes: product quality risk, product availability risk, and data risk (participants perceived personal data and payment data risk as one risk dimension). In general, the analyses reveal that product quality and data risks have significant negative effects on consumers' attitudes toward the selected MCTs, while product availability risk has a significant positive impact (research question 1). Hence, the research project proves consumers' perceived risks play an important role in the formation of a positive attitude toward the selected MCTs. In particular, it becomes clear that certain risk perceptions may deteriorate the attitudes toward the MCTs, while others have the potential to improve them. Therefore, consumers' risk perceptions in terms of their impact on consumers' attitudes toward MCTs should not necessarily be viewed as inherently negative.

Further, the results show that the outlined effects of consumers' risk perceptions on their attitudes toward the selected MCTs differ depending on the particular technology (research question 2). Overall, the research project finds that the influence of the different types of risk perceptions is worst for click and collect. Here, the negative effects of quality and data risk are highest, while the positive impact of availability risk is lowest, compared to the other two technologies. This is in line with the additional finding that consumers generally have the most negative attitude toward click and collect in the comparison between the three selected MCTs. This is a remarkable finding, as many retailers regard click and collect to be one of the most important and popular MCTs (Forrester, 2014; Hübner,

Wollenburg, & Holzapfel, 2016; Jin et al., 2018; Kim et al., 2017; Ma et al., 2014). Moreover, the results show a negative impact of quality risk on consumers' attitude toward the availability check, and no significant effect on their attitude toward check and reserve. This implies that consumers generally seem to feel uncomfortable about selecting a specific product online or expressing their interest in this product in any way to the retailer via the internet prior to physically inspecting it. Results, furthermore, reveal that product availability risk has the least positive influence on click and collect. This finding suggests that consumers do not merely include the probability dimension of perceived risk in their risk evaluation or rather in their assessment of how well a particular MCT can prevent or reduce the potential negative consequences, that is, a product not being available. They presumably also consider the magnitude of the potential negative outcome, if the product was not available. This aligns with the common two-dimensional conceptualization of perceived risk, which comprises the perceived probability of negative consequences and their perceived magnitude (Cunningham, 1967). Since the customer has already bought the product, when using click and collect, the potential negative consequences are worst in this case, as s/he is forced to spend time and effort returning the product and getting his/her money back.

The research project finally identifies a significant moderating effect of consumers' general channel preference for purchasing products on the relationship between perceived product availability and data risks and consumers' attitudes toward the selected MCTs (research question 3). The results reveal that the more a customer prefers buying via the online channel, the weaker the effects of these types of risk on the attitude are. For product quality risk, there is no moderating effect of a customer's general channel preference, which indicates that the frequent usage of, or preference for, a specific purchase channel cannot reduce the quality risk's negative impact on the attitudes toward the MCTs. Hence, perceived quality risk has equally negative consequences regarding the attitude toward the selected MCTs independent of the consumers' channel preferences. This makes it particularly important to consider this type of risk when implementing and operating these technologies. The same is true for the relationship between data risk and consumers' attitudes toward click and collect since there is no significant moderation effect either. This implies that a specific channel preference cannot mitigate the negative impact of perceived risk for technologies that require a lot of data from the customer.

With regard to the superordinate research question of this dissertation, research project 1 demonstrates that different types of perceived risk significantly influence consumers' evaluations of the selected MCTs. In doing so, the results show that certain types of risk (product quality and data risk) have a negative impact, while other types of risk (product availability risk) may also positively affect consumers' MCT evaluations. Either way, the research project reveals that consumers' perceived

risks play a decisive role in the context of MCTs, and that retailers can improve customers' attitudes toward the technologies by considering the specific outlined effects of the examined risk perceptions when implementing and operating their MCTs. Additionally, the results imply that consumers generally evaluate click and collect most negatively (compared to the other two MCTs) and that the analyzed types of risk, moreover, affect this technology most negatively. Hence, the study points out, which MCTs retailers need to pay special attention to if they want to provide MCTs that actually deliver value to their customers.

The *second research project* focused on the research gap regarding the impact of MCT design factors on the respective technologies' perceived usefulness and use intention in the pre-purchase stage. Additionally, it addressed perceived risk in the multi-channel context, where detailed research is still needed. To this end, this project aimed to increase value to the customer provided by the selected MCTs, by examining different kinds of MCT design elements with regard to their perceived usefulness from the customer's perspective. In doing so, it mainly analyzed to what extent different types of consumers' perceived risk contribute to this. In particular, the second research project answered the following subordinate research questions:

(4) How do different characteristics of MCT designs (i.e., product pick-up time, confirmation date of product reservations, displayed product availability) affect consumers' perceived usefulness of the selected MCTs?

(5) Do consumers' risk perceptions mediate these effects?

Based on a 2×2×2 between-subjects design experimental study, the results show that different characteristics of MCT designs generally affect consumers' perceived usefulness of the respective MCTs (research question 4). The research project reveals that a specified product pick-up time on the same day, compared to an unspecified pick-up time, positively impacts consumers' perceived usefulness of all three selected MCTs. These effects are mediated by consumers' perceived time risk (research question 5), which implies that time savings which finally result in an earlier possession of the desired product, seem to play an important role in the usage of web-to-store MCTs in general. Regarding the design of the confirmation date for product reservations, the results suggest that consumers do not care whether retailers confirm the reservation immediately, or with a temporal delay (in terms of perceived usefulness and use intention of check and reserve). Availability risk does not play a significant role in this context either. This indicates that as long as retailers confirm product reservations within a reasonable time, consumers do not doubt the possibility of finding the focal product in the store. Therefore, a particularly quick reservation confirmation does not deliver any additional value to consumers. On the contrary, the confirmation can even have a more positive effect if retailers do

not send it out immediately, as a delayed reservation confirmation leads to a higher perceived usefulness of click and collect. However, this only applies if retailers offer check and reserve and click and collect simultaneously. The results, moreover, demonstrate that a higher displayed product availability has a positive impact on consumers' perceived usefulness of the availability check and check and reserve, while it does not affect the perceived usefulness of click and collect. A lower perceived availability risk partially mediates the significant effects. Thus, for MCTs that do not definitely assure store availability of the desired item, a high displayed product availability is required to reduce the perceptions of availability risk, and consequently, make the MCTs useful to consumers. This suggests that although the selected web-to-store technologies should generally decrease the availability risk, only the actual purchase of the product, as is the case with click and collect, can deliver a benefit in terms of assured product availability to consumers, if product availability is low. With regard to the generalizability of the results from the first research project, this is of particular relevance. According to research project 1, a customer's generally high perceived product availability risk contributes to a positive attitude toward the availability check and check and reserve. However, the results from the second research project suggest that this presumably mainly applies under the condition that the displayed product availability is high. Only then do the availability check and check and reserve actually have the opportunity to reduce the customer's availability risk, and hence, ensure a positive attitude and high perceived usefulness of these MCTs.

Additional results empirically validate the positive influence of consumers' perceived usefulness of the MCTs on their use intention for these technologies, which points out the high relevance and benefit of improving the examined internal factors. Finally, the results are in line with the findings of the first research project, in that the perceived usefulness is generally lowest for click and collect and highest for the availability check.

With regard to the superordinate research question of this dissertation, research project 2 first and foremost points out how retailers should design the selected MCTs to maximize their perceived usefulness from the customer's perspective. To this end, some investments are beneficial for consumers and additionally, for retailers (precisely specified and assured product pick-up time on the same day and high displayed product availability), while others are not (immediate confirmation of product reservations). Consequently, retailers can improve consumers' perceived usefulness and, via this, their perceived use intention for the selected MCTs by adjusting their MCT design according to the results of this study. Moreover, the study indicates that consumers' perceived time and availability risks contribute significantly to explaining why different MCT designs lead to varying perceptions of MCT usefulness. Finally, the results support the finding that consumers evaluate click and collect most negatively in the comparison of the three selected MCTs.

The *third research project* finally addressed several further research gaps outlined in the following. Since MCTs are relatively error-prone, due to their relative novelty and complexity, the research project examined the consequences of different sources of service failures and types of recoveries for customer satisfaction against the background of MCTs. By this, it extended the sparse literature on service failures and recoveries in a multi-channel context as well as referring to supplementary (rather than core) services and technology-based services. Most importantly, this project investigated the role of perceived risk in this regard. In doing so, it shed light on the research gaps referring to empirical studies on risk perceptions in the multi-channel as well as in the service failure and recovery area. The latter aspect, has, in particular, been nearly completely neglected in the literature so far. Specifically, the project introduced perceived risk as a new mediator in the relationship between service failure and recovery and customer satisfaction. It additionally considered the (non-)occurrence of a recovery paradox against this background. Overall, the research project's objective was to be able to offer retailers advice regarding critical aspects in their MCT operation, which they should consider as a priority, and show them the best possible way to fix an MCT service failure. More importantly, it intended to provide a better understanding of the psychological processes following service failures and recoveries in general. In particular, the research project offered answers to the following subordinate research questions:

(6) Which source of service failure do consumers perceive as most negative in the context of MCTs?

(7) What is the most effective way for retailers to recover from service failures when using MCTs?

(8) To what extent do perceived justice and perceived functional risk mediate the effects of different sources of service failure and types of service recovery on the satisfaction with a retailer?

(9) To what extent does a service recovery paradox (not) occur in an MCT context, and which role does consumers' perceived risk play in this regard?

Based on a scenario-based online experiment in a 3×3 between-subjects design with a control group and two additional follow-up studies, the results show that consumers perceive different sources of service failures as differently negative in the context of MCTs (research question 6). In particular, a service failure caused by personnel reduces the satisfaction with the retailer least, compared to failures due to random circumstances, or to the technology's system. For the difference between a $failure_{personnel}$ and a $failure_{system}$, which tends to lead to the lowest satisfaction, the impact on customer satis-

faction is mediated by consumers' perceived probability of negative consequences, that is, the probability dimension of perceived risk (research question 8). This is in line with our attribution theory-based assumptions and the empirical proof of study 3 that there is a higher perceived failure controllability and a lower stability for personnel compared to system failures, which may lead to a lower perceived future failure probability and ultimately to a higher customer satisfaction. Thus, perceived risk is an effective approach to explaining why different MCT failure sources reduce customer satisfaction differently strong, even though the outcome of the service failure is exactly the same in all cases. However, the perceived risk probability merely seems to be a suitable explanation for failure sources that consumers perceive as having the same locus of causality. This is the case for personnel and system failures. Here, the consumer blames the retailer for the failure, which study 3 provides empirical support for. Conversely, for a failure due to random circumstances, consumers instead blame chance. In this case, the perceived risk probability does not play a role in any of the comparisons with the other two failure sources with regard to resulting differences in customer satisfaction. Possibly, customers do not perceive a particularly increased risk of another failure due to this failure source since such coincidences can occur anytime and anywhere without anyone being responsible for it or being able to prevent it or reduce its probability. In this respect, a failure due to random circumstances does not increase the perceived risk regarding the probability of a reoccurring failure.

Regarding the service recovery following a failure, the project reveals that a combined recovery approach is most effective in restoring customer satisfaction compared to the two single approaches (research question 7). This is followed by a corrective recovery and finally a compensation, the latter leading to the lowest satisfaction. These effects are serially mediated by consumers' perceived justice of the recovery and their perceived magnitude of negative consequences in case of a reoccurring failure, that is, the magnitude dimension of perceived risk (research question 8). This demonstrates that the more consumers generally perceive retailers as just, the more they are confident that the corresponding retailer will handle potential future failures according to the consumers' interests, which means that perceived potential negative consequences of the failure, that is, risk perceptions, are reduced. Study 2 supports these results, and moreover, reveals that consumers perceive a compensation as least favorable, independent of the particular kind of compensation.

Although service recovery more or less provides the chance to restore customer satisfaction after a service failure, none of the types of recovery examined are capable of raising satisfaction to the level without a service failure or even above. However, since this would be the condition for assuming a recovery paradox, its existence in the context of MCTs cannot be confirmed (research question 9). Moreover, the results reveal that the non-occurrence of a recovery paradox can be explained by consumers' perceived risk. The findings show that both dimensions of consumers' risk perceptions fully

mediate this effect. Hence, on the one hand, customers find it more likely that a failure will occur in the future, and on the other hand, they find it worse if it does, when they have already experienced a previous service failure with subsequent recovery. This implies that previous negative experiences in the usage of MCTs generally have a negative influence on consumers' perceptions of future MCT usage and transactions with the corresponding retailer due to heightened risk perceptions.

Regarding the superordinate research question of this dissertation, research project 3 gives insights into how retailers can operate their MCTs in the most beneficial way from a customer's perspective. Since failures in the provision of services, such as the provision and operation of MCTs, are inevitable, this investigation helps identify the failure sources for which it is most important to invest in improving in order to retain customer satisfaction. Doing so reveals that consumers perceive failures caused by personnel as the least negative and failures caused by the system as the most negative. For this reason, it is important for retailers to pay particular attention to, and prevent the latter. Furthermore, the research project points out the most effective way to recover from these service failures, which is a combined approach of a compensation and a correction. Most importantly, it outlines the specific relevance of consumers' perceived risk for service failure and recovery situations when using MCTs. This is achieved by revealing significant mediation effects of both the perceived probability and the perceived magnitude of potential negative consequences in the relationships between service failures and recoveries and customer satisfaction. The research project thus contributes to explaining the psychological processes underlying these situations.

Overall, each of the three research projects contributes to filling the research gaps outlined in the introduction by answering the proposed superordinate research question as summarized before. In doing so, the first project reveals that different types of consumers' perceived risk generally play an important role in evaluating the selected MCTs, especially for consumers who generally prefer the offline channel for purchasing. Adding to these findings, projects 2 and 3 point out the importance of these risk perceptions in the specific stages of a consumer's purchase process, which are relevant to web-to-store MCTs, that are, the pre-purchase and the purchase stage. Research project 2 thereby demonstrates that retailers have the opportunity to increase consumers' perceived usefulness of the selected MCTs prior to use by designing them in a risk-reducing way. The third research project reveals the effects of different sources of service failures and types of recoveries when customers actually use MCTs by outlining the importance of perceived risk for both the negative consequences of a failure and the positive impact of recovery on customer satisfaction. Thus, the dissertation additionally demonstrates across all research projects that consumers' risk perceptions are relevant to the evaluation of MCTs, both in terms of general risk perceptions independent of MCTs or their specific

characteristics (research project 1) and in terms of risk perceptions influenced by the design and operation of MCTs (research projects 2 and 3). Hence, this dissertation proves that considering consumers' perceived risk is crucial when implementing, designing, and operating web-to-store MCTs.

5.2 Implications for retail practice

Based on the findings of the conducted research projects, and with regard to answering the superordinate research question, this dissertation derives four main implications for the retail practice. Firstly, projects 1 and 2 imply that consumers generally perceive click and collect as least positive or useful in the comparison of the three selected MCTs. Furthermore, research project 1 reveals that different types of perceived risk most negatively affect this technology. This is a particularly important result since many retailers regard click and collect to be the most popular MCT and hence have a particular focus on it (Forrester, 2014; Hübner, Wollenburg, & Holzapfel, 2016; Jin et al., 2018; Kim et al., 2017; Ma et al., 2014). However, this does not seem to be advisable against the background of our results since the complexity and costs are presumably highest for click and collect, while it seems to provide the lowest benefits to consumers, and consequently also to retailers. Therefore, retailers should either seek to improve the customers' image of this technology, for example, by reducing associated risks (see research project 1) and designing it in a more useful way (see research project 2), or not focus that strongly or even exclusively on click and collect. Instead, they are best advised to complement click and collect by the availability check and/or check and reserve, as consumers perceive these technologies as more positive and useful. Moreover, retailers may address a larger target group in this case since consumers then have the opportunity to choose between different MCTs and select the one that best matches their needs and expectations.

Secondly, this dissertation reveals that the particular design of the selected MCTs can have a significant impact on consumers' perceived usefulness of these technologies, and this, in turn, enhances customers' use intention for them. Thus, retailers should design their MCTs accordingly. In particular, they should indicate a specific product pick-up time when customers can expect to collect their reserved or purchased product at the store. In this way, consumers can better assess whether the MCT is actually beneficial to them. Results show that, if possible, this pick-up time should be on the same day. Furthermore, retailers are best advised to ensure and then especially also display a high product availability, since this leads to a higher perceived usefulness of the MCTs. Conversely, particularly those retailers with generally high product availability should offer the selected MCTs. Moreover, results suggest that retailers should not invest in an immediate confirmation of product reservations, as this does not pay off in terms of a higher perceived usefulness of check and reserve from the customer's perspective.

Thirdly, results show that retailers have the opportunity to reduce negative consequences of service failures in the operation of MCTs and increase the positive impact of a subsequent recovery if they consider specific aspects. In particular, retailers should seek to prevent failures that occur due to the MCTs' system, as these failures tend to have the most negative effect on customer satisfaction. Therefore, regarding failure prevention, they should invest most time and money improving MCT systems and ensure that they work properly. Conversely, failures due to personnel have the least negative impact on customer satisfaction. Thus, retailers should train their staff to admit their failures if they happen instead of blaming the system or chance for them. If it comes to a service failure, retailers are generally best advised to offer a combined recovery, that is, a correction of the failure as well as a compensation. Results prove that this type of recovery leads to the highest customer satisfaction. As this effect is mediated by perceived justice, among others, retailers should moreover point out in their communication that they seek to be just in offering this recovery. Suppose retailers do not have a sufficiently large budget for such a recovery. In that case, they should instead offer a failure-dependent corrective recovery as opposed to a failure-independent compensation since the first one affects satisfaction more positively. This means that, where possible, retailers should refrain from a blanket recovery strategy and instead respond specifically to particular failure situations. Suppose a corrective recovery is not possible either. In this case, retailers do not necessarily need to invest money in the compensation, though, since results show that simply providing an alternative similar product restores customer satisfaction just as well as a monetary compensation. However, retailers should seek to avoid service failures in general, as the results do not prove the existence of a recovery paradox. This means that the use of MCTs without experiencing a failure always has a more positive impact on satisfaction than the use of MCTs with any experience of service failure, independent of the recovery provided. Thus, if retailers have a relatively high failure rate in their MCT operation which they are unable to resolve, they should consider instead not offering MCTs at all, as the negative effects due to failures may outweigh the positive effects, that the provision of these technologies may have to offer.

Fourthly, overall, all three research projects reveal that consumers' perceived risks play a significant role in the context of MCTs. Thus, it is crucial for retailers to consider perceived risk in particular when implementing, designing, and operating the selected MCTs. The research projects find that, in this context, different types of perceived risks are of relevance, as well as both risk dimensions, that is, the probability of negative consequences and their magnitude. Regarding the different types of risk, only product availability risk positively impacts attitudes toward the MCTs. However, as pointed out in the general discussion, this presumably applies mainly under the condition that the retailer can ensure a relatively high level of product availability and that the MCTs indicate this to the consumers

so that the technologies do indeed offer the opportunity of reducing availability risk. Retailers should try to use this positive impact of consumers' perceived availability risk as an opportunity, for example, by particularly advertising their MCTs to consumers who visit the store and do not find the desired product due to stock-outs. All the other types of risk we examined in the three projects have a negative influence on the evaluation and perceived usefulness of the selected MCTs. Therefore, retailers should introduce or improve actions that have the ability to reduce the specific risk perceptions. In this respect, retailers could provide product videos, authentic customer reviews, or additional opportunities for virtual fitting for example, to decrease perceived quality risk. To reduce perceived data risk, they should sincerely assure that they protect customer data very well and point out particular data security activities they undertake. To decrease perceived time risk, retailers' websites should provide precise information and details referring to time-related aspects in the context of the MCTs. With regard to the two dimensions of perceived risk, retailers should seek to reduce both the probability and the magnitude of negative consequences of a service failure when using MCTs, as results reveal a negative impact of both dimensions on customer satisfaction and show that they are significantly involved in avoiding a recovery paradox. The reduction of the perceived probability of negative consequences is significant in diminishing the negative effects of service failures in the operation of MCTs. Hence, retailers are best advised to actively communicate this, and stress how they are working on improving specific failure sources if they do cause a service failure. To decrease the perceived magnitude of a potential MCT failure's negative consequences, retailers should provide appropriate recoveries after service failures and design them as fairly as possible.

Figure 14 graphically summarizes the outlined implications.

	Question	Findings of the dissertation	Recommendations for retailers
Implication 1	What should retailers consider when implementing the selected MCTs?	• Consumers perceive CC as least positive and useful • Different types of risk most negatively affect CC	• **Improve the image of CC** referring to associated risks or design it more useful (see implication 2) • **Not focus that strongly or exclusively on CC** -> complement CC by the AC and/or CR
Implication 2	How should retailers design the selected MCTs?	Consumers' perceived usefulness: • Specified product pick-up time > unspecified pick-up time • High displayed product availability > low displayed product availability • Immediate reservation confirmation = delayed reservation confirmation	• **Indicate a specific product pick-up time** for CR and CC, if possible at the same day • Assure and especially **display a high product availability** • Retailers with **generally high availability should offer the MCTs** • Do **not invest in an immediate confirmation** of product reservations
Implication 3	What should retailers consider when operating the selected MCTs?	Customer satisfaction: • No failure and no recovery > failure and recovery • Personnel failures > system failures • Combined recovery > correction > compensation	• **Do not offer CR** or comparable MCTs **in case of a high MCT failure rate** • **Invest with priority in the improvement of MCT systems** and assure that they work properly • **Train staff to admit own failures** • **Offer combined recoveries** (for lower budget rather corrections than compensations) • **Point out to act fair** when recovering
Implication 4	How should retailers consider consumers' risk perceptions in the MCT context?	• Product quality and data risk negatively affect consumers' MCT evaluations • Product availability risk may have a positive impact • Time and product availability risk mediate the effects of different MCT designs on consumers' perceived MCT usefulness • Both risk dimensions (probability and magnitude) contribute to explaining the effects of service failures and recoveries on customer satisfaction	• **Reduce perceived quality risk**, e.g., by providing product videos, realistic customer reviews, or virtual fitting • **Reduce perceived data risk**, e.g., by assuring to protect customer data very well and point out particular data security activities undertaken • **Use availability risk as a chance**, e.g., by advertising MCTs to consumers who visit the store and do not find the desired product due to stock-outs • **Reduce perceived time risk**, e.g., by providing precise information and details referring to time-related aspects in the context of the MCTs • **Reduce risk probability**, e.g., by communicating that and how specific failure sources are improved • **Reduce risk magnitude**, e.g., by providing appropriate recoveries

Note: AC = availability check; CR = check and reserve; CC = click and collect.

Figure 14. Main implications of the dissertation.

5.3 Theoretical contribution and implications for research

As the aforementioned research gaps demonstrate, detailed studies on the selected MCTs are still sparse. In particular, research on the role of consumers' perceived risk in this context is lacking. Hence, this dissertation identifies important extensions of the current literature in three main aspects. Thereby, it gives answers to previously unresolved research questions and highlights relevant aspects in this research area that future studies should consider.

Firstly, by investigating impact factors on consumers' attitudes toward the selected MCTs and their perceived usefulness, research projects 1 and 2 provide insights on how to influence crucial variables which prevail in the use intention for these technologies. The use intention of which, has only been sporadically examined in the literature (e.g., Chatterjee, 2010; Kim et al., 2017). Until now, investigations regarding specific aspects of the MCTs or comparing analyses of these technologies and their acceptance from a customer's perspective are lacking. Moreover, the majority of existing research is limited to the examination of click and collect (e.g., Gallino & Moreno, 2014; Jara et al., 2018; Kim et al., 2017). There are only a few investigations regarding the availability check (e.g., Herhausen et al., 2015; Oh & Teo, 2010; Wollenburg et al., 2018) and even less referring to check and reserve (e.g., Hübner, Holzapfel, & Kuhn, 2016; Jin et al., 2018; Wollenburg et al., 2018). By simultaneously analyzing the three similar (but nevertheless specific) web-to-store technologies, this dissertation allows for a direct comparison between particular technologies within the multi-channel area in terms of consumers' attitudes toward them, their perceived usefulness, and the relevance of different impact factors for these variables. In doing so, this dissertation employs two different study designs: research project 1 providing a within-subjects comparison, and research project 2 identifying between-subjects differences. Both projects arrive at a consistent conclusion, which further validates the results in this aspect. The results support the notion that additional research on the availability check and check and reserve is needed, as both research projects demonstrate that consumers perceive click and collect least positively, and least useful. Therefore, by additionally analyzing the availability check and check and reserve, this dissertation provides an essential contribution to the investigation of alternative web-to-store technologies to click and collect since retailers, in practice, seem to focus too strongly on the latter. Finally, by examining different design characteristics of the selected MCTs, research project 2 provides a detailed analysis of these technologies through analyzing in which way MCTs work best, rather than which MCTs are regarded as best in general. Existing literature has sporadically addressed specific MCT design factors, though it has only examined their impact on more general consumer-related variables such as customer satisfaction, loyalty, and long-term customer value or on retailer profits (e.g., Jara et al., 2018; Jin et al., 2018; Murfield et al., 2017). However, they neglect how the design of the technologies affects their perceived usefulness as a first step, and what the reasons for

this might be. Hence, this dissertation adds to the currently sparse knowledge on the importance of particular MCT designs for their perceived usefulness from a customer's perspective. Furthermore, it shows explicitly how these effects come about by investigating relevant mediation effects.

Secondly, all three research projects contribute to the examination of the role of perceived risk in the context of MCTs, both in general as well as in the specific stages of the purchase process. Prior research mainly concentrates on perceived risk either in the offline (e.g., Derbaix, 1983; Dowling & Staelin, 1994; Roselius, 1971; Stone & Mason; 1995) or the online channel (e.g., Arora & Kaur, 2018; Katta & Patro, 2017), but there are merely a few studies which analyze risk in a multi-channel context (e.g., Gallino & Moreno, 2014; Gao & Su, 2017a; Kim et al., 2017). However, projects 1 and 2 primarily suggest that perceived risk may have specific consequences when taken into account in the combination of online and offline channels. In particular, research project 1 reveals that specific types of risk have significant impacts on consumers' attitudes toward the selected MCTs and thus demonstrates that the consideration of risk perceptions is crucial when dealing with consumers' acceptance of these technologies. Based on these general findings, projects 2 and 3 prove that the relevance of perceived risk can not only be found when regarding MCTs in general but can also be observed in the specific stages of the purchase process related to the selected MCTs. To this end, research project 2 reveals that consumers' risk perceptions are highly relevant in explaining the psychological processes underlying the effect of different MCT designs on consumers' perceived usefulness of these technologies. By identifying respective mediation effects, the project demonstrates the importance of considering consumers' perceived risk in the pre-purchase stage of MCT usage. Finally, research project 3 reveals that perceived risk is also a relevant construct regarding the purchase stage in the context of MCT usage, as it significantly mediates the effects of service failures and recoveries on customer satisfaction. Overall, this dissertation thus implies that researchers examining MCTs from a customer's perspective should not neglect consumers' perceived risk and hence provides another crucial contribution to the theory.

Thirdly, based on the results of research project 3, this dissertation also extends current knowledge on service failure and recovery situations against the background of the two research areas regarding MCTs and perceived risk mentioned previously. Prior literature mainly concentrates on service failures and recoveries regarding pure offline services (e.g., Maxham & Netemeyer, 2002a; Smith et al., 1999; Tax et al., 1998), and increasingly also pertaining to pure online services (e.g., Bijmolt et al., 2014; Holloway & Beatty, 2003; Sousa & Voss, 2009; Wang et al., 2011). However, there are hardly any studies that deal with these situations in a multi-channel context. Previous research also examines numerous mediators in the causal relationship between service failures and recoveries and customer satisfaction (for an overview see De Matos et al., 2007). Nevertheless, consumers' perceived risk

receives almost no consideration in this research. The same applies to the investigation of the service recovery paradox, the existence of which is disputed in the literature, and possible reasons for or against its occurrence have not yet been sufficiently researched (Magnini et al., 2007). Furthermore, in the context of investigating these causal relationships, researchers mostly use attribution and equity theories (e.g., Kau & Loh, 2006; McCollough, 2000; Smith et al., 1999; Van Vaerenbergh et al., 2014). Due to the lack of consideration of consumers' perceived risk, however, it has not yet been examined to what extent the theory of perceived risk can additionally be used as an explanation. The third research project addresses all of these research gaps, and thus contributes to the theory in multiple ways. By analyzing service failures and recoveries when using check and reserve, research project 3 analyzes the way in which this topic plays a role in a multi-channel context. This is a crucial first step in this research field, as the combination and coordination of multiple channels holds an increased failure potential and hence, a high demand for research pertaining to service failures and recoveries. By examining consumers' perceived risk as a mediator in this context, this dissertation additionally introduces a new theoretical approach to explaining the psychological processes that underlie customers' reactions to service failures and recoveries. With the detailed analysis of the two different risk dimensions (probability and magnitude), research project 3 identifies how precisely risk is able to explain the effects of failure and recovery on customer satisfaction. Moreover, the project shows that the two risk dimensions also explain the hindrance of a recovery paradox, which provides further relevant insights into understanding and handling this phenomenon. Finally, this dissertation demonstrates that the theory of perceived risk can extend and supplement established theories, particularly when dealing with MCTs. It thus implies that the theories which researchers currently use are not entirely sufficient in explaining the effects of service failures and recoveries on customer satisfaction. Therefore, research project 3 recommends involving the theory of perceived risk in this context and linking it to attribution and equity theories, as this allows a more comprehensive picture and explanation of the psychological processes underlying the mentioned effects. Additionally, it supports the notion that researchers should generally pay special attention to perceived risk, and the theory of perceived risk in multi-channel contexts.

5.4 Limitations and future research

Besides the specific limitations of the individual research projects outlined in the respective chapters, four general limitations of superordinate relevance have to be considered when interpreting the results of this dissertation. Simultaneously, these limitations represent important starting points for further research. Firstly, we did not conduct any of the studies in an actual purchase setting or with real

customer data. All three research projects are based on online surveys, and projects 2 and 3 are experimental investigations that employ artificial scenarios. Consequently, these studies cannot depict real consumer perceptions and reactions, but can merely simulate and approximate this. However, this dissertation provides valuable initial information on possible consumer evaluations and behavioral intentions in the context of MCTs and perceived risk. To this end, it identifies basic relationships and effects, and reveals general differences between distinct conditions and situations, despite the fact that the overall level or extent of evaluations and behaviors might differ from reality. Moreover, scenario-based experiments are a common approach in the field of consumer research (e.g., De Vries & Zhang, 2020; Hofenk et al., 2019; Schneider & Zielke, 2021), as they enable analyses under controlled conditions (Khan, 2011) in order for the cause-effect relationships under consideration to be investigated in a more focused manner. Future research should validate and extend the basic findings of this dissertation with real customer data and purchase settings, though.

Secondly, the results of this dissertation are limited to specific product groups. Research project 1 contrasts MCTs for electronics with the provision of these technologies in the apparel sector. Research projects 2 and 3 both focus on sports shoes in their scenarios. Therefore, the results are not necessarily generalizable and transferrable to other product categories. The examined effects may depend on different product category-related characteristics in this context. For example, effects may differ depending on the importance of the touch and feel experience for a particular product group. This often also relates to the question of whether the focal products are rather search or experience goods (see Nelson, 1970). For some products, it is thus more relevant to physically inspect them prior to purchase (e.g., Frasquet et al., 2015; Nelson, 1970), which may have an impact on the evaluations of the selected MCTs and their relationship to specific risk perceptions. Additionally, product categories may differ regarding the items' shipping costs or the effort involved in either finding or picking up products at the store. Both aspects might be higher for DIY products than for electronics, for example, which may make the first category more attractive for using the selected web-to-store technologies. In addition, the selected MCTs could be of different relevance in terms of availability risk for other product groups. For example, furniture or similar large products require a lot of space in the store and on the warehouse floors, so they may only be available in relatively limited quantities offline. Due to this, prior assurance of product availability via the selected MCTs in this product group could be beneficial in order to avoid or reduce the likelihood of an out-of-stock-experience which is particularly unpleasant since customers may have to order spacious vehicles for the transportation of such large products. Furthermore, it could be relevant whether the product group is rather hedonic or utilitarian for customers, whether it is relatively expensive or cheap or whether consumers have a

high product category involvement or not. Future research should thus test the robustness of the results of this dissertation in different product categories, and thereby identify lucrative industries for the provision of the selected MCTs.

Thirdly, this dissertation specifically addresses the role of consumers' risk perceptions in the implementation, design, and operation of MCTs. Due to the three individual research projects, each with a different specific research focus, a very differentiated and multifaceted impression of the role of perceived risk in the MCT context thus emerges. Although the results demonstrate the high relevance of considering this construct and the corresponding risk types and dimensions in this context, there may be other important variables that influence the examined relationships and constructs, such as, for example, the distance from a consumer's home to the respective store. Another relevant variable could be the country or culture, due to a different prevalence and associated familiarity and usage of the MCTs or a different perception or handling of risks there. Since research on the selected MCTs, especially on the availability check and check and reserve, is still sparse, future research should thus seek to identify these variables. As pointed out in the current state of research, some studies have already figured out relevant factors in this regard, such as, for example, waiting-time costs (Chatterjee, 2010), the perceived characteristics of innovation (i.e., relative advantage, compatibility, and complexity; Kim et al., 2017), consumers' need for control (Ma et al., 2014), the design of the click and collect service area (Jin et al., 2018), the timeliness of a click and collect order (Murfield et al., 2017), or the characteristics of the website and the pick-up station (Jara et al., 2018). However, future investigations could additionally combine the examination of these variables with the analysis of perceived risk to determine their joint, and possibly interacting, effects in the context of the selected MCTs.

Fourthly, all three research projects focus on the consumer's perspective. Consequently, this dissertation does not include the retailer's point of view and interests, which may have alternative aims to be considered as well. This limits the validity of the practical implications for retailers, as the analyses do not comprehensively consider all information that would be necessary to adequately assess and balance the costs and benefits of specific actions. Therefore, future investigations should supplement these results by additionally including and analyzing the retailer's perspective in the context of the selected MCTs and consumers' perceived risks. This would allow a comparison of consumers' benefits and retailers' costs and hence would enable a more valid assessment of whether or to what extent specific actions or improvements in a retailer's MCT management truly pay off.

5.5 Conclusion and outlook

Given the steady growth of online retailing, it is essential, particularly for originally offline-only retailers, to adapt to the resulting changes in the retail industry. But even retailers who already have both an offline and an online channel cannot rest on their laurels. In recent years, customers' expectations have risen far beyond simply providing multiple channels. Consumers expect to be able to switch freely and easily between different channels during their customer journey. In particular, it has become apparent that regarding this multi-channel behavior, customers prefer to search and obtain information online but ultimately purchase or at least pick up the desired product in a brick-and-mortar store. By providing web-to-store technologies, retailers can meet this preference. However, it is highly relevant for retailers to know how best to implement, design, and operate them. Due to the combination of several channels, and the fact that many consumers have not been using the selected MCTs for very long (or not at all), it can be assumed that consumers perceive an increased risk in connection with the MCTs. Therefore, perceived risk is of particular importance when investigating the best possible provision of the selected MCTs.

Against this background, this dissertation provides comprehensive and highly relevant findings. Three individual research projects confirm the conjectures that consumers' risk perceptions have a significant impact on customers' attitudes toward the selected MCTs, mediate the effects of different MCT design elements on the perceived usefulness of the respective technologies, and explain the effects of MCT service failures and recoveries on customer satisfaction. Based on these results, retailers have the opportunity to effectively manage their MCTs. In particular, the results can help retailers identify specific levers to improve consumers' perception and foster their adoption of these technologies by demonstrating that and to what extent retailers can benefit from taking consumers' risk perceptions into account. Moreover, this dissertation thereby reveals how retailers can better meet the demands and needs of their customers. At the same time, however, it becomes clear that consumer-perceived risks can also be a barrier to the positive perception and acceptance of MCTs, as well as to customer satisfaction in connection with their use, if retailers do not sufficiently take them into account. This makes it evident that an attentive and thoughtful management of risks in the context of MCTs is an important and challenging issue for retailers.

Looking at the latest developments in retailing, it turns out that the Covid-19 pandemic has fueled the rapid rise of online shopping even further (Rudolph et al., 2021). At the same time however, it has also become clear that stationary retail is not simply dying out (despite the enormous challenges it faces). While it must constantly adapt to changing circumstances, it can in fact remain relevant to customers. The pandemic, for example, has increased the awareness of technologies that help prepare

a brick-and-mortar purchase or product pick-up online beforehand, as these have been much more widely offered, advertised, and used accordingly due to the pandemic-related circumstances (see ECC Köln, 2020; Rudolph et al., 2021). Such developments in retailing may mean that perceived risks associated with MCTs are also changing. This is because the influence or role of risk in the context of MCTs depends, among other things, on the degree of dissemination of MCTs and their use, as experience with and knowledge of MCTs can act as a risk reliever. Thus, risks may become less significant in this context. Nevertheless, retailers should always keep an eye on potential risks and their influence on the acceptance and use of MCTs.

With a view to the future development of retailing, it is to be expected that there will continue to be increasing linking of the various channels and touchpoints, and that the switch between them will therefore become increasingly blurred. In the course of this, new technologies will also enter the market, which in turn will give rise to unknown risks, or in the use of which, various risks will play a role. Since it can be assumed that this development will continue steadily, consumers' risk perceptions in connection with MCTs and how to deal with them will presumably remain a highly relevant topic in the future as well, which retailers will have to continuously monitor and take into account.

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Appendix

Research project 1:

Research project 2:

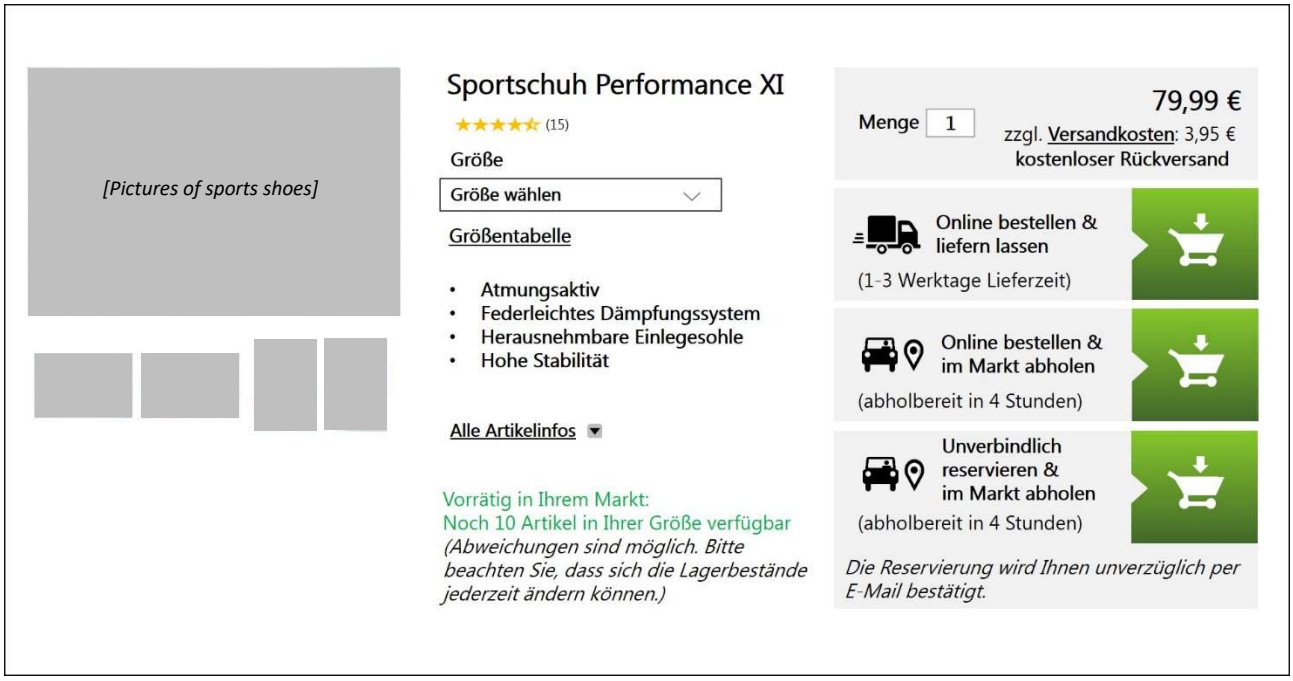
Research project 3:

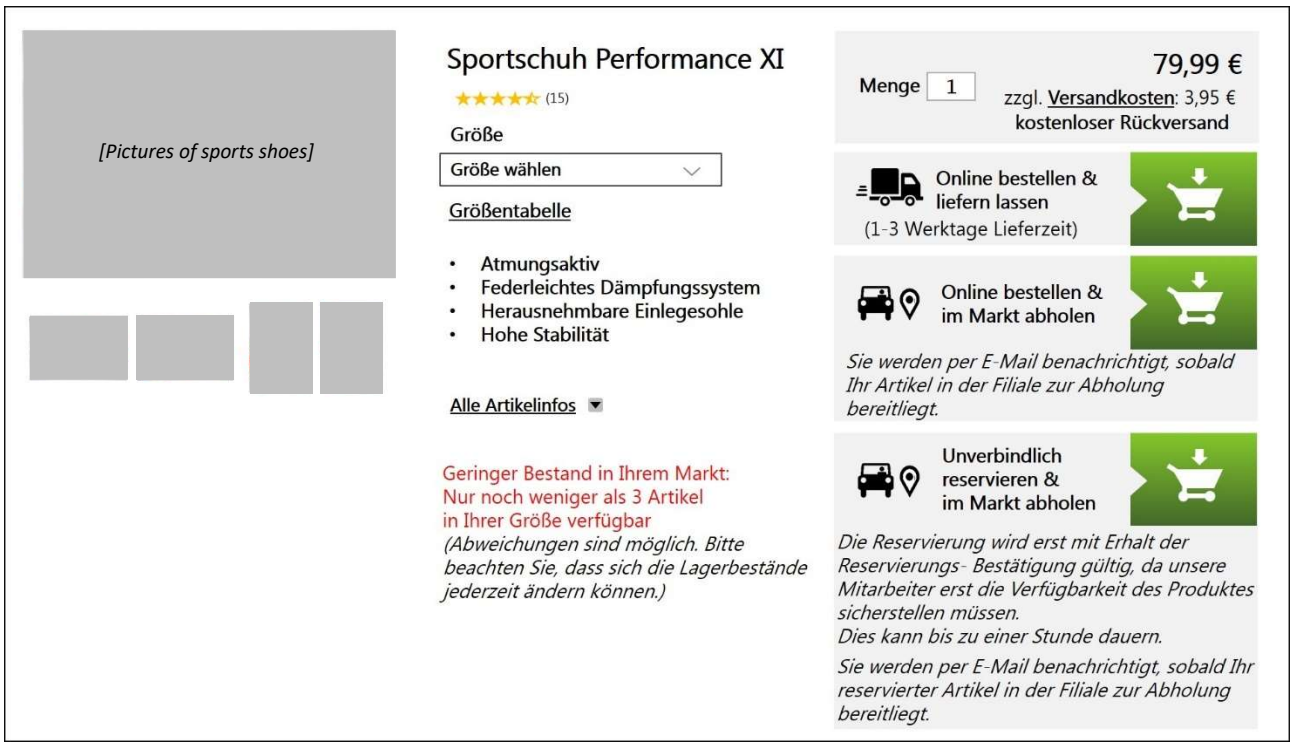
Appendix A. Project 1 – Measurement of constructs with corresponding Cronbach's alpha values and factor loadings.

Constructs	Items	Cronbach's alpha	Factor loadings
Product quality risk	It is difficult to judge the quality of a [product], when I can solely regard it online.		.778
	There is a large probability that I do not get the [product] I have expected, when buying via the online channel.		.863
	When I buy a [product] online, I am often disappointed, when I finally hold it in my hands.	.803	.814
Product availability risk	When I want to buy a [product] in the store, I am often disappointed, if it is not in stock.		.726
	It is difficult to assess, whether a certain desired [product] is available in the store.		.779
	Once in a while, I experienced that a [product] was out of stock when I wanted to buy it in the store.		.854
	There is a high probability that a desired [product] is not available when I want to buy it in the store.	.836	.848
Payment data risk	I think it is risky to provide one's financial data, as credit card information, online.		.861
	I hesitate to enter my bank connection online.		.845
	I believe that my financial data is well protected online. (r)	.820	.703
Personal data risk	I hesitate to enter personal information like my name, address, and phone number online.		.770
	I think it is risky to provide one's personal data online.		.846
	I believe that my personal data is well protected online. (r)	.783	.652
Attitude (for each of the particular MCTs)	Good - Bad		.826-.886
	Pleasant - Unpleasant		.826-.887
	Like - Dislike	.960-.965	.825-.876
Channel preference	In general, where do you preferably buy [products]?	-	-
Innovativeness	In general, I am among the first in my circle of friends to try new products and services.		.851
	I always use the newest products and services.		.830
	I like to try new and different products.	.896	.825
Time pressure	I am always busy.		.832
	I usually find myself pressed for time.		.895
	Generally, I have little time for shopping.	.867	.856

Note: [product] is replaced by either clothing or electronics; (r) = reverse item.
Items were translated from German to English.

Appendix B. Project 2 – Example websites.





Note: Top: scenario 1 (specified pick-up time, immediate reservation confirmation, high availability).

Bottom: scenario 8 (unspecified pick-up time, delayed reservation confirmation, low availability).

Appendix C. Project 2 – Measurement of constructs with corresponding Cronbach's alpha values and factor loadings.

Constructs	Items	Cronbach's alpha	Factor loadings
Time risk	I am unsure about how long I would have to wait until I could pick up the sports shoes in the store.		.850
	I am concerned that it could take too much time until I would receive the sports shoes in the store.		.838
	Picking up the sports shoes in the store could entail that I would have to wait longer for them.		.806
	It is difficult to assess, when I would really receive the sports shoes in the store.	.879	.804
Product availability risk	I am unsure whether I would really find the sports shoes in the store, if I went to pick them up there.		.856
	I am concerned that the sports shoes might be not available in the store, if I went to pick them up there.		.822
	The sports shoes might be out of stock, if I went to the store to pick them up.		.806
	It is difficult to assess, whether the sports shoes would really be available, if I went to the store to pick them up.	.884	.843
Perceived usefulness availability check	Overall, I find the opportunity to see the number of available sports shoes in the nearest store online (online availability check) useful for shopping.	-	-
Perceived usefulness check and reserve	Overall, I find the opportunity to reserve the sports shoes online for pick-up in the nearest store (check and reserve) useful for shopping.	-	-
Perceived usefulness click and collect	Overall, I find the opportunity to buy the sports shoes online for pick-up in the nearest store (click and collect) useful for shopping.	-	-
Intention to use	How likely is it that you would use [MCT] for the purchase of the sports shoes?	-	-
Realism check	It was very easy for me to put myself into the described purchase situation.		.884
	I can well imagine the described purchase situation.		.920
	I think the described purchase situation is realistic.	.869	.868
Manipulation check product availability	According to the website, many of the described sports shoes were still available at the store.	-	-
Manipulation check reservation confirmation	If I had reserved the described sports shoes for pick-up in the store, according to the website, I would have received a reservation confirmation immediately after placing the reservation.	-	-
Manipulation check pick-up time	If I had reserved or bought the described sports shoes for pick-up in the store, according to the website, I could have definitely picked them up on the same day.	-	-
Manipulation check product involvement	According to the described situation, I am very interested in the purchase of new sports shoes.	-	-

Familiarity with [MCT]	Are you generally familiar with [MCT]?	-	-

Note: [MCT] is replaced by either the availability check, check and reserve, or click and collect.
Items were translated from German to English.

Appendix D. Project 3 – Scenarios 1-10.

Imagine that you have recently discovered your enthusiasm for running and have registered for regular jogging in a running group. In order to keep up with the other running group members right from the start, you would like to buy new sports shoes as soon as possible, as your old shoes are already very worn out.

Therefore, you visit the website of a familiar sports retailer, who has shops in your city as well as an online shop. After some searching you find a pair of sports shoes that you like very much. However, since you are unsure whether the shoes fit you, you want to try them on in a nearby store before you buy them.

However, you want to avoid the shoes being sold out when you go to the store to try them on. Therefore, you use the free option offered by the retailer on his website to reserve the selected sports shoes for pickup in the nearest store (check & reserve). Subsequently, you receive a confirmation of your reservation and you go to the store in question a little later.

You go to the pick-up counter and ask the staff there for the shoes you have reserved.

[1] The salesperson takes a quick look and is concerned to find that the shoes in the shop are sold out. He explains with regret that there must have been a failure in the system. He apologizes sincerely and offers to deliver the shoes as quickly as possible and free of charge from a central warehouse by express delivery to your home, where you can try them on and, if you don't like them, return them free of charge or return them to the shop.

[2] The salesperson takes a quick look and is concerned to find that the shoes in the shop are sold out. He explains to you with regret that although the reservation was correctly recorded in the system, the wrong shoes must have been reserved. He apologizes sincerely and offers to deliver the shoes as quickly as possible and free of charge from a central warehouse by express delivery to your home, where you can try them on and, if you don't like them, return them free of charge or return them to the shop.

[3] The salesperson takes a quick look and is concerned to find that the shoes in the shop are sold out. He wanted to reserve the shoes, but at the same time as your reservation, another customer had just tried them on and bought them afterwards. He apologizes sincerely and offers to deliver the shoes as quickly as possible and free of charge from a central warehouse by express delivery to your home, where you can try them on and, if you don't like them, return them free of charge or return them to the shop.

[4] The salesperson takes a quick look and is concerned to find that the shoes in the shop are sold out. He explains with regret that there must have been a failure in the system. He apologizes sincerely and gives you a 20% discount voucher for your next purchase as compensation.

[5] The salesperson takes a quick look and is concerned to find that the shoes in the shop are sold out. He explains to you with regret that although the reservation was correctly recorded in the system, the wrong shoes must have been reserved. He apologizes sincerely and gives you a 20% discount voucher for your next purchase as compensation.

[6] The salesperson takes a quick look and is concerned to find that the shoes in the shop are sold out. He wanted to reserve the shoes, but at the same time as your reservation, another customer had just tried them on and bought them afterwards. He apologizes sincerely and gives you a 20% discount voucher for your next purchase as compensation.

[7] The salesperson takes a quick look and is concerned to find that the shoes in the shop are sold out. He explains with regret that there must have been a failure in the system. He apologizes sincerely and offers to deliver the shoes as quickly as possible and free of charge from a central warehouse by express delivery to your home, where you can try them on and, if you don't like them, return them free of charge or return them to the shop. Additionally, he gives you a 20% discount voucher for your next purchase as compensation.

[8] The salesperson takes a quick look and is concerned to find that the shoes in the shop are sold out. He explains to you with regret that although the reservation was correctly recorded in the system, the wrong shoes must have been reserved. He apologizes sincerely and offers to deliver the shoes as quickly as possible and free of charge from a central warehouse by express delivery to your home, where you can try them on and, if you don't like them, return them free of charge or return them to the shop. Additionally, he gives you a 20% discount voucher for your next purchase as compensation.

[9] The salesperson takes a quick look and is concerned to find that the shoes in the shop are sold out. He wanted to reserve the shoes, but at the same time as your reservation, another customer had just tried them on and bought them afterwards. He apologizes sincerely and offers to deliver the shoes as quickly as possible and free of charge from a central warehouse by express delivery to your home, where you can try them on and, if you don't like them, return them free of charge or return them to the shop. Additionally, he gives you a 20% discount voucher for your next purchase as compensation.

[10/control group] The salesperson takes a quick look and brings them to you shortly afterwards. You try on the shoes and find that they fit you well. So, you pay for the shoes and take them home.

Note: Scenarios were translated from German to English. Underlined passages highlight the manipulations.

Appendix E: Project 3 – Measurement of constructs for study 1 with corresponding values for Cronbach's alpha, composite reliability, AVE, Q^2, and factor loadings.

Constructs	Items	Factor loadings
Perceived risk (Probability of negative consequences)	If I were to use check & reserve again with the described retailer, I would be concerned that this feature would not provide the benefit I would expect.	.852
	As I again consider the use of check & reserve with the described retailer, I worry about whether this technology will really "perform" as well as it is supposed to.	.882
	When I think about using check & reserve again with the described retailer, I am worried about how really reliable this function is.	.884
Cronbach's alpha		*.913*
Composite reliab.		*.896*
AVE		*.742*
Q^2		*.017*
Perceived risk (Magnitude of negative consequences)	**If the check & reserve function again doesn't work as I thought it would, if I used it again at the described retailer, for me it would be a...**	
	minor problem - major problem	.862
	small inconvenience - big inconvenience	.905
	minor aggravation - major aggravation	.886
Cronbach's alpha		*.924*
Composite reliab.		*.901*
AVE		*.752*
Q^2		*.026*
Perceived justice	The outcome I received was fair.	.826
	I did not get what I deserved. (r)	.764
	In resolving the problem, the described retailer reacted appropriately.	.843
	Given the circumstances, I feel that the described retailer offered adequate compensation.	.836
	The outcome I received was inappropriate. (r)	.807
Cronbach's alpha		*.889*
Composite reliab.		*.891*
AVE		*.623*
Q^2		*.090*
Satisfaction with the retailer	I am fully satisfied with the described retailer.	.854
	The described retailer fulfills my expectations.	.875
	Overall, I am very satisfied with the service the described retailer offers.	.792
Cronbach's alpha		*.920*
Composite reliab.		*.905*
AVE		*.760*
Q^2		*.166*
Check and reserve awareness	Are you generally familiar with the function of reserving products online and picking them up in a shop (check & reserve)? (It is not important which product it is.)	

Previous usage of check and reserve	Have you ever reserved products online in the past and picked them up in a shop? (It doesn't matter which product it was.)	
Realism-check	It was very easy for me to put myself into the described situation.	
	I can well imagine the described situation.	
	I think the described situation is realistic.	
Cronbach's alpha		*.819*
Manipulation-check Failure source	The retailer's system is responsible for the failure in the product reservation.	
	The sales staff is responsible for the failure in the product reservation.	
	Random circumstances are responsible for the failure in the product reservation.	
Manipulation-check Type of recovery	The seller has offered me to send the sports shoes to my home free of charge by express delivery.	
	The seller gave me a discount voucher for my next purchase.	
	The seller gave me a discount voucher for my next purchase and offered me to send the sports shoes to my home free of charge by express delivery.	
Manipulation-check Involvement	According to the described situation, I am very interested in buying new sports shoes.	

Note: AVE = Average variance extracted; (r) = reverse item. Items were translated from German to English.

Appendix F: Project 3 – Measurement of constructs for study 2 with corresponding Cronbach's alpha values and factor loadings.

Constructs	Items	Factor loadings
Perceived risk (Magnitude of negative consequences)	**If the check & reserve function again doesn't work as I thought it would, if I used it again at the described retailer, for me it would be a...**	
	minor problem - major problem	.879
	small inconvenience - big inconvenience	.896
	minor aggravation - major aggravation	.886
Cronbach's alpha		*.885*
Perceived justice	The outcome I received was fair.	.792
	I did not get what I deserved. (r)*	
	In resolving the problem, the described retailer reacted appropriately.	.812
	Given the circumstances, I feel that the described retailer offered adequate compensation.	.827
	The outcome I received was inappropriate. (r)*	
Cronbach's alpha		*.842*
Satisfaction with the retailer	I am fully satisfied with the described retailer.	.810
	The described retailer fulfills my expectations.	.867
	Overall, I am very satisfied with the service the described retailer offers.	.809
Cronbach's alpha		*.918*
Check and reserve awareness	Are you generally familiar with the function of reserving products online and picking them up in a shop (check & reserve)? (It is not important which product it is.)	
Previous usage of check and reserve	Have you ever reserved products online in the past and picked them up in a shop? (It doesn't matter which product it was.)	
Realism-check	It was very easy for me to put myself into the described situation.	
	I can well imagine the described situation.	
	I think the described situation is realistic.	
Cronbach's alpha		*.806*
Manipulation-check Type of recovery	The seller has offered me to send the sports shoes to my home free of charge by express delivery.	
	The seller gave me a discount voucher for my next purchase.	
	The seller offered me the same sports shoes in a different color.	
Manipulation-check Involvement	According to the described situation, I am very interested in buying new sports shoes.	

Note: * = Items deleted for subsequent analyses; (r) = reverse item. Items were translated from German to English.

Appendix G: Project 3 – Study 2: Total, direct, and indirect effects of the type of recovery on customer satisfaction**.**

Effect paths	Estimated effects	t	p-values/CI
Total effects			
Comp.discount vs. correct. → satisfaction	-.542	-2.953	.004
Comp.product vs. correct. → satisfaction	-.735	-4.050	.046
Comp.product vs. comp.discount → satisfaction	-.193	-1.023	.308
Direct effects			
Comp.discount vs. correct. → justice	-.501	-2.766	.006
Comp.product vs. correct. → justice	-.843	-4.706	.000
Comp.product vs. comp.discount → justice	-.342	-1.835	.068
Comp.discount vs. correct. → satisfaction	-.271	-2.006	.047
Comp.product vs. correct. → satisfaction	-.195	-1.409	.161
Comp.product vs. comp.discount → satisfaction	.076	.554	.584
Justice → risk magnitude	-.275	-3.357	.001
Risk magnitude → satisfaction	-.230	-4.100	.000
Indirect effects			
Comp.discount vs. correct. → justice → risk magnitude → satisfaction	-.032		95% CI [-.075; -.006]
Comp.product vs. correct. → justice → risk magnitude → satisfaction	-.053		95% CI [-.111; -.014]
Comp.product vs. comp.discount → justice → risk magnitude → satisfaction	-.022		95% CI [-.061; .004]

Note: “vs.” indicates the effect of the group mentioned firstly compared to the group mentioned secondly.

Appendix H: Project 3 – Measurement of constructs for study 3 with corresponding Cronbach's alpha values and factor loadings.

Constructs	Items	Factor loadings
Failure stability	**The cause of the described service failure...**	
	…probably exists only temporarily - …probably exists permanently	.797
	…probably remains stable over time - …probably varies over time (r)	.875
	…probably changes over time - …probably remains the same over time	.743
Cronbach's alpha		*.742*
Failure controllability	**Such a failure in the provision of products reserved online is...**	
	…not at all controllable by the retailer - …very controllable by the retailer	.811
	…not at all avoidable by the retailer - …very well to be avoided by the retailer	.823
Cronbach's alpha		*.837*
Failure's locus of causality	**In my opinion, the cause of the failure…**	
	…falls back on the retailer - …falls back on external circumstances	.797
	…lies with the retailer - …lies outside the retailer	.875
	…concerns the retailer - …concerns external circumstances	.743
Cronbach's alpha		*.872*
Check and reserve awareness	Are you generally familiar with the function of reserving products online and picking them up in a shop (check & reserve)? (It is not important which product it is.)	
Previous usage of check and reserve	Have you ever reserved products online in the past and picked them up in a shop? (It doesn't matter which product it was.)	
Realism-check	It was very easy for me to put myself into the described situation.	
	I can well imagine the described situation.	
	I think the described situation is realistic.	
Cronbach's alpha		*.858*
Manipulation-check Failure source	The retailer's system is responsible for the failure in the product reservation. The sales staff is responsible for the failure in the product reservation.	
	Random circumstances are responsible for the failure in the product reservation.	
Manipulation-check Involvement	According to the described situation, I am very interested in buying new sports shoes.	

Note: (r) = reverse item. Items were translated from German to English.