

# **Designing Multi-Channel Technologies – The Mediating Role of Risk Perceptions**

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## **Designing Multi-Channel Technologies – The Mediating Role of Risk Perceptions**

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 (MCTs), i.e. click & collect, check & 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 certain (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 risk dimensions. 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 & collect. These findings provide implications for the design of MCTs.

Keywords: Multi-Channel; Omni-Channel; Channel Integration; Multi-Channel Technologies; Perceived Risk

## **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 and Wright 2017). Hence, they introduce so-called multi-channel technologies (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, Zielke, and Dobbelstein 2019, 263).

In this paper, we focus on web-to-store technologies, which lead customers from the online to the offline channel (Picot-Coupey, Huré, and Piveteau 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 and Moreno 2014; Mahar and 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, Gallino, and Moreno 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 and Moreno 2014; Ma, Su, and Oh 2014). This may lead to higher sales volumes and the saving of packaging or shipping costs (Forrester 2014; Gallino and Moreno 2014; Gao and Su 2017a; Mahar et al. 2014). Moreover, several studies reveal that consumers’ usage of multiple integrated channels is generally associated with a number of favorable outcomes (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 and Wright 2017; Melacini et al. 2018; Wollenburg et al. 2018). Only a limited number of

previous studies examine specific MCTs (Jin, Li, and Cheng 2018). Some authors already analyzed web-to-store technologies, predominantly click and collect (CC), i.e. buying a product online and picking it up at a local store (Chatterjee 2010; Gallino and Moreno 2014; Gao and Su 2017a; Jara et al. 2018; Kim, Park, and Lee 2017; Ma, Su, and Oh 2014). However, recent literature also examines similar MCTs, such as check and reserve (CR), i.e. reserving a product online and purchasing and picking it up at the store (e.g. Hübner, Holzapfel, and Kuhn 2016; Jin, Li, and Cheng 2018; Wollenburg et al. 2018), or the opportunity to check in-store product availability online, referred to as availability check (AC; e.g. Bendoly et al. 2005; Herhausen et al. 2015; Oh and 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, and 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 and Moreno 2014). Rather, research has to analyze the selected MCTs in more detail (see also Bell, Gallino, and Moreno 2014; Picot-Coupey and Huré 2016). As the implementation of MCTs can be very costly and complex (Bendoly et al. 2005; Forrester 2014; Gallino and Moreno 2014; Hübner, Holzapfel, and 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 and 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, for example, to an imprecise or uncertain specification of the time when consumers can pick up products ordered or purchased online in the store (Park and 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 their risk perceptions. 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 usage intention. 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 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 and Moreno 2014) or investigates exogenous impact factors on consumers' usage intention for particular MCTs (e.g. Kim, Park, and Lee 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 risks. Prior studies mainly analyze perceived risks either in the online (e.g. Katta and Patro 2017) or offline channel (e.g. Stone and 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. The results will help retailers to decide whether to invest money and effort in reducing specific uncertainties in their MCTs.

## **Theoretical Background and Research Hypotheses**

### ***Multi-Channel Technologies***

As omni-channel retailing and corresponding channel integration activities are increasingly gaining attention in theory and practice (Gao and Su 2017a; Jin, Li, and Cheng 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 CC. Further impact factors on the intention to use CC 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, Park, and Lee 2017). Moreover, Ma, Su and Oh (2014) find a positive influence of customers' need for control on their expectations regarding four different dimensions of service convenience when using CC. 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 towards the offline channel, thus generally influencing consumers' channel choice and switching behavior. Regarding the AC, researchers show that it can contribute to higher perceived information quality (Oh and Teo 2010). Gao and Su (2017a) reveal that CC 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 CC 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 CC 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, Li, and Cheng (2018) analyze the optimal design of the CC service area and the most suitable product type for this MCT. Additionally, they compare the profitability of CC and CR, showing that under specific conditions, CR can be more profitable for retailers than CC. Murfield et al. (2017) reveal a positive effect of the timeliness of a CC order on consumer satisfaction, which in turn positively affects consumer loyalty. Results from Jara et al. (2018) show that CC 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.

### ***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 he/she cannot foresee with certainty and that he/she considers negative. In doing so, we focus on the perceived risk, i.e. the risk that a consumer subjectively perceives (Mitchell 1999). Past literature divided this risk into several risk dimensions, which each refer to a different aspect of loss or uncertainty, depending on the particular reference object (e.g. Dowling 1986; Festervand, Snyder, and Tsalikis 1986; Peter and Ryan 1976; Stone and Mason 1995).

In the present study, especially time risk may play a role regarding the effects of differing displayed pick-up times for CR and CC. 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 and Pavlou 2003; Roselius 1971; Stone and 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. 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 risk dimensions 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 and Pavlou 2003).

As we examine risks in the particular context of purchasing using the selected MCTs, we additionally include a more specific risk dimension, namely availability risk. Availability risk is the risk of a desired product not being available at the retailer's offline store (Gallino and Moreno 2014). This risk dimension 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 and 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, e.g. 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 CC, 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 AC 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 try to reduce it (Bauer 1960). In doing so, consumers will primarily seek further information to diminish existing uncertainties (Dowling 1986; Lutz and Reilly 1974) and thus reduce the perceived risk (Montoya-Weiss, Voss, and Grewal 2003). Perceived risk in turn often exerts a negative impact on perceived usefulness (Biucky, Abdolvand, and Harandi 2017; Falk et al. 2007; Featherman and 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.

### ***Product Pick-Up Time***

When retailers do not specify the product pick-up time for CC or CR on their website, the time it takes for the product to be received becomes uncertain for consumers (Park and Kim 2007). Following the line of thoughts mentioned earlier, this will lead to increased perceived time risk due to the uncertain waiting time (Park and Kim 2007; see also Montoya-Weiss, Voss, and Grewal 2003). Consequently, according to the theory of perceived risk and the results from prior studies, customers will perceive CC or CR with an uncertain pick-up time as not very useful. 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, Voss and Grewal (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. Researchers, moreover, show a negative relationship between the uncertainty regarding waiting times and consumers' service or website evaluation (Hui and Tse,

1996; Park and Kim 2007), which also supports our assumptions. Thus, we hypothesize:

H1: If the product pick-up time is assured for the same day, consumers' perceived usefulness of a) CR and b) CC 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 AC (when offered together with CR or CC), we expect a different effect based on the implications of the signaling theory (Spence 1973). If the product pick-up time for CR or CC is assured for the same day, the AC may not be very useful to customers, because they already know when they will receive the product. However, if the product pick-up time is unspecified and consequently, consumers' perceived time risk increases, the AC 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 and Camarero 2009). Hence, the AC has the potential to decrease perceived time risk, leading to a higher perceived usefulness of this technology, when pick-up times are unspecified. We conclude:

H2: a) If the product pick-up time is unspecified, consumers' perceived usefulness of the AC is higher than if the product pick-up time is assured for the same day. b) This relationship is mediated by consumers' perceived time risk.

### ***Confirmation Date of Product Reservations***

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 and 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 CR. We propose:

H3: a) If the confirmation of a product reservation happens immediately, consumers' perceived usefulness of CR 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 CR, in the event of a delayed reservation confirmation, cannot immediately assure product availability, CC can because when using this MCT the customer already buys the product (Gao and 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 and Moreno 2014; Su and Zhang 2009). Additionally, the AC 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 CC and the AC. We hypothesize:

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

### ***Displayed Product Availability***

The AC 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 and 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 and Raman 2008) or because other customers purchase the focal product while the consumer is on his or her way to 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 and Zhang 2009). This in turn positively affects the perceived usefulness of the AC. We thus conclude:

H5: a) If the displayed product availability is high, consumers' perceived usefulness of the AC 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 and Su 2017a; Gallino and Moreno 2014). As consumers will strive for this risk reduction, we reason that a low displayed product availability will have a more positive impact on the perceived usefulness of CR and CC than a high displayed availability. We hypothesize:

H6: If the displayed product availability is low, consumers' perceived usefulness of a) CR and b) CC 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' usage 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 (TAM) by Davis, Bagozzi, and Warshaw (1989; e.g. Biucky, Abdolvand, and Harandi 2017; Featherman and Pavlou 2003). Moreover, we analyze interaction effects without proposing formal hypotheses. The following research model graphically summarizes our hypotheses (Figure 1).

[Figure 1 near here]

## **Empirical Study**

### ***Data Collection and Sample***

We conducted a scenario-based online experiment with a 2 (displayed availability: high, low)  $\times$  2 (date of reservation confirmation: immediate, delayed)  $\times$  2 (pick-up time: same-day, unspecified) between-subjects design. Participants were randomly assigned to one of the eight treatment groups, shown in table 1.

[Table 1 near here]

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 A) 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 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. Moreover, we used consumers' familiarity with the selected MCTs (binary: yes/no) as a control variable. 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 (AC: 87.0%, CR: 70.8%, CC: 80.2%).

### ***Measures***

Most items were measured on seven-point Likert scales, mainly ranging from totally disagree to totally agree. 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, Zielke and Dobbstein (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 to very likely. 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 to totally agree. Moreover, we employed the same scale format for the manipulation checks, using our own single-items.

### ***Method***

For the data analysis, we used IBM's statistical software SPSS and Hayes' SPSS macro PROCESS (see Hayes 2013). To assess the discriminant validity of the two risk dimensions, we first conducted a principal component factor analysis with varimax rotation. Subsequently, we executed three-way ANOVAs and mediation analyses via PROCESS to analyze the proposed hypotheses and possible additional interaction effects between the independent variables.

### **Results**

#### ***Reliability, Manipulation and Realism Checks***

Cronbach's alpha exceeds the critical value of .70 for all constructs, indicating an appropriate reliability (Loewenthal 2001; see appendix B for detailed values). A factor analysis further confirmed that respondents properly distinguish between the two requested risk dimensions (see appendix B 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  $p=.000$ ). We also controlled for a high product involvement regarding sports shoes, which participants rated appropriately high ( $M= 6.28$  on a scale ranging between 1 and 7). Moreover, we included a realism check, which indicated that the participants perceived the described scenario as mostly realistic ( $M=5.99$  on a scale ranging between 1 and 7).

### ***Testing of Hypotheses***

For the product pick-up time, we find significant main effects on the perceived usefulness of CR ( $F(1,432)=8.229$ ;  $p=.004$ ), CC ( $F(1,432)=5.309$ ;  $p=.022$ ) and the AC ( $F(1,432)=5.686$ ;  $p=.018$ ). Regarding CR, the results confirm H1a, showing a higher perceived usefulness for a certain ( $M=6.05$ ) than for an unspecified pick-up time ( $M=5.66$ ). The same is true for H1b, as a certain pick-up time ( $M=5.80$ ) leads to a higher perceived usefulness of CC than an unspecified pick-up time ( $M=5.43$ ). These relationships are partially mediated by the perceived time risk with significant ( $p<.05$ ) indirect effects of  $-.087$  for the perceived usefulness of CR and  $-.070$  for CC (coding certain=0 vs. unspecified=1). Thus, we can also confirm H1c. For the perceived usefulness of the AC, we find the same pattern (certain:  $M=6.34$  vs. unspecified pick-up time:  $M=6.06$ ), 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 ( $p<.05$ ) indirect effect of  $-.075$ . Hence, we find support for H2b, even though we expected the mediation in the opposite direction.

Regarding the confirmation date of product reservations, we neither find a significant effect on the perceived usefulness of CR nor a mediation by availability risk. Hence, we cannot support H3. The same is true for the perceived usefulness of the AC. Thus, we find no support for H4b. However, we reveal a significant impact of the reservation confirmation date on the perceived usefulness of CC ( $F(1,432)=4.039$ ;  $p=.045$ ). In line with H4a, the perceived



usefulness of CC is higher for a delayed ( $M=5.78$ ) than for an immediate ( $M=5.46$ ) reservation confirmation. Nevertheless, the mediation by availability risk is not significant in any case, providing no support for H4c.

With regard to the displayed product availability, we reveal significant effects on the perceived usefulness of the AC ( $F(1,432)=5.696$ ;  $p=.017$ ) and CR ( $F(1,432)=6.267$ ;  $p=.013$ ). Analogous to H5a, the perceived usefulness of the AC is higher for high displayed availability ( $M=6.34$ ) than for low displayed availability ( $M=6.06$ ). Thus, the findings support H5a. Moreover, we find a partial mediation of this relationship through availability risk with a significant ( $p<.05$ ) indirect effect of  $-.044$  (coding 0=high vs. 1=low), leading to the confirmation of H5b. The perceived usefulness of CR is also higher for high ( $M=6.02$ ) than for low displayed availability ( $M=5.69$ ). 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 CC. The mediation effect of availability risk for this relationship is not significant, either. However, availability risk partially mediates the impact of the displayed product availability on the perceived usefulness of CR, with a significant ( $p<.05$ ) indirect effect of  $-.053$ . Hence, we can partially support H6c, even though the mediation effect shows an unexpected direction. Figure 2 provides an overview of the differences in mean values for the perceived usefulness of the selected MCTs, depending on the treatments.

[Figure 2 near here]

### ***Additional Analyses***

Besides the proposed relationships, we find two marginally significant interaction effects. The first effect reveals that the negative impact of an uncertain product pick-up time on consumers' perceived usefulness of CR 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 uncertain product pick-up time on consumers' perceived usefulness of CR 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  $p=.000$ ). The standardized beta coefficients are largest for CR ( $\beta=.406$ ), followed by CC ( $\beta=.376$ ) and the AC ( $\beta=.216$ ). 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 AC ( $M=6.20$ ), followed by CR ( $M=5.86$ ) and lastly CC ( $M=5.61$ ). This order exists independent of the treatment, as it also applies to the mean values in all the treatment groups.

## **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 an assured 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 CR and CC. However, this is quite the opposite of what we expected concerning the AC. A possible explanation for this is that the precise same-day pick-up time makes the AC more credible for consumers (see Gallino and Moreno 2014). If the pick-up time is uncertain, 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 AC and perceive it as less useful when

the pick-up time is uncertain. Conversely, a precise pick-up time leads to a higher perceived usefulness of the AC.

Secondly, we find no significant impact of the confirmation date for product reservations on the perceived usefulness of CR, showing that if consumers want to use CR, 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 reasonable for the confirmation of a reservation to take some time and thus 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 CR. However, consumers perceive CC 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 CR, making CC a more useful alternative.

Thirdly, the results show that a higher displayed product availability increases the perceived usefulness of the AC, partly through a lower availability risk. The same applies to the perceived usefulness of CR, 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, as expected. However, this in turn decreases the perceived usefulness of CR ( $\beta = -.118$ ;  $p = .014$ ), instead of increasing it. Possibly, consumers do not perceive CR 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, CR has no potential to reduce availability risk. Regarding the perceived usefulness of CC, the displayed product availability risk has no significant ef-

fect. 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 and 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. These effects indicate that different designs of MCTs may interact with each other in the mentioned ways. As these effects are not significant at the .05 level, we do not interpret them in more detail here, but suggest examining them 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 TAM. 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 AC, followed by CR and lastly CC. This supports the prior research, showing that consumers also have the most positive attitude toward the AC and the least positive toward CC (Ortlinghaus, Zielke, and Dobbelstein 2019). However, this is remarkable, as retailers often regard CC as the most important and popular MCT (Forrester 2014; Jin, Li, and Cheng 2018; Kim, Park, and Lee 2017; Ma, Su, and Oh 2014), which does not seem to be the case in our sample.

### ***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 CR and/or CC, as our study results show a higher perceived usefulness of all three MCTs for a same-day compared to an unspecified pick-up time. As the consumers' perceived time risk mediates these effects, time plays a crucial role here. Thus, if possible, retailers should 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 uncertain pick-up time could lead to an even higher perceived waiting time than it would actually be. Regarding the perceived usefulness of CR, this is especially important for products with a low displayed product availability, as the negative impact of an uncertain pick-up time tends to be even higher in this case.

Secondly, regarding CR, 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 CR. 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 CC. Thus, if retailers prefer consumers to use CC rather than CR, such as for operative reasons, a delayed reservation confirmation can even be an advantage, as it increases the perceived usefulness of CC while not having any negative effects on the perceived usefulness of CR at the same time. However, the perceived usefulness of CR is still higher than that of CC 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 AC and CR in this case. Therefore, retailers should generally try 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 AC and CR, as in this case these MCTs provide a higher usefulness for consumers.

Finally, retailers should invest in improving the perceived usefulness of the selected MCTs, as our study reveals that a higher perceived usefulness is positively related to a higher

usage intention for these MCTs. The proposed MCT design elements can play a crucial role in doing so.

### ***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 and Moreno 2014), e.g. 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, Zielke, and Dobbelstein 2019) or the usage intention for particular MCTs (e.g. Chatterjee 2010; Kim, Park, and Lee 2017). However, these studies skip the variable of perceived usefulness that, according to the TAM, 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 and Kaur 2017; Katta and Patro 2017) or in the offline channel (e.g. Roselius 1971; Stone and 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.

### ***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. 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.

Secondly, we merely focused on the consumer 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 and Wright 2017).

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## Appendices

**Sportschuh Performance XI**  
 ★★★★★ (15)  
 Größe  
 Größe wählen  
 Größentabelle

- Atmungsaktiv
- Federleichtes Dämpfungssystem
- Herausnehmbare Einlegesohle
- Hohe Stabilität

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 (abholbereit in 4 Stunden)

Unverbindlich reservieren & im Markt abholen  
 (abholbereit in 4 Stunden)

Die Reservierung wird erst mit Erhalt der Reservierungsbestätigung gültig, da unsere Mitarbeiter erst die Verfügbarkeit des Produktes sicherstellen müssen. Dies kann bis zu einer Stunde dauern.

Appendix A: Example website.

Constructs	Items	Cronbach's alpha	Factor loadings
<b>Time risk</b>	I am unsure about how long I would have to wait until I could pick up the sports shoes in the store.		0.850
	I am concerned that it could take too much time until I would receive the sports shoes in the store.		0.838
	Picking up the sports shoes in the store could entail that I would have to wait longer for them.		0.806
	It is difficult to assess, when I would really receive the sports shoes in the store.	0.879	0.804
<b>Product availability risk</b>	I am unsure whether I would really find the sports shoes in the store, if I went to pick them up there.		0.856
	I am concerned that the sports shoes might be not available in the store, if I went to pick them up there.		0.822
	The sports shoes might be out of stock, if I went to the store to pick them up.		0.806
	It is difficult to assess, whether the sports shoes would really be available, if I went to the store to pick them up.	0.884	0.843

<b>Perceived usefulness availability check</b>	Overall, I find the opportunity to see the number of available sports shoes in the nearest store online (online availability check) useful for shopping.	-	-
<b>Perceived usefulness check and reserve</b>	Overall, I find the opportunity to reserve the sports shoes online for pick-up in the nearest store (check and reserve) useful for shopping.	-	-
<b>Perceived usefulness click and collect</b>	Overall, I find the opportunity to buy the sports shoes online for pick-up in the nearest store (click and collect) useful for shopping.	-	-
<b>Intention to use</b>	How likely is it that you would use [MCT] for the purchase of the sports shoes?	-	-
<b>Realism check</b>	It was very easy for me to put myself into the described purchase situation.		0.884
	I can well imagine the described purchase situation.		0.920
	I think the described purchase situation is realistic.	0.869	0.868
<b>Manipulation check product availability</b>	According to the website, many of the described sports shoes were still available at the store.	-	-
<b>Manipulation check reservation confirmation</b>	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.	-	-
<b>Manipulation check pick-up time</b>	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.	-	-
<b>Manipulation check product involvement</b>	According to the described situation, I am very interested in the purchase of new sports shoes.	-	-
<b>Familiarity with [MCT]</b>	Are you generally familiar with [MCT]?	-	-

Appendix B: Measurement of constructs with corresponding Cronbach's alpha values and factor loadings.

## Tables

Table 1: Overview of scenarios.

Scenario	Product Pick-Up Time (Check & Reserve + Click & Collect)	Date of Reservation Confirmation (Check & Reserve)	Product Availability (Availability Check)
1	Same day ( <i>in 4 hours</i> )	Immediate	High ( <i>10 items</i> )
2	Not specified ( <i>after e-mail notification</i> )	Immediate	High ( <i>10 items</i> )
3	Same day ( <i>in 4 hours</i> )	Delayed ( <i>within one hour</i> )	High ( <i>10 items</i> )
4	Not specified ( <i>after e-mail notification</i> )	Delayed ( <i>within one hour</i> )	High ( <i>10 items</i> )
5	Same day ( <i>in 4 hours</i> )	Immediate	Low ( <i>less than 3 items</i> )
6	Not specified ( <i>after e-mail notification</i> )	Immediate	Low ( <i>less than 3 items</i> )
7	Same day ( <i>in 4 hours</i> )	Delayed ( <i>within one hour</i> )	Low ( <i>less than 3 items</i> )
8	Not specified ( <i>after e-mail notification</i> )	Delayed ( <i>within one hour</i> )	Low ( <i>less than 3 items</i> )

## Figures

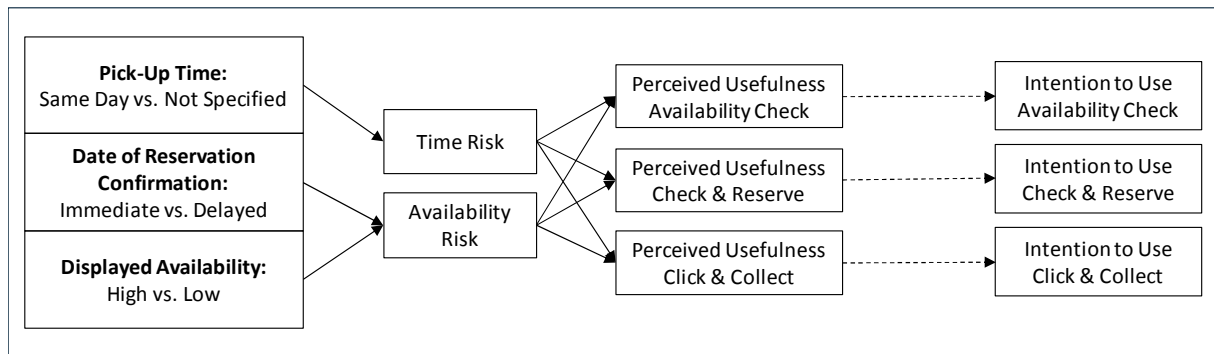


Figure 1: Research model.

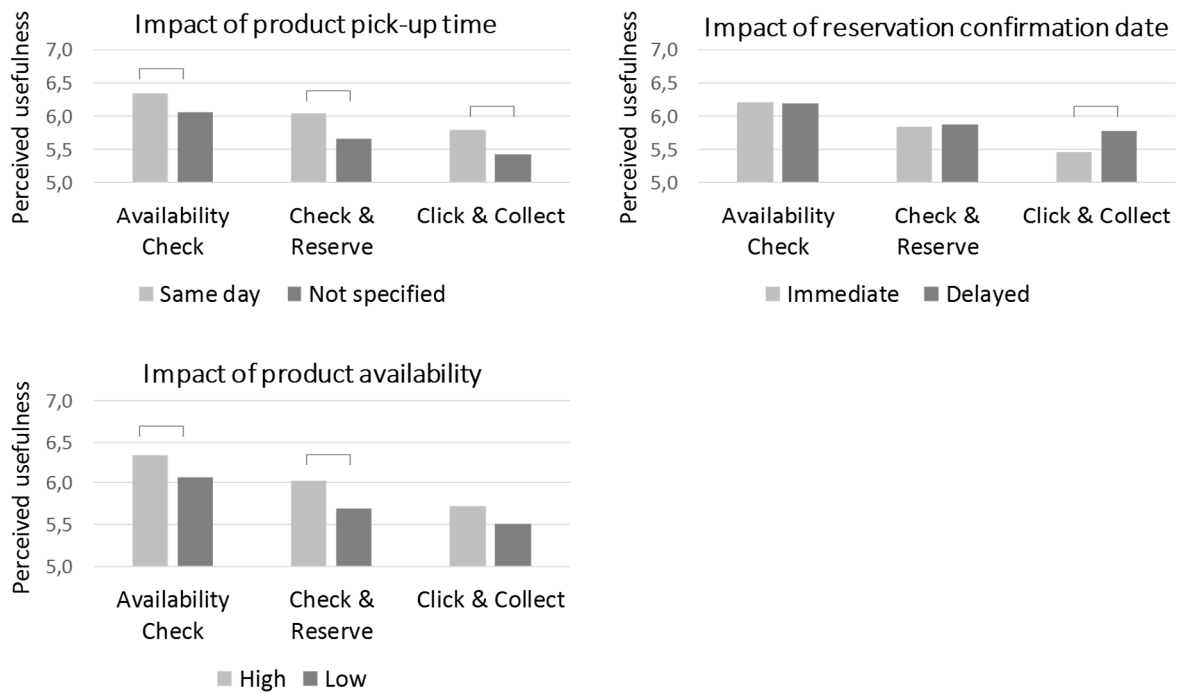


Figure 2: Impact of MCT design manipulations on perceived usefulness of the selected MCTs.

Note: Brackets indicate significant mean differences.