An Exploratory Investigation of Multidimensional Customer Contact Sequences – Insights into Customer Behaviour in Multichannel Retailing

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We used a multidimensional sequence alignment method to cluster customers (N = 304) of a German multichannel retailer for consumer electronics according to the multidimensional sequences of their realised customer contacts (dimension 1), the functions of the realised contacts (dimension 2) and the importance of the customer contact (dimension 3). In doing so, we obtained four clusters. The results of our exploratory study reveal differences regarding the customers’ behaviour concerning the customer contacts and their functions across the entire purchase process and between the customer segments identified. Furthermore, the findings show that the dimensions of the multidimensional sequences are influenced by the complexity and the price of the purchased product and they further influence aspects related to customer satisfaction and perceived risk. The method that we applied is superior to customer segmentation based on demographic or psychographic variables and enriches our knowledge of customer behaviour in a multichannel retail system.

1. Introduction

The contacts between customers and retailers influence the entire purchase process, beginning with the customer’s first intent to buy, which may be initiated by the retailer’s advertising, all the way to the intention to become a repeat customer of that retailer, which may be based on the retailer’s after-purchase services. In this context, a profound knowledge of the customer behaviour through a multichannel system is a strategic success factor for any retailer or service provider (Neslin et al. 2006). The fundamental element for the attainment of customer knowledge is the contact between the retailer and its customers in the different channels of the marketing and distribution system (Silberer 2009). Not only the type and number of the customer contacts in a specific process phase but also their functions and importance to the customer are relevant here, to say nothing of the sequence of these three dimensions during the different phases of the purchase process.

Hence, it can be assumed that customer contact sequences are of great relevance to retail marketing: for example, it can be expected that different customer contact sequences are accompanied by different product purchases and that different customers have different con-
tact sequences according to their individual channel behaviour (Steinmann 2005). Knowledge of the potentially existing interdependencies between the different customer contacts facilitates the purposeful control of the customer across all phases of the purchase process by the retailer and thus extends the commercial possibilities to interact with customers within the bounds of marketing (Peterson et al. 1997; Verhoef et al. 2007). Day (2011) indicates that in the past, there has been a rapid proliferation of touchpoints connecting a retailer with its customers and argues that for an effective and efficient design, it is necessary to investigate which channels are most important to the customer, how customers cope with a multichannel environment, and how firms can take advantage of an investigation of the customer behaviour within such environments across all phases of the purchase process. In this context, the „pinball” framework introduced by Hennig-Thurau et al. (2010) implies that research has to account for different types of channels and the potentially existing spillover effects with other channels when analysing consumer behaviour and the relationship between customers and suppliers over a period of time. Although their framework and the derived research agenda mainly focuses on the influence of new media channels (e.g., social online networks) on customer relationships, this implication is also stated by Oppewal et al. (2013), who highlight that surprisingly few studies have investigated how customers realise contacts with multiple channel alternatives during the purchase process.

Investigating the multidimensional sequence of customer contacts (dimension 1), their functions (dimension 2) and their importance (dimension 3) with regard to the customer behaviour through a multichannel marketing and distribution system can provide crucial insights into the behaviour and the needs and preferences of customers over time because it has become routine to use different channels complementarily in the purchase process (Schramm-Klein et al. 2011; Silberer 2014; Zhang et al. 2010). In this context, Li and Kannan (2014) note that an analysis of the multiple contacts with different touchpoints within a multichannel system is also of crucial relevance for the evaluation of campaign effectiveness across different channels. An analysis of the interdependencies between the realised customer contacts with different channels will deepen the understanding of the channel-related factors or attributes that influence a conversion or an abruption of the purchase process. The ability to understand consumer perceptions and evaluations of the multichannel mix seems to be of crucial relevance for adapting or designing channel offerings that are appropriate to fit the needs and preferences of customers while moving through the purchase process (Steinmann 2005).

Up to today, only a few studies have empirically investigated the sequential behaviour of customers regarding the customer contacts in multichannel environments (e.g., Steinmann et al. 2007; Steinmann and Silberer 2008; van Rijnsoever et al. 2012; Li and Kannan 2014) or other fields of research (see Silberer 2014 for an overview). For example, Steinmann et al. (2007) used the realised customer contacts with several touchpoints of the multichannel marketing system of a retailer of consumer electronics across all phases of the purchase process as a basis for customer segmentation, but did not account for the sequence of the contacts in their analysis. Their results show that customers use the different offline and online channels for different purposes and that the realisation of contacts with specific channels will differ with regard to the stage of the purchase process. Steinmann and Silberer (2008) applied a unidimensional sequence alignment approach to identify customer segments based on the sequence of the customer contacts in the multichannel system of a tour operator, but did not account for the interdependencies between the customer contacts, their functions and importance. These authors applied a sequence analytical method, which was formerly described by Wilson (1998) to analyse as well as to identify similarities regarding the daily activities of consumers over a period of time. Van Rijnsoever et al. (2012) have investigated the role of the sequence of the use of multiple information sources during the pre-purchase phase of a purchase decision for passenger cars in the Dutch market. Their findings imply that consumers’ involvement towards a product category will lead to a more differentiated use of the available information sources as well as to a higher number of realised contacts during the decision-making process. Moreover, Li and Kannan (2014) introduced a probabilistic model to analyse carryover and spillover effects in a multichannel online marketing environment with regard to the impact of sequence of customer contacts on subsequent purchases on a firm’s website. Their study especially focused on contacts with different online channels in the pre-purchase and purchase phase, but did not account for the potential impact of as well as the potentially existing interdependencies with customer contacts with offline channels. Sequence analytical methods have been applied to segment visitors of a web site according to their clickstream behaviour (e.g., Hay et al. 2003). In this context, in a recent study, Anderl et al. (2016) used clickstream data to analyse consumer behaviour in a multichannel online environment with a graph-based Markovian framework. Amongst others, the findings of their study imply that the channels consumers’ use during their customer journey should not be investigated in isolation. Even while the previous mentioned studies focus on the investigation of specific stages of the purchase process or are related to specific aspects regarding a contact between a customer and a company, their findings show that an analysis of the sequence of the customer contacts, their functions and importance will lead to a deeper understanding of the customer behaviour in a multichannel environment.

Therefore, this exploratory study aims to contribute to the retailing literature by addressing how multidimensional customer contact sequences (MCCS) can be mea-
sured and can form the basis for customer segmentation and provide insights into the customers’ behaviour by identifying clusters based on the multidimensional sequence of realised contacts, the functions of the contacts, and the importance of the contacts realised across all phases of the purchase process in multichannel retailing. Our findings show that cluster membership can be satisfactorily predicted by the sequencing of the customer contacts, even if a retailer has only knowledge about a part of consecutive contacts out of the whole sequence. In addition, we derive and test hypothesis with regard to potential determinants and effects of the customer contacts, their functions and their importance. Finally, based on the findings of the present study, implications for retail practice and research are derived and discussed.

2. Conceptual background and literature review

2.1. Customer contacts, their functions and importance across the purchase process

It is common for firms to employ online distribution channels alongside their offline distribution channels and further marketing channels to rely on these complex combinations as a source of competitive advantage and to better serve their customers’ needs and preferences (Geykens et al. 2002). In such environments, many customers have become multichannel users. They realise contacts between the firm and themselves at different contact points (e.g., store, sales staff, homepage) across all phases of the purchase process.

In retailing, we can differentiate three phases of the purchase process, i.e., the pre-purchase phase, the purchase phase and the post-purchase phase, but in other branches or when we are interested in specific problems or research questions, it may be more meaningful to use a more detailed modelling of the process. Furthermore, we can distinguish the variability of the contact points (personal, semi-personal and impersonal contacts; Silberer and Mau 2006). Payne and Frow (2004) define these categories of customer contacts as a continuum of forms that range from physical contact to virtual contact. According to Daft and Lengel (1992), customer contacts can be distinguished according to their relative richness of information provided, which is determined by the medium’s capacity for e.g., immediate feedback and personalisation, from the richest to the leanest medium. Thus, face-to-face contacts represent the richest contact point, followed by telephone contacts, electronic mail and websites up to different types of traditional marketing measures, such as contacts with newspapers and radio advertising.

Every customer contact fulfils different functions across the various process phases. Consequently, speech, sales and service functions can be distinguished (Simons and Bouwman 2004). Therefore, the functions of customer contacts in the different channels throughout the purchase process range from general and selective information regarding the desired product or service, price comparisons and purchasing up to the use of different types of customer services and advisory and complaining (Wallace et al. 2004). Media richness theory (Daft and Lengel 1984) implies that during the purchase process, customers will subsequently find it easier to establish contacts with a retailer in a manner that best fits their needs, which requires that the respective channels and their combination are capable of fulfilling customer needs and preferences concerning the desired functionality in the different process phases.

However, there are channel-related differences in fulfilling customer’s needs and preferences across the purchase process, including the richness of the information presented (Daft and Lengel 1984) and accessibility or convenience. The results of Verhoef et al. (2007) show that customers can benefit from channel-related differences throughout the phases of the purchase process by using the channels according to their individual channel behaviour because channels differ not only in their functionality but also in their ability to fulfill individual customer needs to the same extent across the different process phases. Research also shows that benefits and, thus, the importance of the several contacts sought change across the process phases (Mittal et al. 1999).

The previous comments show not only that customers’ use of the different contact point may differ during the purchase process but also that they support the assumption that the functions, in addition to the importance of the customer contacts, also change during the purchase process. We assume that this phenomenon is reflected in multidimensional customer contact sequences.

2.2. Customer segmentation

For our study, research regarding different approaches to customer segmentation is of particular interest. Sinha and Uniyal (2005) and Ganesh et al. (2007) provide an overview of a large number of empirical studies on this topic. The procedure for the formation of customer segments can thus be divided into two different approaches. Both demographic variables (e.g., age and gender) and psychographic variables (e.g., motives or attitudes) are drawn upon for the segmentation. In doing so, the constituted customer groups reveal who is buying in the investigated stores or channels and why. However, customers’ actual buying behaviour during and after purchase, i.e., how customers inform themselves prior to purchase, how the transaction is realised in the store, and how the relationship between retailers and customers is organised after the purchase, is barely taken into account.

Only a few studies account for the customer’s behaviour in the formation of segments (Bloch et al. 1994; Kim and Park 1997). Although they ultimately have partially different results, the aforementioned studies show the
usefulness of customer segmentation based on customer behaviour. However, with regard to customer behaviour in a multichannel environment, different essential aspects have not been taken into account: the specified studies only examine behaviour in a specific channel of a supplier in the purchase phase. It should be expected that different behaviours during the purchase are reflected in different behaviours prior to and after the purchase. Another aspect addresses the variables used in the segmentation analysis: considering only the behaviour in one specific channel leads to the neglect of other contacts.

According to Hägerstrand (1970), customer behaviour can be viewed as a sequence of interdependent actions over time. However, customer behaviour in the studies noted above is mostly treated as a chain of independent activities. Thus, the sequential order and obvious relations of the activities are often neglected. Therefore, Abbott’s (1995) statement that “We assume intercase independence even while our theories focus on interaction” regarding the social sciences is also largely true for marketing research concerning customer segmentation with regard to the individual behaviour of customers across the purchase process. The aforementioned approaches are far from satisfactory when there is interest in customer segmentation that involves the entire purchase process because important aspects that reflect customers’ behaviour in a multichannel retail environment are not addressed.

The sequential behaviour of customers throughout the purchase process also in different channels has barely been accounted for in the formation of segments. For marketing purposes, e.g., Larsson et al. (2005) use a sequence-analytical clustering approach to evaluate shopping behaviour in a supermarket for the foundation of customer segments. Steinmann and Silberer (2010) used the unidimensional sequence of the customer contacts to evaluate differences in the customer’s behaviour with regard to the whole purchase process. This type of segmentation can give a retailer or service provider important insights into the requirements, preferences and behaviour of customers over a period of time.

The previous discussion shows that customer contacts (dimension 1) not only differ across the successive phases of the purchase process but also support the assumption that the functions (dimension 2) and the importance (dimension 3) of customer contacts also change during the purchase process. The actual behaviour of customers over a period of time is taken into account for customer segmentation through the use of multidimensional customer contact sequences, which facilitates a differentiation of customers that is not possible on the basis of demographic or psychographic variables. This type of segmentation can provide a retailer with important insights into the requirements, preferences and behaviour of customers throughout the purchase process in a multichannel environment.

2.3. Determinants and effects of the customer contacts, their functions and importance

2.3.1. Determinants of the customer contacts, contact functions and contact importance

Research in the field of consumer behaviour in multichannel retailing has shown that the price of the purchased product as well as the product complexity could be considered as important determinants for the realisation of customer contacts (Neslin et al. 2006).

According to Kotter et al. (1995) the complexity of a product is closely related to the number of different attributes or characteristics of a specific product. The more different attributes are combined, the higher is the degree of product complexity. In this context, a notebook is of higher complexity compared to a DVD. According to the concept of adaptive decision-making of Payne et al. (1993), a customer shifts from the pre-purchase phase to the purchase phase from an attribute-based search to an alternatives-based search as he or she progresses in the decision-making process. In the case of complex products or services, these alternatives are complex bundles of attributes and benefits that need to be cognitively processed during the decision-making. In cases where many relevant aspects of the decision cannot be controlled, consumers seek some type of help in decision-making and it is thus more likely that they will realize more contacts and will use the different contact points for more different functions. Furthermore, consumers might use the desired benefit of the realised contacts as the basis of evaluating the characteristics of the different contacts points and the importance of the specific contact in the purchase process (Frambach et al. 2007). The findings of Gupta et al. (2004) imply that this is especially the case for the realisation of customer contacts in the purchase phase, while Steinmann and Silberer (2010) assumed an impact of the product complexity on the realisation of customer contacts across all phases of the purchase process. Moreover, their findings imply that an increasing product complexity will positively influence the number of different contact functions as well as the importance of the realised customer contacts in the multidimensional sequence across the purchase process. Hence, we hypothesise:

\[ H1: \text{The product complexity will positively influence } a) \text{ the number of realised customer contacts, } b) \text{ the number of different contact functions, and } c) \text{ the importance of the customer contacts across the purchase process.} \]

Previous research has shown that the price of a product and the way price and product information are communicated via the different channel of a multichannel system affects the consumers’ perceptions of the performance risk as well as the perceived financial risk regarding the purchase of a product (e.g., Shimp and Bearden 1982). Based on the assumptions and implications of prospect theory (Kahneman and Tversky 1979), consumers will
take efforts during the purchase process to minimize the potential risk of an incorrect purchase decision that might not fit with their desired outcome. We assume that this should be reflected in the number of realised customer contacts, the number of different contact functions, and the importance of the customer contacts across the purchase process. For example, the higher the product price, the more contacts will be realised across the purchase process. Hence, we conclude:

**H2**: The product price will positively influence a) the number of realised customer contacts, b) the number of different contact functions, and c) the importance of the customer contacts across the purchase process.

Previous studies have addressed the impact of the customers’ Internet affinity on channel choice as well as the role of online channels in multichannel environments (e.g., Peterson et al. 1997; Burke 2002; Montoya-Weiss et al. 2004). If a customer has a high Internet affinity and is also used to use the Internet in purchase processes it is likely that more online contacts will be realised across the stages of the purchase process, that such contacts should fulfill more different contact functions and are also of higher importance compared to offline contacts, which should be especially realised by customers with low internet affinity. In this context, Gupta et al. (2004) and Frambach et al. (2007) have shown that internet affinity should not only have an influence on the realisation of contacts with online channels, but also should have an effect on the customer contacts with offline channels which are combined in a multichannel system of a retailer or service provider. Therefore, we assume:

**H3**: Internet affinity will influence a) the number of realised customer contacts, b) the number of different contact functions, and c) the importance of the customer contacts across the purchase process.

### 2.3.2. Effects of the customer contacts, contact functions, and contact importance

Previous studies that have investigated the effects of customer behaviour in multichannel environments on several customer-related outcome variables indicate that the contacts between a retailer and its customers should have an impact on e.g., the perceived risk towards a purchase at a specific retailer, trust, customer satisfaction, and the intention to recommend (e.g., Montoya-Weiss et al. 2003; Steinmann 2011; Wallace et al. 2004). Based on this, we assume that the realised customer contacts, their functions, and importance across the whole purchase process will have an influence on the previous mentioned responses.

Schramm-Klein (2003) has identified an impact of the design of single retail channels as well as of the whole multichannel retailing system on perceived risk towards a purchase at the specific retailer as well as on trust towards the retailer. An increasing number of channels or customer contact points should lead to a decrease of the perceived risk and to an increase of trust towards a purchase at the retailer. In this context, the contact functions, the number of different contact functions as well as the importance of a customer contact should also be of particular interest (Steinmann 2011). For example, a consultation with the sales staff could fulfill several different functions and hence, might also be considered as an important contact at a specific stage of the purchase process that will reduce risk perception and increase trust towards the retailer and the multichannel system.

If the retailer is able to fulfil the specific needs and requirements of the customers across the purchase process this should further positively influence customer satisfaction as well as the intention to recommend. According to Oliver (1997), it seems to be relevant to distinguish between aspects of customer satisfaction, which are strongly related to the experiences and activities of the customers within the several channels across the purchase process (process-related customer satisfaction) and aspects, which are strongly related to the purchased product (output-related customer satisfaction) (Montoya-Weiss et al. 2003). One might conclude that number of the realised customer contacts, the number of the different contact functions, and the importance of the customer contacts, especially, should influence process-specific aspects of customer satisfaction. But, in this context, the findings of Steinmann and Silber (2009) imply that also product-specific aspects of customer satisfaction could be affected. Moreover, the findings of Wallace et al. (2004) and Steinmann and Silberer (2009) imply that the customers’ intention to recommend the retailer is influenced by the realised customer contacts, their functions and importance. Hence, we assume:

**H4**: The number of a) the realised customer contacts, b) the number of the different customer contacts, and c) the contact importance across the purchase process will influence the customers’ 1) perceived risk towards a purchase, 2) trust towards the retailer, 3) customer satisfaction, and 4) customer loyalty.
channel marketing and distribution system that enables the retailer to get in touch with its actual and potential customers via a broad range of different channels (e.g., the store, sales staff, website, newspaper advertising, TV and radio advertising). Therefore, we were able to get a comprehensive impression on how the several channels of the multichannel system were complementary used by the customers across all phases of the purchase process.

To support the recollection of events from the distant past – the customer contacts realised, their functions, and importance as well as the sequence across all phases of the purchase process – in the interviews a procedure based on cognitive psychology was chosen (Ericsson and Simon 1980). Therefore, the questionnaire leads the customer through his or her memories step by step – starting with the events that are most accessible because they were realised closest to the interview (post-purchase phase) – and ending with those situations that are initially difficult to remember without any support because they date from the distant past (purchase phase and pre-purchase phase). If the customer was first asked for contacts prior to purchase, then he/she would have to remember those events dated farthest back – an attempt at which he/she would potentially not succeed. By contrast, the events and their attributes – the realised contacts, their functions, and importance – after the purchase are most clearly in memory as they date back the shortest period of time. Therefore, the first questions were directed to the realised customer contacts with the different contact points of the retailer, the functions of each contact realised, the importance of the realised contacts, as well as to the sequence of the realised contacts in the post-purchase phase. Closely connected with events after purchase are those situations in memory that lie temporally prior, i.e., during the purchase. If the customer remembers the post-purchase phase, then the events during the purchase are more present. Therefore, the realised customer contacts, their functions and importance during the purchase phase were surveyed second. Pursuing the same strategy, customer contacts, contact functions, contact importance, and the contact sequence in the pre-purchase phase was recorded third. Hence, the captured MCCS included different customer contacts realised at the several contact points of the retailer (dimension 1: e.g., retailer advertising, retailer website, store, sales staff), the functions of the realised contact (dimension 2: gathering general and selective information, price comparison, purchase, advisory and complaining) and the importance of each realised customer contact (dimension 3). The importance of each realised customer contact in the MCCS (dimension 3) was measured with a single item on a six-step rating scale ranging from 1 = entirely unimportant to 6 = very important. The previous described procedure for the collection of the relevant sequential information in the questionnaire was developed step by step, starting with an approach to survey the realised customer contacts across the whole purchase process to the collection of the unidimensional sequence of the customer contacts up to the measurement of the multidimensional customer contact sequence in different branches. Previous versions of the questionnaire as well as the version used in the present study have been successfully applied in several preliminary studies, which were related to customer behaviour in multichannel environments (e.g., Silberer and Mau 2006; Steinmann et al. 2006, 2007; Steinmann and Silberer 2008, 2009).

In each interview, not only the MCCS actually realised but also their potential determinants and the effects were examined. Based on previous research on the determinants of the realisation of customer contacts, we considered the complexity of the purchased product, the product price, the participants’ internet affinity, and age as well as gender as potential determinants for the realisation of customer contacts, the contact functions, and the contact importance in the MCCS. Product complexity was operationalised by using the approach of Kotteaku et al. (1995). Hence, based on the number of different attributes, which are combined in a single product, we distinguished between purchased products with a low degree of complexity (e.g., CD-ROMs, DVDs), products with an average degree of complexity (e.g., a coffee machine), and products with a high product complexity (e.g., notebook, digital camera). The price of the product was measured with a single-item in an open-ended question ("What was the price of the purchased product?"). According to Jepsen (2007), we used the average Internet usage of the participants as an indicator of Internet affinity. The average internet usage was measured with a single-item on a five-point rating scale ("How often do you use the Internet on average?", 1 = less than once a week – 5 = several times a day). We used a single-item in an open-ended question to measure the participants’ age ("How old are you?"). Finally, the gender of the participants was observed and recorded in the interviews.

Regarding the effects of the MCCS, we examined customer satisfaction with the purchased product and its price and the retailer’s service across the successive phases of the purchase process, customer loyalty towards the retailer, perceived risk, and trust towards the retailer in the interviews. Customer satisfaction was measured on a six-point rating scale (ranging from 1 = entirely dissatisfied to 6 = very satisfied) by adapting the approaches introduced by Schütze (1994) and Rapp (1995) to the context of our study. Hence, we were able to distinguish between process-related aspects of customer satisfaction and output-related aspects of customer satisfaction (e.g., How satisfied are you with the purchased product?). Process-related customer satisfaction was measured with three items and covers the satisfaction with the service outcomes of each single phase of the purchase process (e.g., "How satisfied are you with the retailer’s service prior to your purchase?"); Cronbach’s alpha = .74), while output-related customer satisfaction was operationalised with six items and includes e.g., the satisfaction with the purchased product or with the pricing of the retailer (Cronbach’s alpha = .76).
(2006), loyalty towards the retailer was collected with single-item measures of two loyalty facets namely, recommendation intention („Did you recommend the retailer because of your purchase?“) and the likelihood for repeat purchases („How likely is it that you will again purchase a product at this retailer?“). 1 = very unlikely – 6 = very likely). According to Spence et al. (1970), perceived risk was measured with a single item („How risky do you evaluate purchasing a product from this retailer?“). 1 = not risky at all – 6 = very risky). In line with Barney and Hansen (1994), a single-item was also used to measure the participants’ trust towards the retailer on a six-step scale („How trustworthy do you evaluate this retailer?“). 1 = not trustworthy at all – 6 = very trustworthy).

3.2 Participants

We used a convenience sample and acquired only those customers who actually affected a purchase at the selected retailer within the last six months prior to the study that they could remember well. The interviews were conducted in 2008/2009 in a stationary shop of the selected German multichannel retailer for consumer electronics in a medium-sized German city under the guidance of the first author of the present manuscript by two business students of the Georg-August-University Göttingen (Germany) with Marketing as their major field of study. Before the interviews commenced with the main study, both students were trained in conducting personal interviews and they further pretested the questionnaire. Non-alcoholic beverages and cookies were offered to each participant as an incentive for supporting the study. Furthermore, the participants could take part in a raffle in which they had the chance to win a voucher of the retailer, which they had the chance to win a voucher of the retailer, with a value of 20, 30, or 50 Euros.

A total of \( N = 304 \) customers of the German retailer for consumer electronics participated in the survey. Customers were addressed at the central entrance and exit of the store while they were leaving. In the sample, women represented 48.0%. The average age of the participants was \( M = 37.2 \) (\( SD = 13.8 \)) years. Overall, more than one-third (36.2%) of the customers bought electronic appliances and accessories, and PC hardware and software were purchased by 20.5% of the participants in our sample. Other frequently purchased product categories were sound carriers and DVDs (19.4%), consumer electronics (6.2%), and digital cameras (6.0%). The average price of the purchased products was \( M = 137.36 \) (\( SD = 273.01 \)) Euros. Overall, 61.9% of the customers in our sample spent less than 50 Euros. Slightly less than one-third (30.3%) of our sample spent up to 500 Euros, and 7.8% of the customers paid more than 500 Euros. The participants were nearly equally satisfied with process-related aspects (\( M = 4.89, SD = 1.1 \)) and the output-related aspects of the purchase (\( M = 4.81, SD = 0.9 \)). Perceived risk was considerably low (\( M = 2.10, SD = 1.3 \)) and trust towards the retailer was considerably high (\( M = 4.71, SD = 1.0 \)). The participants’ likelihood for repeat purchases was \( M = 5.42 (SD = 1.2) \), while – interestingly – the intent to recommend the retailer was only \( M = 1.23 (SD = 0.7) \) on average.

3.3. Multidimensional sequence alignment and sequence clustering

To analyse the captured MCCS, we applied the multidimensional sequence alignment method (SAM) (Joh et al. 2002). The idea of SAM is to equalise two different sequences with regard to the operations insertion, deletion and substitution. The weight of one is mostly assigned to the operations insertion and deletion; for substitutions, the consecutive operations deletion and insertion are summed. Typically, there are different ways to transfer one sequence to another in the aforementioned operations, and therefore, the minimal sum of the weighted operations, i. e., the Levenshtein distance (Levenshtein 1966), is commonly used as a similarity measure for the considered sequences (Joh et al. 2002). According to Joh et al. (2002, p. 386–387), „the interesting feature of sequence alignment is that it employs biological rather than geometric distance (Euclidean) distance as the basic concept of comparison.” Hence, such approaches account for the real behaviour of customers in a multichannel environment, and therefore, they make it possible to identify behaviour-related customer segments, which is one of the most important challenges for an effective and efficient multichannel system design (Neslin et al. 2006, Zhang et al. 2010).

In this study, customer behaviour is not represented as the customer contacts by a single attribute. To gain deeper insights into the differences in customer behaviour and to obtain powerful clusters, the MCCS were characterised by three dimensions: the customer contact sequence (dimension 1), the sequence of the functions related to the customer contacts (dimension 2), and the sequence of the importance (dimension 3) of the contacts to the customers. The easy way to compare such sequences is to calculate the Levenshtein distance for each dimension separately and then sum the measured distances of all dimensions. This approach is based on the assumption that all attributes are independent. However, in the context of the present study, this is clearly not the case because there are dependencies between the customer contacts, their functions and their importance. Therefore, the calculation of the measured attributes for each dimension distorts the result. To avoid such distortions with regard to the different measurement scales of the dimensions, we use a multidimensional approach, called „optimal trajectory multidimensional SAM,” which identifies the elements that can be aligned simultaneously without calculating the costs twice (Joh et al. 2002). The distances are calculated, using the DANA software [1], as a basis for our cluster analysis using the Ward Method. Based on the elbow criterion as well as on a visual inspection of the dendrogram, the results of our cluster analysis imply that the differentiation into four clusters proved to be reasonable.
4. Results: Multidimensional sequence clusters

In the following, the results of our segmentation using multidimensional sequence alignment as well as the differences between the four clusters with regard to the multidimensional customer contact sequences, the realised contacts, the contact functions, and the importance of the realised contacts across all phases of the purchase process will be presented. In the first step the four identified cluster will be described based on their multidimensional centroid sequences, the typical representative of each of the identified multidimensional sequence clusters. Additionally, the four clusters will be described by the realised customer contacts, their functions, and importance in the different phases of the purchase process. Moreover, differences between the clusters with regard to the investigated determinants as well as the effects of the MCCS are reported. Finally, the results of a multinomial logistic regression on the cluster level show that cluster membership can be satisfactorily explained by the sequencing of the customer contacts.

4.1. Description of the clusters using constituent variables

As mentioned above, the clusters identified are described using the MCCS (centroid) typical for them (see Tab. 1). The typical representative of cluster 1 has realised the lowest number of customer contacts across the purchase process. After two very important contacts with newspaper and TV advertising in the pre-purchase phase, which were used for price comparison and selective information, the desired product was bought in the store.

The centroid of cluster 2 is the only centroid that includes a customer contact with the retailer’s homepage in the purchase process. The first contact in the centroid of cluster 2 was realised with the store and was used to obtain general information about the retailer’s offers. This contact was followed by a contact with other websites, which were used for selective information. These two customer contacts were both realised during the pre-purchase phase and were rated as important contacts. During the purchase phase, the product was bought after consulting the sales staff. Such contacts were of specific relevance and were therefore rated as very important contacts.

The centroid of cluster 3 shows that these customers realised the highest number of contacts in the purchase phase. They sought contact with TV and newspaper advertising in the pre-purchase phase to obtain general information. These contacts with the retailer’s different types of advertising were both evaluated as important contacts. During the purchase phase, the customers of the third cluster often realised contacts with advertising at the point-of-sale that were used for selective information. Such contacts were also rated as important. The following consultation of the sales staff and the purchase of the product in the store were of highest importance to the customers of cluster 3 and evaluated as very important contacts.

The centroid of cluster 4 shows that these customers realised the highest number of customer contacts across the...
entire purchase process and in the pre-purchase phase. Furthermore, the customer contacts in this multidimensional centroid sequence cover all phases of the purchase process. One can observe that all of the contacts prior to the purchase were realised in the store. After two contacts with different types of advertising at the point-of-sale for obtaining general information, these customers sought contact with the sales staff, followed by two customer contacts in the store for advisory functions. With regard to these findings, one may conclude that the opportunity of direct product contacts in the store is of specific relevance to the customers in cluster 4. In the purchase phase, the product was purchased in the store. In the post-purchase phase, a contact with the sales staff, followed by two contacts with different types of advertising at the point-of-sale, was used for advisory functions. The customers evaluated this contact as very important.

### 4.2. Description of the clusters using the realised customer contacts

For the description of the cluster solutions within the four clusters, differences regarding the realised customer contacts are of particular interest. The results in Tab. 2 describe the clusters by way of the number of different customer contacts realised in the entire purchase process as well as by the number of different customer contacts in each process phase (pre-purchase, purchase, and post-purchase phase). Furthermore, the clusters are described by the percentage of realised contacts with the different contact points of the retailer in each process phase.

Overall, the customers in the first cluster realised the lowest number of contacts with regard to the entire purchase process and concerning the proportion of contacts in the post-purchase phase compared to the other clusters. Furthermore, the findings show significant differences concerning the proportion of selected customer contacts in the different phases of the purchase process. Additionally, we obtained significant differences concerning the average number of contacts with specific contact points across the purchase process.

As expected, the customers of the fourth cluster realised the highest number of contacts with the sales staff and with the store during the purchase process (contacts with the store: CL1: \( M = 1.37, SD = 0.51 \); CL2: \( M = 1.79, SD = 0.76 \); CL3: \( M = 1.74, SD = 0.75 \); CL4: \( M = 1.89, SD = 0.74 \); \( F = 9.35, p < .001 \); contacts with the sales staff: CL1: \( M = 1.16, SD = 0.43 \); CL2: \( M = 1.48, SD = 0.77 \); CL3: \( M = 1.41, SD = 0.58 \); CL4: \( M = 1.54, SD = 0.58 \); \( F = 3.09, p < .05 \)).

In addition, our findings show significant differences amongst the four clusters concerning the number of realised contacts in the pre-purchase phase (\( F = 5.124, p < .01 \)).
.01) and the purchase phase ($F = 13.770, p < .001$). Furthermore, with regard to the differences in the number of customer contacts amongst the different process phases within each cluster, we only obtained significant results for cluster 4 ($Hotelling’s Trace F = 6.599, p < .05$).

4.3. Description of the clusters using the contact functions

An analysis of the functions of the realised customer contacts will provide important insights into the intentions and motives of the customers for using the different contact points of the retailer. The findings in Tab. 3 show differences regarding the number of the contact functions and concerning the proportion of the functions of different contact points. With regard to the number of contact functions in the entire purchase process, the findings show significant differences amongst the four clusters ($F = 25.331, p < .001$).

The customers of the fourth cluster used the contact points for the most different functions, whereas the customers in cluster 1 used the contacts the least differentiated manner. Furthermore, our findings show significant differences concerning the number of contact functions between the different process phases for the customers of the first, the second, and the third cluster (CL1: $Hotelling’s Trace F = 17.669, p < .001$; CL2: $Hotelling’s Trace F (2, 22) = 30.561, p < .001$; CL3: $Hotelling’s Trace F (2, 30) = 26.176, p < .001$; CL4: $Hotelling’s Trace F = 2.259, p = .144$).

Moreover, concerning the average number of specific contact functions, the results show significant differences for the selective information and advisory functions amongst the clusters. In particular, the customers of cluster 4 used the contacts to obtain selective information during the purchase process (CL1: $M = 2.15, SD = 1.09$; CL2: $M = 2.65, SD = 1.55$; CL3: $M = 2.88, SD = 1.67$; CL4: $M = 3.23, SD = 1.77$; $F = 5.807, p < .001$). The advisory functions were mostly obtained by the customers of the third cluster (CL1: $M = 1.24, SD = 0.73$; CL2: $M = 1.81, SD = 1.39$; CL3: $M = 1.89, SD = 1.60$; CL4: $M = 1.66, SD = 0.87$; $F = 2.408, p < .05$).

4.4. Description of the clusters using the importance of the customer contacts

Tab. 4 summarises our findings with regard to the average importance of the realised customer contacts in the entire purchase process as well as with regard to the contact importance in each phase of the purchase process. Overall, the customers of cluster 2 evaluated the contacts as most important compared to the other clusters. Interestingly, in each cluster, the contacts in the post-purchase phase were evaluated as the most important contacts ($F = 6.538, p < .001$).

In the pre-purchase phase, our findings show significant differences with regard to the importance of the retailer’s advertising, the contacts in the store and customer contacts with the sales staff. For the customers in cluster 1, the latter was of considerably less importance compared to the other clusters. During the purchase phase, contacts with the sales staff were most important to cluster 2. Surprisingly, during the post-purchase phase, our results show no significant differences in the importance of the customer contacts. In this phase, contacts with the service staff were of great importance to all customers, most likely because this contact point was mostly used for advice and for complaining. Interestingly, the findings do not show significant differences concerning the importance of customer contacts between the phases of the purchase process within each cluster.

4.5. Discriminatory power of contact sequences

We used a multinomial logistic regression (Hosmer and Lemeshow 2000) on the cluster level to test if cluster membership can be satisfactorily explained and predicted by the sequencing of customer contacts. With regard to the differences in the number of realised contacts and the number of realised customer contact points, we used the number of the ten most frequently realised transitions in the MCCS consisting of two consecutive customer contacts as independent variables in a first multinomial logistic regression model with the cluster membership as the dependent variable. In the second logistic regression model, we additionally controlled for the influence of the potential determinants that could be associated with cluster membership namely, age and gender. Therefore, the second model included product-related and socio-demographic variables (see Tab. 7).

As model 1 in Tab. 5 indicates, the sequence information is strongly associated with segment membership and provides a correct classification of 74.6 % of the customers in our sample. The statistical association between the substrings and cluster membership remains generally robust, although the significance level of the parameters decreases and the correct classification increases slightly (81.4 %) when the control variables are included in model 2.

In particular, substrings including contacts with the store, contacts with the retailer’s different types of advertising, customer contacts with the sales staff, the price of the product and internet affinity are contributing factors in explaining cluster membership. The results of the likelihood ratio test show an overall good fit for both models (model 1: $\chi^2(30) = 163.368, p < .001$; model 2: $\chi^2(51) = 129.094, p < .001$) and the statistics provided in Tab. 7 (Hosmer and Lemeshow 2000).

4.6. Determinants of the multidimensional customer contact sequence clusters

The findings of the multinomial logistic regression analyses indicate that the complexity of the purchased product, the product price, as well as the participant’s average internet usage might act as predictor variables for cluster membership and hence, they might also influence the
different dimensions of the multidimensional customer contact sequence. In $H1a–H1c$ it was surmised that increasing product complexity would have a positive influence on the number of realised customer contacts, on the number of different contact functions, and on the average importance of the customer contacts across all phases of the purchase process. We applied several multiple regression analyses with the potential determinants as predictor variables and the number of realised customer contacts, the number of contact functions, and the average contact importance as dependent variables. Contrary to our expectations, the findings show no significant impact of the product complexity on the number of customer contacts across all stages of the purchase process, rejecting $H1a$. But, the findings of an additional regression analysis with the number of realised contacts in the different process phases as dependent variables show, that especially the number of realised contacts in the purchase phase is slightly significant positively influenced by product complexity ($\beta = .323, p < .1$), while the realisation of contacts prior and after the purchase is not affected. We obtained empirical support for the hypothesised relationships in $H1b$ and $H1c$. With an increasing product complexity, the contact points were used for more different functions ($\beta = .116, p < .05$) and will be evaluated on average as more important ($\beta = .155, p < .01$). Interestingly, with regard to the single process phases, product complexity has positively influenced the differentiated use of the contact points in the pre-purchase ($\beta = .159, p < .05$) and post-purchase phase ($\beta = .237, p < .01$). A plausible reason for these results might be that complex products have a higher need for explanation, especially prior and after the purchase, and hence, the customers’ use the contact points for more differentiated functions, when they are seeking for product-related information prior to the purchase or for using several after-sales services of the retailer.

<table>
<thead>
<tr>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Different Contact Functions in the Purchase Process M (SD)$1$</td>
<td>3.83 (1.2)</td>
<td>4.96 (1.4)</td>
<td>5.09 (1.5)</td>
</tr>
</tbody>
</table>

### Pre-Purchase Phase

<table>
<thead>
<tr>
<th>Retailer’s Advertising</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>General information</td>
<td>77.9$^2$</td>
<td>65.5</td>
<td>75.7</td>
<td>100</td>
</tr>
<tr>
<td>Selective information</td>
<td>11.0</td>
<td>22.0</td>
<td>28.4</td>
<td>33.3</td>
</tr>
<tr>
<td>Price comparison</td>
<td>37.9</td>
<td>38.2</td>
<td>58.1</td>
<td>76.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Store</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>General information</td>
<td>39.1</td>
<td>46.2</td>
<td>47.5</td>
<td>30.8</td>
</tr>
<tr>
<td>Selective information</td>
<td>60.9</td>
<td>57.7</td>
<td>79.6</td>
<td>84.6</td>
</tr>
<tr>
<td>Price comparison</td>
<td>56.5</td>
<td>50.0</td>
<td>60.0</td>
<td>76.9</td>
</tr>
<tr>
<td>Advisory</td>
<td>2.2</td>
<td>3.8</td>
<td>17.5</td>
<td>15.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sales Staff</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>General information</td>
<td>0.7</td>
<td>3.8</td>
<td>22.2</td>
<td>15.4</td>
</tr>
<tr>
<td>Purchase</td>
<td>25.0</td>
<td>11.8</td>
<td>5.6</td>
<td>20.0</td>
</tr>
<tr>
<td>Advisory</td>
<td>25.0</td>
<td>52.9</td>
<td>72.2</td>
<td>60.0</td>
</tr>
</tbody>
</table>

### Purchase Phase

<table>
<thead>
<tr>
<th>Advertising at the PoS</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>General information</td>
<td>36.4</td>
<td>85.7</td>
<td>56.5</td>
<td>50.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sales Staff</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>General information</td>
<td>31.0</td>
<td>96.4</td>
<td>85.1</td>
<td>86.7</td>
</tr>
<tr>
<td>Selective information</td>
<td>21.8</td>
<td>73.6</td>
<td>80.4</td>
<td>57.7</td>
</tr>
<tr>
<td>Advisory</td>
<td>25.4</td>
<td>79.9</td>
<td>88.9</td>
<td>69.2</td>
</tr>
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</table>

### Post-Purchase Phase

<table>
<thead>
<tr>
<th>Store</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advisory</td>
<td>75.0</td>
<td>50.0</td>
<td>85.7</td>
<td>58.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sales Staff</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advisory</td>
<td>23.0</td>
<td>63.3</td>
<td>90.9</td>
<td>77.8</td>
</tr>
<tr>
<td>Complaining</td>
<td>8.7</td>
<td>16.7</td>
<td>36.4</td>
<td>66.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service Staff</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advisory</td>
<td>75.0</td>
<td>20.0</td>
<td>100</td>
<td>66.7</td>
</tr>
</tbody>
</table>

*** $p < .001$, ** $p < .01$, * $p < .05$, † $p < .1$, ns = not significant; $^1$ Mean (Standard deviation); $^2$ 100 % corresponds to the customers in cluster 1 who realised an advertising contact; all significant differences amongst the four clusters were calculated with a chi$^2$ adaptation test or the F-Test.

Tab. 3: Cluster description by the functions of selected contact points
In H2a–H2c, we assumed that the price of the purchased product would have a positive impact on the three dimensions of the multidimensional customer contact sequence. The results of several multiple regression analyses show a slightly significant impact of the product price on the number of realised customer contacts across all stages of the purchase process (β = .146, p < .1). Moreover, the price of the purchased product has also a posi-

<table>
<thead>
<tr>
<th>Importance of Customer Contacts in the entire Purchase Process M (SD)1</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store sales staff</td>
<td>4.21 (1.1)2</td>
<td>4.94 (1.3)</td>
<td>4.91 (1.1)</td>
<td>4.02 (0.8)</td>
</tr>
<tr>
<td>Retailer’s advertising</td>
<td>4.41 (0.9)</td>
<td>3.49 (1.1)</td>
<td>3.88 (1.0)</td>
<td>3.76 (0.9)</td>
</tr>
<tr>
<td>Retailer’s homepage</td>
<td>4.61 (1.7)</td>
<td>3.73 (2.1)</td>
<td>4.25 (1.8)</td>
<td>4.89 (1.3)</td>
</tr>
<tr>
<td>Other websites</td>
<td>4.00 (1.8)</td>
<td>4.75 (1.5)</td>
<td>4.53 (1.6)</td>
<td>5.00 (1.4)</td>
</tr>
<tr>
<td>Store</td>
<td>4.39 (1.8)</td>
<td>4.88 (1.4)</td>
<td>4.74 (1.2)</td>
<td>4.92 (0.8)</td>
</tr>
<tr>
<td>Sales staff</td>
<td>3.49 (1.9)</td>
<td>5.35 (1.1)</td>
<td>4.67 (1.2)</td>
<td>4.80 (1.1)</td>
</tr>
</tbody>
</table>

Pre-Purchase Phase

<table>
<thead>
<tr>
<th>Contact Importance M (SD)</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retailer’s advertising</td>
<td>4.17 (1.5)</td>
<td>3.28 (1.6)</td>
<td>3.43 (1.2)</td>
<td>3.43 (1.2)</td>
</tr>
<tr>
<td>Retailer’s homepage</td>
<td>4.41 (0.9)</td>
<td>3.49 (1.1)</td>
<td>3.88 (1.0)</td>
<td>3.76 (0.9)</td>
</tr>
<tr>
<td>Other websites</td>
<td>4.61 (1.7)</td>
<td>3.73 (2.1)</td>
<td>4.25 (1.8)</td>
<td>4.89 (1.3)</td>
</tr>
<tr>
<td>Store</td>
<td>4.39 (1.8)</td>
<td>4.88 (1.4)</td>
<td>4.74 (1.2)</td>
<td>4.92 (0.8)</td>
</tr>
<tr>
<td>Sales staff</td>
<td>3.49 (1.9)</td>
<td>5.35 (1.1)</td>
<td>4.67 (1.2)</td>
<td>4.80 (1.1)</td>
</tr>
</tbody>
</table>

Purchasing Phase

<table>
<thead>
<tr>
<th>Contact Importance M (SD)</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retailer’s advertising</td>
<td>4.37 (1.4)</td>
<td>5.09 (0.8)</td>
<td>4.59 (0.9)</td>
<td>4.24 (1.1)</td>
</tr>
<tr>
<td>Retailer’s homepage</td>
<td>3.59 (1.8)</td>
<td>4.00 (1.3)</td>
<td>3.65 (1.6)</td>
<td>3.17 (1.8)</td>
</tr>
<tr>
<td>Store</td>
<td>4.84 (1.5)</td>
<td>5.27 (1.3)</td>
<td>5.04 (1.1)</td>
<td>4.37 (1.5)</td>
</tr>
<tr>
<td>Sales staff</td>
<td>3.94 (1.8)</td>
<td>5.45 (0.7)</td>
<td>5.03 (1.2)</td>
<td>4.58 (1.3)</td>
</tr>
</tbody>
</table>

Post-purchase Phase

<table>
<thead>
<tr>
<th>Contact Importance M (SD)</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store</td>
<td>5.27 (0.9)</td>
<td>5.75 (0.4)</td>
<td>5.02 (0.8)</td>
<td>5.18 (1.0)</td>
</tr>
<tr>
<td>Sales staff</td>
<td>5.13 (1.1)</td>
<td>5.60 (0.5)</td>
<td>5.24 (0.9)</td>
<td>5.17 (1.5)</td>
</tr>
<tr>
<td>Service staff</td>
<td>5.80 (0.4)</td>
<td>5.67 (0.5)</td>
<td>4.90 (0.8)</td>
<td>5.22 (1.1)</td>
</tr>
</tbody>
</table>

*** p < .001, ** p < .01, * p < .05, † p < .1, ns = not significant; 1 Mean (Standard deviation); 2 examined on a six-step rating scale ranging from 1 = entirely unimportant to 6 = very important.

Tab. 4: Cluster description by the importance of customer contacts

| Model 1 | Model 2 |
|-----------------|---------|---------|---------|---------|---------|---------|
| Substring | Cluster 2 | Cluster 3 | Cluster 4 | Cluster 2 | Cluster 3 | Cluster 4 |
| Store → Sales staff | 2.416** | 2.430*** | 1.914** | 3.144*** | 2.499** | 2.576** |
| Store → Retailer’s advertising | -0.98ns | 1.210* | -0.354ns | .984ns | 1.067ns | .130ns |
| Retailer’s advertising → Store | -.266ns | .313ns | -.210ns | -.142ns | .346ns | .171ns |
| Retailer’s advertising → Retailer’s advertising | .689† | .718† | 1.317** | .746ns | .682ns | 1.652** |
| Retailer’s advertising → Sales staff | 2.638*** | 2.208*** | 2.935*** | 2.808** | 2.471** | 3.251*** |
| Sales staff → Store | .700ns | .476ns | .133ns | -.705m | -.183m | .142ns |
| Retailer’s advertising → Retailer’s homepage | -.357ns | .081ns | .491ns | .042ns | .365ns | .821ns |
| Other websites → Store | -.345ns | .482ns | .663ns | -.350m | .740m | .553ns |

Selected Determinants

<table>
<thead>
<tr>
<th>Age</th>
<th>Average Internet Usage1</th>
<th>Product Complexity2</th>
<th>Product Price3</th>
<th>Constant</th>
</tr>
</thead>
<tbody>
<tr>
<td>+.065**</td>
<td>+.033†</td>
<td>-.00ns</td>
<td>+.372†</td>
<td>-.449*</td>
</tr>
<tr>
<td>.132ns</td>
<td>.618†</td>
<td>-.798†</td>
<td>+.005**</td>
<td>+.001ns</td>
</tr>
</tbody>
</table>

Correctly Classified 74.6 % 81.4 %
-2LL 417.091 101.219
Cox & Snell R² .416 .729
Nagelkerke R² .454 .807

*** p < .001, ** p < .01, * p < .05, † p < .1, ns = not significant; 1 Average Internet Usage: ranges from 1 = less than once a week to 5 = several times a day; 2 product complexity: ranges from 1 = low to 3 = high; 3 Product price in Euros.

Tab. 5: Discriminatory Power: Multinomial Logistic Regression Estimates (Reference Category = Cluster 1)
tive impact on the number of different contact functions ($\beta = .056, p < .01$) as well as on the average importance of the customer contacts ($\beta = .040, p < .05$), supporting $H2b$ and $H2c$. In particular, the findings of an additional analysis have shown that the price of the purchased product will influence the average importance of personal contacts with e.g., the sales staff in the stationary store ($\beta = .079, p < .05$).

With regard to the potential impact of the average Internet usage, we proposed an impact of this variable on the number realised customer contacts, the number of different functions, and the average importance of the customer contacts ($H3a$--$H3c$). The findings of several regression analyses have shown that average Internet usage has a slightly positive impact on the number of realised customer contacts in the multidimensional contact sequence ($\beta = .079, p < .1$) and that this is especially the case in the pre-purchase phase ($\beta = .285, p < .1$). As expected, average Internet usage has further positively influenced the realisation of contacts with the retailer’s website ($\beta = .585, p < .001$). Contrary to our expectations, average Internet usage had no significant impact on the number of different contact functions as well as on the average importance of the realised customer contacts across the purchase process, rejecting $H3b$ and $H3c$. Not surprisingly, with regard to the importance of specific contact points, average internet usage had a positive impact on the importance of contacts with the retailer’s website.

4.7. Effects of the multidimensional customer contact sequence clusters

In addition to the determinants, the impact of specific facets of the dimensions of the multidimensional customer contact sequences on final variables such as customer satisfaction, perceived risk, trust, and different facets of customer loyalty ($H4$) were also examined by applying multiple regression analyses.

The results show that perceived risk was only influenced by the number of different contact functions across the purchase process, supporting $H4b1$. We obtained a positive impact of this variable on risk perception ($\beta = .184, p < .05$), meaning that perceived risk increases when a customer had to use the contact points in a more differentiated way to satisfy specific information needs at different stages of the purchase process. Moreover, we identified no significant impact of the predictor variables on trust towards the retailer. Interestingly, the findings of multiple regression analyses have shown that output-related aspects of customer satisfaction were positively influenced by the number of different contact functions ($\beta = .123, p < .1$) as well as by the average importance of the customer contacts across the whole purchase process ($\beta = .142, p < .05$), partially supporting $H4b3$ and $H4c3$. In this context, contrary to our expectations, we obtained no significant impact of the different aspects of the customer contacts in the MCCS on process-related customer satisfaction. Finally, regarding the proposed impact on customer loyalty, we obtained no significant impact of the number of customer contacts, the number of different contact functions, and the average importance of the contacts across the purchase process neither on the likelihood for repeat purchases nor on the intent to recommend the retailer.

5. Discussion and conclusions

5.1. Summary

The results of our exploratory study demonstrate that customers can successfully be classified with regard to their MCCS. Based on the dimensions of the multidimensional customer contact sequence, we identified four clusters of customers with different channel strategies across the different stages of the purchase process. The multidimensional sequences indicate differences in the purchasing process; for example, our results with regard to the differences in customers’ behaviour concerning the usage and functions of the different contact points across the purchase process suggest amongst the customer clusters identified. Customer segmentation based on demographic or psychographic variables would not have been able to enrich the customer knowledge of the retailer in this manner. Moreover, the results of the logistic regression show that a few types of sequential information of the sequence of all customer contacts already provide a highly satisfactorily classification of the customers. The findings of our analyses regarding the potential determinants have shown that the realisation of customer contacts, the contacts functions, and the importance of the contacts are mainly influenced by the complexity and the price of the purchased product. In this context, we are in line with previous studies in the context of customer behaviour in multichannel systems that have addressed the impact of the product price on consumer behaviour (e.g., Gupta et al. 2004; Steinmann and Silberer 2010). With regard to the effects of the MCCS, our findings indicate that perceived risk is affected by the number of different contact functions across the purchase process. Furthermore, especially output-related aspects of customer satisfaction were influenced by the number of different contact functions as well as the average importance of the customer contacts across the purchase process.

5.2. Implications for management

An analysis of MCCS provides a retailer with detailed information on the differences regarding the behaviour as well as the preferences and requirements of customers segments in multichannel environments across the whole purchase process. By tracking multidimensional customer behaviour across channels, firms can improve their understanding of their customers’ decision-making and develop a basis for creating strong relationships and improving retention (Dholakia et al. 2005). Hence, investigating multidimensional contact sequences will strength-
en the understanding of the customers’ behaviour across the whole purchase process and hence, foster the retailer’s knowledge about the actual customers. This new type of information puts retailers in a position to adapt the establishment of individual customer contact points to the different customer segments and to guide customers via contacts in the purchase process. Knowing these segments and their sequences enables the retailer to anticipate further contacts and to offer suitable measures. If the retailer pursues a particular strategy with regard to the sequence of the contacts, then these results provide information on the proportion of the customers who behave accordingly. Therefore, the balance between the aspired and actual sequence of the customer contacts can be used to monitor the marketing communication and the entire marketing strategy. Moreover, clustering customers according to their MCCS can form the basis of segmented marketing approach. As the multidimensional sequence was not only related to the use of different channels across the purchase process, but also to the purchased product and other final variables, it seems to be important to recognise the different customer channel strategies with regard to the phases of the purchase process. Furthermore, our analysis also illustrates differences in the usage frequency, the contact functions, and the contact importance of single channels in the purchase process. Such information could be considered for allocating marketing budgets across the several channels of a multichannel system (Li and Kannan 2014).

The multidimensional contact sequences can also provide crucial insights into potentially existing cross-channel synergies. Furthermore, in applying probabilistic models an analysis of the sequential behaviour of customers will also support the identification of carryover and spillover effects across the channels of a multichannel marketing system (Li and Kannan 2014). Such insights will contribute to an approach to optimal multichannel integration and an optimal multichannel mix and to a successful customer relationship management, which will increase customer satisfaction and lead to profitable and long-term customer relationships. Therefore, on the one hand, retailers must exploit advantages from every individual channel through adapted and customer-centric touchpoints; on the other hand, channels must be integrated and tied together to create a holistic multichannel retailing system that provides paths for a seamless customer journey (Wagner 2015; Zhang et al. 2010). From a retailer’s perspective, channel integration, today especially offline-online channel integration, seems to be of crucial relevance for the overall success of single channels as well as of the whole multichannel system (Herhausen et al. 2015).

5.3. Limitations and future research

Because we conducted the exploratory analysis of the multidimensional customer contact sequences with survey data, which was collected in 2008/2009, a strong limitation of the present manuscript is the data does not cover the broad variety of online channels or new media channels, which nowadays enable customers to realise contacts with retail companies via a broad range of online channels as well as online touchpoints (Hennig-Thau et al. 2010; for a comprehensive overview see Wagner 2015). At the time of the study, most of nowadays common devices or the related Internet-enabled channels were not introduced to the market or were only used by a small portion of consumers. Furthermore, the website was the only online channel that was integrated into the retailer’s multichannel system. However, one aim of our exploratory study was to investigate if an analysis of multidimensional customer contact sequences could provide insights into customer behaviour across the purchase process as well as in different customer segments that are of relevance for the configuration and coordination of a multichannel system. In nowadays the results derived with the used approach potentially will lead to different results and different customer segments. Hence, future research should apply the method used in the present manuscript to identify how customer channel strategies have evolved over time and to further explore the role of online channels and new media channels in consumer behaviour in offline and online multichannel systems over a period of time.

Furthermore, we did not include the problem ofshowrooming (Zimmerman 2012) in our study. Hence, future research should investigate this phenomenon by applying sequence analytical methods to identify critical incidents, which will trigger such behaviour. In this context, future research should address how retailers can collect and consolidate data from all of the (relevant) channel touchpoints that consumers utilise during their purchase processes to better understand and predict customer behaviour and to personalise and enrich the customer experience across channels (Wagner 2015). Another relevant area for research would be to examine how retailers can keep the brand experience consistent across the several channels of their multichannel system (Carlson and O’Cass 2011).

Furthermore, in future research the impact of the potential determinants on and the effects of the MCCS should be investigated in more detail. In the present paper, we especially used single-item measures to operationalize the dependent variables under study. To cover the impact of the customer contacts, their functions and importance on perceived risk, trust, customer satisfaction, and customer loyalty in a more comprehensive manner, future research should investigate this phenomenon by applying probabilistic sequence analytical methods to identify critical incidents, which will trigger such behaviour. In this context, future research should address how retailers can collect and consolidate data from all of the (relevant) channel touchpoints that consumers utilise during their purchase processes to better understand and predict customer behaviour and to personalise and enrich the customer experience across channels (Wagner 2015). Another relevant area for research would be to examine how retailers can keep the brand experience consistent across the several channels of their multichannel system (Carlson and O’Cass 2011).

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sults of Steinmann and Silberer (2010) further indicate that age should also have an effect on the number of different contact functions as well as on the importance of the customer contacts across the purchase process. Elderly customers might prefer personal – face-to-face – contacts and use such contact points for more different functions, while younger customers realise more often contacts with online channels (Black et al. 2002). According to Burke (2002, p. 423) „men and women had distinctly different views of what would constitute an ideal shopping experience“. Hence, one might assume that gender will have an impact on the realisation of customer contacts, their functions and importance across the purchase process. For example, women tend to prefer offline contacts, especially in stationary retail stores because of the opportunity for direct product inspections and social interactions, while men more often realise contacts with online channels in multichannel environments (Burke 2002). Furthermore, one might conclude that involvement towards the product category might act as a moderator of the strength of the relationship between determinants of the dimensions of the MCCS as well as between the dimensions of the MCCS and the final variables. Hence, future research should control for the potential moderating impact of the involvement towards the product category when analysing MCCS.

Last but not least, there are also important implications for marketing science because individual customer contacts and parts of the purchasing process have primarily been explained through partial theories in previous research (Kumar and Venkatesan 2005). However, the differences identified in the multidimensional customer contacts sequences cannot be explained with such approaches. A comprehensive theory that, ideally, integrates all of the individual phenomena from the purchasing phases and that can explain the customers’ differences in their contact sequences and, therefore, in their customer journeys is necessary. In addition, our results as well as the findings of Li and Kannan (2014) imply the application of other sequence analytical methods, such as Markov models, to predict customer behaviour and the cluster membership based on MCCS. Furthermore, we only analysed customer contacts and contact sequences in one branch with one retailer; hence, future research in other branches is necessary to gain a deeper understanding of customer behaviour in multichannel systems.

Notes


References


**Keywords**

Multichannel Retailing, Customer Contacts, Contact Functions, Contact Importance, Multidimensional Contact Sequence, Sequence Alignment.