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Master Thesis Business Administration

Development of a Measurement Instrument for Smartphone Behavior During the Customer Journey in Different Product Categories

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ABSTRACT

A gap exists in the literature on customer behavior in an omni-channel environment (Verhoef, Kannan, & Inman, 2015). When examining common measurement instruments such as the UTAUT, UTAUT(2), and WebQual 4.0, the application for omni-channel customer smartphone behavior seems limited (Barnes & Vidgen, 2002; Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012). In order to test existing constructs and develop a modernized model, a questionnaire was designed. Five relevant product categories were identified: fashion and textile, books, grocery shopping, consumer electronics, and financial services. Besides the product categories, a construct of individual characteristics was designed with the following dimensions and subsequent variables: consumer characteristics, perceived quality, experience, shopping motives, and social influence. Consumer behavior was conceptualized as four measurable phases of the customer journey: information search, purchase, receive/return/reorder and after-sales service. The model underwent testing by means of a pre-test and pilot test. The nature of the questionnaire design resulted in the unforeseen consequence of a data shortage in several product categories and customer journey phases. Combining the product categories was necessary to aggregate sufficient data to test the individual characteristics construct. Reliability testing of the adjusted items of the UTAUT2 and WebQual 4.0 model averaged a Cronbach's alpha of 0.916 and a composite reliability of 0.883. Factor loadings were clear and measured above 0.7, with the exception of the design variable in the perceived quality dimension (0.697). Results indicate that the existing models can be adapted for use in an omni-channel environment in which the use of the smartphone device is the focus. The responses on the categorical items for the behavioral construct have been adjusted where necessary and deemed ready for a full-scale survey.

Dedicated to Dirk Herrmann

ACKNOWLEDGEMENTS

This project made me realize how many people are part of such a journey. Many thanks to my supervisor, Dr. Van Reekum, for his valuable input and guidance during this research. Furthermore, I would like to thank my girlfriend for being by my (slightly stressed-out) side throughout this thesis as well as all my friends and family for supporting me. I am grateful for all that you have done.

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1. INTRODUCTION

This chapter introduces the research and addresses the background of modern retail, facts and figures about the omni-channel customer journey, and corresponding touchpoints. The first section also discusses widely used measurement instruments, including their limitations. Second, the chapter explains the goal of the research and presents the research questions, scope, and structure of the research.

1.1 BACKGROUND AND RELEVANCE

The last decade has witnessed a significant change in the field of retailing with the combination of new technology and Internet use. Faster, almost unlimited access to information has enabled both consumer and retailer to reach each other in new ways (Sorescu, Frambach, Singh, Rangaswamy, & Bridges, 2011). Multi-channel retailing aims to *design, deploy, coordinate, and evaluate the channels to enhance customer value through effective customer acquisition, retention, and development.* The ever-increasing moments of direct or indirect contact that a brand or firm has with a customer changes the field of marketing and often forces retailers to rethink their current strategy (Valentini, Montaguti, & Neslin, 2011). These moments of contact are called "touchpoints." While traditional marketing in the field of retailing has concentrated on "pushing" the information toward consumers, consumers nowadays are "pulling" an increasing amount of information on their own. This behavior further increases the need for a seamless customer experience among all retail channels and touchpoints (Court, Elzinga, Mulder, & Vetvik, 2009).

The continuous development of technology has driven a large part of this information pull. Smartphones, for example, are ubiquitous. In the Netherlands, nearly 85% of the population above 12 years of age has access to a smartphone. The use of smartphones among those between 12 and 25 years of age was at an amazing 97.7% in 2016 (CBS, 2016). This presents the retailer with a touchpoint that is in use throughout the day and at the consumer's side at almost all times. The retail literature has identified multiple topics as particularly saturated in the multi-channel paradigm; however, the current shift towards the omni-channel retail landscape has produced new and interesting opportunities for research. The smartphone, among other technological advancements, has been part of these opportunities. Furthermore, in the topic of customer behavior across channels, there has not been a clear transition toward the omni-channel paradigm (Verhoef, Kannan, & Inman, 2015).

Current measurement instruments were often designed in an environment of multi-channel retailing, or even before this. The current shift toward omni-channel has piqued interest in designing an instrument for the purpose of measuring consumer behavior during the customer journey, specifically relating to the smartphone, across different product categories. Widely used measurement instruments such as the UTAUT2 model by Venkatesh, Thong, and Xu (2012) measure the adoption of mobile Internet, which can be considered an already adopted online method for the majority of the Dutch population. Moreover, the WebQual 4.0 by Barnes and Vidgens (2002) also exhibits no direct omni-channel implementation and focus, further increasing the relevance of this project.

1.1.1 Facts and figures

In recent years, retailers in The Netherlands have withstood challenging times due to worldwide economic tumult. Unfortunately, some large, long-standing retail chains have been closed, such as V&D, while others are closing a significant number of stores or have already done so. While the total revenue growth of retail has been under pressure since 2009, it is noteworthy that online retail has been expanding ever since the publication of data in 2003 (CBS, 2016). Webshops increased their revenue by 11% in 2014, 15.2% in 2015, and 18.7% in 2016, while retail as a whole grew by only 0.5% in 2014, 1.4% in 2015, and 1.9% in 2016 (CBS, 2017). It is clear that retailers who successfully combine their online and offline channels can profit even in economically tumultuous times. In 2014, a total of 10.4 million people – 62% of the population – made an online purchase, and 7.9 million are considered frequent buyers by the Central Bureau for Statistics CBS (2015). This all is in line with smartphone, tablet, and personal computer (PC) ownership in the Netherlands, as consumers are becoming more closely connected with a retailer through multiple channels and via a variety of online devices and touchpoints. For example, in 2013, almost 80% of the Dutch population used social media. Although social media as a stand-alone sales channel might not be as effective compared to other channels, it does function as a touchpoint for brands to interact with customers. The percentage of households that are online in the Netherlands is particularly high; 73% of all households have smartphones, 72% a laptop, 58% a tablet, and 50% a desktop. Also, outside of home, 67% of the Dutch people ages 12 years and over used their smartphone to go online, compared to 40% in 2012 (CBS, 2016). These developments create a new type of shopper, who is always online, is used to almost immediate information access, uses several online and offline channels, and actively compares products and prices (Verhoef et al., 2015). However, this does not mean physical stores are of less use. Up to 40% of customers change their minds because of something they see, learn, or do in the store with the product. This leads to a shopper who is increasingly difficult to satisfy, hence the requirement for omni-channel retailing and the need for a seamless customer experience regardless of channel choice. This is necessary to satisfy consumers' needs to find what they want, when they want it (Piotrowicz & Cuthbertson, 2014).

1.1.2 Omni-channel

Valentini, Montaguti, and Neslin (2011) have argued that multi-channel retail aims to establish the channels in such a way that they increase customer value. To refer to basics, "multi-channel" simply refers to a company that sells through multiple channels. Sears and Roebuck introduced this in 1925 by making sales through catalogues and physical stores. Whereas catalogue use is a diminishing channel, others such as webshops have become increasingly important. "Cross-channel" is often used to describe the degree of Internet-based methods of selling and contacting (potential) customers. A cross-channel example is a customer making a purchase online and returning it in a physical store, which conveys that the channels partially interact. Even though this already creates a stronger perceived integration of channels, the step after multi-channel to cross-channel is called "omni-channel." In this strategy, the retailer offers the customer unison of data across all available channels, such as the physical store, webshop, mobile devices, telephone, and catalogues (Beck & Rygl, 2015). For the consumer, this instills a feeling of being central in an interwoven web of information throughout devices and channels, as Figure 1 depicts below.

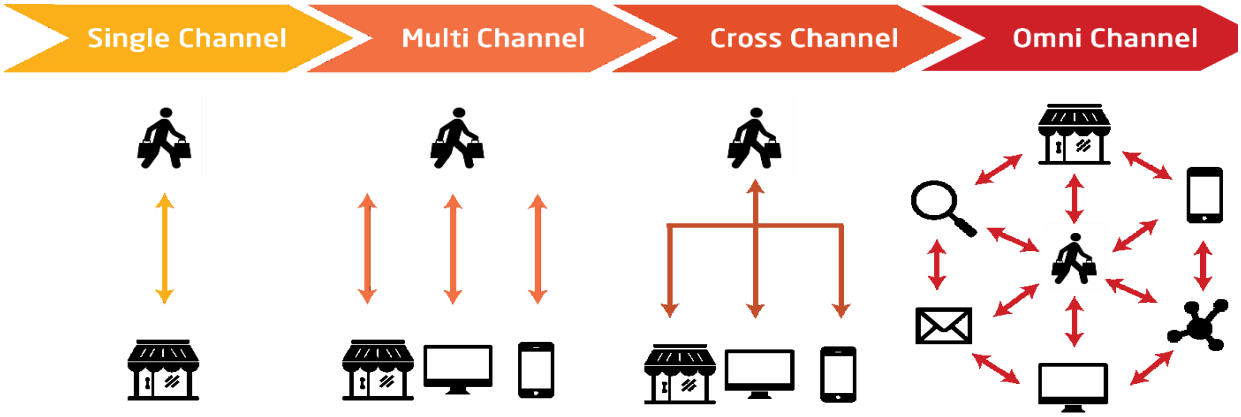

Figure 1. Single-channel to omni-channel, a visual representation from the consumer's point of view *(Edmond P. , 2015)*

Some of the most in-demand features for consumers are the ability to purchase online and pick up in the store, to purchase in the store and ship to home, and to access real-time inventory information on all platforms (Forrester, 2014). Furthermore, the retailer must provide the smartphone user with mobile-responsive websites that integrate smartphone-optimized payment methods while simultaneously minimizing the risk of customer loss due to a negative user experience. Leeflang, Verhoef, Dahlström, and Freundt (2014) have argued that the continuous digitalization of the retail environment by means of mobile devices, tablets, and social media demands an integration of all channels in online and offline retailing. This evolution from multi-channel to cross-channel and toward omni-channel preferably yields the concept of omni-channel management. This informs the following definition omni-channel: "a *synergetic management of the numerous available channels and customer touchpoints, in such a way that the customer experience across channels and the performance over channels is optimized"* (Verhoef et al., 2015). Business-to-consumer (B2C) companies are trying to seamlessly integrate their channels in the quest to become omni-channel, and even business-to-business (B2B) companies are developing omni-channel solutions (Boeyink, 2015).

1.1.3 Customer Journey

Traditionally, the goal of marketing is to reach consumers when their decisions are influenced the most. Contact with touchpoints affects these decisions. For years, these touchpoints were visualized through the use of a funnel: the consumer starts with a variety of brands at the wide end of the funnel and then methodically reduces this to reach a decision. Nowadays, this linear method does not suffice as a result of the rise of different kinds of media, Internet access, and increasingly numerous product choices. Touchpoints are constantly present in the form of advertisements, news reports, word of mouth, and product experiences, among others. Whether a person actively notices a touchpoint or not, at some point it can trigger the impulse to buy. Court, Elzinga, Mulder, and Vetvik (2009) have designed a new model whereby the customer decision journey replaces the funnel. This journey continues after the moment of purchase as the consumer builds expectations based on the experience, which then can translate into loyalty, repeat purchases, and positive advocacy. Post-purchase service is increasingly critical compared to the traditional marketing "push" through the funnel. Companies have employed this same "push" marketing strategy a majority of time through the use of traditional advertisement, direct marketing, sponsorships, and other methods in order to influence the customer's decision. Presently, consumers are

increasingly active in an information-"pull" environment by searching for online reviews, word-of-mouth recommendations, and in-store interactions. The customer journey, which Figure 2 depicts below, partially aims to provide the customer with an omni-channel experience across all channels. Online devices, such as desktop computers, tablets, mobile phones, and a variety of smart devices, are assuming a more decisive role. The smartphone by itself can be a substantial part of the customer journey as well. This device is more accessible for customers than the store itself, as a smartphone is within arm's reach.

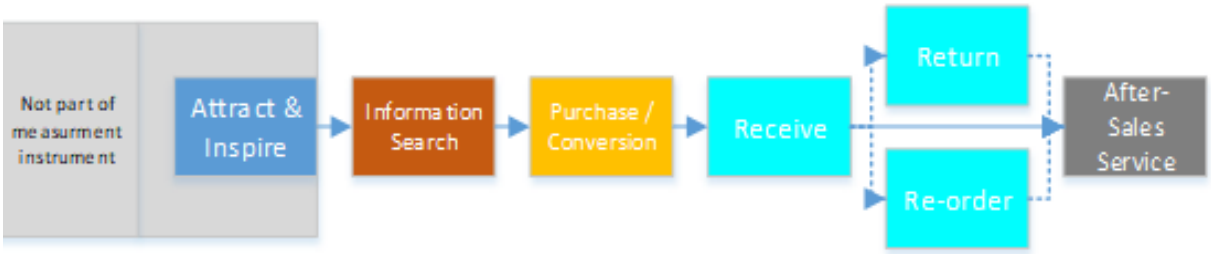

Figure 2. The customer journey. Adapted from Watkinson, M. (2012).

This research concerns the smartphone device during the customer journey. Furthermore, consumer behavior differs between product categories. Even products that can be categorized under the same name can generate different attitudes, involvement, and knowledge (Beatty & Smith, 1987). Therefore, the generalization of channel selection for the entire retail environment does not seem appropriate. Differentiating between product categories adds specificity to this research and can provide an insight into behavioral differences among them. Examples of correct omni-channel implementation are available throughout product categories and services. The product categories that omni-channel experts have recommended, and which demonstrate the highest concentration of online and offline channel integration, shifts between channels, and consumer activity on smartphones and other devices, were fashion and textile, books, grocery shopping, consumer electronics, and financial services.

1.1.4 Current Measurement Instruments

The literature has presented a plethora of consumer behavior models, most of which were designed prior to the 21st century. Based on the literature review, this research identifies three main measurement instruments that seem appropriate for this study. The WebQual 4.0 model by Barnes and Vidgens (2002) is a method for assessing the quality of websites. This research adapts and translates constructs of this model and brings them up to par with the current development of omni-channel smartphone possibilities. The second and third instruments are the unified theory of acceptance and use of technology (UTAUT) model by Venkatesh et al. (2003) and the modified and modernized UTAUT2 model (Venkatesh, Thong, & Xu, 2012). Although the models have tested constructs, changes are necessary to maximize the fit with the intended research instrument in order to measure omni-channel smartphone behavior among Dutch consumers in different product categories.

1.2 RESEARCH DESIGN

To more effectively structure this research, it is divided into several sections. By clearly stating a project's framework, the goal and means of achieving it, the applied research model, and the subsequent research questions, it is easier to maintain a clear view (Verschuren & Doorewaard, 2015).

1.2.1 Research Question

This study adopts a scientific point of view. The main objective is to create an instrument to measure the smartphone behavior of consumers during key parts of the omni-channel customer journey in various product categories (grocery shopping, consumer electronics, books, fashion, and financial services). The study also strives to contribute academic knowledge on the subjects of consumer smartphone behavior, the omni-channel customer journey, and product categories as a scientific objective. It also features the practical objective of increasing the knowledge specific to e-commerce companies or companies that operate within one or more product categories.

The main research question is as follows:

"How can the behavior of Dutch consumers with regard to smartphone use in the omni-channel customer journey be measured for different product categories?"

To answer the main research question, this research first approaches more specific and manageable sub-questions, which are as follows:

1. *Which factors influence consumer behavior in an omni-channel environment?*
    a. *Which measurement instruments are usable for an omni-channel environment?*
    b. *Which product categories are suitable for omni-channel implementation?*
2. *How are smartphones used in omni-channel retail?*
    a. *Who is using smartphones?*
    b. *How are smartphone users segmented?*
3. *How does the smartphone affect consumer behavior in the customer journey?*

1.2.2 Research Scope

Technological developments are closely associated with the retail environment and are changing the ways in which the customer interacts with the retailer and the retailer interacts with the customer. An omni-channel approach creates seamless experiences in all channel forms or devices, and the smartphone is a major part of this. Because omni-channel retail as a whole and the corresponding channels, touchpoints, and devices are too broad of a topic, it was necessary to increase the feasibility of this research by limiting the scope (Bui, 2013, p. 31). The following information summarizes the scope:

- **Channel and Device Choice.** While channels have traditionally been physical stores, catalogues, and webshops, the catalogue is currently diminishing in importance. Furthermore, the possibility to reach the online channel has expanded with the rise of mobile phones, tablets, PCs, smartwatches, and the overall integration of online devices into daily life via social media,

messaging, and e-mail, among other means. Herhousen, Binder, Schoegel, and Herrmann (2015) have indicated that the integration of online and offline channels is vital for omni-channel success. In order to narrow its scope, this study focuses on the smartphone as the sole device in the measurement instrument.

- **Customer Journey**. The customer journey does not stop after purchasing and receiving the product or service. The usage and possibility of return also add to the overall experience and satisfaction. It is, however, too broad to examine all aspects of the customer journey in detail. Instead, the central concern is the four phases of the customer journey: the search; the purchase; the delivery, return, or reorder; and the after-sales phase. Since the initial attraction and inspiration are difficult to measure and less concrete than e.g. the moment of purchase, they are therefore omitted.
- **Business to consumer.** Both B2B and B2C companies are using smartphones to attract, retain, and sell products and services to customers. Considering that end consumers differ from B2B customers and the vast majority of smartphone traffic is on the B2C side of the spectrum, the decision was made to focus solely on the B2C sector.
- **Omni-Channel Environment**. The primary focus of this study is the omni-channel retail environment. Product categories also include services, as these are continuously becoming more omni-channel as well. The literature has provided sufficient argumentation for the claim that omni-channel retailing is the future for the vast majority of the market. In view of this, the choice has been made to focus on an omni-channel environment and exclude specific niches. The product categories, which were chosen because of their prominence in the omni-channel environment, growth potential, and diversification, are the following: fashion and textile, grocery shopping, consumer electronics, books, and financial services.
- **Population**. Because of the home address of the researcher and location of this study, the Netherlands was chosen as the site for this project. Saturation of smartphones is high, although smartphone usage in the Netherlands differs as much as 46% between age categories. Increasing the age category decreases the use of smartphones. Since there is still a sizeable older population that could be of interest for this study, there is no age limit in this research. The minimum age is the same as that which the Dutch Statistics Bureau uses: 12 years of age.

1.2.3 Research Structure

A series of steps can schematically represent the structure of this research. These steps signify the necessary path to answer the research question. The current literature on consumer behavior is extensive, especially in a multi-channel environment. Whereas more publications are appearing in regard to omni-channel, the literature on consumer channel choice behavior in an omni-channel environment is not yet robust (Verhoef et al., 2015). Research instruments have not been situated specifically in an omni-channel environment, further indicating the importance of this research.

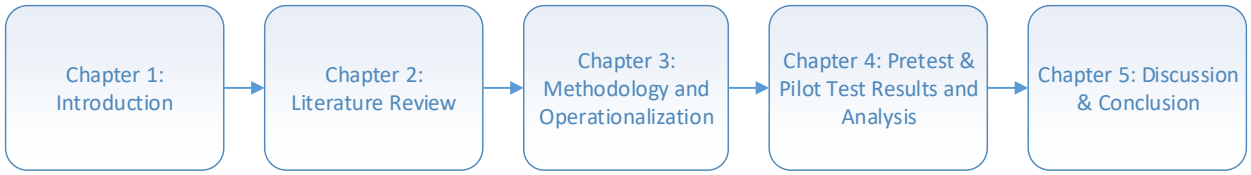

Figure 3. Report structure.

After the introduction, a literature review is conducted that starts with the establishment of a "base level" regarding the central themes of this study. Besides reviewing long-standing theories on consumer behavior, a more focused approach is needed to examine omni-channel, touchpoints, channel choice, smartphone use, and the resulting consumer behavior. A review of the validated constructs that can be used in creating the measurement instrument follows as well. After this phase, the proven constructs found in the literature are supplemented, as needed, by interviews with topic experts and other literature that the researcher has deemed appropriate. The result of the operationalization is a preliminary measurement instrument that undergoes a pre-test. Following the resulting adjustments, a pilot test is conducted and further improvements are made to the reliability and validity of the instrument. The results of the pilot-test are analyzed and discussed. Chapter 5 provides the final discussion and conclusion as well as further research and limitations.

2 LITERATURE REVIEW

This chapter delves into the currently available literature on the selected topics and aims to answer the sub-questions developed in the previous chapter. Based on the sub-questions, the literature review contains three chapters: (1) consumer behavior, identifying traditional behavioral models, reviewing online behavior, and specifying the relevant product categories; (2) Omni-channel retailing and the use of smartphones; and (3) the customer journey and an in-depth review of its phases. Furthermore, the literature review identifies measurement instruments that can be applicable to this project as well as provide specific knowledge that is required to create the envisioned measurement instrument.

2.1 CONSUMER BEHAVIOR

Consumer behavior has been an interesting field of study for a long time, and many studies about the subject date back to the 1950s. The fields of expertise range from experimental, clinical, and developmental psychology in micro consumer behavior (individual focus) to demographic, historical, and cultural anthropology in macro consumer behavior (social focus) (Solomon, Russell-Bennett, & Previte, 2012). Consumer behavior revolves around the processes that are involved when a product or service is selected, purchased, used, or disposed of in order to satisfy needs and desires (Quester, Neal, Pettigrew, Grimmer, Davis, & Hawkins, 2007). Advancements that translated into e.g. faster travel or the use of Internet have changed the shopping environment. A basic categorization of consumer behavior has already been established. According to Sandhusen (2000), the stimuli for consumer behavior are classified either as interpersonal (between people), which includes social or cultural groups, such as those based on family or gender, or as intrapersonal (within people), which includes motivations, perceptions, and attitudes. These stimuli inform a well-known model, the "black box" model, which Table 1 displays below. In this model, it is not only environmental factors, such as marketing stimuli, but also personal buyer characteristics that lead buyers through a decision process that results in a product, brand, and dealer choice at a certain time (Sandhusen, 2000).

Table 1
The Black Box Model

Environmental Factors		**Buyer's black box**		**Buyers responses**
Marketing stimuli	Environmental stimuli	Buyer characteristics	Decision process	
-Product **-Place** **-Price** **-Promotion**	-Economic -Technical -Political -Cultural	-Attitudes -Motivation -Perception -Lifestyle	-Problem recognition -Information search -Alternative evaluation -Purchase decision -Post-purchase behavior	-Product choice -Brand choice -Dealer choice -Purchase timing -Purchase amount
Sandhusen, R. (2000). *Consumer Behavior Marketing* (3rd ed.). Hauppauge, N.Y.: Barron's. p. 218				

The marketing stimuli, environmental stimuli, and buyer characteristics encompass the reasons why people shop, according to Sandhusen (2000). Engel and colleagues (1978, 1986), however, have combined the factors in the following categories: social influences, situational and economic factors, and individual characteristics. These categories exhibit similarities to the previously mentioned model. Another well-

known buying behavior model by Kotler and Armstrong (2014), which Table 2 explains below, features cultural, social, personal, and psychological categories. The categories mentioned thus far are broad and attempt to encompass all variables that affect a consumer's behavior. Each factor has several deeper levels to consider. When marketing campaigns are created, factors such as perception are taken into consideration. Perception is influenced by sights, sounds, smells, tastes, and textures, and these details and stimuli are meaningful when designing marketing efforts for certain products or services. For example, smells – artificial or natural – play an important role in supermarkets (e.g. the smell of fresh bread) or the "new car smell" that certain premium automobile producers spray in their cars in order to raise the perception of quality (Lindstrom, 2011).

Table 2
Buying Behavior Model

Cultural	Social	Personal	Psychological	
-Culture **-Subculture** **-Social Class**	-Reference Groups -Family -Roles and Status	-Age and Life Cycle Stage -Occupation -Economic Situation -Lifestyle -Personality and Self-Concept	-Motivation -Perception -Learning -Beliefs and Attitudes	**Buyer**
Kotler, P., & Armstrong, G. (2014). *Principles of marketing* (15th ed., global ed.). Harlow: Pearson.				

The consumer characteristics have been used for segmentation of consumer behavior in traditional literature and are still applicable in today's research environment. Bhatnagar, Sanjog, and Raghav (2000) have indicated that characteristics can significantly affect consumer behavior and have identified gender as more significant than age and marital status. In a study by Li, Kuo, and Russel (1999), education was among the significant predictors for buying behavior. The construct of consumer characteristics has a strong foothold in behavioral studies. The most recurrent items are age, gender, education, and income. Items such as marital status or lifestyle have extremely limited significance (Forsythe & Shi, 2003). Although age often does not explain much variance, the segmentation information on age is still valuable and should not be excluded.

2.1.1 Online Behavior

As is the case with consumer behavior as a whole, online consumer behavior has been and continues to be studied in a variety of ways. The advantage of online consumer behavior is the addition of tools that can analyze a consumer's movement through websites in incredible detail, the most common of which are Google Analytics and tools to create heat maps of webpages. During the early stages of online shopping, a model was proposed with following five factors: sense of security, trust, preference, roles of purchasing, and accessibility to the Internet (Chen & Sukpanich, 1998). Online consumer behavior is often adapted, as Chen and Sukpanich (1998) have done, from behavioral models that were designed before the invention or general adoption of the Internet.

Studies concerning the performance of a website have identified usability, information quality, and service interaction as the main factors influencing website performance (Barnes & Vidgen, 2006). The "American perceived quality measurement scale" was once the preferred measurement method for the

perceived quality of a store but unfortunately is not (fully) applicable anymore in today's omni-channel environment, as the scale's dimensions of physical aspects, reliability, personal interaction, problem-solving, and general policy are aimed strictly at a physical store (Dabholkar, Thorpe, & Rentz, 1995). A study on an online bookstore by Leonidio, Montezano, and Carvalho (2011_) has measured usability, design, quality of information, reliability, and empathy dimensions for perceived quality. This study employed a model designed by Barnes and Vidgen (2002) called the WebQual 4.0 Model (website quality measure). The questions in this model reflect similarities to the UTAUT2 model by Venkatesh et al. (2012). In both models, the items that demonstrate similarities score highly in reliability testing, evidencing their potential for other instruments. The WebQual 4.0 items form five factors in the instrument: usability, design, information quality, trust, and empathy. As the construct of perceived quality is a reoccurring factor in consumer behavior and satisfaction, the items were only slightly modified and rephrased for each of the product categories and customer journey phases of this project.

Besides the perceived quality, the perceived value of a channel influences behavior as well (Cronin, Brady, & Hult, 2000). The sacrifice made for the consumer, often in terms of time and money, as well as the value of the service and the price satisfaction were measured on a nine-point scale. The results indicated that higher service value can increase price satisfaction, even if the price is higher than those of competitors. The website's responsiveness, overall design, and personalization have varying degrees of effect on the service quality and overall customer satisfaction, according to Lee and Lin (2005). It is to be noted that this study was held before virtually all omni-channel retailers had mobile-responsive websites and implemented some degree of personalization. Other research by Cheung et al. (2003) has also identified website quality, interface, satisfaction, and experience as factors influencing online consumer behavior.

A significant amount of research has been directed at the relationship between online search and purchase behavior. Notably, a relation has been established between risk, perceived customer service, and shopping experience in regard to the attitude and intention to fulfill the shopping need online (Grant, Clarke, & Kyriazis, 2007; Vijayasarathy & Jones, 2000). This suggests that previous experience, either positive or negative, can significantly influence the decision to use a channel, device, or method of shopping again (Shim, Eastlick, Lotz, & Warrington, 2001). Falk, Schepers, Hammerschmidt, and Bauer (2007) have further built upon this study by demonstrating that previous experience with a channel increases the chance that it will be used again during the customer journey in specific product categories. The online channel enjoys a preference in service-oriented categories during pre- and post-purchase periods, when the consumer's Internet experience is higher. This contributes to the importance of a consumer's previous experience during his or her customer journey (Frambach, Roest, & Krishnan, 2007).

2.1.2 Behavior Per Product Category

The product itself can be a significant factor in consumer behavior, according to Vijayasarathy and Jones (2000). In 2014, a study by Walker Sands concluded that the most common types of products purchased online were consumer electronics, books, and clothing and apparel. Gbadamosi (2016) has additionally identified apparel, consumer electronics, home improvement, grocery products, and books, CDs, and DVDs. Some research has categorized the products into two distinct groups: (1) "search" products such as

books and CDs, which are standardized across channels and have high expectations of performance based on prior experience, and (2) "experience" products, such as wine, cars, and restaurants, which require not only search but also experience elements (Grant, Clarke, & Kyriazis, 2007). Shopping behavior often differs between product categories, with some more apparent than others. Grocery shopping, for example, has different motives and frequencies than consumer electronics. How smartphones are used can also differ per product category. In-store search behavior on smartphones indicates that over half of users checked the prices of competitors. Only one-fifth of the search behavior during grocery shopping is aimed at checking pricing (Gbadamosi, 2016, p. 179). The following categories are notably prevalent and are further reviewed below: consumer electronics, fashion and textile, books, fast-moving consumer goods (FMCGs), and online services (Statista, 2016).

2.1.2.1 Fashion and Textile

The fashion and textile industry has long been dominated by physical stores. The ease of shopping and factors such as the increased need to save time predict that 40% of total fashion sales in 2020 will be made online (Starkenburg, 2011). The fashion industry is heavily influenced by the self-image of the consumers, as self-esteem is a strong driver of the consumption of fashion products (Banister & Hogg, 2004). The fashion industry has changed significantly in the last 20 years, most notably in that fashion has become "faster." More seasonal styles and collections have been produced, brands have been quick to incorporate trends and fads into their designs, and the overall speed from design to market has increased in order to satisfy more demanding and fashion-savvy consumers (Bhardwaj & Fairhurst, 2009). The typical fashion market experiences short life cycles, is highly volatile, and is difficult to predict. This all leads to high levels of impulse buying (Park & Kim, 2003). Research has also revealed that over half of consumers have used mobile devices to purchase clothing. For 68%, the smartphone is their first point of research, and 67% frequently use their phones in stores (Criteo, 2016).

There are two types of shopping value that can be created: utilitarian and hedonic. Utilitarian shopping defines the task-oriented value of a shopping experience and can be viewed as a cognitive and non-emotional outcome of shopping. Hedonic value, on the other hand, is the value related to the shopping experience itself, regardless of task-related activities. It reflects the value from multi-sensory, fantasy, and emotive aspects of the experience. Impulse buying of fashion items is closely related to emotional and hedonic shopping in both physical and online stores (Jones, Reynolds, & Arnold, 2006; Joo Park, Young Kim, & Cardona Forney, 2006). While the terms of hedonic and utilitarian shopping are now discussed in this segment, a study by Voss, Spangenberg, and Grohmann (2003) has indicated that they also apply to other categories. This study identified words that can be linked to specific shopping motives, regardless of the product category.

2.1.2.2 Books

Amazon's online bookstore, which was launched in 1995, was the first glimpse of the many possibilities in the new e-commerce industry. While books might seem easy to generalize, a clear division between physical and digital is possible. Nowadays, 30% of all books are sold digitally, yet the digitization of books on readers such as the Kindle (an Amazon product) is settling after initially rapid growth. In the United Kingdom, physical books experienced a massive reduction in popularity from 2011 to 2013 as sales

declined by 25%. Online sales of books are mainly influenced by two factors – information satisfaction and relational benefit – which in turn are driven by variables that are similar to the factors mentioned in Chapter 2.1. A study on customers of online bookstores identified the quality of the user interface, product information and service information, the security perception, and the site awareness as significantly related to site commitment and actual purchase behavior (Park & Kim, 2003, p. 23). The WebQual 4.0 model was designed and tested in various domains, including the Internet bookstores of Amazon, BOL, and the Internet Bookshop (Barnes & Vidgen, 2002).

2.1.2.3 Grocery Shopping

Fast-moving consumer goods include processed foods, soft drinks, and toiletries. This category grew only 1.6% from June 2015 to June 2016. However, online grocery shopping grew by 15% during this same period to $48 billion, and is predicted to be worth $150 billion by 2025. Grocery shoppers are also extremely loyal, with 55% of online grocery shoppers buying the same brands from the same merchants after a purchase (Kantar Worldpanel, 2016). In the United Kingdom, online grocery sales grew 13% from 2015 to 2016 and are expected to increase a further £6 billion to £15 billion in 2020. Almost half of the British population has shopped online for groceries, but a quarter reportedly has no interest in doing so. Even so, online grocery shopping is still a minor part of the entire food industry, which reached almost £200 billion in total consumer expenditures in 2014. Grocery shopping is a rather new market that is exhibiting fast online growth (Carroll, 2016). Often, FMCGs also encompass consumer packaged goods (CPGs), which are high in quantity and relatively low-cost products, most people are familiar with some of the large companies in this sector, such as Unilever, Nestle, Procter & Gamble, Coca-Cola, PepsiCo, and General Mills. The packaging mainly influences behavior in this category and corresponds with the nature of FMCG (Deliya, 2012).

The FMCG market as a whole is too broad for the purpose of this research, which focuses on grocery shopping as a category. Research on why consumers use the online channel for grocery shopping has categorized consumers into four groups. The smallest group, convenience shoppers, predominantly considers time saving and overall convenience. The largest group, variety seekers, takes into account the variety of product types and brands throughout the online and offline channels in addition to the online convenience. Physical store orientation and planning purchases as well as shopping trips are important for this group. Similar to the variety seekers is the balanced buyers group, which displays a mix of variety seeking and convenience. Finally, the store-oriented shoppers are characterized by a need for immediate acquisition of goods and, as the name suggests, score highly on physical store orientation (Rohm & Swaminathan, 2004). Grocery shopping as a whole is an interesting market for e-commercialization, as the growth is rapid compared to other categories. This category is strongly task-oriented and of high utilitarian shopping value, thus creating an inviting market for innovative solutions to encourage consumers to shop via their smartphones. For example, in South Korea, Tesco conducted tests in subway stations with a digital wall of products from which items could be scanned and purchased via smartphone and then picked up on the way home (Celantano, 2016).

2.1.2.4 Consumer Electronics

The industry of consumer electronics is constantly evolving and suggests high revenue-growth potential. Brands in this industry are among the most famous in the world, with players such as Apple, Microsoft, Samsung, Canon, Philips, and Dell. In the United States alone, $218 billion of revenue was achieved in consumer electronics in 2014 (Statista, 2017). Major electronics retailers such as Best Buy, Mediamarkt, and the vast amount of webshops have established this category as a hotspot for research on consumer behavior. It is notable that smaller, physical, electronic stores are struggling to compete with large retailers. In the Netherlands, a 34% increase in sales through online channels was noted in the first quarter of 2016 compared to the first quarter of 2015, all while physical stores suffered a 10.7% decline in sales. To put this growth into perspective, 75% of consumer electronic purchases in 2014 were still made in physical stores, yet this figure was 85% in 2012 (CBS, 2016). Research has indicated that when consumers are searching online for electronics, it decreases the likelihood of relying on traditional offline search methods (Rigopoulou et al., 2008). Factors listed as main influencers of consumer electronic purchases when shopping online are the results of a search engine, user-generated content, and manufacturer and brand sites. The most common reason that consumers go to a physical store – ranking above convenience or price advantage – is to see or try a product. Consumers often display a phenomenon called *showrooming*, which refers to trying or seeing the product in the store but then using e.g. a mobile device to check prices and make a purchase elsewhere (Verhoef, Neslin, & Vroomen, 2007). Although retailers often fear the showrooming or contrary webrooming phenomena, studies have also reported that the use of mobile devices in stores often increases in-store spending as well as the likelihood of purchasing the product (iab, 2013). Stores such as MediaMarkt use Wi-Fi tracking in their stores to monitor physical movement. Retailers can also monitor which products are researched in the store in order to adapt prices or physical layouts, among other adjustments.

2.1.2.5 Financial Services

Several services industries that are based both online and offline, such as car insurance and financial services, are moving to an online-dominated orientation. Since the term “service industry” is far too broad for the goal of this research, it focuses on the financial service industry. Bhatnagar and Ghose (2004) have compared online search times on automotive, telecom, travel, and financial websites and reported that financial websites were visited for an average of 25 minutes compared to a 10-minute average in the other categories. Excluding social media as a service, the behavioral literature often focuses on financial services. Most of the time, smartphones in the financial service category are used for Internet banking (Board of Governors of The Federal Reserve System, 2016). Research by Frambach et al. (2007) has identified that previous experience in online channels has no effect on the channel preference between online or offline when the product is a complex service, such as a mortgage, but does have an impact in other product categories. A measurement model for service quality (SERVQUAL) was designed to measure the expectation and perceptions of a service along five dimensions: reliability, assurance, tangibles, empathy, and responsiveness. These are influenced by the personal needs, expected service, and perceived service on the consumer side of the spectrum.

2.2 OMNI-CHANNEL RETAILING

As mentioned in the introduction, the ultimate goal of omni-channel retailing is to create "a *synergetic management of the numerous available channels and customer touchpoints, in such a way that the customer experience across channels and the performance over channels is optimized"* (Verhoef, Kannan, & Inman, 2015). In general, multi-channel shoppers are more valuable than single-channel shoppers (Neslin & Shankar, 2009). Although offline retailing still dominates online retailing in revenue, the online retail sector is quickly growing. In the United States, a growth from $231 billion in 2013 to $370 billion in 2017 was forecasted. China is on track to become the biggest e-commerce market in the world (Lomas, 2013). Although online channels lack the obvious trait of physically sampling a product, the different abilities of online and offline channels to deliver information and product fulfillment can complement each other in an omni-channel environment. Furthermore, an omni-channel retailer increases the consumer convenience and can provide them with access to increased product variety (Bell, Gallino, & Moreno, 2013). Even product categories that were traditionally expected to benefit only marginally from online channels because of their "touch and feel" nature are shifting toward an omni-channel environment. In a study on eyewear, the introduction of a try-on showroom with no inventory and an online sample program that delivers testers free of charge resulted in increased online conversion as well as higher sales and lower costs by e.g. reduced returns (Bell, Gallino, & Moreno, 2013). The researchers added, "*Our research underscores that the best sellers will win the omni-channel revolution by working across the permeable boundaries of information and fulfillment, offering the right combination of experiences for the customers that demand them."* A variety of statistics have indicated the benefits of providing the consumer with omni-channel solutions. Fifty percent of consumers expect to buy online and pick up in store. Additionally, 71% of shoppers use their smartphone in stores, and 90% of customers expect interactions to be consistent throughout channels. Companies with effective omni-channel customer engagement strategies retain 89% of their customers, and 84% of retailers perceive consistent customer experience as highly important (Cybra, 2017; v12data, 2017).

The current technological possibilities and almost limitless information that is available to consumers has increased competitiveness in the retail landscape. Consumers are expecting increased convenience and access to information. To become truly omni-channel is a difficult, costly feat to achieve and requires constant attention from the retailer. Besides ensuring that the retailer's business strategy is appropriate for an omni-channel approach, the business processes need to be in place as well. It can be costly to implement systems that convey real-time inventory per store on the retailer's website, as is the case with sophisticated CRM software, marketing tools, sales, and after-sale service. Merely processing and correctly using the data gathered through the channels can often become a hurdle for businesses. However, the rewards are apparent; omni-channel shoppers spend almost one-quarter more than multi-channel shoppers, who in turn spend one-quarter more than single-channel shoppers (Schaeffer, 2016). Overall, retailers must consider that consumers are likely to engage in some degree of research shopping in which the search and purchase channels differ from each other (Verhoef, Neslin & Vroomen, 2007).

2.2.1 Smartphone Usage

Precise numbers vary between studies, but the overall trend is consistent throughout: the majority of people wake up and immediately grab their phone. Some reports have mentioned that 90% of young people between 18 and 30 identify grabbing their phone as their very first action in the morning, most of them while still in bed (Gorges, 2012). Other statistics reveal that 80% of the 18-30 group has their phone on them for all but two hours of their waking day (Stadd, 2013). Furthermore, 80% of Americans now have a smartphone, and the worldwide number of smartphone owners is estimated to surpass 2.5 billion in 2018 (Statista, 2017; Pew Research Center, 2017). As this research is aimed at the Dutch market, a few more statistics are relevant. In 2016, 99% of people from 12 to 65 years of age had access to the Internet, although after 65 this figure steeply declined to 77%. A similar trend is visible in smartphone ownership: until 65 years of age, between 90 and 98% of the population owns a smartphone; above 65, it is only slightly over half (CBS, 2016).

2.3 The Customer Journey

At the most basic level, a decision process can be divided into three separate stages and corresponding challenges: (1) pre-purchase, in which a consumer seeks information and has certain attitudes toward a brand, product, or service; (2) purchase, or the process of acquisition in which the questions of how, when, and where are of importance; and (3) post-purchase, when the product or service must fulfill expectations to achieve possible satisfaction (Quester, Neal, Pettigrew, Grimmer, Davis, & Hawkins, 2007). Many researchers have expanded this basic model to fit their points of view. Most traditional models consist of steps that correspond to need recognition, information search, evaluation of alternatives, purchase decision, and post-purchase behavior. This was first used by Sandhusen in his book *Marketing* in 1993 and is displayed in Table 1 of the consumer behavior chapter. Awareness, consideration, preference, purchase, and post-sale service are five steps that a variety of researchers have used (Thompson, Knox, & Mitchell, 1997; Markham, Gatlin-Watts, & Cangelosi, 2006; Nunes & Cespedes, 2003). Another popular model was proposed that specified stimulation, search for information, purchase, delivery, and after-sales service (Engel, Blackwell, & Miniard, 1995). For this research, the more modern model of Watkinson (2012) is relevant, as seen below and previously in the introduction.

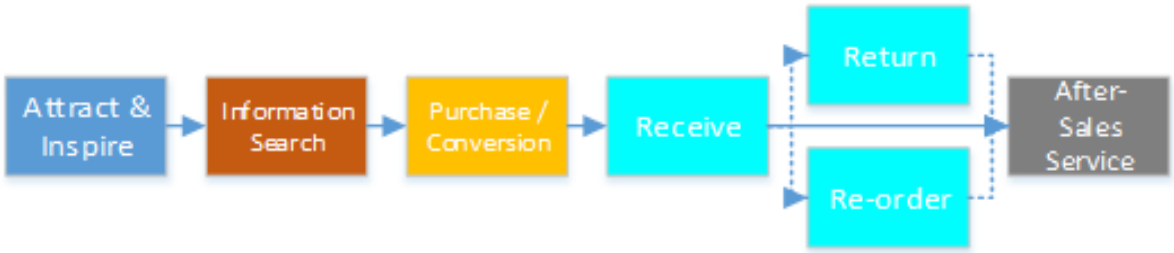

Figure 4. Customer journey model adapted from Watkinson, M (2012).

Nowadays, the traditional subject of the purchase decision has shifted toward the *customer journey*. This term is only recently becoming common and is used in conjunction with an omni-channel environment. As previously explained, customers have a large variety of options and possess capabilities to choose their preferred channels during the journey of finding, purchasing, and using an item or service. All the moments of interaction with a brand during the customer journey are called touchpoints. These

points are moments in time when a consumer "touches" the brand in any way. Whereas the customer journey is more concerned with tracking behavior, the customer experience is a term that brands often employ. All of the touchpoints combined during the customer journey form the customer experience. Omni-channel retailers aim to ensure that the experience for customers is identical throughout their journey. In order to identify points of interest for the measurement instrument, the following sections further explain each phase.

2.3.1 Attract and Inspire

A consumer can develop interest in a product or service in a variety of ways. Most likely, a brand or retailer will try to pique interest through its marketing efforts. The traditional marketing mix consists of the "four P's" coined by Kotler and Armstrong (2010) in the 1970s, which remains relevant to this day despite the development of new or improved marketing possibilities that reach the consumer in a variety of ways. Some new ways to reach a potential customer are via social media, mobile and online advertisements, and YouTube commercials. There is no definitive number of advertisements that a person is exposed to in a day; estimates vary from 4,000 to 10,000 per day for Americans, although some studies have noted that consumers actually note only a few hundred advertisements (Johnson, 2014; Marshall, 2015). Once again, it is difficult to precisely measure the impact of marketing efforts, especially offline advertisements. With online click-tracking and cookies, the effectiveness of online advertising is easier to measure. Tracking from an advertisement clicked on via smartphone to an eventual sale is possible. Tracking a word-of-mouth inspiration is almost impossible. Nowadays, word-of-mouth also includes social media, which has been described as the "word of mouth on steroids" (Keller, 2011). For this study, the instrument does not measure this particular phase, as the exact moment of inspiration is too vague.

2.3.2 Information Search

Modern consumers have access to a vast, almost limitless source of online information. Traditionally, information search has aimed to locate the most beneficial price during individual search efforts (Wilde & Schwartz, 1979). Another traditional influencer is the time costs; this, however, is significantly less important as a result of Internet access and availability of online information to consumers by means of mobile devices (Dutta & Das, 2017). Through the use of cookies and analytic tools such as Hotjar, Google Analytics, DoubleClick, and others, online behavior is trackable in increasing detail. Retailers must cater to the constant rise of smartphone use during the customer journey. Forty percent of mobile users will switch to a competitor's website if they have a negative mobile experience (Smith, 2016). This indicates a need to add a "previous experience" variable to the instrument. Google's (2014) research has demonstrated that the information sought on mobile channels is not only aimed at online stores but also at brick-and-mortar stores. Three-quarters of respondents searched for the price at a nearby store and the availability of the item. Sixty-six percent wanted a map with the closest store that had the product in stock. Even when in a store, almost half of consumers used smartphones to find information regarding products in which they were interested (Google, 2014). Although information is plentifully available online, consumers have several sources of information that influence their decisions. Word of mouth is still a substantial source of information, as it is an interest trigger. The way in which information is searched for also differs per product category, as often the physical touch or feel of a product is more informative than an online manufacturer's description.

2.3.3 Purchase / Conversion

The vast variety of influencing factors leads to the purchase decision. During this phase, the specific product or service is selected as well as where and how to buy. The actual purchase is a combination of all the previous steps. Placing an item into a (virtual) shopping basket does not guarantee the purchase. Online cart abandonment is not uncommon; as much as 88% of online shoppers have abandoned their cart at least once in the past, and approximately 25% of online shoppers leave their cart when shopping online on average (Forrester Research, 2005). In online stores, the moment of purchase – often called the "conversion" – is the moment that traffic to the website leads to an actual sale. In the United States, the average person spends more time on their mobile phone than on a desktop device. The mobile phone, however, has a lower conversion rate than desktops: 1.22% vs 3.99% in 2015. Smartphones can substitute for cash and credit or debit cards, as the Near Field Communication (NFC) chips allow for contactless payment in stores, which further highlights the importance of measuring smartphone purchase or conversion behavior during the customer journey (Statista, 2017).

2.3.4 Receive, Return, Reorder

The delivery process is currently being revolutionized with same-day delivery, and even drone-delivery. In the last two years, retailers such as MediaMarkt, Bloomingdale's, Macys, Ebay, and Amazon have introduced same-day delivery, with the latter even offering a one-hour delivery service in major American cities (Lierow, 2016). Customers are becoming more accustomed to free shipping and next-day delivery. Nine out of ten customers have identified free shipping as the main incentive to shop online, especially if there is no price difference compared to physical stores (Walker Sands, 2016). Smartphones are often used to track a shipment or verify the delivery. Delivery is influenced by product category as well, as each category has other characteristics that are important for the consumer. Making the experience as positive as possible also includes handling and facilitating returns. In some product categories, returning items can make or break companies; even fashion giant Zalando is struggling with a return rate of 50% (Evert, Gribnitz, & Seidel, 2013).

2.3.5 After-Sales

A retailer's final goal is to satisfy a customer, who will in turn become an advocate of the brand, product, or service. Many studies have indicated that poor after-sales service has a significant effect on customer satisfaction and spills over to other consumers. Compared to satisfied customers, customers who are not satisfied are more likely to speak out about their experiences and consequently have a further reach (Karatepe, 2006; Gaiardelli, Saccani, & Songini, 2007; Rigopoulou, Chaniotakis, Lymperopoulos, & Siomkos, 2008). Besides the benefit of advocacy, a returning customer is cheaper to maintain than new customers (Bhattecherjee, 2001). Often, retailers overlook the merit of the after-sales contact, instead losing focus after completing the sale. Moreover, although after-sales service is often thought of as a B2B-oriented aspect, the B2C sector can benefit as well, as it is widely evidenced that, in most cases, repeat customers are easier to maintain than new customers. After-sales contact by means of e.g. e-mail or loyalty programs can help retain customers. Besides contacting customer service with e.g. questions about a purchased product or service, after-sales services also include requests for reviews or surveys, e-mails or messages regarding optimal use of the purchase, free maintenance for the first period, and, of course, a general warranty (Pettinger, 2012; InfusionSoft, 2017).

2.4 Measurement Instruments

In 2003, Venkatesh et al. developed the UTAUT. The subsequent UTAUT2 model extended the previous model to measure the acceptance of mobile Internet. The previous chapters have identified a variety of factors that exhibit similarities to the UTAUT2 model. The independent variables are performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit. These are in turn moderated by age, gender, and experience. However, the goal of the UTAUT models was to measure acceptance of technology (Venkatesh et al., 2012). It can be reasonably stated that smartphones and their usage is widely accepted among the Dutch population. The UTAUT2 model and the previously mentioned WebQual 4.0 model have similarities in their questions, although there is no mention of WebQual 4.0 in the UTAUT2 paper. Reliability tests score high in both studies, also for the similar item between the models, further increasing the confidence in the use of items from the UTAUT2 and WebQual 4.0 model. The original UTAUT2 model is displayed below.

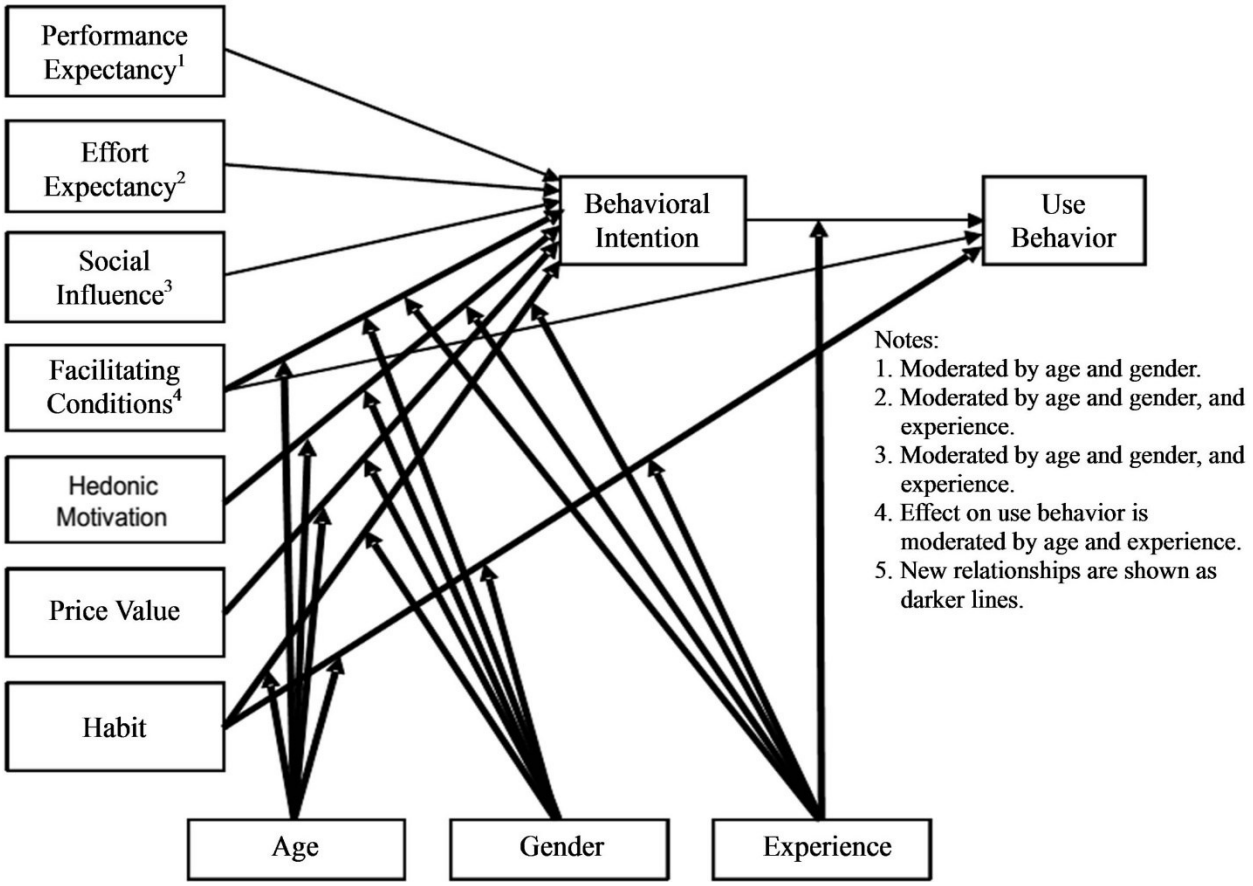

Figure 5. The UTAUT2 model

The resulting conceptual model has three distinct variables: (1) individual characteristics, (2) product categories, and (3) consumer smartphone behavior. The consumer smartphone behavior is the dependent variable and consists of the steps in the customer journey, as described in the previous chapter. Individual characteristics acts as an independent variable consisting of the consumer characteristics, perceived quality, experience, shopping motives, and social influence. Part of the consumer characteristics, age and

gender, are modeled as control variables in the original UTAUT2 model. Considering that age, gender, education, and income remain constant, there are similarities to the control variables in the UTAUT2 model. However, in the conceptual model, the consumer's characteristics are not specifically designed to act as control variables. The other variables in the individual characteristics are kept as close to the original items as possible. Perceived quality is part of the WebQual 4.0 model, while the other variables of social influence, experience, and shopping motives are as close as possible to the UTAUT2 items. The shopping motives have been extended to add the utilitarian aspect as well, as measurement items are readily available (Voss, Spangenberg, & Grohmann., 2003).

Having discussed two of the three variables of the model, only the product categories remain unaddressed. In the conceptual model, each of the individual characteristics – with the exception of the consumer characteristics of age, gender, education, and income – are measured for each of the phases in the consumer smartphone behavior. These measurements are applicable for each product category, effectively creating five separate models: one for each category. By adding the categories as an independent variable to the conceptual model, there is no mediating variable that changes the effect between individual characteristics and the consumer smartphone behavior. Product categories can, however, act as a moderator alongside the independent variable when maintaining the conceptual model's design. Product categories then acts as a third variable that modifies the strength or direction of the relationship between individual characteristics and the consumer smartphone behavior. As Wu and Zumbo (2008, p. 397) have stated, the moderator is often relatively stable or is an unchangeable background, environmental, or contextual variable. Testing for possible moderating effects is not possible in this scenario, as the sample size is insufficient. Therefore, product category is depicted as an independent variable with a dotted line to indicate a possible moderating role. Below, Figure 6 presents the conceptual model. This model informs the measurement instrument's design, and the following chapter further explains the variables, items, and measurements.

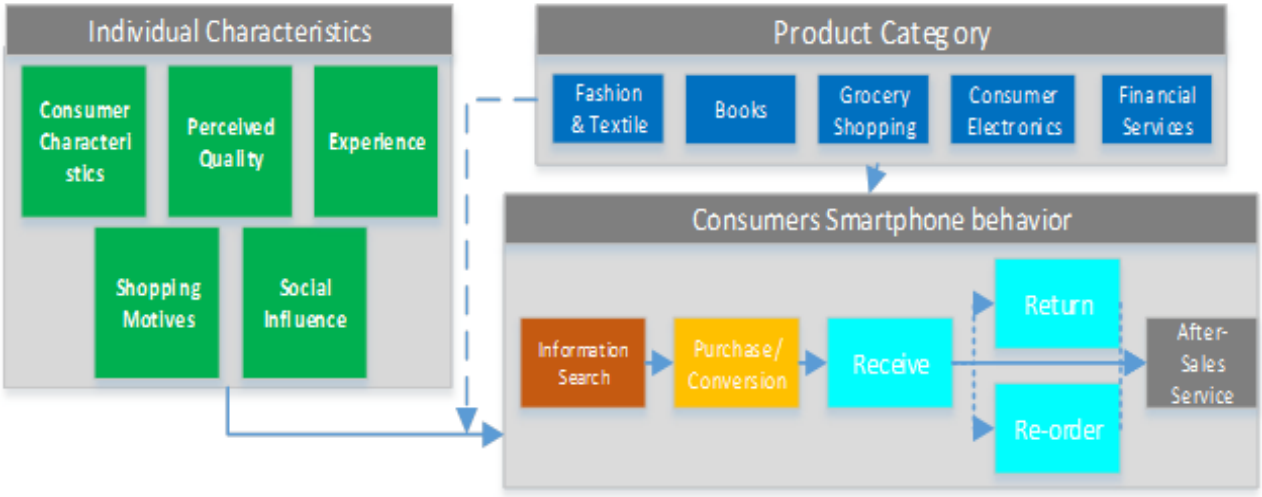

Figure 6. The conceptual model

3 METHODOLOGY

Verhoef, Kannan, and Inman (2015) have identified a lack of literature on specific omni-channel areas, such as touchpoint and channel choice correlation during parts of the customer journey, part of which is the subject of this study. The previous chapter has provided the necessary literature regarding the relevant topics of this research, culminating in the conceptual model. This chapter discusses the operationalization of the constructs that are used for the measurement instrument. Furthermore, the pre-test and pilot test are discussed until the results, which follow in Chapter 4.

3.1 OPERATIONALIZATION

The majority of the factors influencing consumer behavior can be derived from the literature review. The UTAUT2 model, which measures user acceptance of information technology, is a validated construct for the adoption of mobile Internet. The model, however, was not developed for an omni-channel retail environment in which smartphones are used. The WebQual 4.0 model was also not designed for an omni-channel environment. However, the construct of perceived quality can be used, with only minor adjustments to the items, and integrated as a dimension in the individual characteristics construct. The following sections discuss the constructs, dimensions, and items. Each dimension has one or more items that are the measurable part of the construct. Following are the measurement scales, a description, and the source.

3.1.1 Product Categories

This study has identified five product categories, which have been explained in previous chapters. These categories act as independent variables, and the literature indicates that product categories can act as a strong influencer of consumer behavior. The individual characteristics construct should be able to measure validly and reliably across the categories and not generalize all behavior a consumer displays.

Table 3
Product Categories Construct

Variables	Description	Measurement Scale	Source
Fashion and Textile	Items such as shoes, jackets, jeans, shirts, pullovers, and sweaters; Retailers such as Zalando, C&A, G-Star, Jack & Jones, CoolCat, and Hunkemöller	Nominal (yes or no question), which is combined in a selection question with the customer journey phases	(Walker Sands, 2016) (Nanji, 2013) (Gbadamosi, 2016) (Statista, 2016)
Books	Physical or digital books; Retailers such as Ako, Bol, and Bruna		
Grocery Shopping	Daily or weekly grocery shopping; Retailers such as Albert Heijn, Jumbo, and Plus		
Consumer Electronics	Items such as televisions, electronic toys, audio equipment, mobile phones, and personal computers; Retailers such as MediaMarkt, Euronics, Expert, and BCC		
Financial Services	Health or car insurance, mortgage, or a loan at companies such as ABN Amro, RaboBank, SNS, ING, Menzis, FBTO, and Achmea		

3.1.2 Individual Characteristics

The individual characteristics construct is divided into several dimensions with their respective variables and items. The consumer characteristics are measured once, simply because age, gender, education, and income does not change between product categories or customer journey phases. The other dimensions are repeated throughout the measurement instrument for each product category and phase of the customer journey, and are further explained in their corresponding sections below.

3.1.2.1 Consumer Characteristics

There is a plethora of studies that have identified specific individual characteristics that affect consumer behavior (Bhatnagar et al., 2000; Cronin et al., 2000; Forsythe & Shi, 2003; Li et al., 1999; Shim et al., 2001; Voss, 2003). The UTAUT2 model lists age, gender, and experience as moderating variables. The main characteristics chosen for this research, based on the literature review and expert interviews, are gender, age, education, and economic situation. This is also depicted in Table 4 below. The measurement scales sometimes differed between studies, e.g. a five-point versus seven-point Likert scale. For this research, a five-point Likert scale was used for all ordinal measurements.

Table 4

Consumer Characteristics Dimension

Variables	Description	Measurement Scale	Source
Gender	The gender of the consumer	Nominal (male/female)	(Venkatesh, Thong, & Xu, 2012) (Forsythe & Shi, 2003) (Bhatnagar, Sanjog, & Raghav, 2000) (Li, Kuo, & Rusell, 1999)
Age	The age of the consumer	Ratio (number)	
Education	The level of completed education or, if enrolled, highest received	Nominal (Elementary / mbo, vmbo / Havo, Vwo / HBO / WO)	
Economic Situation	Yearly income	Nominal (0-15k, 15.01k-25k, 25.01k-50k, 50.01k+)	

3.1.2.2 Perceived Quality

In the UTAUT model, the independent variable of performance expectancy is intended as a main driver for the employee to use the technology. In the UTAUT2 model, aimed at mobile Internet, the entire set of questions is not directly applicable to the measurement in this research. The dimensions can partly overlap with the "American perceived quality scale," which assumes a physical store. In contrast, the WebQual 4.0 model is aimed at a website. Although this research concerns behavior on smartphones, not the perceived quality of only the specific website or application, the proven construct of the WebQual 4.0 model provides items that can be slightly modified for the purposes of this research. The likeliness of the items in the usability (WebQual 4.0) and effort expectancy (UTAUT2) variables should be noted. The original items can be found in Appendix A and B.

Table 5

Perceived Quality Dimension

Variables	Description	Measurement Scale	Source
Usability Design	Qualities associated with "design" and "usability," e.g. appearance, ease of use and navigation, and the image conveyed to the user	Ordinal (five-point Likert scale: strongly disagree, mildly disagree, neutral, mildly agree, strongly agree)	(Barnes & Vidgen, 2002)
Information Quality	The quality of the content; the suitability of the information for the user's purposes in terms of e.g. accuracy, format, and relevance		
Trust Empathy	The quality of the service interaction experienced by users as they delve deeper into the site, embodied by "trust" and "empathy"; e.g. issues of transaction and information security, product delivery, personalization, and communication with the site owner		

3.1.2.3 Experience

The literature on the influence of experience on the channel choice is robust (Grant et al., 2007; Vijayasarathy & Jones, 2000; Shim et al., 2001; Falk et al., 2007; Frambach et al., 2007). The UTAUT2 model measures "experience" as a mediating factor and "habit" as an independent variable, according to Venkatesh et al. (2012). The experience factor was operationalized based on the passage of time, while the habit factor was defined as the extent to which behavior is performed automatically as a consequence of learning. Smartphone usage in the Netherlands is highly pervasive among the population. Therefore, the experience variable is not designed to measure the experience or habit by learning. The experience factor in this case is aimed at previous usage of a smartphone for phases in the customer journey and product categories. It could arguably be part of the consumer characteristics, as the UTAUT2 model identifies experience as a moderating factor next to age and gender. For this research, it was decided to separate these factors. The effort expectancy variable from the UTAUT2 model was not used because the items were almost identical to the usability variable in the WebQual 4.0 model. The habit factor from the UTAUT2 model is added, as experience and habit were identified as two related but distinct constructs (Venkatesh, et al., 2012).

Table 6

Experience Dimension

Variables	Description	Measurement Scale	Source
Previous Experience	The previous experience the consumer has had on his or her smartphone device during the specific phase of the customer journey and product category	Ordinal (five-point scale: strongly negative, mildly negative, neutral, mildly positive, strongly positive)	ATAUT2 (Venkatesh, Thong, & Xu, 2012)
Habit	The extent to which an individual believes the behavior to be automatic; results of prior experiences	Ordinal (five-point Likert scale: strongly disagree, mildly disagree, neutral, mildly agree, strongly agree)	

3.1.2.4 Shopping Motives

Literature has already suggested that hedonic and utilitarian motives can be assigned to certain product categories (Voss et al., 2003). Because this research distinguishes between five product categories, the shopping motives can have an increased importance. In the UTAUT2 model, only hedonic motivation is measured; therefore, the addition of utilitarian is necessary. Voss et al. (2003) have identified keywords that have also been used in the UTAUT2 model. In view of this, the utilitarian keywords are used, unchanged, from Vos et al. (2003) and the items implemented in the measurement instrument.

Table 7

Shopping Motives Dimension

Variables	Description	Measurement Scale	Source
Hedonic	Dimension resulting from sensations derived from the experience of using the smartphone for the customer journey phase per product category	Ordinal (five-point Likert scale: strongly disagree, mildly disagree, neutral, mildly agree, strongly agree)	Venkatesh, Thong, & Xu (2012)
Utilitarian	Dimension derived from functions performed by the smartphone for the customer journey phase per product category		Voss, K. E., Spangenberg, E. R., & Grohmann, B. (2003).

3.1.2.5 Social Influence

The UTAUT2 model describes social influence as the degree to which a person uses a technology – in this case, the smartphone – because significant people, such as friends and family, believe that he or she should. In the current age of social media, the social influence aspect has additional meaning, so the variable is therefore carried over from the UTAUT2 model. The questions have been adapted accordingly to fit the customer journey and product categories.

Table 8

Social Influence Dimension

Variables	Description	Measurement Scale	Source
Social Influence	The extent to which consumers perceive that important others (e.g. family and friends) believe that they should use a particular technology	Ordinal (five-point Likert scale: strongly disagree, mildly disagree, neutral, mildly agree, strongly agree)	Venkatesh, Thong, & Xu (2012)

3.1.3 Consumer smartphone behavior

The dependent variable measured for this construct is the behavior of the consumer on their smartphone during the specified phases of the customer journey. On the simplest level, a consumer either uses his or her smartphone or does not. The independent variables are those that can influence the smartphone behavior, i.e. the decisions consumers make on or with their smartphones. The dependent variable is therefore aimed at the decisions that a consumer can make during the specific parts of the customer journey. The possible decisions differ throughout the customer journey. The attract and inspire phase was not included in the instrument as e.g. it is impossible for the respondent to remember all possible exposure to marketing efforts by brands and companies. Another notable detail is that respondents are

asked in regard to their behavior in the last four weeks, not in their lifetimes, in order to maintain accuracy in their responses.

During the consumer behavior, each phase has distinct points of interest. Some variables are the same, such as frequency, preferred device, and physical location. Other variables need rephrasing or redesigning of the items, as the customer journey phases cannot be copied to one another.

Table 9
Consumer Smartphone Behavior Construct

Dimension	Variable	Description	Measurement Scale
Information Search	Frequency	Number of smartphone uses in the last four weeks to search for information, per product category	Ratio
	Preferred Device	Degree of being the preferred device to search for information, per product category	Ordinal (five-point Likert scale: strongly disagree, mildly disagree, neutral, mildly agree, strongly agree)
	Method of Search	The first location the consumer accesses for information on his or her smartphone, per product category	Nominal (search engine, retailers website or app, brand website or app, comparison websites, social media, friends and family, other [blank])
	Reason of Search	The main reason the consumer searches for information on his or her smartphone, per product category	Nominal (check price, look for discount vouchers, reviews / user experience, find physical location of store, add product or service to wishlist, check inventory levels, detailed information about product or service, continue later on another device, other [blank])
	Physical Whereabouts	The consumer's physical location when searching for information on his or her smartphone, per product category	Nominal (home, work, school, in-store, walking, traveling, restaurant or bar, other [blank])
Purchase / Conversion	Frequency	Number of smartphone uses in the last four weeks for purchasing, per product category	Ratio
	Preferred Device	Degree of being the preferred device to purchase, per product category	Ordinal (five-point Likert scale)
	Method of Purchase	The first location the consumer accesses to purchase on his or her smartphone, per product category	Nominal (Google shopping, retailer website or app, brand website or app, comparison websites, other [blank])
	Method of Payment	The preferred method of payment on the smartphone, per product category	Nominal (PayPal, iDeal, authorization, wire transfer,

			AcceptGiro, AfterPay, other [blank])
	Reason of Purchase	The main reason the consumer purchases on his or her smartphone, per product category	Nominal (best price, fast delivery, complete purchase at that very moment [no delay], being in store and having order home delivered, paying in store and walking out with the purchase, finalize payment on another device, other [blank])
	Physical Whereabouts	The consumer's physical whereabouts when purchasing on his or her smartphone, per product category	Nominal (home, work, school, in-store, walking, traveling, restaurant or bar, other [blank])
Receive / Return / Reorder	Frequency	Number of smartphone uses in the last four weeks for tracking, rescheduling, returning, or reordering, per product category	Ratio
	Preferred Device	Degree of being the preferred device to track, reschedule, return, or reorder, per product category	Ordinal (five-point Likert scale)
	Physical Whereabouts	The consumer's physical location when tracking, rescheduling, returning, or reordering on his or her smartphone, per product category	Nominal (home, work, school, in-store, walking, traveling, restaurant or bar, other [blank])
After-Sales Service	Frequency	Number of smartphone uses in the last four weeks for contact with after-sales services, per product category	Ratio
	Preferred Device	Degree of being the preferred device for contact with after-sales services, per product category	Ordinal (five-point Likert scale)
	Reason of After-Sales	The main reason the consumer has after-sales contact on his or her smartphone, per product category	Nominal (customer support/service, writing reviews, reading information sent by retailer or brand, free maintenance, warranty issues, other [blank])
	Physical Whereabouts	The consumer's physical location when contacting after-sales services on his or her smartphone, per product category	Nominal (home, work, school, in-store, walking, traveling, restaurant or bar, other [blank])

3.2 Reliability and Validity

According to Bryman and Bell (2007), the external reliability is the degree to which a study can be replicated. As this research aims to create a measurement instrument for the exact purpose of reliably measuring consumer behavior, the goal is to maximize reliability. Furthermore, the instrument validity is, according to Straub (1989), the measure of calling the measurement instrument valid. The following three topics need to be addressed. First, the *content validity* ensures that the instrument is measuring every applicable measurement of the research. Second, the *construct validity* assures that the measures are stable across methodologies, meaning an accurate depiction of the data, or whether the method of measurement influences the scores itself. Finally, the *reliability* translates into stable measurements, guaranteeing that the measurement error is as low as possible.

The development of the instrument should be done in four phases, as Straub (1989) has mentioned, which are seen in Table 10 below. The phases consist of a pre-test, a technical validation, a pilot test, and finally the full-scale survey. As the full-scale survey is not applicable in this study, the first and third phases are further explained, as each of the phases has its own benefits and purpose. The second, technical validation, entails data collection with dissimilar methods in order to determine the extent to which the instrumentation itself affects the findings. This research does not test this phase due to lack of time and resources.

Table 10
Instrument Validation

Phase	Name	Validation Tests Performed	Content Validity	Construct Validity	Reliability
1	Pretest	Qualitative	X	X	X
2	Technical Validation	Cronbach's Alphas			X
		MTMM Analysis		X	
3	Pilot Test	Cronbach's Alphas			X
		Factor Analysis		X	
		Qualitative	X		
4	Full-Scale Survey				

Adapted from: Straub, D. W. (1989). Validating instruments in MIS research. *MIS quarterly*, 147-169.

3.2.1 Pre-test

During the pre-test, a draft version of the measurement instrument was subjected to a qualitative testing of the three validities (Straub, 1989). Interviews were held in order to identify and correct possible deficiencies in the measurement instrument. Interviewee selection was based not only on their omni-channel retail expertise but also on their knowledge in methodology in order to receive feedback on multiple levels to achieve maximum improvement after each edit of the measurement instrument. To maximize the effect of the pre-test with the interviewees, Straub (1989) has suggested starting with a general discussion in an open-ended fashion followed by semi-structured questions and, finally, a highly structured examination of every item in the measurement instrument. Furthermore, interviewees need to be encouraged to not withhold any opinions, and it must be clear beforehand that their input is of vital

importance. Additional attention to the exact wording of the interviewees' responses on the constructs can increase the content validity and reliability. The pre-test clearly identified several issues with the measurement instrument. These issues and intended solutions are discussed in the next chapter.

3.2.2 Pilot Test

A pilot test also acts as a dry run before the actual questionnaire is administered. The pilot-test can also identify issues that were missed in the pre-test and subsequently fixed before the final version. The pilot test adds to the increased reliability and validity of the measurement instrument, thus increasing confidence of the instrument. Although this research does not measure the possible differences in measurement methods, the pilot test is critical because it adds further possibilities to enhance validity and reliability. Isaac and Michael (1995) have determined a sample size of 10 to 30 for pilot tests. In other fields of study, Julious (2005) has set the pilot sample size at 12. A decision was made to be on the side of a higher sample size for the pilot test and use n=25. When using a random sampling technique, each member of the target population has an equal chance of being selected. Using simple random sampling (SRS) could yield results that do not accurately reflect the population. The aim is to measure the behavior of consumers who are 12 years of age or older with four variables in the individual characteristics dimension (age, gender, education, and income). Ideally, the population would be randomly sampled from these four stratified characteristics. However, this method is highly complex and can put a strain on resources. Therefore, in this pilot test, SRS was used to gather the required respondents.

Table 11

Pilot Test Sample Individual Characteristics Frequencies

Gender		**Age**		**Education**		**Income**	
		24 and below	2				
		25-35	11	VMBO	1	€0 - €25.000	5
Male	20	36-45	4	MBO	5	€25.001 - €50.000	15
Female	5	46-55	6	HBO	14	€50.001 and above	5
		56-65	2	WO	5		
		66 and above	0				

A frequency table from the individual characteristics indicates that the population is far from perfectly represented in this sample. In this particular set, 80% of the respondents are male, 44% are between 25 and 35 years of age, and 56% have completed a HBO degree, which does not match with the distribution of the population. Only the income can be considered normal, as the average wage is €37,000 in the Netherlands (CBS, 2016).

4 RESULTS

This chapter discusses the results of the pre-test and pilot test. These two key moments for instrument validation have resulted in numerous changes to the instrument, which are discussed in the corresponding chapters. The final design of the questionnaire can be found in Appendix C.

4.1 PRE-TEST RESULT

The first flaw that was found in the original design was the grouping of the product categories for most of the variables. This created a situation in which the respondent would not use his or her smartphone in certain product categories, yet this category would still show in the questions. By adding a selection question at the beginning, the respondent can select which actions have been completed of the customer journey and in which product category. Questions were filtered on the selected items, and all unselected items were no longer shown. As a direct result of this decision, it was necessary to recreate the entire measurement instrument, with each question split into five for the product categories. Coding each question to only display selected items was also required. Although a time-consuming process, filtering the questions for the respondent reduces the possibility of the respondent losing focus and attention because of non-applicable items, and consequently decreases dropout rates.

Multiple items with a nominal scale had finite answer possibilities, confining the question. Especially during testing, an “other” answer is important to collect data. If ultimately no other answers are given, it is still possible to remove this option. Therefore, the nominal questions have been modified with the possibility to add an option in a textbox placed directly next to the “other” option. The ordinal items were designed with a seven-point Likert scale. While discussing each item, respondents often had difficulties making the distinction between two side-by-side options. By proposing a five-point Likert scale, the decisions for the respondents were easier to make and less time-consuming.

The next issue identified was the composition of the receive, return, and reorder phase of the customer journey. The grouping of these individual actions results in double-barreled items, combining all three possibilities into one question. In order to fully solve this, the steps should be separated. Judging by the number of items that would add, the decision was made to create an item in which the respondent indicates that they do not use their smartphone for a specific action.

There was some concern about the order of the items, as each variable was measured in succession. This could cause the respondent to have trouble remembering the experience. The advice was to order the questions according to all selected phases of the customer journey, per product category. In other words, display all times related to a specific product category, then move on to the next instead of measuring a variable across all product categories.

By far, the most frequently mentioned issue during the pre-test was the length of the questionnaire. Even though variables had been taken from existing models, such as the WebQual 4.0, UTAUT2, and SERVQUAL, the five product categories multiply the number of items by five. Furthermore, the customer journey is measured in four areas, creating four further points of measurement of the perceived quality,

previous experience, shopping motivation, and social influence. Thus, respondents are faced with up to 330 questions if everything is selected in the first selection question. Even though a significant amount of time had already gone into developing the questionnaire, the decision had to be made to create a second questionnaire with a reduced number of items by changing the measurement intention of the individual characteristics. Instead of measuring perceived quality, previous experience, shopping motivation, and social influence for each product category in each of the four measured phases of the customer journey, they would instead be measured only among the five product categories. The decision to shorten the length is also supported with research by Rolstad, Adler, and Rydén (2011), who have conducted a meta-analysis on the length and response rate of questionnaires and suggested that questionnaires longer than 30 minutes will increase partial responses due to a lack of concentration. An argument against changing the length of the instrument is that the individual characteristics are only measured per product category and combined for the entire customer journey. Preferably, each customer journey phase is measured individually. Before deciding on which instrument to use, the original-length and new shorter-length questionnaires were sent to five people to gather initial data on the time required to complete the questionnaire. The results were somewhat surprising, as a nearly 100% increase in possible questions resulted in only a 5% increase in time. While five respondents is a scarce amount, the results give confidence in continuing with the longer, intended version.

Table 12

Questionnaire Times

Questionnaire Length	Time in seconds	Median time
Short (max. 152 questions)	323, 513, 389, 667, 496	477 seconds (±8 minutes)
Long (max. 302 questions)	445, 292, 387, 560, 797	496 seconds (±8½ minutes)

4.2 Pilot Test Results

The n=25 contains only completed questionnaires with no partials or respondents who have finished the questionnaire within 3 minutes, or one-third of the previously found median of 8½ minutes, The median time of the 25 respondents was almost 12 minutes. The goal of the pilot test is to test for reliability and validity, not to delve into correlations or extract hypotheses. As the majority of the individual characteristics are based on proven constructs, the reliability tests can be compared to the results from the research of origin. The perceived quality, experience, shopping motives, and social influence constructs are created from items that are almost identical to the source. Only slight rephrasing in the items was needed to fit the different customer journey phases and product categories. According to Straub (1989), besides a qualitative test, the Cronbach's alpha and factor analysis should be tested. The first step is to check how much data each construct actually has, as the questionnaire allows respondents to skip the non-selected questions. In order to check this, the first selection questions with corresponding frequencies are presented below.

Table 13

Selection Frequency

Customer Journey Phase: / Product Categories:	Information Search	Purchase / Conversion	Track / Reschedule, return or re-order	After-Sales Service Contact	**Total:**
Fashion & Textile	16	12	5	5	**38**
Books	17	3	3	4	**27**
Grocery Shopping	12	9	6	2	**31**
Consumer Electronics	13	13	9	4	**39**
Financial Services	18	7	2	3	**30**
Total:	**76**	**44**	**25**	**18**	

It is interesting to note that even with the limited number of respondents, smartphones were mostly used for the information search phase. The frequency table also reveals that the customer journey phases besides the information search and purchase phases have only a few respondents. This resulted in the decision to focus on the information search during initial testing and to combine product categories where necessary.

Perceived Quality Construct

The exploratory factor analysis in the original paper on the construct of perceived quality exhibited a fairly simple factor structure. The five factors comprising the perceived quality construct are clearly identified in the principle component analysis (Barnes & Vidgen, 2002). Conducting the same analysis as Barnes and Vidgen (2002) using principal components with varimax rotation yielded no clear depiction of the factor structure for any of the product categories during the information search. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was not even displayed. By combining the product categories in the information search to test the perceived quality measurement, the results were clearer, with four out of the five factors clearly identified and only the information quality measurement remaining unclear. The KMO measurement displayed a 0.893, indicating adequate sampling. Below, Table 14 presents the factor analysis, with the results from the original study in red. Furthermore, the Cronbach's alpha was computed with combined product categories, resulting in a combined score of 0.959. When analyzing each variable individually, the Cronbach's alpha is higher than the original test, and most variables even show no increase in alpha when removing an item. A composite reliability score was also calculated to support the reliability analysis, which poses promising results. However, this does not apply for the trust variable, which is just slightly off from 0.7, at which point it is considered adequate (Yoo & Donthu, 2001).

Table 14

Exploratory Factor Analysis for Perceived Quality During Information Search

	Component				
	1	2	3	4	5
Usability Q1	.830	.780			
Usability Q2	.833	.789			
Usability Q3	.840	.794			
Usability Q4	.859	.777			
Design Q1		.730	.713		
Design Q2			.726		.619
Design Q3					.737
Design Q4			.576	.580	.552
Quality Q1	.702	.596			
Quality Q2	.711			.695	
Quality Q3	.756			.543	
Quality Q4	.706	.539			
Quality Q5	.599	.647			
Quality Q6	.608			.562	
Trust Q1		.607	.671		
Trust Q2		.887	.761		
Trust Q3		.862	.536		
Empathy Q1			.869		.688
Empathy Q2			.779		.882
Empathy Q3			.684	.883	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 11 iterations.

Table 15

Reliability Analysis for Perceived Quality During Information Search

Variable	Questions	α	Source α	Composite Reliability
Usability	1-4	0.945	0.88	0.925
Design	5-8	0.886	0.90	0.797
Information Quality	9-14	0.930	0.89	0.873
Trust	15-17	0.906	0.80	0.697
Empathy	18-20	0.890	0.70	0.882

The perceived quality construct during the information search phase of the customer journey has been tested according to the methods described by Straub (1989), and the results have been compared to the original results. Outcomes could reflect higher construct validity, as the factor loading is not perfectly clear. That the construct validity increased from basically unusable to its current state by combining the product categories indicates a lack of respondents as the main issue. The reliability analysis in terms of Cronbach's alpha can also be conducted without combining the product categories, but this would entail measuring the reliability and validity with the dataset used in different ways. Therefore, the

product categories are not separated for the reliability analysis. To verify the decision to focus on the information search phase, the same tests were conducted on the receive, return, and reorder phase, as well as the after-sales phase. The errors and warnings are a clear indication of a lack of data. A factor analysis of the purchase phase could be conducted, albeit with a KMO of 0.673 (considered mediocre). The eigenvalues showed five components, but the factor loadings were far from the clarity of the information search. Cronbach's alpha for the construct during purchase is 0.928, and none of the items increases the alpha by being removed.

Experience Construct

The explanatory factor analysis shows a KMO of 0.786, which is adequate. The factors were loaded on one component, as the eigenvalue displays only one component, explaining 72% of the variance. This suggests that the items are uni-dimensional. If the extraction is set to two factors, the previous experience is clearly separated from the habit variable, as evident in Table 16 below. Items for the habit variable derive from the UTAUT2 model as well as the experience item. The Cronbach's alpha for the individual questions indicates that the items are closely related, with an alpha of 0.871 (Table 17).

Table 16

Exploratory Factor Analysis for Habit During Information Search

	Component	Component	
	1	1	2
Habit Q1	.912		.953
Habit Q2	.829	.786	
Habit Q3	.927	.916	
Previous Experience Q1	.719	.849	
Extraction Method: Principal Component Analysis. a. 1 components extracted.		Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 3 iterations.	

Table 17

Reliability Analysis for Experience During Information Search

Variable	Questions	α	Composite Reliability
Previous Experience	1	0.871	0.912
Habit	2-4		

Shopping Motives

Shopping motives are divided into two variables – hedonic and utilitarian – and the factor analysis in Table 18 clearly indicates this. The eigenvalue of two components explains 87% of the variance, and the KMO is 0.724. Composite reliability is similarly high compared to the Cronbach's alpha of the variables, as Table 19 notes below.

Table 18

Exploratory Factor Analysis for Shopping Motives During Information Search

	Component	
	1	2
Hedonic Q1		.918
Hedonic Q2		.936
Hedonic Q3		.899
Utilitarian Q1	.952	
Utilitarian Q2	.905	
Utilitarian Q3	.927	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

Table 19

Reliability Analysis for Shopping Motives During Information Search

Variable	Questions	α	Composite Reliability
Hedonic	1-3	0.930	0.941
Utilitarin	4-6	0.930	0.949

Social Influence

The three social influence items were derived from the UTAUT2 model. With 0.771, the KMO is considered middling but sufficient. A factor analysis clearly indicates one component with 92% of the variance explained. At 0.960, the Cronbach's alpha is equally impressive and could not be increased by deleting items.

Table 20

Exploratory Factor Analysis for Social Influence During Information Search

	Component
	1
Social Q1	.971
Social Q2	.954
Social Q3	.965

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

Table 21

Reliability Analysis for Social Influence During Information Search

Variable	Questions	α	Composite Reliabilty
Social Influence	1-3	0.960	0.975

Consumer Smartphone Behavior

Thus far, the individual characteristics have been tested on validity and reliability. By combining the product categories, the collected data was sufficient and could be properly tested. Testing for reliability with Cronbach's alpha is not possible for most of the behavioral items since they are a nominal scale, with the exception of one question. The exception – if the smartphone is the preferred device for a phase in the customer journey, per product category – has a Cronbach's alpha of 0.760. Often, the reliability in a nominal scale refers to the consistency of observations by multiple experts, and the predominant procedure is to use kappa or weighted kappa. However, this is not applicable for this study either. The frequency can used to gain further insight into the collected data. For the frequency of use item, this can

easily be extracted. The frequency items were not categorized in the pre-test and pilot test, as the appropriate size of the categories was unclear. When combining all frequencies, it resulted in the following boxplot. One side is divided per product category, and the other per phase of the customer journey. The decision was made not to replace all missing values by zero uses because the respondents first passed a selection question that filtered out the zero uses. The minimum value is therefore 1.

The boxplot and corresponding sample mean and standard deviation clearly indicate the frequency distribution. One outlier of 65 in the information search of the fashion and textile category is not visible in the chart (Appendix D), but duly noted. The categories for frequency of use can be created and implemented in the final version of the instrument. The categories are 1-5, 6-10, 11-15, 16-20, 21-25, 26-30, and 31+ frequency of use in the last four weeks.

Other adjustments to the final instrument focus on the multiple items that have been designed to be infinite by adding an "other" answer option. The collected pilot test data reveals that only a few of the 25 respondents used this option. Most of the answers that were given "other"' could also be expressed through the existing answer possibilities, e.g. "Bol.com / Bruna" for the information search in the books category, which equals the answer "retailers website or app", and two responses where the answer "home" was overlooked for physical location and entered as an "other" option. One respondent added a payment method for consumer electronics, "Payza," that is not commonly used in the Netherlands and therefore not added to the answer options. One respondent answered "I don't" on multiple occasions, and further inspection can only lead to the conclusion that the respondent accidentally selected items in the selection question, as the frequency of use was answered with "0" for these questions as well. The same respondent answered "nowhere" once for the item on the predominant physical location of the respondent when using his or her smartphone for a phase in the customer journey. Considering the low number of invalid data, it can be said that the items are formulated correctly and that the answer possibilities for the nominal measurements are sufficiently complete.

According to the conceptual research model, the product categories and individual characteristic constructs influence the behavior of the consumer during the customer journey phases. Although data is limited in this sample, a preliminary test was conducted to test for independence of the categorical variables in the consumer smartphone behavior construct. Using the chi-squared test of independence on the categorical variable assesses whether the effects of one variable depend on the value of another. Performing this test for all of the dimensions of the individual characteristics construct against any of the categorical items of the behavioral construct resulted in another warning concerning the sample size. According to Yates, Moore, and McCabe (1999), the limit of expected counts that are less than five should be 20%. In this case, all the tests were between 80 and 100%.

5 CONCLUSION AND DISCUSSION

This chapter provides the findings, limitations, and recommendations for further research. It first presents the findings of the research and process of developing the measurement instrument. Then, it discusses the limitations of the project and offers suggestions for future studies.

5.1 FINDINGS

The primary research question was as follows: *"How can the behavior of Dutch consumers with regard to smartphone use in the omni-channel customer journey be measured for different product categories?"* By examining the available literature and research models, a conceptual model was designed and a measurement instrument was drafted. A pre-test and a pilot test yielded interesting data that lead to numerous changes to the instrument. Considering that the main research question intended to define a method of measuring Dutch consumers' smartphone behavior in the omni-channel customer journey for different product categories, it has only been partially answered. There is not a definitive instrument resulting from this study. There is, however, a tested instrument that scores well on reliability testing and is ready for a full-scale implementation. All questionnaire items can be found in Appendix D.

A comprehensive review of the literature was conducted to gather the necessary knowledge for the development of the instrument and was specifically aimed at the omni-channel customer journey and the consumer behavior. The latter started as a wide, almost historical overview of the main factors of consumer behavior. Models by Sandhusen (2000) and Kotler and Armstrong (2014) are frequently referenced when commencing research into consumer behavior. After the initial review of traditional literature, a focus on online behavior resulted in the identification of the first tested measurement models that eventually were used in the instrument. Furthermore, the product categories were identified as fashion and textile, books, grocery shopping, consumer electronics, and financial services. Research on behavioral literature per product category highlighted more insights, concepts, and theories that could be applied to the final instrument. An in-depth review of the omni-channel retailing and customer journey literature revealed a current shift from multi- to omni-channel, resulting in quite new and recent publications about the themes. There is no set definition of the customer journey in terms of precisely how it looks, functions, or should be measured, but noticing reoccurring structures informed the model used in this project based on the principles behind the customer journey by Watkinson (2012).

Designing the measurement instrument in such a way that large parts are derived from proven constructs was deemed imperative, not only by the researcher but also by the supervisors. Following this advice and the literature review resulted in predominantly using constructs and items from three models: UTAUT, UTAUT2, and the WebQual 4.0 model (Venkatesh et al., 2012; Barnes & Vidgen, 2002). The items had to be redesigned to match the identified product categories and the steps of the customer journey. During the redesigning of the items, it was crucial to remain as close as possible to the original wording. This resulted in the creation of five versions per item (product categories) for each of the four measured customer journey phases. After the initial measurement instrument was designed following the conceptual model, the pre-test produced some interesting results. A direct consequence was the reorganizing of the instrument, whereby wording and items were adjusted and the time required to finish

the questionnaire was tested. Following the pre-test, a version of pilot-test that was originally thought to be too long was administered to 25 respondents by method of SRS. The selection question at the beginning of the questionnaire resulted in some unforeseen consequences. The respondents have to select the product category and phase of the customer journey in which they have used their smartphone in the last four weeks. Because of the large variety of choices a respondent can make (selecting anywhere from 1 to 20 "options"), the collected data proved to be insufficient for a variety of tests and forced the combination of either product categories or customer journey steps. After combining either categories or phases, the data was tested. Nearly all variables derived from the UTAUT(2) and WebQual 4.0 model scored high on Cronbach's alpha and composite reliability, the latter of which was calculated in conjunction with an exploratory factor analysis. The results indicate that the individual characteristics construct, which is based on existing instruments, can be applied in the omni-channel smartphone environment. The instrument is technically ready for a full-scale survey to measure consumer smartphone behavior in an omni-channel retail environment during the four phases of the customer journey and five product categories.

This study has both a scientific and a practical objective. In terms of the added scientific value, it has made a significant step toward the implementation of an instrument for measuring smartphone behavior during the customer journey. Since the designed instrument has now undergone pre-testing and a pilot test, the next step would be a full-scale implementation. The results of a full-scale survey can illuminate the possible mediating or moderating roles of the variables, after which not only e-commerce companies or retailers active in one of the product categories can use the instrument for research of their own. If significant differences between product categories can be identified, it could add value to omni-channel organizations in the way they currently operate.

5.2 Limitations and Recommendations for Further Research

The development of the measurement instrument was subject to several limitations. According to Straub (1989), a technical validation of the instrument is necessary to determine any influence from the type of instrument itself. However, because of time and resource constraints, this validation was not carried out. Therefore, results could be influenced by the nature of an online questionnaire. Furthermore, the sample does not accurately reflect the population. The main indicator for this is that 80% of the respondents are male. While data analysis does not focus on correlations and aims to validate the questionnaire, this bias does decrease external validity. There is the possibility of a respondent being forced to answer all questions, if selected at the beginning of the survey. The average selection is 6.52 (=7) categories and customer journey combinations out of a possible 20. The average time to complete the questionnaire was 12 minutes. During a possible full-scale test, respondents may drop out, only partially complete the survey, or lose concentration if they select a high number of combinations. It is suggested to create multiple versions of the questionnaire with varying order of categories; this offers the opportunity to test if questions that are answered in the beginning significantly change compared to those answered toward the end. The sample size itself can be considered a limitation as well, although the literature has suggested that n=25 should be adequate. The influence of the selection question was not expected to be so high. Some combinations received limited response, as evident in Table 13 (p. 30), thus invalidating the factor

analysis and reliability testing for most of the combinations. This forced the combination of either product categories or customer journey phases, which limited the goal of the product category construct. The construct was designed in order to avoid generalizing all findings across product categories but also provide the researcher with the possibility to test for significant differences. Therefore, future research should be extremely cautious of the sample size in order to assure that all combinations have sufficient data and analysis is possible.

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APPENDICES

APPENDIX A

The original items from the UTAUT2 model

Performance Expectancy

PE1. I find mobile Internet useful in my daily life.
PE2. Using mobile Internet increases my chances of achieving things that are important to me. (dropped)
PE3. Using mobile Internet helps me accomplish things more quickly.
PE4. Using mobile Internet increases my productivity.

Effort Expectancy

EE1. Learning how to use mobile Internet is easy for me.
EE2. My interaction with mobile Internet is clear and understandable.
EE3. I find mobile Internet easy to use.
EE4. It is easy for me to become skillful at using mobile Internet.

Social Influence

SI1. People who are important to me think that I should use mobile Internet.
SI2. People who influence my behavior think that I should use mobile Internet.
SI3. People whose opinions that I value prefer that I use mobile Internet.

Facilitating Conditions

FC1. I have the resources necessary to use mobile Internet.
FC2. I have the knowledge necessary to use mobile Internet.
FC3. Mobile Internet is compatible with other technologies I use.
FC4. I can get help from others when I have difficulties using mobile Internet.

Hedonic Motivation

HM1. Using mobile Internet is fun.
HM2. Using mobile Internet is enjoyable.
HM3. Using mobile Internet is very entertaining.

Price Value

PV1. Mobile Internet is reasonably priced.
PV2. Mobile Internet is a good value for the money.
PV3. At the current price, mobile Internet provides a good value.

Habit

HT1. The use of mobile Internet has become a habit for me.
HT2. I am addicted to using mobile Internet.
HT3. I must use mobile Internet.
HT4. Using mobile Internet has become natural to me. (dropped)

Behavioral Intention

BI1. I intend to continue using mobile Internet in the future.
BI2. I will always try to use mobile Internet in my daily life.
BI3. I plan to continue to use mobile Internet frequently.

Use

Please choose your usage frequency for each of the following:
a) SMS
b) MMS
c) Ringtone and logo download
d) Java games
e) Browse websites
f) Mobile e-mail
Note: Frequency ranged from "never" to "many times per day."

APPENDIX B

The original items from the WebQual 4.0 model

No.	Description
1	I find the site easy to learn to operate
2	My interaction with the site is clear and understandable
3	I find the site easy to navigate
4	I find the site easy to use
5	The site has an attractive appearance
6	The design is appropriate to the type of site
7	The site conveys a sense of competency
8	The site creates a positive experience for me
9	Provides accurate information
10	Provides believable information
11	Provides timely information
12	Provides relevant information
13	Provides easy to understand information
14	Provides information at the right level of detail
15	Presents the information in an appropriate format
16	Has a good reputation
17	It feels safe to complete transactions
18	My personal information feels secure
19	Creates a sense of personalization
20	Conveys a sense of community
21	Makes it easy to communicate with the organization
22	I feel confident that goods/services will be delivered as promised

Scale	Questions
Usability	*1 to 8*
Usability	1 to 4
Design	5 to 8
Information quality	*9 to 15*
Information	9 to 15
Service Interaction quality	*16 to 22*
Trust	16 to18 and 22
Empathy	19 to 21
OVERALL	*1 to 22*

APPENDIX C

Items of the questionnaire after pre-and pilot test. Product category and the customer journey phase are left blank, these can be filled in accordingly.

Have you used your smartphone in the last 4 weeks to:
- search for information
- purchase a product
- track or reschedule a shipment, return or re-order a product or service
- be in contact with after-sales services (such as customer service, writing reviews, email or messages on how to use your purchase, free maintenance or general warranty).

❍ Yes
❍ No

In order to filter the appropriate questions for you in this survey please select, per product category, if you have, on a smartphone done any of the below in the last 4 weeks:

	Searched for information about:	Purchased:	Tracked or re-scheduled a shipment, initiate return or re-ordered:	In contact with After-Sales Service in:
Fashion and Textile (Shoes, jackets, t-shirts etc)	❑	❑	❑	❑
Books	❑	❑	❑	❑
Grocery shopping	❑	❑	❑	❑
Consumer Electronics (TV's, audio equipment, gaming, computers etc)	❑	❑	❑	❑
Financial Services (Mortgage, loans, banking, insurance)	❑	❑	❑	❑

Questions regarding your customer journey in specific product categories are aimed at the entire or partial stages one 'travels' in the acquisition of a product or service. These stages are:
(1) attract & inspire
(2) information search
(3) purchase
(4) receive / return / re-order
(5) after-sales service.

What is your age?
❍

What is your gender?
❍ Male
❍ Female

What is your highest level of education? If currently enrolled, highest degree received.

- ❍ No Education
- ❍ Praktijkonderwijs
- ❍ VMBO
- ❍ HAVO/VWO
- ❍ MBO
- ❍ HBO
- ❍ WO

What is your yearly income?

- ❍ €0 - €15.000
- ❍ €15.001 - €25.000
- ❍ €25.001 - €50.000
- ❍ €50.001 +

How often, per month, do you **CUSTOMER JOURNEY PHASE** smartphone (for) **PRODUCT CATEGORY**? (approximately)

- ❍ 1 - 5
- ❍ 6 - 10
- ❍ 11 - 15
- ❍ 16 - 20
- ❍ 21 - 25
- ❍ 26 – 30
- ❍ 31 +

My smartphone is my preferred device to **CUSTOMER JOURNEY PHASE** about:

	Strongly Disagree	Mildly Disagree	Neutral	Mildly Agree	Strongly Agree
PRODUCT CATEGORY	❍	❍	❍	❍	❍

Specific categories for Receive/Return/Reorder

In the **PRODUCT CATEGORY**, my smartphone is my preferred device to

	Strongly disagree	Mildly disagree	neutral	Mildly agree	Strongly agree	I don't use my smartphone for this
track a shipment	❍	❍	❍	❍	❍	❍
change the delivery location or time	❍	❍	❍	❍	❍	❍
initiate a return	❍	❍	❍	❍	❍	❍
re-order a product or service	❍	❍	❍	❍	❍	❍

If I use my smartphone to **CUSTOMER JOURNEY PHASE** on a specific product or service in the **PRODUCT CATEGORY** I use the following as my first point of **CUSTOMER JOURNEY PHASE**:

Specific Categories for Information Search:

- ❍ Search Engine (e.g. Google)
- ❍ Retailers Website or App (e.g. Zalando, Amazon, Ebay, Coolblue)
- ❍ Brand Website or App (e.g. Zara, H&M, Apple, Albert Heijn)
- ❍ Comparison Websites (e.g. Kieskeurig.nl, tweakers)
- ❍ Social Media (e.g. Facebook, Instagram, Twitter)
- ❍ Friends and family (via messaging, calling, facetime etc)
- ❍ Other _____

Specific Categories for Purchase:

- ❍ Google Shopping
- ❍ Retailers Website or App (e.g. Zalando, Amazon, Ebay, Coolblue)
- ❍ Brand Website or App (e.g. Zara, H&M, Apple, Albert Heijn)
- ❍ Comparison Websites (e.g. Kieskeurig.nl, tweakers)
- ❍ Other _____

Item only for purchase phase:
My preferred payment method for **PRODUCT CATEGORY** on my smartphone is:

- ❍ PayPal
- ❍ iDeal
- ❍ Authorization (Machtiging)
- ❍ Wire-Transfer (Overschrijving)
- ❍ AcceptGiro
- ❍ AfterPay
- ❍ Other _____

If I use my smartphone to **CUSTOMER JOURNEY PHASE** on a specific product or service in the **PRODUCT CATEGORY** my main reason is:

- ❍ Check Price
- ❍ Look for discount vouchers
- ❍ Reviews / user experiences
- ❍ Find Physical Location of Store
- ❍ Add product or service to wishlist
- ❍ Check Inventory Levels
- ❍ Detailed Information on Product or Service
- ❍ Continue Later on Another Device
- ❍ Other _____

Specific Categories for Purchase:

- ❍ Best Price
- ❍ Fast Delivery
- ❍ Complete purchase at that very moment (no delay)
- ❍ Being in-store and have purchase home delivered
- ❍ Paying in-store and walking out with the purchase
- ❍ Finalize payment on Another Device
- ❍ Other _____

Specific Categories for After-Sales:

- ❍ Customer Support/Service
- ❍ Writing Reviews
- ❍ Reading information send by retailer or brand
- ❍ Free Maintenance
- ❍ Warranty Issues
- ❍ Other _____

If I **CUSTOMER JOURNEY PHASE** on my smartphone about **PRODUCT CATEGORY**, I'm in the following location most of the time:

- ❍ Home
- ❍ Work
- ❍ School
- ❍ In-Store
- ❍ Walking
- ❍ Traveling (Bus, Car, Train, Plane etc)
- ❍ Restaurant or Bar
- ❍ Other _____

Specific categories for Receive/Return/Reorder:
For **PRODUCT CATEGORY**, I'm in the following location most of the time when I:

	Home	Work	School	In-store	Walking	Traveling (bus, car, train etc)	Restaurant or bar	Other	I don't use my smartphone for this
track a shipment on my smartphone	❍	❍	❍	❍	❍	❍	❍	❍	❍
change delivery location or time	❍	❍	❍	❍	❍	❍	❍	❍	❍
initiate a return on my smartphone	❍	❍	❍	❍	❍	❍	❍	❍	❍
re-order a product or service on my smartphone	❍	❍	❍	❍	❍	❍	❍	❍	❍

My previous experience with **CUSTOMER JOURNEY PHASE** for **PRODUCT CATEGORY** on my smartphone was:

Very negative	Mildly negative	Neutral	Mildly positive	Very positive
❍	❍	❍	❍	❍

The use of my smartphone for **CUSTOMER JOURNEY PHASE** regarding **PRODUCT CATEGORY** has:

	Strongly Disagree	Mildly Disagree	Neutral	Mildly Agree	Strongly Agree
become a habit for me	❍	❍	❍	❍	❍
become an addiction	❍	❍	❍	❍	❍
become a must for me to use	❍	❍	❍	❍	❍

The **CUSTOMER JOURNEY PHASE** on my smartphone regarding **PRODUCT CATEGORY**:

	Strongly disagree	Mildly disagree	neutral	Mildly agree	Strongly agree
was easy to learn to operate	❍	❍	❍	❍	❍
had clear and understandable interaction	❍	❍	❍	❍	❍
was easy to navigate	❍	❍	❍	❍	❍
was easy to use	❍	❍	❍	❍	❍

The **CUSTOMER JOURNEY PHASE** on my smartphone regarding **PRODUCT CATEGORY**:

	Strongly disagree	Mildly disagree	neutral	Mildly agree	Strongly agree
is appropriate for the type of product category	❍	❍	❍	❍	❍
is attractive in appearance	❍	❍	❍	❍	❍
conveys a sense of competency	❍	❍	❍	❍	❍
creates a positive experience for me	❍	❍	❍	❍	❍

The **CUSTOMER JOURNEY PHASE** on my smartphone regarding **PRODUCT CATEGORY** had:

	Strongly disagree	Mildly disagree	neutral	Mildly agree	Strongly agree
accurate information	❍	❍	❍	❍	❍
believable information	❍	❍	❍	❍	❍
timely information	❍	❍	❍	❍	❍
relevant information	❍	❍	❍	❍	❍
easy to understand information	❍	❍	❍	❍	❍
information at the right level of detail	❍	❍	❍	❍	❍

At **CUSTOMER JOURNEY PHASE** on my smartphone for **PRODUCT CATEGORY**:

	Strongly disagree	Mildly disagree	neutral	Mildly agree	Strongly agree
it felt safe to complete transactions	❍	❍	❍	❍	❍
my personal information felt secure	❍	❍	❍	❍	❍
I felt confident that goods or services will be delivered as promised	❍	❍	❍	❍	❍

The **CUSTOMER JOURNEY PHASE** regarding **PRODUCT CATEGORY** on my smartphone was in a location of which I felt that

	Strongly Disagree	Mildly Disagree	Neutral	Mildly Agree	Strongly Agree
a sense of personalization was created	❍	❍	❍	❍	❍
a sense of community was conveyed	❍	❍	❍	❍	❍
it was or would be easy to communicate with the organization	❍	❍	❍	❍	❍

I use the smartphone to **CUSTOMER JOURNEY PHASE** about **PRODUCT CATEGORY** because it is:

	Strongly disagree	Mildly disagree	Neutral	Mildly agree	Strongly agree
Fun	❍	❍	❍	❍	❍
Enjoyable	❍	❍	❍	❍	❍
Exciting	❍	❍	❍	❍	❍

I use the smartphone to **CUSTOMER JOURNEY PHASE** about **PRODUCT CATEGORY** because it is:

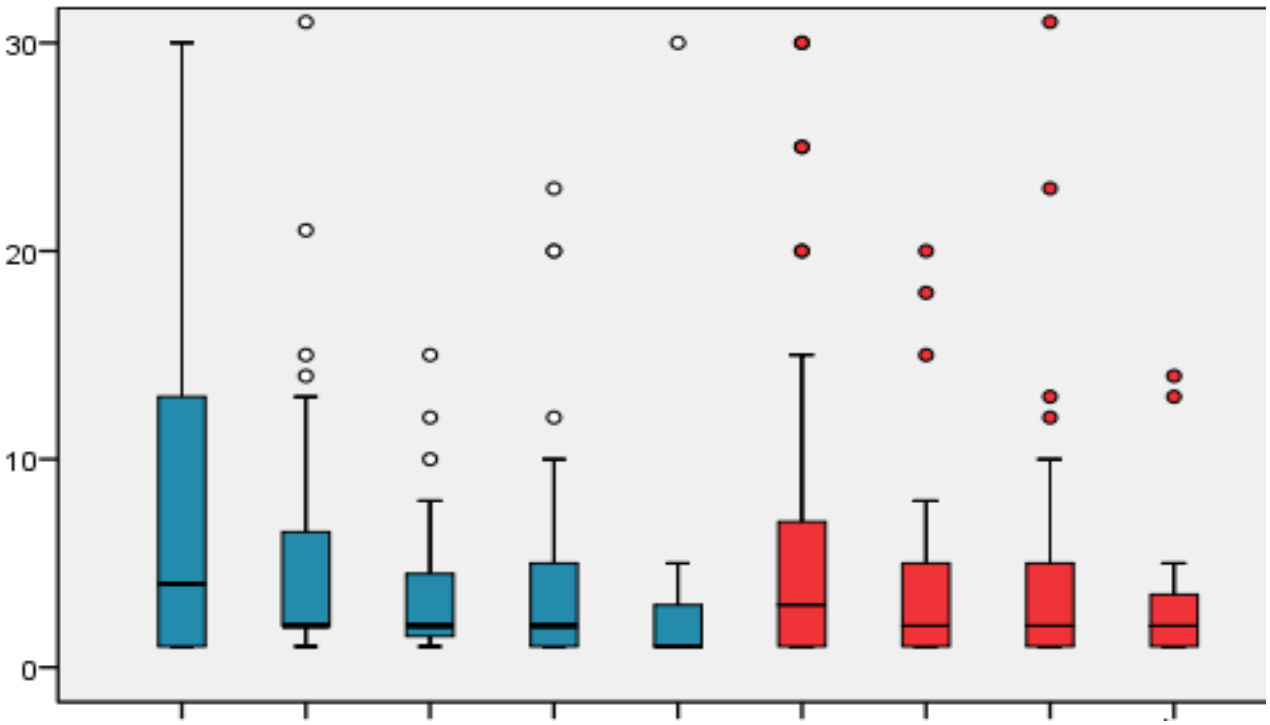
	Strongly disagree	Mildly disagree	Neutral	Mildly agree	Strongly agree
Functional	❍	❍	❍	❍	❍
Helpful	❍	❍	❍	❍	❍
Effective	❍	❍	❍	❍	❍

I should use my smartphone to **CUSTOMER JOURNEY PHASE** about **PRODUCT CATEGORY** because:

	Strongly disagree	Mildly disagree	Neutral	Mildly agree	Strongly agree
people who are important to me think I should use my smartphone	❍	❍	❍	❍	❍
people who influence my behavior think that I should use my smartphone	❍	❍	❍	❍	❍
people whose opinions I value prefer that I use my smartphone	❍	❍	❍	❍	❍

APPENDIX D

Smartphone usage frequency boxplot per product category and customer journey phase



	Fashion & Textile	Books	Grocery Shopping	Consumer Electronics	Financial Services	Information Search	Purchase	Receive / Return/ Reorder	After Sales
Mean	$\bar{x}$ 10	$\bar{x}$ 6	$\bar{x}$ 4	$\bar{x}$ 4	$\bar{x}$ 3	$\bar{x}$ 3	$\bar{x}$ 2	$\bar{x}$ 1	$\bar{x}$ 1
St. Dev	σ 14	σ 7	σ 4	σ 6	σ 7	σ 8	σ 5	σ 4	σ 1