Junior Management Science 4(3) (2019) 339-391

Junior Management Science

journal homepage: www.jums.academy

Mobile App Service Quality Dimensions and Requirements for Mobile Shopping Companion Apps

Tobias Wulfert

Westphalian Wilhelms-University, Münster

Abstract

The increasing utilization of mobile apps for shopping leads retailers to provide customers with dedicated mobile shopping companion apps to create an omni-channel shopping experience involving traditional brick-and-mortar, electronic and mobile business. Mobile shopping companion apps extend the traditional and electronic services of brick-and-mortar retailers by an additional mobile channel providing the customer with a digital companion supporting the shopping within and outside the stores using mobile technology. A twofold approach is pursued in this thesis. Firstly, a structured literature review is conducted to identify candidate dimensions for developing a scale for measuring the service quality of mobile shopping companion apps. Secondly, design requirements for improving the service quality of these mobile apps are deduced from online customer reviews of three exemplary mobile shopping companion apps applying a qualitative content analysis. The mobile app service quality of mobile shopping companion apps can be measured using a hierarchical and multi-dimensional scale consisting of three primary dimensions, seven secondary dimensions and 22 related items. The primary dimensions interaction quality, environment quality and outcome quality structure the secondary dimensions responsiveness, information, security and privacy, design, performance, technical reliability and valence. Based on these dimensions, 22 implementation guidelines and 14 service design requirements are derived as potential areas for optimizing the mobile app service quality of mobile shopping companion apps and achieving a high overall service quality. A mobile shopping companion app should include a set of features consisting of 16 features from three different areas. Results show that measuring the service quality of mobile shopping companion apps require for a tailored measurement scale. Equally, design requirements are proposed for this particular category of mobile apps. Retailers should provide a single mobile shopping companion app providing all features and mobile services to the customer.

Keywords: mobile service; mobile commerce; shopping companion; service quality.

1. Introduction

The ubiquity of smartphones including the possibility to be always connected to the internet allows customers to buy products using mobile applications (apps) on the move without temporal or spatial constraints (Heinonen and Pura, 2008, p. 4). Innovations such as the introduction of the smartphone and the increasing speed of cellular networks impact the retail sector by converging the retailers' value chains (Grewal et al., 2017; Verhoef et al., 2015). Customers increasingly use mobile apps and provided mobile services (m- services) for shopping leading retailers to provide their customers with dedicated mobile apps for shopping to create an omni-channel shopping experience (Yang and Kim, 2012, p. 778).

Overall, the Mobile Commerce (m-Commerce) revenue and share of the retail sales is rapidly growing with a projected revenue of USD 156 billion for the American market for 2017 (EMarketer, 2017; Meola, 2016). While the traditional brick-and-mortar retailing and Electronic Commerce (e-Commerce) only grew by three respectively 14 percent in the first quarter of 2017, m-Commerce revenues increased by 43 percent (Lipsman, 2017, p. 37). This increase is mainly caused by high growth rates for smartphone-based mobile shopping (EMarketer, 2016). Further, a steadily increasing number of customers prefer to use the mobile channel for shopping while at the same time spending more money on m-Commerce (Meola, 2016). In the first quarter of 2017, nearly every fifth dollar was spent by the customers using mobile devices (Lipsman, 2017, p. 8).

Acknowledging the increasing importance of electronic

DOI: https://doi.org/10.5282/jums/v4i3pp339-391

and mobile sales and distribution channels as drivers for overall company success and future development and the stagnating role of the traditional brick-and-mortar business, traditional retailers previously only operating brick-and-mortar stores recently entered e-Commerce and m-Commerce providing additional electronic services (e-services) and m-services and especially mobile shopping companion apps for their customers (Lu et al., 2009; Kuo et al., 2016; Rudolph et al., 2015). Mobile shopping companion apps executed on mobile devices provide an omni-channel experience for the customers supporting the shopping within and outside the stores. They support and enrich the customers' online shopping experience and extend the features of general mobile shopping apps by accompanying the customer in-store enhancing the customers' offline shopping experience in the brick-and-mortar stores. Thus, they offer several features that are neither usefully realizable on stationary channels nor the traditional internet (Rudolph et al., 2015, p. 43).

With an increasing number of brick-and-mortar retailers also competing in the m-service environment with mobile apps and customers demanding higher quality services, the measurement of the retailers own Mobile App Service Quality (MASQ), enabling the specific improvement of their m-services is essential to those retailers (Huang et al., 2015; Kuo et al., 2016). Service Quality (SQ) is an important determinant for the success of a company influencing "business performance, lower cost, customer satisfaction, customer loyalty, and profitability" (Seth et al., 2005, p. 913). Thus, brick-and-mortar retailers aim at providing the best MASQ to further increase their mobile and traditional sales and to put themselves in a superior position compared to their competitors (e.g., Bauer et al., 2006; Kuo et al., 2016; Lu et al., 2009). For measuring the MASQ of the mobile shopping companion apps the "disconfirmation paradigm" (Brady and Cronin, 2001, p. 35) that is already used for the early conceptualizations of the SQ construct is transferred to the context of mobile apps (Grönroos, 1984; Parasuraman et al., 1985). It defines SQ as the difference between perceived and expected quality of a service (Brady and Cronin, 2001, p. 35).

The definition of mobile shopping companion apps as a shopping companion for in-store and mobile shopping demands for a tailored scale to assess the SQ of the specific features and m-service provided by the mobile shopping companion app in the m-Commerce environment (Ladhari, 2010, p. 474). Thus, existing scales for measuring Electronic Service Quality (ESQ) and Mobile Service Qualitys (MSQs) do not cover all aspects of the MASQ. Existing scales do not fully consider the impact of m-service delivery on in-store and mobile shopping simultaneously. Applying ESQ and MSQs measurement scales on mobile shopping companion apps may result in inconsistent results. Unfortunately, research on service provisioning via mobile shopping apps on mobile devices is very rare. One scale for measuring MASQ is provided by Kumar (2017) however it contains inconsistencies in the line of argumentation and is not published in a renowned journal. Another approach is presented by Kuo et al. (2016) in a conference paper without elaborating on the proposed measurement dimensions. This thesis contributes to the extant literature by introducing a dedicated measurement scale for assessing the SQ of mobile shopping companion apps and extensively elaborating on its dimensions.

> RQ1. How can the service quality of mobile shopping companion apps be assessed?

Most of the previous papers on ESQ and MSQ close after the development of a scale assessing the quality of a service (e.g., Parasuraman et al., 2005; Stiakakis and Petridis, 2014). Only a few deliver concrete suggestions on how to improve e-services and m-service with regards to the identified SQ dimensions (e.g., Knote and Söllner, 2017). Again, these suggested design requirements are only partly transferable to the specifics of mobile shopping companion apps. Besides being able to measure their MASQ, retailers demand for concrete design requirements as suggestions for improving their mobile shopping companion apps. As SQ is perceived by the retailers' customers, the users of the mobile apps, their perceptions and opinions have to be taken into account for deriving design requirements for each of the identified dimensions. Hence, a further contribution of this thesis is to derive design requirements from online customer reviews that might lead to a high SQs for mobile shopping companion apps according to the MASQ measurement scale. For this thesis, the online customer reviews for the mobile shopping companion apps provided by Walmart Stores, Inc. (Walmart), Tesco PLC (Tesco) and Marks and Spencer plc (M&S) are analyzed as examples for major mobile apps in the United States and the United Kingdom. Online customer reviews are a form of electronic word-of-mouth (eWOM) and are publicly accessible in the mobile app stores (Hennig-Thurau et al., 2004, p. 39). These design requirements should involve functional and non-functional requirements such as aesthetic or performance aspects.

> RQ2. What are design requirements for a high service quality when developing mobile shopping companion apps?

The main emphasis of this thesis is put on the derivation of design requirements for a high MASQ and an explicit empirical analysis of the applicability and validity of the various dimensions in the context of the MASQ measurement scale is out of focus. The applicability and validity of the used MASQ dimensions is already proven in the context of ESQ and MSQ and implicitly validated within the Qualitative Content Analysis (QCA) identifying relevant online customer reviews for each of the MASQ dimensions. To answer these research questions, the following course of investigation is undertaken that follows the content structuring approach for a QCA (Mayring, 2015, p. 98):

Following this general introduction, the main constructs underlying this thesis are introduced and defined in the theoretical background chapter. Mainly, these are the development of SQ, the delimitation of mobile shopping companion

apps from general mobile apps and the introduction of online customer reviews. Then, the twofold approach applied in this thesis consisting of a Structured Literature Review (SLR) for searching previous literature on ESQ and MSQ as basis for the MASQ dimensions and a QCA for analyzing the online customer reviews in a structured manner is presented (Mayring, 2015; Vom Brocke et al., 2009). The scale for measuring MASQ is established in the next chapter based on the results of the SLR. After the explanation of the scale development and its presentation, the theory-based definition of the single dimensions is derived. The structure of this chapter follows the primary and related secondary dimensions of the MASQ scale. Next, design requirements for the developed MASQ dimensions are derived from the online customer reviews. The presentation of the retailers and their analyzed mobile shopping companion apps is followed by an overview of the sample of online customer reviews exported from the Mobile Application Distribution Platforms (MADPs). The illustration of the design requirements for high quality mobile shopping companion apps also follows the primary and secondary dimensions for measuring the MASQ identified in the previous chapter. The chapter closes with an analysis of features required for mobile shopping companion apps. Afterwards, the resulting MASQ measurement scale and the design requirements and their derivation are discussed incorporating underlying assumptions of this thesis and open topics. This thesis closes with a short summary and an outlook on possible future research directions.

2. Theoretical Background

The following chapter introduces definitions for the main terms and basic constructs that build the foundation for the rest of this thesis. Firstly, a general introduction to design requirements, quality in general and services is provided. Secondly, the development from SQ towards MASQ is shown, followed by a delimitation of mobile shopping companion apps from general mobile apps. Then, online customer reviews in the context of mobile app stores are narrowed down.

2.1. Design Requirements, Service and Quality

Design requirements describe "what the system should do" (Sommerville, 2011, p. 83) including provided services and potential operational constraints. The requirements include essential conditions or capabilities "needed by a user to solve a problem or achieve an objective" (Pohl, 2010, p. 16). For the application developers, the design requirements are often summarized in guiding design principles (Stahlknecht and Hasenkamp, 2005, p. 246). The term requirement stems from requirements engineering in the context of software development. Requirements can be differentiated in functional and qualitative requirements and constraints (Pohl, 2010, p. 17). Functional requirements are concerned with the main functions that describe the scope of a service including in- and outputs (Stahlknecht and Hasenkamp, 2005, p. 245). Quality requirements define quality properties "of the entire system or of a system component, service, or function" (Pohl, 2010, p. 18). Wiegers and Beatty (2013) summarize the quality requirements in eight requirements important for users and four requirements important for developers (p. 197). "A constraint is an organizational or technological requirement" (Pohl, 2010, p. 22) restricting the development process which deals among other things with system realization, quality, usability, reliability, safety and costs (Stahlknecht and Hasenkamp, 2005, p. 245). Design principles in general support the software design (Heinrich et al., 2004, p. 605). A principle in general guides the thinking, acting and behavior and is often used in practice if standardized methods are not applicable in a given context (Heinrich et al., 2004, p. 507). Within this thesis design requirements subsume requirements for the design of mobile shopping companion apps and the design of the m-services they provide.

A service "is defined as the co-creation of value between service systems (customers, providers, etc.), and service systems resources (the dynamic configuration of people, technology, organizations, and shared information) connected internally and externally by value propositions" (Hsu, 2009, p. 7). Norman (1984) describes services as "social acts which take place in direct contact between the customer and representatives of the service company" (p. 14). Services should provide value to the recipient of a service (Heinrich et al., 2004, p. 196). The service provider possesses the equipment and know-how for the execution of the service and typically charges the recipient with a service fee (Alpar et al., 2011, p. 81). Services can be characterized as heterogeneous, immaterial and intangible. Further, service production and consumption are inseparable and happen simultaneously (Grönroos, 1984; Sower et al., 2001). In the retailing context, services are typically "rendered to the consumer" (Grönroos, 1984, p. 38). A single service encounter describes "a period of time during which a consumer directly interacts with a service" (Bitner, 1990, p. 72). It can take place without interpersonal interaction in the e-service or m-service environment.

Quality is defined by the International Organization for Standardization (2008) as the "degree to which a set of inherent characteristics fulfills requirements". However, a universal definition of quality does not exist in literature. Distinct definitions of quality exist within nearly each research domain. So, for each quality related research it has to be decided which quality construct to choose (Reeves and Bednar, 1994). The authors define quality along excellence, value, conformance to specifications, and meeting or exceeding expectations. In the context of services, quality is often defined from a customer-based perspective as "meeting or exceeding customer expectations" (Evans and Lindsay, 2011, p. 9).

2.2. Development towards Mobile App Service Quality

Historically, SQ measures the quality of interpersonal, non-internet-based service interactions between a customer and a company (Li and Leng, 2008, p. 1). First conceptualizations are introduced in the 1980s and 1990s (Cronin and Taylor, 1994; Grönroos, 1984; Parasuraman et al., 1985).

With the commercialization and dissemination of the internet since 1994 (Fischer and Hofer, 2008, p. 414f.), services could be accessed electronically through websites even without the presence of a service provider's employee. The omission of the interpersonal interaction requires for adapted and new dimensions to measure the ESQ. Following, the development and increasing downstream of mobile cellular networks with the launch of the universal mobile telecommunications system in 2004 and introduction of mobile internet devices such as the Personal Digital Assistant (PDA) and smartphone, enables customers to access the provided services without timely and spatial constraints (Rudolph et al., 2015; Stahlknecht and Hasenkamp, 2005). Again, this change in the service provision propels the need for new scales to measure the MSQ. As smartphones further evolve and enable the execution of dedicated, third-party mobile apps (Rudolph et al., 2015, p. 43) provided via MADPs since 2008 (Genc-Nayebi and Abran, 2017, p. 208), this new channel of service provisioning demands new aspects to be considered when measuring the MASQ. This development is illustrated in figure 1 and underpinned with further details in the following subsections.

2.2.1. Service Quality

Because of the service characteristics mentioned in section 2.1 the objective measurement of the SQ is more difficult than the measurement of product quality (Sower et al., 2001). Research on SQ strives to establish frameworks and dimensions for SQ measurement. SQ theory is grounded "in the product quality and customer satisfaction literature" (Brady and Cronin, 2001, p. 34). There exist two early conceptualizations of the SQ construct by Grönroos (1984) called "Nordic" (Brady and Cronin, 2001, p. 35) model in literature and by Parasuraman et al. (1985) also known as "gap model" (van Dyke et al., 1997, p. 197). Both SQ constructs make use of the disconfirmation paradigm suggesting that quality is the result of the comparison between perceived and expected performance (Brady and Cronin, 2001, p. 35). In the context of SQ, perception relates to "the consumer's beliefs concerning the received or experienced service" (Jun et al., 2004, p. 819). Expectations depict a customer's desires or wants about the provided service (Parasuraman et al., 1988, p.17). Implicitly, this means that perceived SQ is a subjective matter, individual to each single customer (Rust and Oliver, 1994). Thus, SQ is defined as the degree of "discrepancy between customers' expectations and perceptions" (Parasuraman et al., 1994, p. 111) towards a received or experienced service (Parasuraman et al., 1985, 1988; Zeithaml et al., 2000). Perceived SQ "is a global judgment, or attitude, relating to the superiority of the service" (Parasuraman et al., 1988, p. 16), compared to customer satisfaction that describes "the result of specific service transactions" (Jun et al., 2004, p. 822). High SQ is achieved if the discrepancy between expectations and perceptions is marginal or if the perceptions exceed the expectations (Parasuraman et al., 1985).

As first SQ dimensions Grönroos (1984) identified technical and functional quality. While the former describes the outcome of the service encounter that is received by the customer, the latter indicates the quality of the service delivery, the transfer of the technical outcome to the customer, itself. Parasuraman et al. (1988) reduce their initial ten dimensions of SQ to the SERVQUAL scale consisting of the five dimensions tangibles, reliability, responsiveness, assurance and empathy (p. 23; fig. 2). Tangibles comprise the quality assessment of "physical facilities, equipment and appearance of personnel" (Parasuraman et al., 1988, p. 23). The accurate performance of the service by the service provider is summarized in the reliability dimension and responsiveness is considered with customer support. Further, assurance includes the ability of employees to be trustful and knowledgeable. The last dimension, empathy, involves customer care and individualized responses to customer inquiries (Parasuraman et al., 1988, p.23). The gap model by Parasuraman et al. (1985) incorporating the SERVQUAL scale is shown in figure 2.

It is of interest for companies to measure and improve the quality of their services because a high SQ positively influences "business performance, lower costs, customer satisfaction, customer loyalty and profitability" (Seth et al., 2005, p. 913). The positive effect on the customer's satisfaction with the used service is highlighted in several papers (e.g. Jun et al. 2004; Lee and Lin, 2005).

2.2.2. Electronic Service Quality

Analogous to traditional service environments, quality is an important determinant for the success of e-services (Santos, 2003; Zeithaml, 2002). A high ESQ is even more important than offering low prices on a web presence (Zeithaml, 2002). Furthermore, it has positive effects on both customer satisfaction and customer web site loyalty (Cristobal et al., 2007; Gefen, 2002; Swaid and Wigand, 2009). Thus, ESQ highly influences the retailer's e-Commerce sales and revenue and even its strategy (Santos, 2003).

Although some authors found evidence for the applicability of SERVQUAL in e-service environments (Pitt et al., 1995), the majority of the literature argues that e-services differ too much from traditional services because of the absence of a physical, interpersonal interaction that is mostly substituted by the interaction with the online retailer's website (Jun et al., 2004) so new scales for ESQ assessment need to be established (e.g., Cox and Dale, 2001; van Dyke et al., 1997; Kettinger and Lee, 1997). E-services differ from traditional services across several characteristics as the services are provided using electronic networks (Jun et al., 2004; Rust and Lemon, 2001). Firstly, the cost structure consists of high fixed costs for the development and only marginal costs for the service provisioning. Secondly, a high degree of technical standardization together with huge parts of the service provisioning in back offices fosters a high degree of outsourcing. Thirdly, new e-services can be rapidly developed and continuously improved through updates. Finally, customer interaction with the e-service environment can be tracked to allow for transparent service feedback (Riedl et al., 2009).

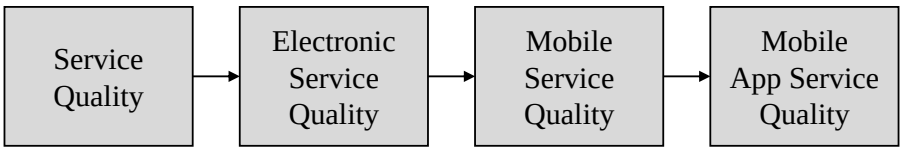

Figure 1: Evolution of Service Quality

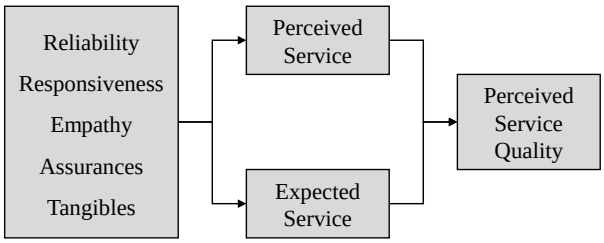

Figure 2: Gap-Model (Parasuraman et al., 1988)

Parasuraman et al. (2005) define ESQ as "the extent to which a web site facilitates efficient and effective shopping, purchasing, and delivery of products and services" (p. 217). Thereby, it “includes both pre- and post-Web site service aspects” (Zeithaml, 2002, p. 136) such as information retrieval, payment and product or service obtainment (Collier and Bienstock, 2006; Francis and Lesley, 2002; Parasuraman et al., 2005; Santos, 2003). Many of the existing scales for measuring ESQ do not cover the whole purchasing process (Blut et al., 2015). Thus, they can be applied by only browsing through a given website (Francis, 2009). ESQ goes beyond the mere assessment of the design of the service provider’s website as some authors suggest measuring the Website Design Quality (WDQ) to determine the ESQ (e.g., Yoo and Donthu, 2001; Aladwani, 2002; Barnes and Vidgen, 2002).

As the ESQ encompasses all phases of a customer’s interactions with a web site (e.g., Li and Leng, 2008; Swaid and Wigand, 2009; Wolfinbarger and Gilly, 2003), Bauer et al. (2006) base their ESQ dimensions upon a four-stages e-Commerce process consisting of an information phase, agreement phase, fulfillment phase and after-sales phase (fig. 3). As customers are likely to evaluate the quality of the overall shopping process and process outcome instead of single phases (Kar et al., 2003), ESQ scales should cover the whole shopping process from the first visit of the website to the after-sales phase.

Even though Zeithaml et al. (2000) state that the evaluation of ESQ does not require to consider the type of the product or service involved, more recent research distinguishes between "pure" e-services dealing with non-tangible products or services and "non-pure" e-services (Vlachos and Vrechopoulos, 2008, p. 5) dealing with tangible products in the e-commerce context. For tangible products, the item availability is important for the service assessment (Parasuraman et al., 2005) while instant availability is usually always the case for non-tangible products such as software or music downloads (Vlachos and Vrechopoulos, 2008).

2.2.3. Mobile and Mobile App Service Quality

Prior research has proven that SQ is also an important factor for m-services. It positively affects the customer satisfaction and loyalty with the m-service provider and thus is a determinant for the provider’s success (Kuo et al., 2016, p. 2). Especially in the context of m-Commerce, SQ measurement is vital for improving the retailer’s m-services (Lu et al., 2009, p. 229). High quality m-services can be a future competitive edge for a retailer (Grewal et al., 2017, p. 2).

M-services differ a lot from traditional and e-services and need to be investigated separately because of certain specific characteristics (Stiakakis et al., 2013, p. 1). Similar to e-services, a personal interaction between the customer and a retailer’s employee will not take place. The interface for accessing the m-service will be a mobile device or more specifically a mobile app (Zhao et al., 2012). However, the main characteristics of m- services is the absence of temporal and spatial constraints (Heinonen and Pura, 2008, p. 4). These services "can be accessed on the move, where and whenever the need arises" (Heinonen and Pura, 2008, p. 2). When designing m-services time-sensitivity, location- awareness and personalization have to be taken into account. Time-sensitivity refers to the currentness of information while location-awareness highlights the ability of m- services to incorporate location-based information in the service delivery. As mobile devices such as smartphones are omnipresent to the user, personalizing the m-service to the user’s requirements is increasingly important (Lee and Benbasat, 2004). Clarke and Flaherty (2003) summarize the benefits of m-services in the factors ubiquity, convenience, localization and personalization differentiating m-services from e-services. Because of these characteristics, m-services can be used throughout the "traditionally distinct spheres of life" (Rao and Troshani, 2007, p. 62) in a seamless and pervasive manner. Therefore, Stiakakis et al. (2013) propose

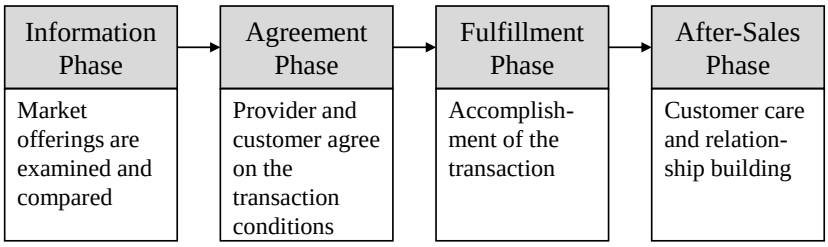

Figure 3: Stages in the e-Commerce Process (Bauer et al., 2006)

to identify quality dimensions specifically for m-services not copying dimensions from ESQ.

The concept of mobility is not well established in literature. However, it can be described as "moving around - either in time or in space" (Bouwman et al., 2012, p. 67). M-services are defined as activities "that occur when mobile consumers interact with systems or service provider employees with the support of a mobile telecommunications network" (Rao and Troshani, 2007, p. 62). Hence, MSQ measures the perceived SQ of m-services (Sti- akakis and Petridis 2014). The literature on MASQ does not provide a dedicated definition for the SQ of mobile apps (Kumar, 2017). Nevertheless, a differentiation between MSQ and MASQ can be made regarding the service provisioning. While MSQ involves any m-service accessible via a mobile device such as mobile internet, location-based services, voice transmission or short and multimedia message service (Bouwman et al., 2012, p. 68), MASQ is more concerned with the mobile apps executed on the mobile device providing the m-services to the users. Thus, MASQ can be seen as a subset of MSQ.

2.3. Mobile Shopping Companion Apps

Before the classification and definition of mobile shopping companion apps a short introduction to its m-Commerce context is given.

2.3.1. Mobile Commerce as Context

Within the last years retailers extended their traditional in-store business by an additional online channel (Rudolph et al., 2015). These retailers are called "multi-channel retailers" (Xing et al., 2010, p. 417), "bricks and clicks" (Xing et al., 2010, p. 417) or "Clicks-and- Mortar" (Laudon et al., 2010, p. 615). In contrast to them "pure online retailers" (Xing et al., 2010, p. 417) do not operate any up-front stores and their only sales channel is the internet. Multi-channel retailers apply "The Retail Model" (Clark, 1997, p. 17) offering their retail products online and extend the online shop with additional services such as store finders or in-store product availability monitoring. Following the recent developments of mobiles devices and the mobile internet, retailers provide their online services also on mobile devices and implemented dedicated mobile apps (Huang et al., 2015, p. 126). These shopping apps do not only make the e-services accessible on mobile devices but also add new features making use of the characteristics of m-services already mentioned above. Compared to mobile websites, mobile shopping apps offer improved security features and keep the customers in the retailer's self-contained environment (Taylor and Levin, 2014). These mobile shopping apps allow the retailers to create a "seamless omni-channel experience" (Rigby, 2011, p. 68) and simplify the shopping process by supporting the customer (Rudolph et al., 2015).

The importance of m-Commerce is increasing and can be measured by the revenue generated (EMarketer, 2017) and the overall time spent with shopping apps (Solomon, 2015). In m-Commerce "transactions with monetary value" (Clarke, 2001, p. 41) are executed "focusing on the trading of goods and services" (Zobel, 2001, p. 3) involving at least one of the business partners using a wireless connection (e.g. cellular network or Wireless Lo- cal Area Network (WLAN)) with a mobile device such as a smartphone, tablet computer or PDA (Laudon et al., 2010; Silberer, 2002; Stahlknecht and Hasenkamp, 2005). At the same time m-Commerce is a subset of all e-Commerce activities and a discrete category involving new technologies that are able to substitute e-Commerce activities and enabling completely new m-Commerce services that are not possible in a wired e-Commerce environment (Zobel, 2001). Besides the possibility to simply access websites with a mobile device, smartphones allow to execute m-Commerce transactions by installing mobile apps deployed by the retailers and other third parties. A smartphone is a mobile device combining speech and textual functions of a mobile phone with data transmission and app execution capabilities of a PDA (Laudon et al., 2010, p. 340).

2.3.2. Classification and Definition

Generally, Nickerson et al. (2009) "define a mobile application as a use of a mobile technology by an end-user for a particular purpose" (p. 7). In case of this definition the purpose can be anything from entertainment to making an airline reservation or doing the shopping. Although a categorization of mobile apps is difficult due to the large number of diverse mobile apps and a limited amount of textual information about each of the apps (Zhu et al., 2014), Put et al. (2014) describe mobile shopping applications as mobile apps that enhance the customers' shopping experience and that are usually executed on a smartphone. These mobile apps are provided by a retailer and installed by a customer on his or her mobile device (Rudolph et al., 2015, p. 43). Indeed,

this is still a broad definition of mobile shopping apps.

Before giving a definition for mobile shopping companion apps, they are classified applying the taxonomy of mobile apps including seven dimensions introduced by Nickerson et al. (2009). Regarding the temporal dimension is the interaction between the user and the application synchronous. The user is informed about the current stock and price information in real time. The direction of information flow as described in the communication dimension is interactional meaning that the mobile app provides the customer for instance with product information and the customer provides information on the products he or she wants to purchase. As purchase transactions including mobile payments can be executed within the mobile app, the transaction dimension for mobile shopping companion apps is transactional. The target group of mobile shopping companion apps is the general public allowing every individual who is interested in using the mobile app to download it. Therefore, the public dimension is public. Concerning the multiplicity dimension each user has the impression that he or she is individually using the mobile app. Group interaction is only partially visible if other users' product reviews are publicly visible. The location dimension introduces the context-awareness to the taxonomy. Mobile shopping companion apps are location-aware as they can provide the user with the location of the nearest store and store related advertising based on the user's location. From the identity dimension point of view, the apps are identity-based. They incorporate customer accounts to enable online shopping, integrate premium programs and their appearance is sometimes customizable to the users' preferences up to a certain extent.

Mobile shopping companion apps can be defined as mobile shopping apps extending the traditional and e-services of brick-and-mortar retailers with an additional mobile channel providing the customer with a digital companion supporting the shopping within and outside the stores using mobile technology. As mobile shopping companion apps make use of m-services that provide the infrastructure for the deployment of the mobile app (Nickerson et al., 2009), mobile shopping companion apps can be further defined by describing the m-services they provide to the user. Using the classification of mobile apps proposed by Varshney and Vetter (2002), mobile shopping companion apps incorporate mobile financial services, mobile advertising services, product locating services and shopping services.

While mobile shopping is often considered as a sole online distribution channel (Groß, 2015), mobile shopping companion apps provide several additional services besides the interface to the retailer's online shop. Following Gummerus and Pihlström (2011), Rudolph et al. (2015) identified the most attractive services of mobile shopping apps using an online survey among the dimensions information, esteem, monetary, convenience and situational value (p. 45). Mobile shopping companion apps contain a barcode scanner for retrieving detailed product information and prices, a tab for managing the retailer's loyalty cards and allow for in-store and online payment using the mobile app. Furthermore, they allow for monitoring the order progress and create shopping lists in addition to notifications for special offers and in-store sales, a tool to analyze sales receipts and offer shopping proposals based on previous shopping. For locating the nearest store location, they make use of the location-awareness. Real-time information enables to check the current in-store and online product availability. Finally, the mobile apps allow information sharing on social media sites and read product reviews created by other customers (tab. 1). As the mobile shopping companion apps are implemented by retailers traditionally Value dimension Services provided by mobile shopping companion apps Monetary Barcode scanner, loyalty card manager, in-app payment Convenience Online purchase, order progress monitoring, shopping lists Information Notifications, sales receipts analyzer, shopping proposals Situational Store locator, in-store and online product availability Social Products reviews, social media link operating brick-and-mortar stores selling nearly exclusively tangible products, this is a form of non-pure m-Commerce. Rudolph et al. (2015) found that mobile shopping companion apps are mostly used in the information and agreement phase (fig. 3) close to the purchase. Mobile shopping companion apps are an additional communication channel in the dyadic constellation of a retailer and its customers (fig. 4).

2.4. Customer Reviews for Mobile Applications

MADP[1] incorporate an opinion platform to allow the users to provide feedback for downloaded and used mobile apps. A MADP, also called mobile app store, is a type of digital distribution that makes mobile apps available for download for smartphone users without the need for physical distribution media (Dibia and Wagner, 2015, p. 4304). In 2008 the first MADP was launched by Apple (Genc-Nayebi and Abran, 2017, p. 208). Until the start of the Mac App Store and the Windows Store for desktop computers and laptops (Idu et al., 2011; Microsoft, 2017), the term app store was solely linked with MADPs.

The feedback published in the MADPs can be characterized as eWOM that is defined as "any positive or negative statement made by potential, actual, or former customers about a product or company, which is made available to a multitude of people and institutions via the Internet" (Hennig-Thurau et al., 2004, p. 39). In case of this thesis, eWOM provided through the Apple App Store (App Store) and Google Play Store (Play Store) is analyzed. It can take the form of ratings or customer review messages (Trenz and Berger, 2013, p. 3). Both eWOM mechanisms are publicly available and visible for other users and the developers of the mobile app (Pagano and Maalej, 2013, p. 125). Both, the Apple App Store (App Store) and Play Store include a rating system on a one to five scale symbolized by stars (Fu et al., 2013, p. 1278). While the App Store only allows half

[1] To avoid mix-ups between Apples App Store and the generic term app store, for the rest of this thesis the term Mobile Application Distribution Platform (MADP) is used.

Table 1: Services Provided by Mobile Shopping Companion App

Value dimension	Services provided by mobile shopping companion apps
Monetary	Barcode scanner, loyalty card manager, in-app payment
Convenience	Online purchase, order progress monitoring, shopping lists
Information	Notifications, sales receipts analyzer, shopping proposals
Situational	Store locator, in-store and online product availability
Social	Products reviews, social media link

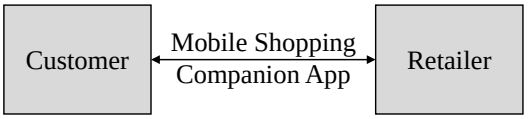

Figure 4: Dyadic Perspective on Mobile Shopping Companion Apps

star intermediate steps, the Play Store shows the actual mean value of all ratings.

Online customer reviews are defined as "peer-generated product evaluations posted on company or third party websites" (Mudambi and Schuff, 2010, p. 186) that are influenced by personal and subjective experiences of a product or service (Trenz and Berger, 2013, p. 2). In case of this thesis, the product resembles the mobile shopping companion apps and a MADP is used for posting the reviews. Users tend to write reviews either if they are euphoric and positively impressed by the use of the app or disappointed about malfunctions or the mobile app in general. Additionally, these reviews are often written using mobile devices on which typing is more difficult and not so much attention is paid on formatting and writing style (Fu et al., 2013, p. 1276). Customer reviews tend to be very short in nature and vary strongly in their quality relating to content and expressiveness (Fu et al., 2013; Genc-Nayebi and Abran, 2017; Pagano and Maalej, 2013) The online customer reviews can be used for "user-driven quality assessment" (Pagano and Maalej, 2013, p. 1) and help to improve the mobile apps or to add new functions desired by the users. Reviews are intended to inform other potential users about the usability and usefulness of the app and to guide the further development. Moreover, PPagano and Maalej (2013) have found that the topics of customer reviews for mobile apps in MADPs cover at least one of the themes "community", "requirements", "rating" and "user experience" (p. 130).

3. Methodology

Within this thesis a twofold approach is applied using two methodologies taken from literature to address the raised research questions. Firstly, a SLR is conducted to develop a multi-dimensional and hierarchical scale to measure the SQ of mobile shopping companion apps based on prior findings in literature (Vom Brocke et al., 2009). Secondly, online customer reviews of three distinct mobile shopping companion apps are analyzed in a QCA to derive design requirements for each dimension of the scale (Mayring, 2015).

3.1. Structured Literature Review

To identify and evaluate appropriate literature for this thesis the SLR approach presented by Vom Brocke et al. (2009) is applied not explicitly on Information Systems (IS) literature but on literature related to service and quality research and retailing literature especially in the field of e-Commerce and m-Commerce. The author's iterative review process consists of the four main phases definition of review scope, conceptualization of topic, literature search and literature analysis and synthesis.

The review scope of the present thesis is defined using the taxonomy of literature reviews by Cooper (1988). The SLR integrates and synthesizes previous research outcomes and theories on a conceptual basis in the context of ESQ, MSQ and MASQ (app. A). The conceptualization of the topic phase has already been addressed through the definitions in chapter 2. The next phase, literature search, itself consists of the sub phases journal search, database search, in-/ exclusion criteria and back-/ forward search. Concerning the searched journals, no restrictions were made during the SLR to allow for an exhaustive coverage. The topic of SQ spreads into various research areas (app. A). Four online databases were searched to identify appropriate literature. EBSCOhost, Scopus and Web of Science reference to papers from the majority of renowned peer-reviewed, scientific journals including retailing, service and quality related articles. The electronic library of the Association for Information Systems (AIS) is included to integrate research papers, conference papers and journal articles from the field of IS research. As Vom Brocke et al. (2009) stated that a precise set of keywords should be used to find appropriate literature in online databases, prior

to the SLR pivotal literature to the topic is checked for keywords used that are in line with the research questions of the present thesis. Structuring those keywords results in the general search string for the online database search as depicted in table 2 (app. A).

The number of initial findings from each online database can be seen in table 3. In- and exclusion criteria have been specified to ensure that only papers relevant for the backdrop of the research questions are selected. Papers are included that focus on the development and evaluation of scales for the measurement of ESQ, MSQ and MASQ. The complete set of exclusion criteria is presented in appendix A. Most importantly papers are excluded whose SQ dimensions are not applicable generally or in the context of e-Commerce and whose focus of the SQ dimensions is not Business to Consumer (B2C). Further, papers are excluded that are not available in English language, duplicates, including papers repeating previously established SQ dimensions. Applying these criteria on the initial set of papers results in 12 relevant papers (tab. 3).

After the set of relevant papers has been selected an additional backward search is conducted with the references of the selected papers and a forward search is executed to find further paper that cited the already selected papers. This results in additional 23 potentially relevant papers. Evaluating these additional papers combined with the already relevant papers results in the final set of 35 relevant papers. These papers are presented in table 4 including quality and measurement domain as well as the number of dimensions[2] and items. The SLR reveals that some of the ESQ scales do not measure the quality of the whole e-Commerce process but only focus on the design of the website. Thus, they are labeled WDQ scales (tab. 4) in line with the findings by Cristobal et al. (2007) and Francis (2009). The final set of papers forms the foundation for the literature analysis and synthesis in chapter 4. This synthesis results in a scale to measure the SQ of mobile shopping companion apps. The dimensions for this scale are derived by comparing prior ESQ, MSQ and MASQ scales in a conceptual matrix using the dimensions by Stiakakis and Petridis (2014) as reference (Webster and Watson, 2002).

3.2. Online Customer Review Analysis

The customer reviews of the three mobile shopping companion apps[3] by Walmart, Tesco and M&S are analyzed to derive design requirements for the improvement of the MASQ. For the analysis of the online customer reviews the systematic approach for a QCA by Mayring (2015) is applied combined with the approach used by PPagano and Maalej (2013) and Knote and Söllner (2017) to extract and prepare the sample of reviews for the purpose of analysis. The QCA by Mayring (2015) is frequently used in literature to derive information from user-generated content like customer reviews (e.g., Balauca and Mehta, 2015; Giannakos, 2014; Spreer and Rauschnabel, 2016).

Following the two-step approach introduced by PPagano and Maalej (2013), in the preparation phase the customer reviews for the three mobile shopping companion apps are exported from the App Store and Play Store using a web-based customer review crawler service[4] on the 3rd of July 2017 (p. 127). Next, the exported customer reviews are converted from the comma-separated value format into a table-based Microsoft Excel file. These raw files contain information concerning the mobile app name, date, title and content of the review, the nick name of the customer who created the review, the rating that is provided and the rated version of the mobile app. Additional columns for the integration of the coding are added to the raw files (digital appendix).

In the first step of the analysis phase, the customer reviews are limited to current reviews from 2017 and useless and non-informational customer reviews with regard to the design requirements are discarded manually (Knote and Söllner, 2017, p. 125). Among others, these are reviews expressing praise like "lovely app" or "Great app!" and criticism without implications for improvements such as "Useless!" or "Can't recommend the app". Additionally, customer reviews concerning the retailer's general assortment, delivery quality, time and costs and recommendations for other users are excluded just like non-English reviews. This step leaves 1,448 reviews for the further QCA (tab. 13).

For the assignment of the customer reviews to the identified dimensions from the literature review, the QCA is applied (Mayring, 2015, p. 50ff.). More specifically, the content structuring approach a form of deductive category assignment (Mayring, 2014, p. 95f.) that allows the extraction of information according to theoretically predefined categories is used (fig. 5). The manual coding of the online customer reviews is supported by an online tool[5]. After the manual coding, it allows to export statistics on the coding categories including exemplary text passages (digital appendix).

The unit of analysis, the customer reviews for mobile apps, has already been defined in section 2.4 including the analysis of the situation of creation and the formal characterization of the material. Initially, 10,099 customer reviews are extracted from a total of 525,813 ratings. For further statistics on the extracted customer reviews see subsection 5.1.2.

The content categories resemble the MASQ dimensions and the characteristics equal the items as manifestations of the categories. These steps are the output of the literature analysis and synthesis in chapter 4. Moreover, definitions, anchor examples and the coding system are also included in this chapter.

[2] If the SQ scale uses a hierarchical structure, the secondary dimensions are presented in brackets.

[3] More information about the three mobile shopping companion apps by Walmart, Tesco and M&Sunder investigation in this thesis can be found in subsection 5.1.1 and appendix B.

[4] The used web-based customer review crawler service is provided by heedzy.com. To exceed the limit of freely extracting 100 customer reviews, a premium license is required.

[5] The online tool supporting the manual coding is QCAmap.org provided by Prof. Dr. Philipp Mayring and Dr. Thomas Fenzl.

Table 2: General Search String

*(("app" OR "mobile" OR "electronic" OR "m-" OR "e-") AND ("service quality") AND ("*commerce" OR "*shopping") AND ("criteria" OR "dimension" OR "measure*"))*

Table 3: Structured Literature Review Summary

	AIS Electronic Library	Web of Science	Scopus	EBSCO Host
Preliminary results	26	122	99	95
Title check and availability	11	41	48	33
Duplicate check		109		
Abstract check		42		
Content check		12		
Forward/Backward search		23		
Final results		35		

As Mayring (2015) suggests evaluating the dimensions and their items with a smaller test sample taken from the set of customer reviews, 100 customer reviews per mobile shopping companion app are analyzed to check the coverage of the identified MASQ dimensions (p. 97). The test run is indicated with the back loop and activity six in figure 5. This test run reveals that the dimension customization/personalization seems not to be of interest for the customers although it is often considered as a MASQ dimension and the mobile shopping companion apps allow at least for minor customization.

The analysis of the customer reviews, the paraphrasing and summary per category are all part of chapter 5 resulting in design requirements for an improved SQ for mobile shopping companion apps. Besides the anchor examples for the dimensions, further quotes taken from the online customer reviews will be integrated in chapter 5 following the prototyping approach (Mayring, 2015, p. 48). These prototypes should illustrate the derivation of the design requirements from the online customer reviews.

4. Mobile App Service Quality

This chapter is dedicated to the development and presentation of the MASQ scale. Firstly, the scale is introduced as multi-dimensional and hierarchical including the process of the scale development (section 4.1). Secondly, the primary dimensions structure the description of the secondary dimensions of the MASQ scale (sections 4.2-4.4).

4.1. Mobile App Service Quality Measurement Scale

As Ladhari (2010) mentions that SQ scales have to be tailored to the specific industry applied (p. 474), the developed measurement scale can be used to assess the MASQ of mobile shopping companion apps provided by brick-and-mortar retailers.

4.1.1. Dimensionality and Hierarchy

The SLR reveals that there is only little previous research available on MASQ. This may be because of m-Commerce increasingly emerged within the last few years making use of recent mobile technologies (Kuo et al., 2016, p. 2). Only the paper by Kuo et al. (2016) deals with MASQ (tab. 4). An additional attempt to develop a scale for the measurement of MASQ was made by Kumar (2017). However, this research was discarded from the final set of papers because of quality reasons. Therefore, the scale for measuring MASQ has to draw on existing MSQ scales as MASQ is described as a subset of MSQ. Additionally, some dimensions from ESQ and even WDQ can be adapted for measuring the SQ of mobile apps.

Though, there seems to be no consensus on the exact number and nature of dimensions and items when measuring ESQ or MSQ (Holloway and Beatty, 2008, p. 349). The number of dimensions reaches from two to 15 while the number of related items varies from eleven to 40 (tab. 4). Previous literature has already proven this finding for available ESQ scales (e.g., Blut et al., 2015; Ladhari, 2010). It is justified by diverse areas of application because of different focuses of the scales and particular industry segments (Hsu et al., 2012, p. 242). Nevertheless, it is broadly recognized in literature that SQ is measured using multi-dimensional scales (e.g., Collier and Bienstock, 2006; Cristobal et al., 2007; Heinonen and Pura, 2008; Wolfinbarger and Gilly, 2002). This is due to the fact that the quality and SQ constructs are complex (Collier and Bienstock, 2006; Parasuraman et al., 1985, 1988) as they encapsulate functional and non-functional aspects (Francis, 2009, p. 451). This is also the case for SQ in the electronic and mobile environment (Aladwani, 2002; Francis, 2009, p.

Table 4: Structured Literature Review Summary

Author	Year	Quality domain	Measurement domain	Number of dimensions/items
Yoo and Donthu	2001	WDQ	e-Commerce	4/9
Aladwani	2002	WDQ	General	6/25
Barnes and Vidgen	2002	WDQ	e-Commerce	5/25
Francis and Lesley	2002	ESQ	e-Commerce	6/23
Gefen	2002	ESQ	e-Commerce	3/22
Janda et al.	2002	ESQ	e-Commerce	5/22
Madu and Madu	2002	ESQ	e-Commerce	15/n.a.
Wolfinbarger and Gilly	2002	ESQ	e-Commerce	4/14
Cai and Jun	2003	ESQ	e-Commerce	4/19
Santos	2003	ESQ	e-Commerce	2(11)/n.a.
Wolfinbarger and Gilly	2003	ESQ	e-Commerce	4/14
Jun et al.	2004	ESQ	e-Commerce	6/21
Long and McMellon	2004	ESQ	e-Commerce	5/19
Webb and Webb	2004	WDQ	e-Commerce	2(9)/43
Cao et al.	2005	WDQ	e-Commerce	4(8)/42
Kettinger and Lee	2005	ESQ	General	4/18
Lee and Lin	2005	ESQ	General	5/15
Parasuraman et al.	2005	ESQ	e-Commerce	4/22
Parasuraman et al.	2005	ESQ	e-Commerce	3/11
Bauer et al.	2006	ESQ	General	5/25
Collier and Bienstock	2006	ESQ	e-Commerce	3(11)/54
Fassnacht and Koese	2006	ESQ	General	3(9)/24
Bressolles et al.	2007	ESQ	e-Commerce	6/18
Cristobal et al.	2007	ESQ	General	4/17
Loiacono et al.	2007	WDQ	General	4(12)/36
Holloway and Beatty	2008	ESQ	e-Commerce	4/37
Li and Leng	2008	ESQ	General	3(9)/n.a.
Tan and Chou	2008	MSQ	General	7/36
Vlachos and Vrechopoulos	2008	MSQ	General	7/32
Swaid and Wigand	2009	WDQ	e-Commerce	7/28
Ding et al.	2011	ESQ	e-Commerce	4/19
Vlachos et al.	2011	MSQ	General	3(7)/n.a.
Stiakakis and Petridis	2014	MSQ	General	3(11)/40
Huang et al.	2015	MSQ	General	4-5/15
Kuo et al.	2016	MASQ	m-Commerce	7/35

467f.).

Moreover, considering the results of the SLR, a hierarchical approach is sometimes used to measure ESQ and MSQ (tab. 4). The concept of a hierarchical SQ scale is first introduced by Dabholkar et al. (1996) in the context of retail stores and underpinned with empirical evidence by (Brady and Cronin, 2001). Especially the more recent papers on MSQ incorporate this hierarchical approach to assess the different connotations of SQ (e.g., Stiakakis and Petridis, 2014; Vlachos et al., 2011).

4.1.2. Development

A multi-dimensional and hierarchical scale is often used for measuring ESQ and MSQ as mentioned in the previous subsection. Hence, the scale for measuring MASQ will also apply multiple dimensions to address the issue of MASQ measurement from various perspectives in a comprehensive manner and will use two hierarchy levels for structuring the dimensions. The overall MASQ of a mobile shopping companion app is thus measured using more detailed sub-dimensions and related items for measuring concrete aspects of the SQ.

For determining the primary dimensions of the MASQ scale, the hierarchical scales identified in the SLR are an-

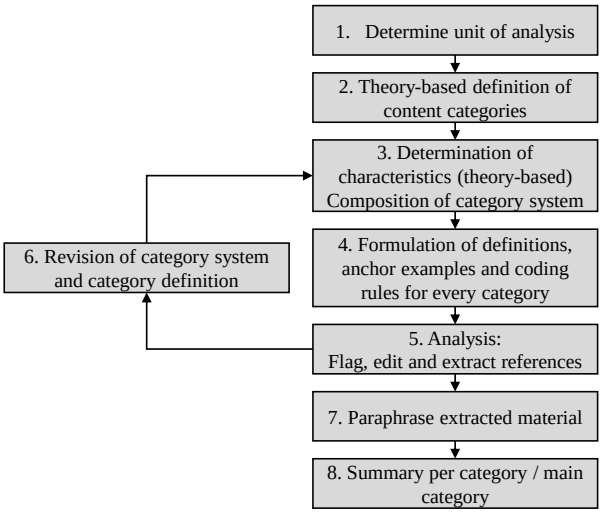

Figure 5: Procedure of the Qualitative Content Analysis (Mayring, 2015, p. 98)

alyzed. Regarding recent hierarchical MSQ measurement scales, it seems that there is at least a consensus concerning the primary dimensions (Fullerton, 2005; Lu et al., 2009; Stiakakis and Petridis, 2014) As primary dimensions interaction quality, environment quality and outcome quality are often used in the context of m- services. These three primary dimensions also form the first-order dimensions for the developed MASQ scale (fig. 6).

To identify relevant secondary dimensions for the MASQ scale, the dimensions of the scales identified during the SLR are compared on a conceptual basis using a conceptual matrix as proposed by (Webster and Watson, 2002). Several authors found that there are some SQ dimensions that are commonly chosen (e.g., Francis, 2009; Hu, 2010). For comparing the dimension, the MSQ dimensions introduced by Stiakakis and Petridis (2014) are used as reference dimensions (tab. 29). These dimensions are chosen as reference because the scale is empirically tested, is developed for measuring MSQ, builds upon prior research on MSQ (e.g., Lu et al., 2009) and provides a comprehensive overview on the SQ of general m-services incorporating all e-Commerce phases. The conceptual comparison of the dimension is not only executed on the denotation of the terms but also considering the specific definitions as presented in literature[6] and related items. Using the conceptual matrix, eight candidate dimensions are identified for measuring the MASQ. These candidate dimensions are commonly used dimensions for assessing the ESQ and MSQ. The percentages in brackets indicate the frequency of occurrence in all SQ scales identified during the SLR (app. C). These are the the secondary dimensions problem solving (84.8%), information (75.8%), security/privacy (78.8%) and customization/personalization (42.4%) subsumed in the primary dimensions interaction quality, equipment (48.5%) and design (78.8%) for the environment quality dimension and reliability (75.8%) and valence (39.4%) for the outcome quality dimension.

The problem solving dimension refers to the quality of the customer support the provider offers in case of any issues. Information resembles to the quality and actuality of the information provided through the mobile app. The dimension security/privacy deals with the protection of the customer's data and quality of security features against vulnerabilities. Customization/personalization describes the ability of a mobile app to be modified according to a user's needs. The equipment dimension is concerned with the performance of the mobile app in context of the mobile device and mobile network. The aesthetics and ease of use are content of the design dimension. Reliability initially describes the reliability of the service completion compared to the agreement with the provider. Finally, the valence dimension measures the customer's overall satisfaction or dissatisfaction with the provided m-service. These dimensions are introduced in more detail following the primary dimension they are related to in section 4.2, 4.3 and 4.4. The remaining secondary dimensions expertise (21.2%), content (9.1%) and tangibles (12.1%) are only rarely used and seem not to be appropriate for measuring the MASQ (tab. 29).

More specifically, the results of the literature synthesis in the conceptual matrix suggest applying modified denotations for the dimensions problem solving and equipment that are used more frequently. Thus, the secondary dimension problem solving is renamed to responsiveness and the secondary dimensions equipment is denoted as performance. The complete conceptual matrix is presented in appendix C.

As the content structuring approach by Mayring (2015) allows to refine the categories established prior to the QCA by using the literature, the candidate dimensions are tested with the actual online customer reviews in a small test sample (sec. 3.2). Analyzing the test sample reveals that the candidate dimension customization/personalization is not of in-

[6] An overview of the dimensions and their definitions of all SQ scales from the SLR can be found in the digital appendix in alphabetic order.

terest for the users of the mobile shopping companion apps. Therefore, this candidate dimension is discarded. Furthermore, the reliability dimensions is further specified, in line with the previous two category refinements and the scope of this thesis. Most of the authors define this dimension as delivery reliability or fulfillment (e.g., Collier and Bienstock, 2006; Francis and Lesley, 2002; Holloway and Beatty, 2008; Huang et al., 2015; Kuo et al., 2016). However, the actual delivery is not part of the MASQ but of the logistics quality that is not included in the MASQ scale. The online customer reviews also tend to highlight technical malfunctions and service dropouts with reliability. Hence, this dimension it further denoted as technical reliability. Moreover, analyzing the test sample, an additional candidate category is inductively found. This category is denoted features and mirrors the influence of a diverse set of features and services on the SQ of a mobile app. Although this dimension appears not to be measurable assessing the mobile app or m-services provided, it is frequently mentioned by customers in the online customer reviews. Thus, it might also be a determinant of MASQ to the regard that a certain feature set is required for achieving a high MASQ. Therefore, the set of features requested by the customers compared with the suggestions from literature is not integrated in the MASQ measurement scale but depicted separately in section 5.5 (e.g., Rudolph et al., 2015).

As even the secondary dimensions include a huge set of quality aspects that can only be hardly measured directly, each secondary dimension is further specified by more detailed items. These items resemble manifestations of the related secondary dimensions that can be measured as determinants of SQ in the context of mobile shopping companion apps. They are either taken from literature or inductively derived from the results of the QCA.

4.1.3. Overview

Having developed the structure of the MASQ measurement scale and shortly introduced the primary and secondary dimensions of the MASQ scale, the final scale for measuring the MASQ is presented in figure 6 and table 5.

The MASQ as overall quality construct is situated on top of the hierarchy at the right (Stiakakis et al., 2013, p. 1). Then, the primary dimensions form the second-level in the middle and the secondary dimensions are located at the bottom of the MASQ hierarchy at the left (fig. 6). Beneath the level of the secondary dimensions, an additional item level is situated that is not displayed here for reasons of clarity. Though, the 22 items that further describe the secondary dimensions are introduced in table 5. This MASQ scale is intended to measure the SQ of the whole m-service process from the information to the after-sales phase as described by Bauer et al. (2006).

4.2. Interaction Quality Dimension

Interaction quality involves the quality dimensions assessing the interaction between the customer and the m-service provider during the service delivery (Stiakakis and Petridis, 2014, p. 942). It resembles the functional dimension introduced by Grönroos (1984) as presented in subsection 2.2.1. It has a significant influence on the overall perceived MSQ, according to Lu et al. (2009). The primary dimension interaction quality is accompanied by the secondary dimensions Responsiveness, Information and Security and Privacy.

4.2.1. Responsiveness

Responsiveness is concerned with the retailer's ability and willingness to help customers by promptly answering their inquiries and solving their problems when interacting with the mobile shopping companion app (Bauer et al., 2006; Ladhari, 2010). Bauer et al. (2006) also consider the "availability of alternative communication channels" (p. 871) as part of the responsiveness dimension. Indeed, alternative channels for communicating with the customer support personnel are necessary if the mobile shopping companion app does not start. Politeness of the customer service personnel is transferred from the traditional service environment to e-services (Parasuraman et al., 1985, 2005). Moreover, several authors also include the retailer's return and exchange policies into these dimensions (e.g., Bauer et al., 2006; Holloway and Beatty, 2008; Parasuraman et al., 2005). However, this is considered to be out of scope of the MASQ scale since these terms and policies are more general in nature and not adapted for the use with a mobile app. Customer service here only refers to issues related with the particular usage of the mobile shopping companion app and not with any logistics related problems such as false or damaged deliveries. Customer service can be required throughout all e-Commerce stages as requests to the retailer can occur at any time in the purchasing process (Holloway and Beatty, 2008, p. 350). Customer service and responsiveness influences the overall perceived SQ but is not useful for predicting the overall SQ because it is not necessarily needed in all mobile purchases (Lee and Lin, 2005; Wolfinbarger and Gilly, 2003). The responsiveness dimension is defined for the present MASQ scale as the retailer's ability to promptly and politely solve a customer's issues related with the mobile app. A high MASQ is achieved if the responsiveness perceived by the customer meets or even exceeds the expected responsiveness. This dimension involves the items customer service availability, problem solving ability, kindness of employees and guidance within the app (tab. 6).

RES1: Customer service availability

Firstly, customer service quality is measured by the item customer service availability. As mobile shopping companion apps allow access to the retailer's m-services without temporal and spatial constraints, customer service also has to be reachable at any time a customer has an issue with the mobile shopping companion app. This instant help can take the form of a communication with an employee via phone or electronic media, e-mail or a Frequently Asked Questions (FAQ) page. Although self-service sites and FAQ pages are available at any time, customers prefer personal advice and communication with a retailer's employee (Santos, 2003, p.

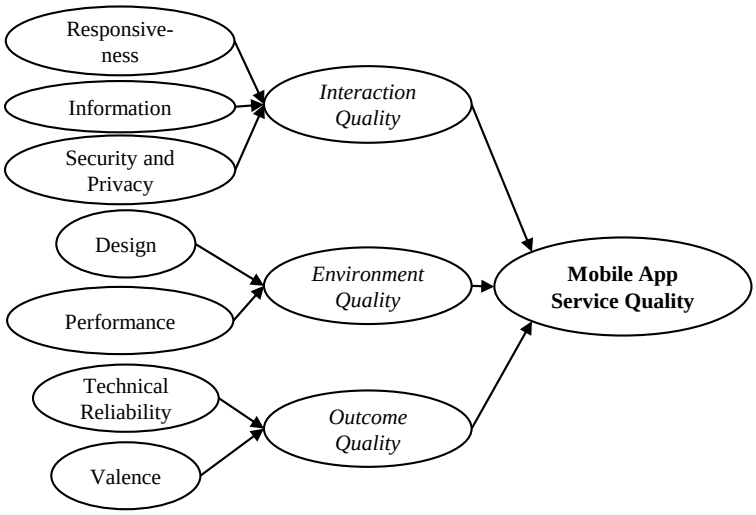

Figure 6: Mobile App Service Quality Measurement Scale

242). The availability of the service personnel can be an issue (Bauer et al., 2006, p. 871).

"I have rung Customer Services on a number of occasions only to be fobbed off if I got one on the line."[7]

RES2: Problem solving ability

Secondly, the retailer's problem solving ability covers prompt and correct responses to customer inquiries. These responses should solve the customer's problems. Advice should be given in a precise, polite and understandable manner giving the customer the feeling that someone is caring for his or her problems.

"Went into store who told me to ring customer services who told me to go on website!!"

RES3: Politeness and kindness of personnel

Thirdly, customer service quality is influenced by the politeness and kindness of the personnel directly interacting with the customer. Analogous to the traditional service environment where Parasuraman et al. (1985) introduced the term "courtesy" (p. 47), customers still expect polite personnel when having issues with their mobile shopping companion app. "I always find Customer Service advisers, polite and caring."

RES4: Guidance and instructions for app usage

Finally, the mobile shopping companion app should incorporate guidance and instructions for using the mobile app. Among other things the actual shopping procedure has to be accompanied with instruction if something remains unclear for the user and features have to be explained for a proper usage. The in-app guidance and instructions for mobile app usage item is introduced to the MASQ measurement scale because customers unfamiliar with the handling of mobile apps begin to make their shopping mobile. Especially, elderly people are introduced to mobile devices by their relatives or friends and try to do their regular shopping with the mobile shopping companion apps. Hence, this item is added to represent these customers. The mobile app should be usable by a new user without considering additional sources of information. This information should be contained within the mobile app.

"Can't find instructions on how to use, and there are features that are not all that intuitive."

4.2.2. Information

The information dimension refers to the quality of information provided through the m- services and the benefit that can be derived from it (Ladhari, 2010, p. 473). The information quality dimension impacts the overall perceived SQ (Collier and Bienstock, 2006; Santos, 2003). It can even affect the customer satisfaction and the customer's reuse and repurchase intentions (Lynch and Ariely, 2000). Information quality is even more important in pure m-services (e.g. online purchase) as they cannot by accompanied by information available in a traditional store (Yang et al., 2005). As mobile shopping companion apps are also designed to enhance the shopping experience in brick-and-mortar stores, they have to sensibly extend the information available offline. The information quality dimension is sometimes integrated within website design or content dimension in existing ESQ and MSQ scales identified during the SLR (e.g., Holloway and Beatty, 2008; Santos, 2003).

For a high SQ, customers demand "up-to-date, detailed, sufficient, and accurate informa- tion" (Stiakakis and Petridis, 2014, p. 943). Yang et al. (2005) differentiate between usefulness and adequacy of information for their information quality dimension (p. 578f.). Information provided through m-services has to be up-to-date at any time. Customers should not feel misled by out-dated information (Santos, 2003, p. 240). Furthermore, the information provided

[7] The online customer reviews used as anchor examples and evidence for implementation guidelines and service design requirements are cited verbatim and are neither corrected in grammar or orthography.

Table 5: Mobile App Service Quality Measurement Scale

Dimension	Description	Sources
Interaction quality	Reflects all the quality characteristics of a customer's interaction with the m-service provider	Lu et al. (2009), Stiakakis and Petridis (2014)
Responsiveness	The retailer's ability to promptly and politely solve a customer's issues related with the mobile app RES1: Customer service availability RES2: Problem solving ability RES3: Politeness and kindness of personnel RES4: Guidance and instructions for app usage	Bauer et al. (2006), Blut et al. (2015), Holloway and Beatty (2008), Parasuraman et al. (2005), Wolfinbarger and Gilly (2003)
Information	The provision of accurate and precise information by the retailer INF1: Information adequacy INF2: Information usefulness INF3: Information correctness	Collier and Bienstock (2006), Fassnacht and Koese (2006), Holloway and Beatty (2008), Loiacono et al. (2007), Santos (2003), Stiakakis and Petridis (2014), Yang et al. (2005)
Security and Privacy	The protection of system and network resources from any external or internal attack and the protection of the customers' personal data SEC1: Information security SEC2: Data protection SEC3: Data collection	Blut et al. (2015), Holloway and Beatty (2008), Parasuraman et al. (2005), Santos (2003), Stiakakis and Petridis (2014), Wolfinbarger and Gilly (2003)
Environment quality	Reflects the context in which mobile apps are delivered, and quality characteristics of the equipment that affect the mobile apps delivery	Lu et al. (2009), Stiakakis and Petridis (2014)
Design	The aesthetics features and layout of the user interface design DES1: Visual aesthetics and clarity of layout DES2: Quality of multimedia content DES3: Ease of use and ease of navigation DES4: Search function and filters	Collier and Bienstock (2006), Fassnacht and Koese (2006), Holloway and Beatty (2008), Parasuraman et al. (2005), Santos (2003), Stiakakis and Petridis (2014), Wolfinbarger and Gilly (2003)
Performance	The performance of the mobile app and its resource requirements PERF1: Processing speed PERF2: Device storage usage and mobile network usage PERF3: Device and connection quality	Collier and Bienstock (2006), Fassnacht and Koese (2006), Huang et al. (2015), Madu and Madu (2002), Parasuraman et al. (2005), Stiakakis and Petridis (2014)
Outcome quality	Reflects the technical quality of the service delivery and the customer's satisfaction with the mobile service	Lu et al. (2009), Stiakakis and Petridis (2014)
Technical reliability	The accurate and consistent operation of the mobile app and the services provided REL1: Mobile app and feature reliability REL2: Availability of m-services REL3: Continuous operation after updating	Fassnacht and Koese (2006), Huang et al. (2015), Li and Leng (2008), Santos (2003), Stiakakis and Petridis (2014), Swaid and Wigand (2009), Wolfinbarger and Gilly (2003)
Valence	The final impression of the customer upon the completion of the service delivery VAL1: Overall satisfaction with the m-services VAL2: Satisfaction with the scope of services	Bauer et al. (2006), Fassnacht and Koese (2006), Loiacono et al. (2007), Stiakakis and Petridis (2014), Tan and Chou (2008), Vlachos et al. (2011)

Table 6: Responsiveness Dimension Summary

Definition	The retailer's ability to promptly and politely solve a customer's issues related with the mobile app
Items	RES1: Customer service availability RES2: Problem solving ability RES3: Politeness and kindness of personnel RES4: Guidance and instructions for app usage
Anchor examples	"I have rung Customer Services on a number of occasions only to be fobbed off if I got one on the line." "Went into store who told me to ring customer services who told me to go on website!!" "I always find Customer Service advisers, polite and caring." "Can't find instructions on how to use, and there are features that are not all that intuitive."
References	Bauer et al. (2006), Blut et al. (2015), Holloway and Beatty (2008), Parasuraman et al. (2005), Wolfinbarger and Gilly (2003)

should be tailored to the customer segment usually purchasing at the retailer to be understandable and relevant (Collier and Bienstock, 2006; Loiacono et al., 2007). The amount of information and its presentation have to be adequate because excessive or substandard information are both perceived negatively by customers (Santos, 2003, p. 240). These characteristics of information quality need to be fulfilled throughout the whole period of interaction with the mobile shopping companion app and need to apply for all information provided such as product, system and retailer information (Fassnacht and Koese, 2006, p. 26).

For the MASQ scale, information quality is defined as the provision of adequate and useful information by the retailer. With regards to the information quality dimension, a high MASQ requires the customers' perceptions of the information quality meet or exceed their expectations. Information quality is further specified by the items information adequacy, information usefulness and information correctness (tab. 7).

INF1: Information adequacy

The information adequacy item is concerned with the "completeness of information" (Yang et al., 2005, p. 579). In case of m-Commerce, complete information involves product descriptions including price transparency and payment information to allow customers to understand the product and make informed purchase decisions. This also involves system information such as the "full disclosure of policies, procedures" (Collier and Bienstock, 2006, p. 264), additional charges and update descriptions including changes, features and bug fixes. Additionally, general information about the provided m-services and the retailer itself should be given (Yang et al., 2005, p. 579).

"Items lack critical input such as dimensions, item #'s, descriptions, etc."

INF2: Information usefulness

Information usefulness can be described by relevancy, clearness, accuracy, consistency and currency. More specifically, information currency involves the timeliness of information and regular updates to incorporate new and adapted information. Information accuracy relates to freedom of errors and information relevancy describes the relevance of information to serve the purpose and task of the customer (Yang et al., 2005; Loiacono et al., 2007).

"Clear and useful product descriptions"

INF3: Information correctness

Information correctness deals with providing and displaying the right information in the mobile app. Among other things, this refers to product descriptions or locations and prices. The correctness of in-store and online stock is essential for the usefulness of the stock availability check. Besides the correctness, the currency is also important as the stock information should ideally be real-time (Holloway and Beatty, 2008, p. 361). This enables customers to see how many items are on stock and if the product is available at their preferred store. The correct and timely stock information is also important for mobile purchases to ensure an on-time delivery. The focus of the information correctness item is placed on the correctness and currency of in-store and online stock information as many customers complain about incorrect stock information in the online customer reviews as presented in the QCA in section 5.1.1.

"I downloaded this app to see if an item was in stock at a store. It says it was. I drove all the way there. It was not there. What good is an app that says something is in stock if it is inaccurate?"

4.2.3. Security and Privacy

Security and privacy is a concern of 26 of the 33 scales identified during the SLR (app. C). Although security and privacy issues are already a concern in e-service environments, Kuo et al. (2016) found that this issue is even of higher importance in mobile shopping apps with less control over personal and payment information (p. 5). Security and privacy haven "a very strong impact on m-service quality" (Stiakakis and Petridis, 2014, p. 943). Issues related to security and

Table 7: Information Dimension Summary

Definition	The provision of adequate and useful information by the retailer.
Items	INF1: Information adequacy INF2: Information usefulness INF3: Information correctness
Anchor examples	"Items lack critical input such as dimensions, item #'s, descriptions, etc." "Clear and useful product descriptions" "What good is an app that says something is in stock if it is inaccurate?"
References	Collier and Bienstock (2006), Fassnacht and Koese (2006), Holloway and Beatty (2008), Loiacono et al. (2007), Santos (2003), Stiakakis and Petridis (2014), Yang et al. (2005)

privacy are relevant across all phases of commerce from information to after sales (Holloway and Beatty, 2008, p. 350).

While Parasuraman et al. (2005) describe privacy as protection of customer-related and credit card information, Holloway and Beatty (2008) interpret this dimension broader, also including the feeling of safety when interacting with an e-service. Customer-related information are a customer's personal information such as name, address and purchasing information that are linked with the customer. Privacy also includes that the retailer is not allowed to hand over customer-related information to any third-party without the customer's explicit permission. In addition, the retailer has to ensure that the customer's personal data and credit card information are secured against any form of fraud or hacker attacks and that the information is not lost due to any system malfunctions, besides the intentional handover of customer-related information (Holloway and Beatty, 2008, p. 357).

Hence, adequate security features of the mobile app are important for a high MASQ such as encrypted data transmission (Fassnacht and Koese, 2006, p. 27) and secured log-in (Wolfinbarger and Gilly, 2003, p. 193). Customers oftentimes do not use the mobile app if they have doubts regarding the security of their personal and credit card information (Blut, 2016, p. 505). For the MASQ scale security and privacy is defined as "the protection of system and network resources from any external or internal attack and the protection of the customers' personal data"(Stiakakis and Petridis, 2014, p. 943). The security and privacy dimension includes the manifestations information security, data protection, data collection (tab. 8).

SEC1: Information security

Information security is not only the most important SQ factor in e-services but also in m-services (Ladhari, 2010; Kuo et al., 2016). Because of the wireless transmission in m- services there is an additional potential security issue. For mobile shopping companion apps, the retailer as developer and distributor of the mobile app has to ensure that personal and payment data that are stored for convenience at the checkout, are kept confidentially without any intended or unintentional access of any third-party or unauthorized personnel. This security has to be assured for the data transmission via the mobile internet, for the storage within the systems of the retailer and especially for the mobile shopping companion app executed on the smartphone. This involves encryption on the device and secured access to the mobile app using passwords or finger prints to restrict at least the access to the check-out to the intended customer if the smartphone is used by another person. The customer should not be in doubt about his or her personal or payment data (Santos, 2003, p. 242).

"Needs better security features was hacked and almost lost my money to a Russian."

SEC2: Data protection

Data protection in this context means that the customer always has to possess the control over his or her personal and payment data. The retailer or its employees are only allowed to store and use the customers' data after they explicitly granted their permission. Especially, for sharing customer-related data with third-parties such as advertisers or suppliers permission is required. This includes explicit indications when data is shared and stored and the possibility to change and delete personal or payment data.

"Without my knowledge or permission, it stored my credit card information. This is absolutely unacceptable!"

SEC3: Data collection

With an increasing safety awareness of the customers, the developers of smartphone operating systems have integrated features to control the permissions of the mobile apps executed on the smartphone. These permissions govern the data collection potential of the mobile app. Among others, these permissions include access to a customer's media files or social media accounts and device functions such as storage, network usage or camera. A mobile shopping companion app is considered as safe in this regard if it requires as less permissions as possible to obtain its complete functionality. This means that for instance the barcode scanning feature of the mobile shopping companion app only works properly if it has the permission to access the camera. Otherwise the screen will stay black. Hence, a potential security breach may be if the mobile shopping companion app requests permissions that are not necessary for a properly execution. This item is newly added to the context of MASQ as data collection and

Table 8: Security and Privacy Dimension Summary

Definition	The protection of system and network resources from any external or internal attack and the protection of the customers' personal data.
Items	SEC1: Information security SEC2: Data protection SEC3: Data collection
Anchor examples	"Needs better security features was hacked and almost lost my money to a Russian." "Without my knowledge or permission, it stored my credit card information. This is absolutely unacceptable!" "The last version of the app [. . .] requires so many extra permissions that I am not willing to keep installed"
References	Blut et al. (2015), Holloway and Beatty (2008), Parasuraman et al. (2005), Santos (2003), Stiakakis and Petridis (2014), Wolfinbarger and Gilly (2003)

especially permissions are not such an issue in the ESQ environment. The awareness of data collection has evolved in recent years with the emergence of mobile apps on mobile devices.

"The last version of the app [. . .] requires so many extra permissions that I am not willing to keep installed".

4.3. Environment Quality Dimension

Environment quality describes the quality characteristics of the mobile device used to access the m-service and "the quality of the context in which m-services are delivered" (Stiakakis and Petridis, 2014, p. 942). The environment quality has a huge impact on the quality perception compared to e-services because users can use the provided services without spatial and temporal constraints (Heinonen and Pura, 2008, p. 2). The technical features of the mobile device (e.g. screen size, battery capacity) and the network coverage of mobile cellular networks affect the quality of the delivered m-services (Stiakakis and Petridis, 2014, p. 942). Environment quality is measured with the secondary dimensions Design and Performance.

4.3.1. Design

The design dimension is concerned with the visual aesthetics of the User Interface (UI) of the mobile app and features for a more efficient information retrieval such as the internal search engine and filters. Several authors have shown that the visual design of an e-service or m-service highly impacts the customer's overall SQ perception (e.g., Brady and Cronin, 2001; Lu et al., 2009; Stiakakis and Petridis, 2014; Vlachos and Vrechopoulos, 2008; Wolfinbarger and Gilly, 2002). Besides the mere SQ, the design dimension not only influences the customer's intention for reuse and revisit but also the customer's perception of the retailer (Rosen and Purinton, 2004; Sohn and Tadisina, 2008). Although the design dimension is present in 26 of the 35 ESQ and MSQ scales identified during the SLR, there is no consensus about the number of design related dimensions. Parasuraman et al. (2005) use the term "Efficiency" (p. 7) to include design-related aspects in their E-S-QUAL scale. Efficiency describes an e-service as "simple to use, structured properly" (Parasuraman et al., 2005, p. 7) and requiring less input by the customer. Collier and Bienstock (2006) for instance introduce the two dimensions "Design" (p. 264) and "Ease of use" (p. 264) in the context of the design dimension. Santos (2003) even uses the three design-related secondary dimensions "Ease of use", "Appearance" and "Structure & layout" below the "Incubative dimension" (p. 239) in her ESQ measurement scale.

Generally, design refers to the "visual appearance and audible application" (Collier and Bienstock, 2006, p. 264) of a mobile app including "color, animation, pictures, text, format, and sound" (Collier and Bienstock, 2006, p. 264). The visual appearance also includes the layout and structure of the mobile app. It can be used to simplify the use of the mobile app by having a flat and clean design that guides the customer through the whole mobile app (Santos, 2003, p. 239). Design quality is subjectively perceived by every single customer. Preferences for colors used, layouts and images vary widely among customers (Swaid and Wigand, 2009, p. 16). While a specific color is preferred by a certain group of customers, it may be disliked by another. High design quality is achieved if the customer's perceived design quality meets or exceeds their expected design quality. Additionally, a high quality UI should be to some extent innovative (Collier and Bienstock, 2006, p. 272). The design dimension is defined as the aesthetics features and layout of the UI design for the MASQ measurement scale. This dimension encapsulates several facets of the UI of the mobile shopping companion app. Therefore, it incorporates the items visual aesthetics and clarity of layout, quality of multimedia content, ease of navigation and ease of use and search function and filters (tab. 9).

DES1: Visual aesthetics and clarity of layout

Visual aesthetics and clarity of layout describe the customers' overall perception of the "appearance of the site" (Parasuraman et al., 2005, p. 7). This is the first aspect the customer

Table 9: Design Dimension Summary

Definition	The aesthetics features and layout of the user interface design.
Items	DES1: Visual aesthetics and clarity of layout DES2: Quality of multimedia content DES3: Ease of use and ease of navigation DES4: Search function and filters
Anchor examples	"Good size text and clear with suitably neutral colors which are pleasing on the eye." "Pictures are clear and give good detail of the product." "Difficult navigate back to product listings after viewing details of a product." "Good filters allowing easy viewing of appropriate size and fit of items along with other handy filters."
References	Collier and Bienstock (2006), Fassnacht and Koese (2006), Holloway and Beatty (2008), Parasuraman et al. (2005), Santos (2003), Stiakakis and Petridis (2014), Wolfinbarger and Gilly (2003)

observes when he or she starts the mobile shopping companion app (Santos, 2003, p. 239). Thus, it is important to use colors and a structure that suits the majority of the customers. The mobile app should be visually pleasing for the customers (Loiacono et al., 2007, p. 84). While Santos (2003) underpins the importance of the appropriate size for websites in their ESQ scale, this can be transferred to the MASQ scale. Mobile apps should provide an appropriate resolution for the screen size of the mobile device they are executed on without simply enlarging a lower resolution to the higher one. In this regard, providers need to update their mobile apps if a manufacturer introduces larger displays or a higher resolution. The clarity of layout is defined as "the degree to which the design structure of the user interface helps users to find their way" (Fassnacht and Koese, 2006, p. 26). This includes "the organization and presentation [...] of content and information" (Santos, 2003, p. 240). Most importantly the layout has to be simple and clean to foster an easy navigation through the mobile app.

"Good size text and clear with suitably neutral colors which are pleasing on the eye."

DES2: Quality of multimedia content

The item quality of multimedia content measures the quality of the visual representation of multimedia elements in mobile apps such as font, icons and digital images or videos (Fassnacht and Koese, 2006, p. 26). Fonts and icons are considered of high quality if they are easy to read and understand (Loiacono et al., 2007, p. 83). For digital images, it is required that they have an appropriate resolution and are zoom-able enabling the customer to visually capture details of the product. Besides the quality of the graphical elements, the mobile app has to use an appropriate amount of graphics, text, animations and effects because both, too many and too little of each will negatively affect the customer's perceived SQ. Although this item also seems to be relevant for ESQ and MSQ it is not explicitly mentioned in the analyzed literature. Nevertheless, it is added to the MASQ measurement scale to capture the influence of the quality of multimedia content on the perceived SQ. "Pictures are clear and give good detail of the product."

DES3: Ease of use and ease of navigation

In general, the item ease of use and ease of navigation is related to the UI of a mobile app and efficient information retrieval and purchase process (Santos, 2003, p. 239). Ease of use describes the quality of the UI with regards to the facilitation of access to the m-services (Fassnacht and Koese, 2006, p. 26). A customer should be able to find the information required or to process the purchase as efficient as possible. For websites, the concept of as less clicks as possible has been coined (Collier and Bienstock, 2006, p. 264). Concerning m-services, it should be easy and intuitive for the customer to learn how to operate the mobile app (Loiacono et al., 2007, p. 83). In particular, ease of navigation is considered with efficient navigation through the different tabs, sites and products of the mobile shopping companion app. Ideally, customers should always know at which position of the mobile app they are. Further, they have to be capable of getting to any menu level they want as well as to the previous level or site (Collier and Bienstock, 2006, p. 264). A customer should be able to manoeuver through the mobile app back and forth as he or she desires it (Parasuraman et al., 2005, p. 7).

"Difficult navigate back to product listings after viewing details of a product."

DES4: Search function and filters

The search function and filters facilitate the search for specific products by "product, features, or keyword" (Santos, 2003, p. 239). This especially applies for the internal search engine of the mobile app. It should retrieve the information and products the customer searched for. A good search function is required for a high SQ (Parasuraman et al., 2005, p. 7). Filters enable the customers to narrow down the products or search results by specific product characteristics such as color, size or product category etc. While the quality of the search func-

tion is mentioned as determinant for the overall SQ in extant literature, the quality and scope of filters is added based on the analysis of online customer reviews.

“Good filters allowing easy viewing of appropriate size and fit of items along with other handy filters.”

4.3.2. Performance

The performance dimension deals with the overall responsiveness of the mobile app itself. The mobile app should be perceived as smoothly operating without any glitches or dropouts. Several authors mention that the performance dimension is an important aspect for measuring the ESQ (e.g., Collier and Bienstock, 2006; Parasuraman et al., 2005) and the MSQ (e.g., Huang et al., 2015). Kuo et al. (2016) also revealed that efficiency that also encapsulates performance is relevant for measuring MASQ. To fulfill the requirements of m-services that are accessible without spatial and temporal constraints, the m-services provided by mobile shopping companion apps have to be available 24 hours a day to allow customers to shop online even at night (Fassnacht and Koese, 2006, p. 27). The 24 hours availability includes a consistent level of performance the whole day. Customers always expect the same performance when they are using the mobile app (Madu and Madu, 2002, p. 251). It does not matter to them whether the m-services are requested by many customers at the same time as they always have the impression that they are using an individual instance of the mobile app independently of other customers as expressed in the multiplicity dimension by Nickerson et al. (2009) in their taxonomy of mobile apps. Performance is perceived within "the speed of downloading, search, and navigation" and maneuvering through the mobile app (Santos, 2003, p. 241).

High performance quality is achieved if the customer’s perceived performance of the mo- bile app exceeds its expected performance. The performance dimension is defined as the performance of the mobile app and its resource requirements for the MASQ measurement scale. It is refined by the items processing speed, device storage usage and mobile network usage and device and connection quality (tab. 10).

PERF1: Processing speed

Most importantly, the performance dimension involves the processing speed item. It is concerned with the processing performance of any operation within the mobile shopping companion app involving for instance page loading and transitions, smooth scrolling and quick responses to the customer’s inputs (Collier and Bienstock, 2006, p. 264). Processing speed is also concerned with the "ability to quickly download information" (Madu and Madu, 2002, p. 251) such as visual graphics from the mobile app. Besides the processing speed it is also related to quality of data processing and transfer (Fassnacht and Koese, 2006, p. 27).

“There are a few long pauses when switching the screens.”

PERF2: Device storage usage and mobile network usage

The item device storage usage and mobile network usage measures the amount of disk space the mobile app requires on the mobile device and the network traffic it causes for the mobile cellular network and the customer’s purchased volume of data. Madu and Madu (2002) introduce a "storage capability" (p. 251) dimension for e-services. However, this dimension is more concerned with the capability of the website to store information and the amount of information it is able to store. In the context of mobile apps, the device storage usage is concerned with the disk space usage on the mobile device. As the storage space of a mobile device is finite and cannot be extend for all devices with additional memory cards, mobile apps should have an appropriate size. Appropriate in this case means that the mobile app requires as little storage as required for the provisioning of its m-services to the customer. The memory usage is a major concern for not downloading a mobile app provided by a retailer (Lipsman, 2017, p. 40). Mobile network data usage measures the traffic the mobile app causes (Knote and Söllner, 2017, p. 129). Although this item is not derived from the SLR, it is mentioned frequently in the QCA and also inductively derived in another paper (Knote and Söllner, 2017, p. 125). Especially, for volume-based and per-megabyte contracts it is important that the mobile app does not cause to much avoidable mobile network traffic besides the traffic required to provide its features and information. Avoidable mobile network traffic can be caused among other things by constantly fading-in advertisements or uncompressed data transfer.

“It runs in the background, and uses a LOT data!!”

PERF3: Device and connection quality

Stiakakis and Petridis (2014) introduced an "Equipment" dimension that is concerned with the performance of the customer’s mobile device itself and the quality of the mobile internet connection (p. 943). However, the device and connection quality dimension is not directly related with the mobile app itself, it can influence the performance and thus the perceived SQ of the mobile app because an error of the mobile device or malfunctions and glitches that are caused by a connection interruption are likely to be projected on the SQ of the mobile app. Several authors have proven that this item is related to the primary dimension environment quality (e.g., Lu et al., 2009; Vlachos and Vrechopoulos, 2008).

"I had this app on my Motorola phone and it scanned the receipts without any problems. When I change to a Samsung the app stopped scanning."

4.4. Outcome Quality Dimension

Outcome quality reflects the technical quality of the service delivery and the customer’s satisfaction with the mobile service. It is similar to the technical quality dimension introduced by Grönroos (1984). In contrast to Stiakakis and Petridis (2014) and Lu et al. (2009), it does not involve the quality of the product delivered in the context of m- Commerce and only considers m-services provided through a mobile shopping companion app. As customers are likely to evaluate the quality of the whole service endeavour jointly (Li and Leng, 2008), outcome quality also plays an important role in measuring the overall perceived MASQ. The outcome

Table 10: Performance Dimension Summary

Definition	The performance of the mobile app and its resource requirements.
Items	PERF1: Processing speed PERF2: Device storage usage and mobile network usage PERF3: Device and connection quality
Anchor examples	“There are a few long pauses when switching the screens.” “It runs in the background, and uses a LOT data!!” "When I change to a Samsung the app stopped scanning."
References	Collier and Bienstock (2006), Fassnacht and Koese (2006), Huang et al. (2015), Madu and Madu (2002), Parasuraman et al. (2005), Stiakakis and Petridis (2014)

quality is described using the secondary dimensions Technical Reliability and Valence.

4.4.1. Technical Reliability

In the context of IS, reliability is defined as consistent performance according to predefined specifications under certain boundary conditions (Fischer and Hofer, 2008, p. 698). Reliability is one of the quality properties mentioned in chapter 2.1 and describes the "probability of the system executing without failure for a specific period of time" (Pohl, 2010, p. 19). The promised services should be operated "accurately and consistently" (Santos, 2003, p. 241) in line "with the provider’s promises/guarantees" (Stiakakis and Petridis, 2014, p. 944) and the mobile app should operate properly without any crashes, glitches or malfunctions (Huang et al., 2015, p. 134). In general, the perceived reliability is a major determinant for the overall SQ (e.g., Fassnacht and Koese, 2006; Lu et al., 2009; Santos, 2003; Seth et al., 2007). This dimension focuses on the technical aspects of reliability in the context of mobile apps. It is only concerned with technical aspects that can be directly related to the mobile shopping companion app and m-services directly related to it. Among other things, these are the consistent performance of the overall mobile app, the accuracy of in-app payment and billing and the correct operation of single features such as the barcode scanner (Santos, 2003, p. 241). Hence, neither any logistics-related quality aspects such as delivery time or delivery quality (Lin et al., 2016, p. 392) nor assortment-related aspects such as quality and diversity of products (Wolfinbarger and Gilly, 2003, p. 189) are in scope of this dimension.

Although the composition of this dimension is unique compared to the extant literature, most of the identified papers subsume aspects of technical reliability under various dimensions. Parasuraman et al. (2005) introduce the technical reliability as correct service operation within the "System Availability" (p. 18) dimension. Lu et al. (2009) partially integrate aspects of this dimension in their "punctuality" (p. 233) dimension that emphasizes the timely delivery of a service including the logistics quality. In contrast to the narrow description of reliability as timely delivery, Stiakakis and Petridis (2014) use the broader conceptualization of reliability that incorporates the punctuality aspect raised by Lu et al. (2009). Li and Leng (2008) integrate the technical reliability dimension within their "assurance" (p. 4) dimension that combines delivery reliability, responsiveness and update frequency. Besides the accurate and consistent operation of the mobile app, the technical reliability dimension also includes frequent updates for the mobile apps (Santos, 2003, p. 241). As content updates (e.g. new products or product reviews) are included within the information quality dimension, updates in the context of the technical reliability dimension incorporate technical updates of the mobile app such as adding, improving or removing features, fixing technical problems or adapting security mechanisms. In addition, the mobile shopping companion app has to correctly handle the purchases made by a customer and transfer the purchase data to the retailer using certain m-services. The transaction should be free of errors from a technical point of view (Wolfinbarger and Gilly, 2003, p. 188). Moreover, automatically generated confirmation e-mails (e.g. for confirming a purchase) are considered part of the technical reliability dimension (Swaid and Wigand, 2009, p. 16).

However some authors claim that the reliability quality can only be measured after the completion of the m-service including the delivery and payment (e.g., Fassnacht and Koese, 2006; Stiakakis and Petridis, 2014), the technical aspects of reliability does not include the delivery and thus can be perceived at any time of the service delivery. For instance, a malfunction or crash of a certain feature can be perceived by the customer immediately within the operation because a completion of the service is often impossible after a crash. A high technical reliability is achieved if the perceived technical reliability of the overall mobile app meets or exceeds the customer’s expectations. Nevertheless, the QCA shows that aspects of technical reliability are mentioned if a provided feature or service does not work properly. In the context of the MASQ measurement scale, the technical reliability dimension is defined as the accurate and consistent operation of the mobile app and the services provided. This dimension is subdivided into the items mobile app and feature reliability, availability of m-services and continuous operation after updating (tab. 11).

Table 11: Technical Reliability Dimension Summary

Definition	The accurate and consistent operation of the mobile app and the services provided.
Items	REL1: Mobile app and feature reliability REL2: Availability of m-services REL3: Continuous operation after updating
Anchor examples	“Have to manually add receipt information after the last update. The camera comes on but doesn’t focus or scan the Barcode or QR code.” "Used to be able to access my sparks but now I just get an error message saying sparks are not available." “Where is search – latest update seems to have removed it?”
References	Fassnacht and Koese (2006), Huang et al. (2015), Li and Leng (2008), Santos (2003), Stiakakis and Petridis (2014), Swaid and Wigand (2009), Wolfinbarger and Gilly (2003)

REL1: Mobile app and feature reliability
The mobile app and feature reliability item is used to measure the promised performance and proper operation of the overall mobile app and single features. Often, the mobile app reliability is related to the proper start and continuous operation of the mobile app without any glitches. In extreme cases, glitches and malfunctions can lead to a crash of the mobile app requiring a restart involving the risk of losing previous information such as selected products or already entered data. Rarely, the QCA reveals that the mobile shopping companion app does not even start because of any technical inconveniences so it is completely useless for the customer. Besides, also single features cannot operate properly due to technical reasons such as the online check out or product search. The malfunction of a single feature can also cause the crash of the whole mobile app.

“Have to manually add receipt information after the last update. The camera comes on but doesn’t focus or scan the Barcode or QR code.”

REL2: Availability of m-services
The availability of m-services is an item of the technical reliability dimension because it is difficult for a customer to differentiate if a malfunction is caused by a glitch in the mobile app or an unavailability of a requested m-service. Availability is another quality property of a system and describes "the percentage of time during which the system is actually available" (Pohl, 2010, p. 19). For the proper operation of the mobile app the m-services have to be available and the mobile app itself has to be to the greatest possible extent free of errors. The m-services provided through the mobile app have to be available at any time a customer wants to access and use them. As m-services can be accessed without temporal and spatial constraints, they have to be available at any time. An unavailability of an m-service negatively influences the perceived technical reliability of the mobile app. "Used to be able to access my sparks but now I just get an error message saying sparks are not available."

REL3: Continuous operation after updating
As frequent updates are a concern of the technical reliability dimension, the continuous operation after updating has to be ensured. The updates should be applied with the objective of improving the customer’s perceived SQ and providing additional or required m-services. For each update, there should be a detailed update description or release notes to inform the customer about any intended changes. If features are removed, there should be a description giving evidence for the feature deletion. Above all, the accurate and consistent operation has to be taken for granted after the update. This includes the proper operation of all features and m-services as beforehand the update including the storage and reloading of the customer information.

“Where is search – latest update seems to have removed it?”

4.4.2. Valence

The valence dimension describes the customer’s feeling after having experienced the m- services through the mobile shopping companion app. This feeling can be anything between "good or bad" (Stiakakis and Petridis, 2014, p. 944) after the completion of the service endeavor. A good feeling can be created for the customer by enabling him or her to efficiently use the mobile app in the shortest possible amount of time. Most importantly, the customer has to gain positive experiences when using the mobile app. These positive feelings may result in an overall positive experience of the mobile app and a positive judgment regarding the SQ of the mobile app and the retailer itself (Stiakakis and Petridis, 2014, p. 947). The valence dimension is concerned with emotional and hedonic aspects of SQ mostly influencing the overall customer satisfaction (Stiakakis and Petridis, 2014, p. 944). A customer that is enjoying the website or mobile app provided by the retailer is likely to spend more time and money on it than expected (Fassnacht and Koese, 2006, p. 27). Although, the "enjoyment dimension" (Bauer et al., 2006, p. 873) is only rarely reflected in the existing literature, Bauer et al. (2006) found that it has huge impact on customer profitability and re-purchase intentions.

The valence dimension is at least partially addressed in

several identified papers using var- ious denotations (e.g., Bauer et al., 2006; Cai and Jun, 2003; Loiacono et al., 2007; Vlachos et al., 2011). In line with the positive experience that a high SQ mobile app should create, Fassnacht and Koese (2006) introduce the "emotional benefit" (p. 27) dimension. It is defined as "the degree to which using the service arouses positive feelings" (Fassnacht and Koese, 2006, p. 27). Li and Leng (2008) also introduce the emotional benefit dimension and follow the aforementioned definition by Fassnacht and Koese (2006). Another dimension including aspects of valence is the "trustworthiness" (Cai and Jun, 2003, p. 512) dimension. It measures the customer's perceived feelings of the online purchase and its relation to the trust in the retailer. Vlachos et al. (2011) incorporate aspects of the valence dimension within usefulness. An enhancement of performance when using m-services positively influences a customer's feelings (p. 38). Tan and Chou (2008) incorporate perceived playfulness in their "perceived usefulness" (p. 652) dimension. Perceived playfulness also measures the feelings and emotions in the e-Commerce environment.

Every buying decision is determined by a combination of benefit dimensions. Besides utilitarian benefits there are also hedonic and emotional benefits as determining dimensions (Sheth et al., 1991, p. 27). Bauer et al. (2006) found that online shopping can be fun, exciting and entertaining (p. 870). Loiacono et al. (2007) revealed that mobile shopping can make customers feel happy, cheerful and sociable when using mobile shopping apps (p. 84). These feelings influence the actual and future buying decision and even the relation with the retailer (Stiakakis and Petridis, 2014, p. 947). A high valence is achieved if the customers' perceived feelings after the completion of the transaction using a mobile app meet or exceed the customer's expectations before the use of the mobile app. For the MASQ measurement scale, valence is defined as "the final impression of the [customer] upon the completion of the service delivery" (Stiakakis and Petridis, 2014, p. 944). In contrast to the previous secondary dimensions, valence cannot be measured by analyzing the mobile app itself. It can only be measured by asking at least a sample of customers about their satisfaction with the mobile shopping companion app. The customers' opinion can be retrieved for instance in personal interviews and questionnaires or by analyzing online customer reviews. This dimension is expressed by the items overall satisfaction with the m-service and satisfaction with the scope of services (tab. 12).

VAL1: Overall satisfaction with the m-service

The first item measures the overall satisfaction with the m-service after the usage of the mobile shopping companion app and the m-services it provides access to. It also reflects the impact of the valence dimensions on the reuse intention of the mobile app and the repurchase intention at the retailer providing the mobile shopping companion app. In addition, it influences the customer's intention to recommend it to other customers. Customers having positive feelings after using the m-services through the mobile shopping companion app are likely to use the mobile app again and repurchase at this particular retailer. Contrary, dissatisfied customers will not reuse the mobile app and are likely to switch to a competing retailer.

"This method of viewing items and proceeding to the payment section is the easiest possible way of ordering online that I have come across."

VAL2: Satisfaction with the scope of services

Besides the overall satisfaction with the m-services, the next item satisfaction with the scope of services measures the customers' satisfaction with the set of features and m- services provided by the mobile shopping companion app. This item is neither adapted from the ESQ nor the MSQ environment, but created for the MASQ measurement scale based on the QCA that reveals that some online customer reviews deal with the provided scope of m-services by the mobile shopping companion app. The set of features provided by mobile shopping companion apps is already introduced in subsection 2.3.2 and the features additionally requested are subsumed within the features dimension. Although each retailer should decide upon the implemented features and m-services based on its group of customer's demands and objectives of the mobile app, a proposed set of features and m-services for an exemplary mobile shopping companion app of an arbitrary retailer is deduced in section 5.5. Nevertheless, retailers seem to follow two distinct approach for the assembly of their mobile apps, either implementing one mobile app encapsulating all provided m-services or providing smaller sets of m-services in single apps (sec. 5.4.2). "You have so many apps doing different things! Payqwiq, Clubcard and Groceries. Link them for easy use."

5. Design Requirements for Mobile Shopping Companion Apps

The design requirements that will lead to a high MASQ for mobile shopping companion apps are presented in the following chapter. This chapter is structured according to the MASQ measurement scale developed and presented in chapter 4 using the identified primary and secondary dimensions from the SLR and QCA as a framing. To underpin the derivation of the design requirements from the online customer reviews, exemplary extracts from the online customer reviews are quoted within this chapter. Selected design requirements are further illustrated with screenshots taken from the three exemplary mobile shopping companion apps.

5.1. Overview of Analyzed Customer Reviews

Before coming to detail with the design requirements that will lead to high MASQ, the three mobile shopping companion apps chosen as reference for this thesis and the retailers providing them for their customers are introduced. As the design requirements are derived from online customer reviews, some statistics about the sample of online customer reviews exported from the MADPs for the QCA are presented as well.

Table 12: Valence Dimension Summary

Definition	The final impression of the customer upon the completion of the service delivery.
Items	VAL1: Overall satisfaction with the m-services VAL2: Satisfaction with the scope of services
Anchor examples	"This method of viewing items and proceeding to the payment section is the easiest possible way of ordering online that I have come across." "You have so many apps doing different things! Payqwiq, Clubcard and Groceries. Link them for easy use."
References	Bauer et al. (2006), Fassnacht and Koese (2006), Loiacono et al. (2007), Stiakakis and Petridis (2014), Tan and Chou (2008), Vlachos et al. (2011)

5.1.1. Exemplary Retailers and Mobile Shopping Companion Apps

The three reference mobile shopping companion apps are provided by Walmart, Tesco and M&S. They are chosen as exemplary retailers as they address a large proportion of people in the countries of their operation and the majority of the online customer reviews for their mobile apps is available in English. Moreover, these retailers operate traditional brick-and-mortar stores, introduced online shops and most recently launched mobile shopping companion apps for improving their customers in-store and online shopping experience. The mobile shopping companion apps are distributed via MADPs as native apps executed directly on the customer's smartphone accessing the hardware via application programming interfaces and libraries (Charland and Leroux, 2011).

Walmart Stores, Inc.

As an American multinational retailer, Walmart operates a total of 11,695 stores in 28 countries employing more than 2.3 million people worldwide (Walmart, 2017b, p. 16). Walmart was founded in 1962 by Sam Walton in Rogers, United States of America. Today, Walmart's headquarter is still situated in Rogers (Walmart, 2017a). In the fiscal year 2017 Walmart generated a total revenue of USD 485.9 billion and a net income of USD 14.3 billion (Walmart, 2017b, p. 36). Walmart's mobile shopping companion app is called "Walmart: In-Store & Online Shopping. Easy Reorders". It was relaunched in the current form as an upgraded mobile shopping companion app in 2011 (Perez, 2011).

The Walmart app encapsulates all m-Commerce related services within one mobile app. It enables the customer to access the online shop without temporal and spatial constraints, allows to find the nearest Walmart store including stock availability, has an integrated administration for loyalty cards and mobile payment and allows to access the Walmart savings catcher (app. B). The start screen of the Walmart app is shown in figure 7.

The savings catcher is a unique selling proposition of Walmart's mobile shopping companion app compared to the other two mobile apps. The savings catcher compares the prices of products on the customer's receipt with the prices in other Walmart stores and other retailers in the area and offers a cash back if a cheaper price is found in the form of an electronic gift card in the amount of the price difference. The cash back can also be accumulated within the savings catcher and payed out at a later point in time. To promote for a possible cash back, the customer either has to scan a quick response code on the bottom of the paper-based receipt or has to type in the receipt number manually. The purchase and the receipt should not be older than seven days. Afterwards, it is checked whether a lower price can be found by the mobile shopping companion app (Walmart, 2017c). The mobile app highlights the lower price with a green cash back icon and indicates the amount of cash back and the receipt in an electronic form that causes the cash back (fig. 8).

Tesco PLC

Tesco is a Britain-based retailer operating multinationally in twelve countries with 6,500 stores employing 460,000 people worldwide (Tesco, 2017c, p. 1). It was founded in 1919 by Jack Cohen as a group of market stalls (Tesco, 2017b). Its headquarter is situated in Welwyn Garden City, England (Tesco, 2017a). Tesco closed the last fiscal year with a total revenue[8] of USD 72.4 billion and a net income of minus USD 70 million (Tesco, 2017c, p. 1). In contrast to e.g. Walmart providing an integrated mobile shopping app incorporating all m-Commerce services, Tesco provides several m-Commerce related mobile apps e.g. for finding the shelf number (Tesco Finder), for shopping wine (Wine Finder), for online payment (Tesco PayQwiq), or for managing Tesco's loyalty card (Tesco Clubcard). Besides these mobile apps, Tesco provides a "Groceries" app enabling customers to purchase groceries without temporal and spatial constraints (fig. 9). This particular mobile app is used as reference mobile app from Tesco because it provides the largest set of features compared to the simpler mobile apps mentioned before including the access to Tesco's online shop (Brown, 2010). The Tesco Groceries app allows for searching products, arranging delivery time slots, create shopping lists and syncing orders with the customer's online account (app. B). The Tesco Groceries app was released in 2010 (Brown, 2010).

[8]The figures are converted from GBP to USD for a better comparability.

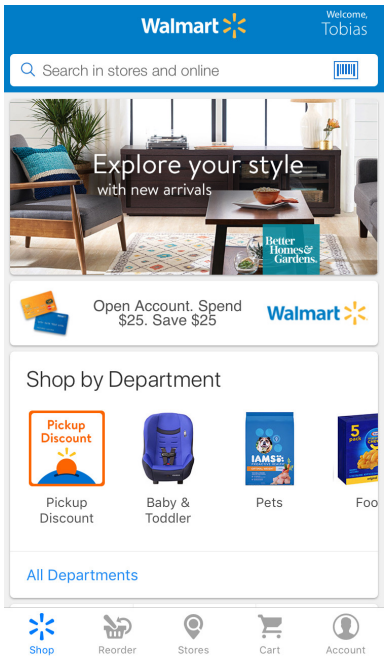

Figure 7: Walmart App Start Screen

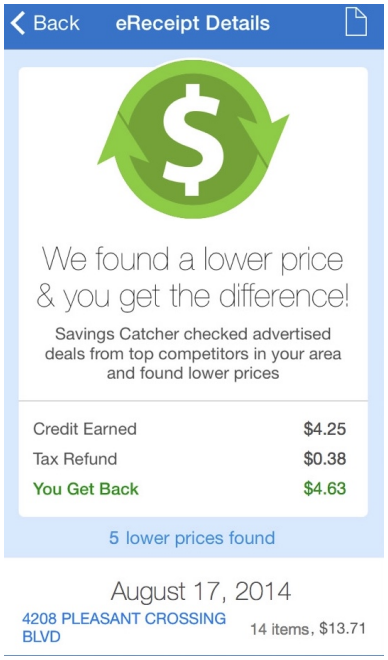

Figure 8: Walmart Savings Catcher (148apps.com, 2017)

Marks and Spencer plc

M&S also is a Britain-based multinational retailer operating in 55 countries and 1,433 stores (M&S, 2017a). M&S employs 85,000 people in total (M&S, 2017b, p. 108). Founded in 1884 by Michael Marks and Thomas Spencer, M&S is nowadays headquartered in the City of Westminster, England (M&S, 2017c). The fiscal year 2017 resulted in a revenue8 of USD 13.7 billion and a net income of USD 152.8 million for M&S (M&S, 2017b, p. 8). The mobile shopping companion app provided by M&S is also called "M&S". M&S states that already 52 percent of all online orders are processed using the mobile app on mobile devices (M&S, 2017b, p. 7). M&S' mobile shopping compan ion app integrates the management of their loyalty program Sparks, notifications for new products and offers and access to the online shop (app. B). The start screen showing the clothing section of the M&S

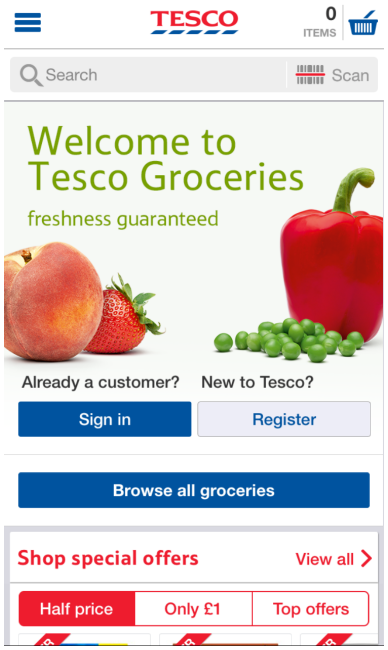

Figure 9: Tesco App Start Screen

app is presented in figure 10. For fostering its multi-channel strategy M&S introduced its mobile shopping companion app in 2012 (Faulkner, 2012).

For further information about the three particular mobile shopping companion apps and other m-Commerce-related mobile apps provided by the three retailers see appendix B.

5.1.2. Online Customer Review Statistics

The MASQ is perceived subjectively by every single customer who uses a mobile app. Thus, the customers' perceptions, experiences and expectations need to be used to develop design requirements for a high MASQ for mobile shopping companion apps. Therefore, online customer reviews are analyzed as a form of eWOM in a QCA to develop these design requirements from the perspective of the customers as potential users. By doing so, it is ensured that the design and feature set of the mobile app fits the customers' desires. A total of 10,099 customer reviews has been exported from the two MADPs App Store and Play Store for the QCA on the 3rd of July 2017 (tab. 13). The online customer reviews evaluate one of the three mobile shopping companion apps by Walmart, Tesco9 or M&S. The extracted online customer reviews cover a time period from September 2014 to the beginning of July 2017. Due to the fact that mobile apps are updated frequently within short time intervals (Nayebi et al., 2016), for the analysis only 8,237 online customer reviews from 2017 are considered (tab. 13).

The sample of online customer reviews has an overall rating of 4.1 stars across all mobile shopping companion apps[9] and MADPs. Following, the ratings of each mobile shopping companion app are presented including the overall rating of the three mobile shopping companion apps in brackets taken from the MADPs (app. B). The mobile shopping companion app provided by M&S is rated highest within the sample 4.5 (4.0) followed by the mobile app by Tesco 4.4 (4.5) and Walmart 3.4 (3.0) for the App Store. In the Play Store the mobile shopping companion app implemented by Walmart is rated with 4.2 (4.5) and the mobile app by M&S with 4.0 (4.3). The average rating of the sample of online customer reviews differs only slightly from the overall ratings in the MADPs. In the initial sample of online customer reviews, each review tends to be very short with an average of 89 characters, similar to Pagano's and Maalej's (2013) findings. As the Play Store allows to publish empty customer reviews, the total length of the online customer reviews varies from zero to 2,705 characters.

In line with PPagano and Maalej (2013), the current analysis reveals that the average customer only posts a single online customer review in the MADP. Contrary, a small number of customers rates a mobile app several times. One customer rated a mobile app nine times over the time period of analysis. Admittedly, this finding has to be treated carefully, as the actual customer can hide himself or herself behind nicknames in the MADP. Hence, the online customer reviews cannot be related to a real customer as they are enabling a single customer to publish reviews under a number of nicknames (Pagano and Maalej, 2013, p. 128).

Following Knote and Söllner (2017) online customer reviews useless for the derivation of design requirements are discarded (sec. 3.2). More specifically, online customer re-

[9]Because of restrictions in the online crawler service, for Tesco only reviews from the App Store could be exported.

Figure 10: M&S App Start Screen

Table 13: Number of Analyzed Customer Reviews

	Walmart	M&S	Tesco
Number of exports from App Store	1,084	818	662
Number of exports from Playstore	4,964	2,571	n.a.
Total number of reviews		10,099	
Total number of reviews from 2017		8,237	
Total number of relevant reviews		1,448	

views are discarded from the QCA if their topic is not concerned with the SQ of the mobile shopping companion app itself but other retailer related topics. Reviewers also tend to complain or praise the retailer's general assortment ("I would recommend all Marks wine I have yet to find a bad one. They are all equally wonderful."). Sometimes the customers also evaluate the product quality in the online customer reviews ("I like the quality of your clothes"). Or they express their praise for the retailer ("I enjoy shopping at that stores"). Sometimes it is not even obvious if the mobile shopping companion app, the retailer's employees or the appearance of the brick-and-mortar stores is meant by an online customer review ("Always clean, friendly, helpful!"). Excluding these online customer reviews, the manual process results in 1,448 online customer reviews further analyzed using the QCA approach introduced by Mayring (2015).

As most of the online customer reviews cover more than one specific topic, the online customer reviews are coded using the secondary dimensions and items identified in chapter 4 allowing for multiple assignments for a single online customer review and sub-classifying a single online customer review into its components (Pagano and Maalej, 2013, p. 129). This results[10] in a total of 1,307 coded components of online customer review that are distributed as follows among the seven secondary dimensions: Responsiveness (93), Information (103), Security/Privacy (67), Performance (140), Design (452), Technical Reliability (394) and Valence (58) (fig. 11). The QCA also shows that nearly 400 online customer reviews deal with features demanded by customers for a mobile shopping companion app. The resulting feature set for mobile shopping companion apps is the concern of section 5.5.

To allow for a more detailed description of design requirements for mobile shopping companion apps, the components of the online customer reviews are further coded according to the items specifying each secondary dimension. The amount

[10]The raw exports of the online customer reviews from the MADPs and the results of the analysis including the coding for each online customer review can be found in the digital appendix.

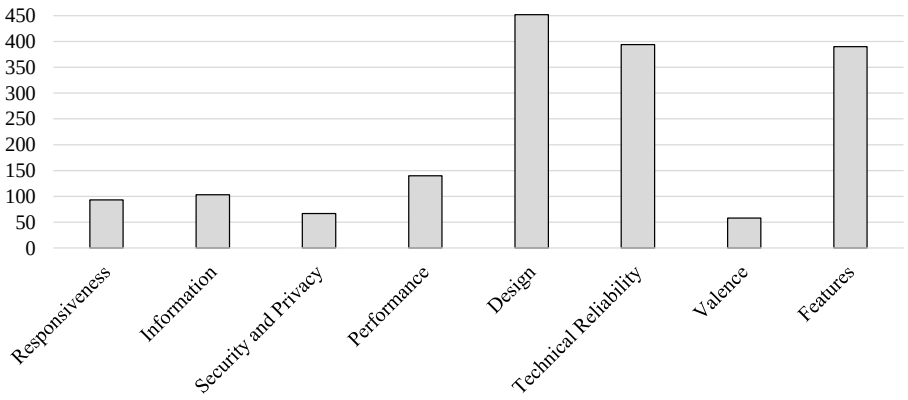

Figure 11: Online Customer Review Statistics - Dimensions

of online customer review components per item varies between five and 298 per item (tab. 14). This fact already highlights that the customers emphasize some of the dimensions and items with higher importance than others. Ease of use and ease of navigation as determinant of the design dimension seems to be more important to the customer than for instance the politeness and kindness of personnel in the customer service specifying the responsiveness dimension (tab. 14).

Although the scope of this thesis lies on the development of a MASQ measurement scale and design requirements for the improvement of the SQ of mobile shopping companion apps, the QCA of the online customer reviews reveals some further characteristics that are also worth mentioning briefly. Firstly, the online customer reviews taken from the App Store tend to be longer and more detailed in total than the reviews in the Play Store that often consist only of a single or a few words. In the extracted sample, the average online customer review from the App Store has a length of 143 characters while the average review from the Play Store consists of 70 characters and also allows for empty reviews (digital appendix). Some users explicitly mention that they like the convenience of the mobile shopping companion app over website that can be accessed using a mobile device without installing a dedicated particular mobile app. Exemplary, a user stated that using the mobile app is "better than just looking at the mobile version of the website!".

5.1.3. Implementation Guidelines and Design Requirements Overview

From the analyzed online customer reviews, 22 implementation guidelines and 14 service design requirements are derived. They are depicted in table 15. While the implementation guidelines directly refer to the mobile shopping companion app suggesting possible changes in the actual implementation of the mobile app, the service design requirements affect the design of the m-services provided by the retailer. These 36 suggestions for adapting the mobile shopping companion app and related m-services should help retailers and their employees to improve the MASQ of their provided mobile apps. The presented suggestions resemble possible areas for improving the MASQ.

5.2. Interaction Design Requirements

Interaction design requirements include all the design requirements derived during the QCA that are related to the interaction quality primary dimensions. While the service design requirements are generally formulated and related to the m-services, the implementation guidelines make concrete suggestions for improving the mobile shopping companion apps. The subsections are labeled analogous to the secondary dimensions of the MASQ measurement scale as presented in section 4.2 as Responsiveness, Information and Security and Privacy.

5.2.1. Responsiveness

The responsiveness design requirements deal with the customers' demands for a customer support providing a high SQ involving the retailer's employees and the mobile shopping companion app (tab. 16).

R01: Continuous availability

Most importantly, the customer service should be available continuously, at any time a customer needs to contact the customer service no matter the reason for the need for a contact. Moreover, the customer service availability and its responsiveness should not be limited due to a high volume of customers contacting the customer service simultaneously. "When you call about the issue a message states that there is a high call volume and tells you to call back and hangs up on you. Seems Walmart doesn't really care about what is going on and why customers keep receiving these emails."

G01: Provision of contact details

The establishment of the contact should be as easy as possible for the customer and free of charge. Contact details for the customer support should not only be made available in the mobile shopping companion app but should also be presented on the retailer's website, in the brick-and-mortar stores and on the general hotline. The mobile shopping companion app should include contact details for specific retailer

Table 14: Online Customer Review Statistics - Items

Dimension	Items			
Responsiveness	RES1: 27	RES2: 52	RES3: 5	RES4: 9
Information	INF1: 29	INF2: 28	INF3: 46	
Security and Privacy	SEC1: 35	SEC2: 16	SEC3: 16	
Design	DES1: 38	DES2: 20	DES3: 298	DES4: 96
Performance	PERF1: 119	PERF2: 10	PERF3: 11	
Technical Reliability	REL1: 312	REL2: 19	REL3: 63	
Valence	VAL1: 45	VAL2: 13		
Features	FET1: 145	FET2: 245		

and customer related topics such as complain handling, return or warranty issues. figure 12 shows the page of the M&S app for gathering the contact information of the retailer or directly get into contact with M&S' employees. "No one to call no one to email."

R02: Multiple contact channels

A high SQ mobile shopping companion app should provide multiple channels for the establishment of a contact to the customer service besides the mobile app. The interaction with the customer service personnel should be possible using for instance phone or e-mail and by consulting a retailer's employee directly in the store. This requirement is already introduced for e-services (Bauer et al., 2006, p. 871).

"Plus if it is weekend no help even reaching out to store manager, they would have to call same number"

G02: Integration of customer service chat

As multiple contact channels are required by the customers, the mobile shopping companion app itself should at least offer a dedicated channel to contact the customer service personnel. The Walmart and M&S apps integrate a chat to enable immediate customer support. Another possible communication channel would be the integration of a more sophisticated video chat allowing for virtual face-to-face communication similar to traditional service environments. The landing page for starting the customer service chat including the possibility to choose a specific topic for the M&S app is depicted in figure 12.

"Had to start a CS chat twice in 3 days because it wouldn't allow me log in or change my password without the chat rep sending me a code."

R03: Satisfaction with problem solving ability

The customer service personnel should be able to assist the retailer's customers with any inquiries or problems. The inquiries and problems should be solved to the customer's satisfaction and the established customer contact should only be terminated if the customer is satisfied with the offered solution. An unsatisfactory solution in the context of m-Commerce is proposing to use the website as an alternative, if the mobile shopping companion app is not working because the mobile app becomes obsolete in case the customer has to use the website anyhow.

"Nobody in the store or at customer service when I call can help."

As the mobile shopping companion apps are deployed by multi-channel retailers operating brick-and-mortar stores, the first contact person in case of issues with the mobile app is not the development or customer service personnel in many cases but the retailer's employees available at the local stores such as cashiers or shopping assistants. Thus, they have to be trained in using the mobile shopping companion apps and providing at least first-level support to customers with complaints and issues.

"The employees are clueless on how to even help you."

Moreover, the customer service should not forward the customer continuously to other contact points if it is avoidable. If a problem cannot be solved by the first contact person, the customer's issue should be forwarded to the technical support or a contact to the technical support should be established by distributing the contact information of the technical support. The contact information of the customer service has to be unambiguous and establish a single point of contact for the customer so that he or she does not struggle with diverging telephone numbers or e-mail addresses to prevent the customer from being left in loops forwarded from one employee or department to the other. This also involves not trying to get rid of customers' inquiries or problems by consoling the customer to another day.

"Horrible customer service. Was directed to different numbers/emails with no resolution for my issues."

After having received help and solution from the customer service, the customer should have the feeling that the retailer cares about their individual inquiries and problems. Individual contact to the retailer's employees via multiple communication media is vital for it.

"The self-checkout was a little intimidating until Eddie who works that area made it easy and pleasant experience"

R04: Prompt reply and solution

Similar to the problem solving ability, the customer service should solve the customers' inquiries and problems as quickly as possible. At best, at least a temporary solution should be given immediately after the problem is recognized and evaluated by the retailer's employee.

"Had problem just called and they had it fixed in 2 mins thanks"

Table 15: Implementation Guidelines and Service Design Requirements Overview

#	Guideline / Requirement	Description
Responsiveness		
R01	Continuous availability	The customer service should be available anytime a customer tries to contact it
G01	Provision of contact details	Provide contact information directly within the mobile app
R02	Multiple contact channels	Multiple channels should be available to contact customer service
G02	Integration of customer service chat	A chat should be integrated within the mobile app directly linked to a customer service employee
R03	Satisfaction with problem solving ability	The customer service should be able to assist the retailer's customers with any inquiries or problems
R04	Prompt reply and solution	The customer service should solve the customers' inquiries and problems as quickly as possible
R05	Politeness of customer service personnel	The customer service personnel should be polite and kind
G03	In-app guidance	The mobile app should include clear instructions for using the whole mobile app and single features
Information		
R06	Adequacy and completeness of information	The product and system information provided should be complete
G04	Exact sizing charts	Exact sizing charts should be provided for mobile clothing shopping
G05	Detailed update descriptions	Detailed update descriptions and release notes should be provided
R07	Clearness and understandability of information	The information provided through the app should be clear and understandable to the user
R08	Correctness of information	The information provided through the mobile app should be correct
G06	Correctness of stock information	The stock information should be displayed correctly for in-store and online shopping in the mobile app
Security and Privacy		
R09	Data protection against vulnerabilities	The customers' personal and payment data should be protected against external vulnerabilities
G07	Request password	The customer should log-in for using the mobile app
G08	Provide privacy policy	The retailer should provide transparent information on information processing and security
R10	Permission for data storage and processing	The customer's personal and payment data should only be stored if the explicit permission is granted
G09	Limited advertisement	Appropriate amount of advertisement in and caused by the mobile app
G10	Limited permissions for mobile app	The amount of permission requested by the mobile app should be appropriate
Design		
G11	Simple design	The mobile app should have a modern, clean design that fosters its intuitive use
G12	Clear and intuitive layout	The layout of the mobile app should be clean, simple and reduced
G13	High quality multimedia content	The mobile app should display high quality multimedia content aligned to the screen resolution
G14	Simple navigation	The navigation of the mobile app should be simple and convenient for the customer
G15	Reliable search engine	The search engine should provide the customer with the demanded results
G16	Convenient filters	Convenient filters should foster the search for requested items
Performance		
G17	Quick start-up	The mobile app should start up quickly without long waiting times for the customer
G18	Fast responsiveness	The mobile app should react responsively to the customer's interactions

(Continued)

Table 15—continued

G19	Adequate storage usage	The mobile app should occupy ass less storage as possible
R11	Reasonable network usage	The mobile app should cause as less network traffic as possible
G20	Reduced background activity	The background activity of the mobile app should be reduced
Technical Reliability		
R12	Accurate and consistent operation	The mobile app should be executed according to the description and promises given by the retailer
R13	Continuous availability of m-services	The m-services provided should be available anytime the customer wants to access them
G21	Sustainable updating	The mobile app should operate sustainably after the installation of an update
Valence		
R14	Overall satisfaction	The retailer should ensure that the mobile app satisfies the customers' needs and requirements
G22	Scope of features and services	The mobile app should incorporate all m-services provided by the retailer

Table 16: Responsiveness Design Requirements

Responsiveness	Implementation Guidelines / Service Design Requirements
RES1	R01: Continuous availability G01: Provide contact information directly within the mobile shopping companion app R02: Multiple contact channels G02: A chat should be integrated within the mobile shopping companion app directly linked to a customer service employee
RES2	R03: Satisfaction with problem solving ability R04: Prompt reply and solution
RES3	R05: Politeness of customer service personnel
RES4	G03: The mobile shopping companion app should include clear instructions for using the whole mobile app and single features

R05: Politeness of customer service personnel
Furthermore, the customer service personnel interacting with the customer personally or virtually should be polite and kind to make the customer feel treated well. Politeness should be ensured in all areas of contact to the customer either online or offline and also includes automatically generated documents such as electronic order confirmations. Experiencing a kind service will result in a higher MASQ.

"The customer service agent I spoke with was wonderful."

G03: In-app guidance
Considering the customer service within the mobile shopping companion app, it should guide the customer with additional information through the shopping process and provide information on all the features and services offered. There should be clear instructions available for using the mobile shopping companion app and all its features. An integrated manual should help the customer to get familiar with the mobile shopping companion app if it is not intuitive enough or the customer is not used to operate mobile apps.

"Can't find instructions on how to use, and there are features that are not all that intuitive IMHO"

5.2.2. Information

As the information quality dimension refers to quality aspects of information such as adequacy and correctness, the information design requirements introduce guidance on the provisioning of information to the customer through the mobile shopping companion app (tab. 17).

R06: Adequacy and completeness of information
The product and system information provided through the mobile shopping companion app have to be complete in the regard that the customer is able find every information he or she needs or is searching for at a glance. Specifically, customers request to receive information about recent offers and new items in the retailer's assortment.

"Used every day to keep updated with offers and developments"

As already mentioned in the information quality subsection, information not only comprises textual information and descriptions but also visual information using graphics, illustrations or even videos. Especially for non-food articles the

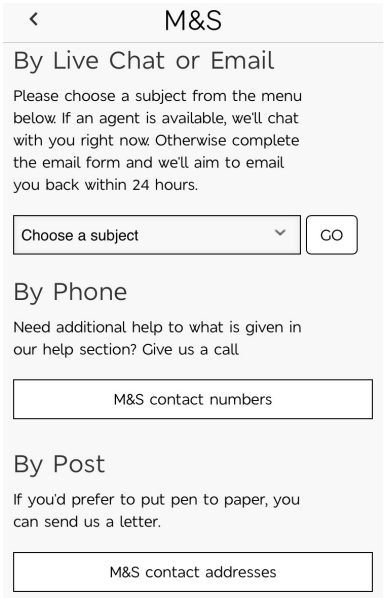

Figure 12: M&S App Contact Details Overview

Table 17: Information Design Requirements

Information	Implementation Guidelines / Service Design Requirements
INF1	R06: Adequacy and completeness of information G04: Exact sizing charts should be provided for mobile clothing shopping G05: Detailed update descriptions and release notes should be provided for each new release of the mobile app.
INF2	R07: Clearness and understandability of information
INF3	R08: Correctness of information G06: The stock information should be displayed correctly for in-store and online shopping in the mobile app.

visual information helps the customer to make an informed purchasing decision. So every item presented in the mobile shopping companion app should be accompanied by detailed visual information presenting every detail of the product supporting the customer's purchasing decision. This includes not only a single visual representation but images from different angles or even 360 degree views. "Everything else is pretty good with pictures of all items from multiple angles and clear descriptions."

Although a purchase can be processed completely within the mobile shopping companion app, customers require the mobile app to send confirmation messages via e-mail e.g. for processed orders or incoming items. They prefer to receive a confirmation of their mobile transaction in written form. These automatically generated messages also have to comply with the requirements mentioned for kindness and politeness.

"I think the confirmation of order message is excellent"

Information completeness also involves system information. An issue raised by customers using the Walmart app is that it requires a WLAN connection to provide all m-services. However, this information is not available to the customer, but only stating the m-services are not available at the moment a customer tries to access them using the mobile cellular network.

"To top it off, NOWHERE is this noted in your app or website documentation, and your associates have no clue, either. Every other app I have works whether on wifi OR cell data. What is wrong with your app????"

G04: Exact sizing charts

To justify the use of the mobile shopping companion apps, they have to deliver additional benefits to the customers compared to the use of the traditional website. Especially for the information quality dimension this means that the information available in the mobile app at least has to equal or better exceed the information that is available on the mobile website and in the store. This includes additional, detailed information about the product such as product characteris-

tics, ingredients or nutritional information and further reaching information such as receipt proposals or allergy alerts for certain ingredients based on the customer's predefined categories. As the virtual m-Commerce environment comprises certain limitations compared to the physical brick-and-mortar stores, the mobile shopping companion apps have to provide additional information to overcome these issues. One such issue is that purchasing through the e-Commerce or m-Commerce channel is the time-delayed handover of the item using a logistics service provider after the purchase compared to the brick-and-mortar stores in which customers directly take their purchases along. Another issue is that customers are not able to try on clothes. Thus, for shopping clothing in the appropriate size, the mobile shopping companion app should provide exact sizing charts as additional information. figure 13 shows the general sizing chart for women integrated in the M&S app. Under "Fit Guides" M&S also provides detailed instructions for the positions of measuring the different girths.

"And that is that there is no sizing charts for clothing. I can't make clothing purchases without one."

G05: Detailed update descriptions

Although mobile apps are frequently updated (Nayebi et al., 2016), developers should provide detailed update description and release notes every time a new version of the mobile shopping companion app is released. This enables interested customer to inform themselves about any changes made compared to the previous release and to decide whether they need or want to update or not. According to the customers, detailed update descriptions should include a list of bug fixes, added or removed features, security improvements and fixes against vulnerabilities as well as the complete date and version of the update. "When YOU update your app, you need to specify what changed features, bug fixes, etc. BS like WE MADE IT BETTER is not an update description."

R07: Clearness and understandability of information

To provide an additional benefit to the customer, information provided through the mobile shopping companion app should be clear and understandable for every user of the mobile app. The retailer has to ensure that the provided information is not misleading for the customer. A concrete manifestation of this design requirement is to provide consistent measurement units for product size and weight at least throughout a product category. This allows customers to easier compare items and make a more informed purchase decision.

"Shame you can't compare times as some are given in pence per kg and others pence per gram, making comparisons difficult."

R08: Correctness of information

The information provided by the mobile shopping companion app and related m-services should be correct. Correctness of item information in this case means that the product information resembles the real information about the product. Attaching the items to the adequate product categories is also part of information correctness. An important characteristic of correct information is its topicality. Correct information always has to be up to date. In an optimum manner, this information should be updated in real-time if it is changed in store or in the retailer's back-end systems. Further, the graphical representation of the products in the mobile shopping companion app should match reality and presented characteristics of the product (e.g. blue trousers should be displayed in blue). In addition, price information has to be correct (minor differences compared to the in-store prices are possible). In-store and online prices rarely equal each other and often times the prices differ from store to store.

"I bought a lawnmower that on the website clearly shows it was self propelled. I get to the store and it wasn't."

Correctness of information is also considered with system information related to technical specifics of the mobile shopping companion app and purchase process information such as delivery tracking and other notifications.

"Don't understand why I'm not getting notifications when my order is ready for pickup.??" An example of the importance of correct information is given by a user of the Walmart app. For a certain area of the United States, the store locator feature also displays distribution centers as stores for customers. However, when using the store finder feature, the mobile shopping companion app should only show brick-and-mortar stores and no distribution centers as customers usually cannot purchase anything there.

"If someone is using the app and looking for the store nearest to them, why would you have a distribution center come up as the closest store and then direct people there? Only actual stores should come up when looking for stores"

G06: Correctness of stock information

Another manifestation of the importance of correct information is the correctness of stock information that is provided through the mobile shopping companion app. It should provide accurate and correct information on the availability of items and the actual number of items available in each brick-and-mortar store and for the online shop. The in-store stock availability information is important to mention here, because customers tend to rely on this information and go to the store assuming that the product is available and get dissatisfied if it is not and the stock information provided by the mobile app appears to be false. By analyzing the online customer reviews in the QCA it seems as if some stores do not update the stock information immediately leading to the described discrepancies in the stock availability.

"I downloaded this app to see if an item was in Stock at a store. It says it was. I drove all the way there. It was not there. What good is an app that says something is in Stock if it is inaccurate?"

5.2.3. Security and Privacy

Security and privacy are very important in the m-Commerce context with less control over private and payment data (Kuo et al., 2016, p. 5). The security and privacy dimension of the MASQ measurement scale is concerned with the protection of the customers' private and payment information. Thus,

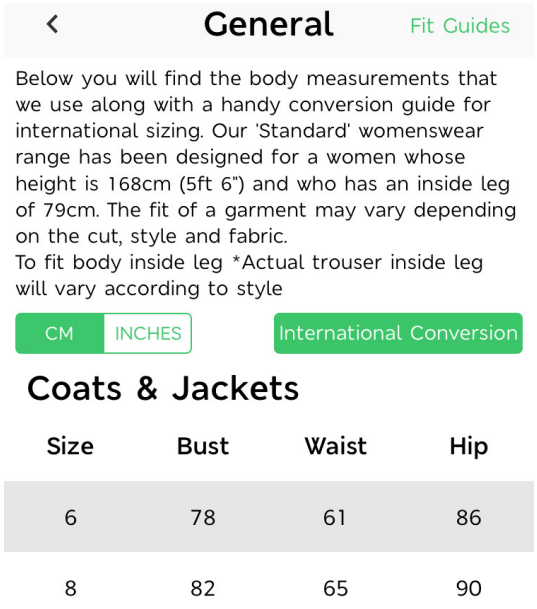

Figure 13: M&S General Sizing Chart

the design requirements and implementation guidelines presented are mainly concerned with procedures and methods protecting any personal information (tab. 18).

R09: Data protection against vulnerabilities

Because personal customer and payment data is a valuable resource in the information age, the retailer has to ensure that personal customer and payment data is not leaked to unauthorized people neither through external hacker attacks nor internal data leaks (Eaton and Bawden, 1991). If the data protection is not successful at a certain time and a data leak occurs, the retailer should reduce the damage for the customer and offer compensation for the losses.

"Someone hacked my account and took $ 35.00 from me and Walmart didn't do anything about it!"

The analysis of the online customer reviews reveals several security features requested or even taken for granted by the customers. Firstly, the customers' personal and payment data should be encrypted on the mobile device, on the data transfer via the mobile internet and on the retailer's back-end systems.

G07: Request password

Secondly, a way to protect the customer's personal and payment data on the mobile device is to request for a sign-in every single time the customer wants to use the mobile shopping companion app although some customers complain that it is annoying to re-type the password each time using the mobile app and at important phases of the purchasing process such as the check-out. The password required for signing-in should be as complex as possible[11] and not be restricted to a short length of twelve characters as limited by Walmart on its Android app. This customer complaint can be weakened by integrating fingerprint-based log-in mechanisms such as Apple TouchID simplifying the log-in procedure for the customer.

"Forcing re-entry of password for checkout is annoying."

G08: Provide privacy policy

Thirdly, further customer complaints and doubts especially on providing and storing credit card information can be addressed by providing detailed and transparent information regarding the data security, data storage and usage of personal and payment data (Rudolph et al., 2015, p. 47). The three analyzed mobile shopping companion apps include the retailers' customer privacy policy statements. Customers can get detailed information on the information security and data protection. The retailers highlight their measures to secure and protect the customer' personal and payment data. Moreover, they explain and justify the data processing and collection through the mobile apps. An exemplary part from the customer privacy policy provided by M&S is presented in figure 14. Trust in the usage of mobile shopping companion apps can be further increased by applying renowned quality labels (Rudolph et al., 2015, p. 48).

"Oh and check the privacy policy by following the link on this page and you get 'Sorry, the page you are trying to access does not exist.'"

R10: Permission for data storage and processing

For storing and processing the customer's personal and payment information, the customer's explicit permission is required. Although it seems to make the purchasing process more convenient for the customer, storing his or her personal or payment data should only be done after the customer has explicitly granted the permission for storing his or her data. This also applies for tracking, storing and processing the cus-

[11] The National Institute of Standards and Technology regularly releases guidelines concerned with the complexity of passwords.

Table 18: Security and Privacy Design Requirements

Security and Privacy	Implementation Guidelines / Service Design Requirements
INF1	R09: Data protection against vulnerabilities G07: The customer should log-in for using the mobile app. G08: The retailer should provide transparent information on information processing and security.
INF2	R10: Permission for data storage and processing G09: Appropriate amount of advertisement in and caused by the mobile app.
INF3	G10: Only request permissions required for accessing the m-services provided by the mobile shopping companion app.

tomers' shopping habits online and in the brick-and-mortar stores.

"Major privacy concern I just used the app to make a purchase. Without my knowledge or permission, it stored my credit card information. This is absolutely unacceptable!"

G09: Limited advertisement

The mobile shopping companion app should not overload the customer with advertisements. The amount of advertisement displayed in and caused by the mobile app has to be appropriate. The advertisements are usually integrated in the mobile app in the form of banners, notifications or images but the mobile shopping companion app can also cause advertisement emails. For providing advertisements to the customer, the customer should be asked for the explicit permission. Even if this permission is granted, the customer should not be overloaded with advertisements and not distracted from the actual purchasing process.

"Way too many ads. So much so that I could not complete a purchase and had to finish on my computer."

G10: Limited permissions for mobile app

The mobile shopping companion app should only request permissions that are necessarily required for the proper provision of its m-services and features. Permissions to access personal information and smartphone functions not required for providing the m-services seems not to be appropriate at first glance. It is not the mere number of permissions required but also their quality with regards to the interference of private information and the possibility to cause additional costs for the customer. Furthermore, the mobile shopping companion app should not grant itself permissions the customer has not granted before or the customer has intentionally removed. In this regard, the mobile shopping companion app should be executable even if not all permissions are granted. At least these features not requiring permission should operate properly.

"Unwarranted permissions - why does it need access to WiFi info, media files and photos, contacts - no, really M&S, and no explanation either Again: why these dangerous permissions."

5.3. Environment Design Requirements

Environment design requirements subsume the design requirements identified in the QCA that refer to the environment quality primary dimension. Because this section is concerned with the Design and Performance of the mobile shopping companion apps, it mainly provides implementation guidelines as suggestions for improving the MASQ of these mobile apps.

5.3.1. Design

In line with the description of the design SQ dimension as presented in subsection 4.3.1, design implementation guidelines for this dimension include suggestions for the aesthetic aspect of the UI and filter and search function (tab. 19). These suggestions are tailored for the characteristics of mobile devices such as relatively small displays and touch control.

G11: Simple design

The UI design of the mobile shopping companion app should be modern and clean to foster the intuitive use of the mobile app. It should follow a flat and straight design approach involving color contrast to ensure a better clarity for the customer (e.g. fig. 7, 10). To overcome the restrictions regarding the display size, developers should design the usability of the mobile apps as easy and intuitive as possible. Operating and navigating through the mobile apps should be simplified by using symbols and pictures instead of huge amount of textual information. However, complex and large graphics should be omitted to avoid long loading times (Rudolph et al., 2015, p. 47).

"Very simplistic user interface which could be more intuitive."

Although it is difficult to fulfill all the customers' individual preferences with regards to the used color scheme, the used colors should be appealing to the majority of customers. In addition, it should fit the corporate identity of the retailer and transfer the retailer's vision to some extent.

"Good size text and clear with suitably neutral colours which are pleasing on the eye."

G12: Clear and intuitive layout

The layout of the mobile shopping companion app should be

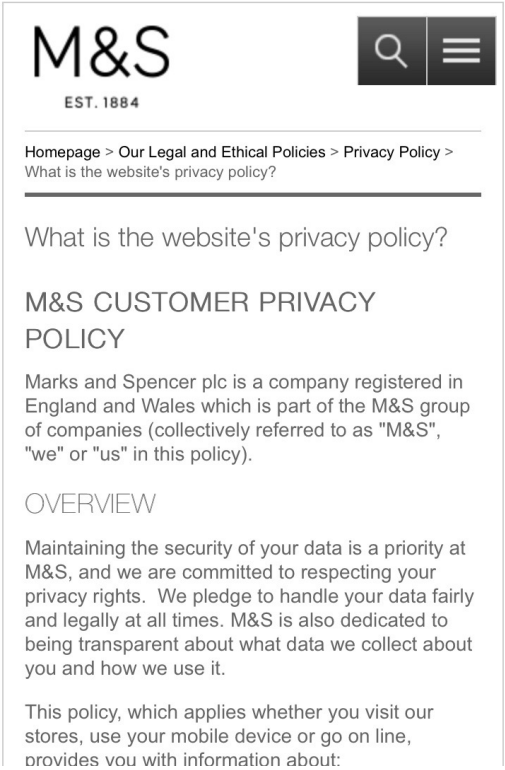

Figure 14: M&S App Customer Privacy Policy

Table 19: Design Design Requirements

Design	Implementation Guidelines
DES1	G11: Mobile shopping companion apps should have a modern, clean design that fosters its intuitive use. G12: The layout of the mobile shopping companion app should be clean, simple and reduced.
DES2	G13: Mobile shopping companion apps should display high quality multimedia content aligned to the screen resolution.
DES3	G14: The navigation of the mobile app should be simple and convenient for the customer.
DES4	G15: The search engine should provide the customer with the demanded results. G16: Convenient filters should foster the search for requested items.

clean and simple. It should be reduced to essential elements directing the customer's focus on the items and features provided. Having implemented a layout, it should be consistent through every single page of the mobile shopping companion app. A consistent layout is more intuitive for the customers because a uniform structure of the UI does not require learning and understanding multiple layouts.

"Love the way items are arranged in the categories for pickup discounts and price rollback"

For the customers one aspect of a clear layout is the spatial separation of UI elements. Overlapping UI elements not only may distract the customer when using the mobile shopping companion app but also may make information of the rear objects invisible and unreadable for the customer.

"The green purchased checkmarks on your list are annoying because they cover the item picture."

G13: High quality multimedia content

As mobile shopping companion apps include various kinds of multimedia content such as icons, graphics, sounds and videos, this content also should fulfill certain quality characteristics with regards to resolution and graphical quality. Moreover, the quality of the multimedia content should be appropriate to and fit the screen size and resolution. The image and video resolution should be high enough to view

them on a mobile device in full screen. With the introduction of mobile devices with increasingly larger screen sizes and higher display resolutions, not only the multimedia content has to be available in higher resolution but also the whole mobile shopping companion app has to be tailored to the new resolution.

"doesn't get 5 stars because of the ui and graphics. Low resolution or not optimized for retina screens."

Especially graphical product representations should be of high quality and resolution because pictures of the product may influence the customer's purchasing decision. Thus, the representation of the products should be close to reality presenting all necessary product details to the customer. The product representation should adapt according to the selection made by the customer with regards to e.g. color, size or cutting. Moreover, the pictures should be enlargeable to make more product details visible for the customer. In this regard, it is useful to offer multiple pictures from multiple angles to give the customer a complete overview. Optimally, these multiple pictures should build up a 360 degree view which is controllable by the customer.

"Pictures are clear and give good detail of the product."

G14: Simple navigation

An easy use and navigation is the top mentioned requirement by the users of the three mobile shopping companion apps under investigation (tab. 14). Navigation and maneuvering through the mobile shopping companion app should be as convenient as possible for the customer. Navigation should be intuitive not requiring long time periods for learning. Although it is certainly meant ironically, some customers complain that the mobile app is "Too easy to use" because using the mobile app it is simple and fast to spend more money. The mobile shopping companion app should involve a flat menu structure enabling the customers to find items without the necessity of navigating through many hierarchical menu levels.

"This app is very easy to navigate and find your way round"

Commands and buttons that are important to the customer and often used should be easy accessible. Among others, these are a button for signing out of the mobile app and the final check-out button. Analogous to the consistency of the layout, the navigation should be similar through the whole mobile app.

"Navigating around the pages for shopping is fine, but difficult to navigate around account & Sparks information and contacting M&S with queries."

The mobile shopping companion app should offer an easier access to the retailer's online shop on the mobile device than the mobile version of the website. The mobile app should be more responsive and easier to navigate making use of advanced technologies of the mobile device. "This app is far quicker & easier to use than the website."

G15: Reliable search engine

The mobile shopping companion app should integrate a reliable search engine to query the assortment and other features of the mobile app. The search engine should provide the results the customer is searching for with a particular query. Thus, the search result has to match the search query. To allow for an appropriate search result, the search engine should allow the customer to use synonyms and paraphrases in case the exact denotation of an item or brand is unknown.

"Also a search for 'high heeled shoes' only gave 2 results whereas searching for Shoes and filtering on women's and High heel height brought up a whole load of shoes"

To enable a quick product search, the search function should be accessible from everywhere in the mobile app. In addition, the search engine should not only search the retailer's assortment but also other features and services of the mobile shopping companion app. For instance, it should be able to search previous orders for particular items or search for the customer's loyalty card identification number.

"Also, the search function is only available on the home screen, that's really not practical."

G16: Convenient filters

Besides the presented search engine, retailers should implement the possibility to filter search results and even whole product categories in their mobile shopping companion apps as additional instrument for identifying the product desired by the customer. The filters should allow the customer to narrow down the search results or the whole assortment as detailed as possible. Further, the number of filters and the product characteristics that can be filtered should be convenient for the customer. Customers are used to apply filters because they are usually integrated in web-based shops. Thus, the filter functionality of the mobile shopping companion app has to meet the functions provided on the website otherwise it appears as providing a lower SQ. This includes the possibility to apply multiple filters at the same time and even to build up a filter hierarchy.

"The filter is excellent, no need to waste time looking through items not available in your size or the colour you want etc."

Filtering products and search results should also include on option to order the products according to certain characteristics (e.g. price or size). This additional function of the filter enables customers to identify the desired product even faster.

"Why doesn't this app allow me to sort my results? Like price high - low?"

5.3.2. Performance

Performance design requirements deal with suggestions to improve the overall responsiveness of the mobile shopping companion app also containing issues with the mobile internet connection in brick-and-mortar stores and performance-related aspects of the mobile device executing the mobile app (tab. 20).

G17: Quick start-up

Smartphone users are accustomed to an almost immediate access to their device and their installed mobile apps. Hence, mobile shopping companion apps should also start-

Table 20: Performance Design Requirements

Performance	Implementation Guidelines / Service Design Requirements
PERF1	G17: The mobile app should start up quickly without long waiting times for the customer. G18: The mobile app should react responsively to the customer's interactions.
PERF2	G19: The mobile app should occupy ass less storage as possible. R11: Reasonable network usage
PERF3	G20: The background activity of the mobile app should be reduced.

up as quickly as possible without causing long waiting times for the customers. At best, it should be available immediately after the customer has opened it. The customer should not get the impression that he or she has to wait for the mobile shopping companion app to start-up. The quick start-up also involves a fast log-in procedure that might be necessary for reasons of security. "Opening app takes a long time."

G18: Fast responsiveness

After a quick start-up, the mobile shopping companion app should also react responsively to the customer's input enabling an interruption-free interaction between the customer and the mobile app. The mobile shopping companion app should respond to the customer's interactions almost immediately. The customer should not get the impression that he or she has to wait for the mobile app to respond. This design requirement does not involve waiting time that is caused by a slow connection to the internet induced by an insufficient WLAN or mobile cellular connection. The responsiveness should not be influenced by the number of customers accessing the m-services at the same time. In case the mobile shopping companion app still freezes or lags it should continue its operation after an appropriate amount of time and should not crash completely requiring a restart because a restart always involves the danger of losing previously entered information.

"It takes 20 seconds just to add or remove items from my cart and when it was time to check out it took me 10 minutes to go through 3 simple steps"

G19: Adequate storage usage

The overall storage capacity of mobile devices is limited. Even the increase of the storage capacity of mobile devices over the last years does not solve this issue since mobile apps, the mobile operating system and multimedia content also require more storage capacity (Stahlknecht and Hasenkamp, 2005, p. 351). Therefore, the mobile shopping companion app should only use as less storage of the mobile device as required for providing all of its features and m-services. A mobile app requiring much storage while not providing enough benefit is not worth being installed for some customers. Because the internal storage of mobile devices is limited and part of it is already occupied by the operating system of the mobile device, some of them allow attaching of an additional memory card to extend the storage capacity. To clear storage capacity on the internal storage for other purposes, the mobile shopping companion app should be transferable to the additional memory card if available.

"With storage space at a premium on my phone, I am seriously reconsidering the necessity of having this app."

R11: Reasonable network usage

Even though the overall mobile network usage and volume of data per mobile line is steadily increasing, the aim of each mobile app should be to consume less mobile network volume to keep it for other purposes of the user (Bundesnetzagentur, 2017; VATM, 2017). Hence, the mobile shopping companion app should use as less mobile network data as required for providing its features and m-services. Especially, avoidable network usage should not be generated. Avoidable network usage in this case are bytes transferred via the mobile cellular network not necessary for providing the features and m-services of the mobile app (e.g. advertisement including large graphics). Moreover, the mobile shopping companion app should be able to access the m-services using both the mobile cellular network and WLAN. Although this should be an inherent feature of mobile apps, several customers reported that some features of the Walmart app only seem to work with mobile internet access via WLAN. Furthermore, due to sometimes complex structures of brick-and-mortar stores, the connection to the mobile cellular network can even be slow with potential dropouts. Therefore, retailers should set-up a free WLAN to decrease the loading times and increase the experience for using the mobile shopping companion app (Rudolph et al., 2015, p. 47).

"Too data intensive. I am simply trying to refill a prescription (my ONLY use for this app) and it is taking FOREVER to load a bunch of ads that are rotating and won't let me go to the pharmacy link"

G20: Reduced background activity

Recent mobile apps perform some activities in the background even when the mobile app is not running in the foreground or the mobile device is locked. These background activities consume resources of the mobile device such as processing power or network connection that will require battery power leading to a reduced durability of the battery. Although some background activities are required to keep the mobile shopping companion app updated with current information for the customer, others are avoidable and only "wasting the battery" (Ravindranath et al., 2012, p. 118). Therefore, mobile shopping companion apps should only be

executed in the background if it is necessary for the provision of the m-services and then go easy on the resources of the smartphone. “It is active in the background to such a degree that it is a constant drain on my battery– and constant activity means increased and continual risk to my privacy and safety.”

5.4. Outcome Design Requirements

The outcome design requirements integrate the implementation guidelines and design requirements identified during the QCA that reference to the outcome quality primary dimension of the MASQ measurement scale. They are further subdivided according to the related secondary dimensions Technical Reliability and Valence.

5.4.1. Technical Reliability

Technical reliability design requirements are concerned with measures ensuring an accurate and consistent performance of the mobile shopping companion app. The mobile app should be executed without any failure on the mobile device from a technical point of view (tab. 21).

R12: Accurate and consistent operation

The mobile shopping companion app, its features and provided m-services should be executed accurately and consistently according to the description and promises given by the retailer. Although developers frequently provide new releases of their mobile apps (Nayebi et al., 2016), they have to ensure a certain quality for each release. The QCA reveals that many online customer reviews deal with technical malfunctions of the mobile app as a whole or single features. Customers not only report the malfunctions but also express their disappointment that may lead customers to stop using the retailer’s mobile shopping companion apps. Even though a single feature does not work or an m-service is not available, the mobile shopping companion app should not crash.

“Nullpointer exception when trying to add anything to basket”

For several malfunctions, the reasons for their occurrence are not obvious. Nevertheless, the developers should monitor the customers reports about failures and malfunctions and fix them as quickly as possible within a new release of the mobile app. According to the QCA, the Walmart app has issues with the barcode scanning feature within the savings catcher. As customers already report some problems with the camera permissions, the developers should provide a workaround until the malfunction is fixed in a new release.

“Can’t get scanner on App to work. When scan is selected on search you just get a black screen"

R13: Continuous availability of m-services

Mobile shopping companion apps provide mobile access to services such as the online store that are executed and hosted on the back-end systems operated by the retailer. The m-services provided by the mobile shopping companion app should be available anytime the customer wants to access them. Thus, they should be available 24 hours a day. Once customers get used to the mobile provisioning of these services, they rely on using them. Hence, an unavailable m-service may negatively influence the overall perceived MASQ. In case an m-service is temporarily not available, the retailer should ensure that it will continue operating as soon as possible and should apologize for any inconveniences.

“Keep on getting message. Oops we are having temporary system issues... Simply doesn’t work!”

The mobile shopping companion apps are intertwined with other mobile apps of the retailer and also with third-party m-services like Apple Pay[12]. Thus, it is difficult to determine the cause for a malfunction of the mobile app. It could also be a problem with the referenced mobile app, m-service or the interface between them. However, customers tend to charge the malfunction to the mobile shopping companion app itself. Only in case of the involvement of third-party m-services they acknowledge other causes.

"My checkout using Apple Pay failed once but went through the second try. Not sure who is to blame here Apple or M&S."

G21: Sustainable updating

As the mobile apps are frequently updated (Nayebi et al., 2016), the retailer should guarantee that the mobile shopping companion app operates sustainably after the installation of an update as it has done previous to the update. Developers have to ensure that the transition to a new release of the mobile app is smooth for the customer. At best, the customer does not have to take any additional effort to make the mobile shopping companion app operate accurately and consistently after the installation of a new update. The mobile shopping companion app should also remember the customers’ personal and log-in information if they are stored before. In addition, new releases should introduce technical, aesthetical or functional improvements to the customers and most importantly fix known issues.

“STILL can’t use scanner...ever since November 2016 update. Walmart WHEN are you going to fix the camera interface?”

Moreover, the mobile shopping companion app should give correct notifications if an update is required. It should not mislead the customer with a notification to a new release if the installed release of the mobile app is already the most current version. Several customers of the Tesco app reported in the online customer reviews that they are notified by the mobile shopping companion app that it needs to be updated although the most current release is already installed on the mobile device. Unfortunately, the mobile shopping companion app cannot be used if the notification for the update appears. When the customer presses the blue "OK" button, the mobile shopping companion app is closed and the customer is redirected to the MADP whether a new release of the mobile app is available for installing or not. The update notifi-

[12] Apple Pay is an m-service introduced by Apple Inc. allowing users to pay securely online and in-store using existing contact-less payment terminals that is only available on recent mobile devices designed by Apple.

Table 21: Technical Reliability Design Requirements

Technical Reliability	Implementation Guidelines / Service Design Requirements
REL1	R12: Accurate and consistent operation
REL2	R13: Continuous availability of m-services
REL3	G21: The mobile shopping companion app should operate sustainably after the installation of an update.

cation nearly covering the whole screen of the mobile device is depicted in figure 15.

“Caught in an infinite loop, tells me app is out of date even though it’s just been installed. Useless”

5.4.2. Valence

The valence design requirements deal with the customer’s satisfaction when using a mobile shopping companion app and highlight the necessity of a satisfied customer after having used the mobile app. The valence quality dimension is one of the most important quality dimensions in the MASQ scale. It summarizes the customer’s overall feelings and perceptions about the mobile shopping companion app and the m-service provided from the information to the after-sales phase (tab. 22).

R31: Overall satisfaction

By fulfilling the previous implementation guidelines and service design requirements, the retailer should ensure that the mobile shopping companion app satisfies the customers’ needs and requirements. After the customer completed a transaction he or she should be satisfied by an enhanced SQ perception compared to the traditional and electronic service environment. Besides the functional and technical satisfaction, the customer should also be emotionally satisfied by aesthetical aspects such as color or appealing sounds. “Honestly, it’s the worst shopping app I’ve ever tried to use. Truly awful in every respect.” Furthermore, the QCA reveals that the customer’s quality perception of the mobile shopping companion app often replaces the quality perception of the brick-and-mortar store itself and even the whole company when shopping with mobile devices. In extreme cases, this can lead customers to shop at other retailers if the perceived MASQ of the mobile shopping companion app is unsatisfactory and thus can negatively influence the retailer’s revenues.

"The last few weeks have had nothing but problems. Today it showed no available slots for 7 days. What’s that about. Thinking of going to Sainsburys!"

Inversely, the expected SQ of the mobile shopping companion app is influenced by the perceived SQ in the traditional brick-and-mortar stores. A high SQ in the store will lead customers to expect an equally high MASQ for the mobile shopping companion app. However, the dimensions for measuring the two qualities are different.

"Overall a very poor experience which is a shame for a good company like M&S" Moreover, a satisfied customer is likely to recommend the mobile shopping companion app to other potential customers such as friends and relatives. This traditional word of mouth may lead to more customers using the mobile app and may also positively influence the retailer’s revenues. “would defiantly recommend this to friends”

While a number of customers is dissatisfied about the security and privacy issues related to the increasing dissemination of mobile apps in further spheres of life such as the in-store and online shopping, others clearly express their satisfaction with a digitized environment. Hence, retailers should further strive for entering their customers’ everyday routines to further improve their shopping experience and loyalty with the retailer. To foster the dissemination of their mobile shopping companion apps, retailers have to try to reduce the barriers for using them. These are among others technical barriers such as relatively small displays of the mobile devices and slow connection to the mobile internet and concerns about the security and privacy of mobile devices and mobile apps (Rudolph et al., 2015, p. 47).

"Thankfully, all that has changed in the world we live in, full of technology. What better way to know exactly where you spend your money, what on, and how to better tailor future advertisements specifically to you!"

G22: Scope of features and services

Analyzing the three mobile shopping companion apps, retailers seem to follow two different strategies when implementing their mobile apps. Either they implement one mobile shopping companion app integrating all features and m-services the retailer provides or they distribute a number of mobile apps dedicated to a single or a small set of features and m-services. While the former approach is used by Walmart with its "Walmart: In-Store & Online Shopping. Easy Reorders" app, the latter is followed by Tesco. Besides a small set of mobile apps that are tailored for a specific target group, the Walmart app includes all the features and m-services provided by Walmart (app. B). An overview of the features and m-services provided by the mobile shopping companion app of Walmart is given on the start screen. This overview is shown in figure 16.

The "Groceries" app provided by Tesco is only one of many m-Commerce-related mobile apps. The Tesco app includes references to other m-Commerce-related mobile apps, m- services and the mobile website (fig. 17). The "Groceries" app contains only a limited set of features (app. B).

“You have so many apps doing different things! Payqwiq,

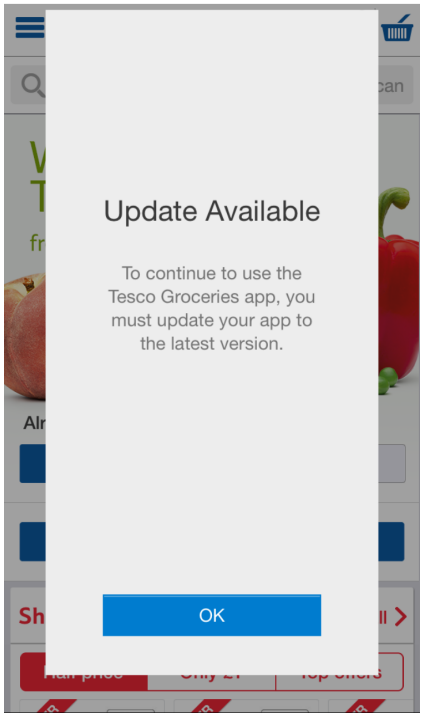

Figure 15: Tesco App Update Notification

Table 22: Valence Design Requirements

Valence	Implementation Guidelines / Service Design Requirements
VAL1	R14: Overall satisfaction
VAL2	G22: The mobile shopping companion app should incorporate all m-services provided by the retailer.

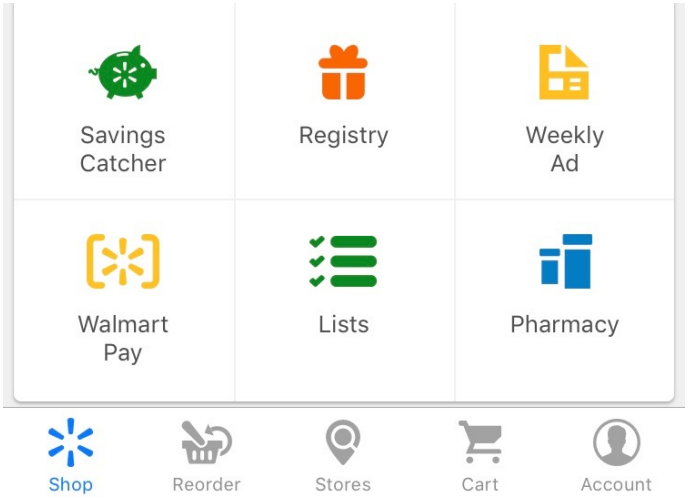

Figure 16: Walmart App Scope of Internal Services

Clubcard and Groceries. Link them for easy use."

The online customer reviews concerned with this topic, suggest that customers prefer to implement mobile shopping companion apps according the first approach having a single mobile shopping companion app encapsulating all features and m-services. Following this approach would prevent customers from constantly switching between different mobile apps e.g. for completing a purchase transaction. Further, developers do not have to take care of links and interfaces between these intertwined mobile apps and can focus on the proper integration of third-party m-services like Apple Pay.

"Everything you need in one place, Sparks and online shopping."

The scope of features and m-services covered with mobile shopping companion apps is further emphasized in section 5.5.

5.5. Analysis of Features

As nearly 400 online customer reviews deal with the specific features already integrated in mobile shopping companion apps or additional features desired by the customers, in the following section an analysis of features of mobile shopping companion apps will be provided along with a proposition for a set of features based on the QCA.

5.5.1. Diversity of Features

Customers demand a certain set of features and services to be likely to rate a mobile shopping companion app as useful. This set of features has to solve the possible problems of the customer (Madu and Madu, 2002, p. 251). Therefore, it is important which "other features are available" (Madu and Madu, 2002, p. 251) besides the mobile access to the online store that constitute a mobile shopping companion app. Additionally, the implementation quality and the resulting usefulness for the customer is a determining factor for the diversity of features demanded by the customers.

A first indication of the features and m-services provided by the mobile apps is already given with the definition of mobile shopping companion apps (subsection 2.3.2). Because the features dimension is only recognized as determinant of ESQ by Madu and Madu (2002) and Collier and Bienstock (2006), it is excluded from the actual MASQ measurement scale. Additionally, a possible features dimensions could not be measured by analyzing the mobile shopping companion app itself but only by interviewing customers about their expected and desired features and m-services.

As the QCA reveals, there are several online customer reviews in which the customers express recommendations for additional features that should be added to the mobile shopping companion app. The additional features should tailor the mobile shopping companion app to the specific problems and needs of the customers. Often, these features are familiar to the customer as they are already implemented in other mobile apps they use more or less frequently. And they consider this particular feature as useful as it has to be offered by the mobile shopping companion app as well. More rarely, customers want the developers to re-implement features that have been removed from the mobile shopping companion app because of some reason.

In addition to the recommendations, other online customer reviews incorporate criticism and praise for implemented features. This feedback allows to deduce if these features should be integrated in a mobile shopping companion app.

"I am loving the Apple Pay option at checkout."

5.5.2. Proposed Set of Features

This subsection should involve concrete suggestions on the composition of the set of features provided by the mobile shopping companion app. In this regard, only features and m-services are presented in this subsection that are mentioned and requested by a majority of customers in the QCA. Moreover, the features introduced resemble to a high degree the m-services suggested by Rudolph et al. (2015) in subsection 2.3.2 such as online purchase, shopping lists or loyalty card manager. The exact set of features and m-services provided by a mobile shopping companion app has to be defined by every retailer based on their customer group's demands and desires (Rudolph et al., 2015, p. 43). Table 23 presents an overview of the set of features including a short description that an exemplary mobile shopping companion app should provide.

Mobile app dissemination

During the SLR some features were identified that allow a larger group of customers to use the mobile apps. Firstly, multilingual support should be implemented. This is especially necessary for retailers operating internationally. Secondly, facilitated conditions for disabled people are required to enable them to also access the m-services such as the possibility to enlarge the font size or change the color scheme (Collier and Bienstock, 2006, p. 264). Furthermore, some customers requested a voice-over reading out the textual descriptions.

"Using Voiceover: You can't double tap on an item to get its further details."

Seamless integration into brick-and-mortar environment

Mobile shopping companion apps are defined as digital companions supporting the shopping and enhancing the customers' shopping experience within and outside the traditional brick-and-mortar stores using mobile technology (sec. 2.3.2). To support the shopping within a traditional brick-and-mortar store, the mobile shopping companion app and its provided m-services have to be integrated in the traditional environment conveniently for the customer. The customers should not experience any disruption or transition using an m-service provided by the mobile shopping companion app while doing the shopping in a brick-and-mortar store. Therefore, they have to be fully integrated and harmonized with the in-store equipment and personnel. The in-store interaction between the customer and the retailer represented either by its employees or equipment should be improved by using mobile shopping companion apps. Although the three

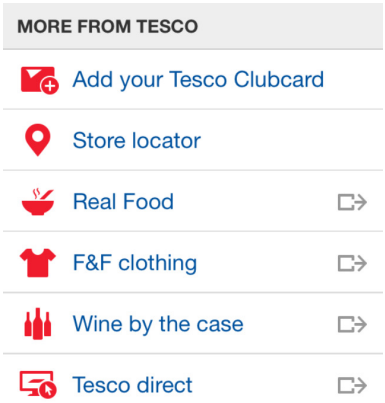

Figure 17: Tesco App References to External Services

Table 23: Proposed Set of Features

#	Feature	Description
Mobile app dissemination		
F01	Multilingual support	Integrate multiple languages into the mobile app
F02	Facilitated conditions	Offer features for easier access for disabled people
Seamless integration into brick-and-mortar environment		
F03	Shelf-locator	Provide the in-store location of an item
F04	Loyalty card scanning	Include a scannable representation of the digital loyalty card on the mobile device
F05	Stock availability	Check in-store and online product availability
F06	Mobile wallet support	Make electronic cards available without launching the mobile app
F07	Mobile payment services	Integrate popular mobile payment services
F08	Savings catcher	Guarantee lowest price for customers based on competitors and other stores
Improving the mobile shopping experience		
F09	Landscape mode	Change orientation when mobile devices is turned into horizontal position
F10	Cross-device linkage	Exchange information across devices based on customer accounts
F11	Online purchase	Provide access to the online shop
F12	Favorites list	Save customer's favorite items on a special list
F13	Continuous basket	Store customer's basket if the mobile app crashes
F14	Item amendment	Amend items to a purchase until final delivery
F15	Swipe pictures	Swipe through multiple pictures
F16	Loyalty card manager	Manage the complete loyalty account on the mobile device

mobile shopping companion apps by Walmart, Tesco and M&S integrate some features for improving the customers' in-store shopping experience, these features can be further enhanced.

F03: Shelf-locator

The mobile shopping companion apps by Walmart and Tesco offer an aisle-or shelf-locator to simplify the in-store product search by providing the aisle number at which the product is located. However, this oftentimes cryptic number is not helpful if it is not displayed in the store. For an enhanced shopping experience, it would be even better to directly include a map of the brick-and-mortar store showing the exact location of the product the customer is looking for. Thinking further the idea of the shelf-locator combined with a map of the brick-and-mortar store, can result in an in-store navigation taking into account the customer's position identified using the location-awareness of the smartphone. By doing so, customers could be guided through the brick-and-mortar store according to their predefined shopping list within the mobile shopping companion app or their personal shopping

behavior and interests.

"Thank you for letting me know that item is on L17. But where the f*** is L section. Useless information. What is good to know that it is on L17 when I can't find f***ing L."

F04: Loyalty card scanning

At M&S the cashiers have to type in the identification number of the electronic loyalty card, called Sparks, manually at each check out. It would reduce waiting times at the check-out if the mobile shopping companion app would provide a barcode, quick response code or another visualization that can be simply scanned from the display of the smartphone at check out. Furthermore, recent smartphones and Point of Sales (POS) systems support Near Field Communication (NFC) for the wireless exchange of information over short distances. Thus, the information of the digital loyalty and credits cards can be exchanged wirelessly at the POS using NFC.

"However many branches I go to cannot scan the barcode and the poor assistant has to type the massive number in"

F05: Stock availability

The mobile shopping companion app should provide the customer with information regarding the actual number of items in each store and available for online purchase. Optimally, this information should be updated in real time as customers usually rely on this information when going to a local store for purchasing a particular item. In addition, there should be a hint if the rest of the shelf is below a certain limit to indicate that the item may be out of stock when the customer arrives.

Annoying when everyday items display as not available, when you then go into the store to find hundreds available on the shelf"

F06: Mobile wallet support

Currently, the customer always has to log-in to the mobile shopping companion app to retrieve his or her loyalty card or payment information at check-out. As the process of logging-in may take some time due to e.g. slow mobile internet connections in the brick-and-mortar stores, the shopping experience can be enhanced by implementing support for Apple or Android Wallet[13]. Supporting the mobile wallet apps allows customers to access their loyalty card or payment information without an additional log-in to the retailer's mobile app. This additional feature further accelerates the check-out process at the POS. "Where is the Apple wallet support? I can't find anywhere allowing me to access my Sparks card from the lock screen via the Wallet. Have to do it from the app, which is a big hassle."

F07: Mobile payment services

To improve the check-out process in-store and for mobile shopping, the retailers often integrate their own proprietary payment options to their mobile shopping companion apps.

However, customers complain about requiring an additional payment, credit card or account just for checking-out for mobile transactions. Hence, retailers should implement third-party payment options in their mobile shopping companion apps such as Apple or Samsung Pay to enable customers to reuse their existing accounts without the need to create new accounts or payment options for m-Commerce. These mobile payment services even offer security mechanisms modified for the mobile environment.

"Great App. Simple to use, but would be so much better with Apple Pay integration for faster and secure payments."

F08: Savings catcher

However, the savings catcher feature offered by the Walmart app is introduced as unique selling proposition in subsection 5.1.1, it is often rated as a useful feature and main reason for using Walmart's mobile shopping companion app in the online customer reviews. It provides customers with discounts in form of an electronic gift card for products that are cheaper at other stores of the retailer, in the retailer's online store or at a local competitor. By using the savings catcher, the customer usually purchases for the lowest available price. Hence, implementing a similar feature could be worthwhile for other retailers. "savings catcher, finds the lowest price locally and refunds me the difference if I paid more at thier store."

Improving the mobile shopping experience

A further set of features and m-services is intended to improve the SQ for mobile shopping. They should make the mobile shopping for the customers more convenient and efficient. Although, most of these features can also be used inside a brick-and-mortar store, they are likely to improve the MASQ on the go.

F09: Landscape mode

Many customers complained that interacting with the three mobile shopping companion apps under investigation on a smartphone, it appears that they are not able to switch to landscape mode if the smartphone is turned into a horizontal position. Unlike most other mobile apps, the mobile shopping companion apps do not respond to the user moving the smartphone into another orientation which is measured by sensors. The landscape mode is often used to display additional information or larger graphics which is only hardly possible with the narrow display size in portrait mode. Further, the landscape mode seems to be more convenient to some customers when using the mobile app for longer periods of time. Thus, mobile shopping companion apps should support a landscape mode that is automatically used when the customer changes the orientation of the smartphone. "Can't believe the app is not able to go into landscape mode."

F10: Cross-device linkage

Following the idea of providing an omni-channel experience for their customers, retailers should not only implement mobile shopping companion apps for mobile devices but also synchronize the customer information and their shopping across multiple devices. This synchronization should also involve stationary devices such as desktop computers or laptops and wearable devices such as smart watches. The customer should have the opportunity to use his or her preferred device for making, continuing or finishing a purchase or information

[13] Mobile wallets store the user's credit, debit, prepaid, store and loyalty cards and other ticket information and make them available from the lock-screen without the need for starting the dedicated mobile app based on temporal and location-related information.

retrieval.

"The app has been updated to remember the content of my basket when changing from iPhone to iPad."

F11: Online purchase

Besides the features presented, a major functionality of a mobile shopping companion app is providing access to the retailer's online shop for mobile shopping. Although mobile devices have smaller displays and a different handling compared to desktop computers, customers should perceive a similar or even better shopping experience when shopping mobile using their mobile shopping companion app.

"I reserved tables and went to pick up, they charged me and said they would arrive in days when I can literally walk over and grab them in store(which I did) they could not refund my $ and I still have to come back and pickup then return the other tables."

F12: Favorites list and F13: Continuous basket

Another group of features deals with the virtual shopping basket of the mobile shopping companion app. The virtual shopping basket for storing the items already selected by the customer should remember the inserted items even the customer closes the app intentionally or unintentionally (e.g. when receiving a phone call) and in case of a crash of the overall mobile app. Besides, customers frequently request a shopping list feature. It should store the items the customer is going to purchase on his or her next shopping trip and should not only replace paper-based lists but extend it with additional features. For instance, it could calculate or estimate the total sum based on online and in-store item prices so that the customer knows in advance how much the purchase will cost. From this shopping list, items should also be markable as favorites to allow customers to easily add them for further shopping.

"It would also be great to have the option to save favourite items or remember previous searches."

F14: Item amendment

Analogous to the shopping list, items that the customer is willing of or thinking of buying in any future purchase should be stored on a so-called wish list. This list needs to be changeable if the customer decides to remove an item. Moreover, already placed orders should be changeable until the order is sent out to the customer. Changing an existing order means deleting or amending an item from the order or modifying the amount of a single item. Thus, the order should only be automatically finalized shortly before its delivery.

"This app is easy to use and very 'forgiving' - so if you make a mistake or change your mind about something it is easily amended - without having to start all over again."

F15: Swipe pictures

For items with more than one picture in the description, the customers demand to swipe through them without the necessity of closing the enlarged view of the item. A further improvement of the swiping feature would be the integration of 360 degree view enabling the customer to watch the product from every angle investigating each detail of the product.

"I would like the addition of being able to see a 360 view of products rather than several photos."

F16: Loyalty card manager

The mobile shopping companion app should not only encapsulate a digital representation of the loyalty card as described above, but also allow to administer the customer's whole loyalty program account on the move. This includes adding and changing personal information, checking the current status and automatically applying the points and discounts on purchases.

"It also Makes checking and adding 'Sparks' so easy. I've just shopped the sale early thanks to sparks."

6. Discussion

The present thesis follows a twofold approach consisting of a SLR for developing the MASQ measurement scale based upon previous literature and a QCA for deriving implementation guidelines and service design requirements for possible measures to improve the SQ of mobile shopping companion apps. The developed MASQ measurement scale follows a hierarchical and multi-dimensional approach based on recent literature (e.g., Stiakakis and Petridis, 2014; Vlachos et al., 2011). Hence, the MASQ of a mobile shopping companion app is measured more detailed using three primary dimensions, seven secondary dimensions and 22 items on the most detailed level. In the analyzed literature consensus seems to be achieved only regarding the primary dimensions interaction, environment and outcome quality (Fullerton, 2005; Lu et al., 2009; Stiakakis and Petridis, 2014). The secondary dimensions vary widely across the analyzed papers and thus are synthesized for the MASQ measurement scale. These are responsiveness, information, security and privacy, design, performance, technical reliability and valence (for the 22 items see ch. 4). Using the MASQ measurement scale as a framing, 22 implementation guidelines and 14 service design requirements are derived from the 10,099 analyzed online customer reviews of three exemplary mobile shopping companion apps in the QCA for the 22 measurement items. These implementation guidelines and service design requirements suggest areas to be improved to achieve a high MASQ. A high MASQ also requires a diverse set of features to be included in the mobile shopping companion app. At least 16 features and m-services from the three areas mobile app dissemination, seamless integration into brick-and-mortar environment and improving the mobile shopping experience should be integrated.

Implications for research

This thesis contributes to the extant literature by carrying forward the research on SQ to the context of MASQ. The MASQ measurement scale is tailored to assess the SQ of mobile shopping companion apps provided by retailers also operating brick-and-mortar stores. While previous papers measure ESQ, MSQ and MASQ using appropriate dimensions, some more recent papers introduce a hierarchical structure involving primary and secondary dimension like the developed MASQ measurement scale for mobile shopping com-

panion apps (e.g., Stiakakis and Petridis, 2014; Vlachos et al., 2011). The first investigations for a hierarchical structure for a SQ measurement scale originally stem from research by Dabholkar et al. (1996). It allows for a more detailed measurement of SQ based on the framing of generally accepted primary dimensions.

The developed MASQ measurement scale does not include changeable dimensions for different product categories. Huang et al. (2015) introduced different MSQ dimensions for virtual and tangible products. According to the authors, the privacy dimension is only required for measuring the MSQ for virtual products. However, including the protection and collection of the customers' personal data as SQ dimension is also essential for tangible products in the m-service environment because the same customer information have to be processed as for purchasing virtual products. When dealing with m-services on mobile devices data security is always a sensitive issue regardless of pure and non-pure services (Kuo et al., 2016, p. 5).

The extensive description of the dimensions and related items should encourage other researchers to apply the developed MASQ measurement scale on further mobile shopping companion apps and explicitly tests its relevance and validity on mobile shopping companion apps in an empirical manner. Further, it may be the basis for discussing the universality of the dimensions and items for mobile apps in the m-Commerce environment. The majority of analyzed papers close after the development of an ESQ, MSQ or MASQ measurement scale, without providing concrete suggestions for improving the quality of services. The implementation guidelines and service design requirements provided in this thesis extend the previous literature with concrete suggestions for improving the MASQ of mobile shopping companion apps in line with Knote and Söllner (2017) who provide these service design requirements for context-aware services in mobile navigation apps. Future research should test these suggestions for SQ improvements from an academic point of view and especially evaluate them with findings from other domains such as UI or user experience design.

As the online customer reviews exported from the App Store seem to be longer and more detailed than the ones crawled from the Play Store in this sample, it might be of future interest to further investigate the influence of a particular MADP on the quality of online customer reviews. Some customers reviewed that the SQ of the mobile shopping companion app is superior to the retailer's mobile website. Because this thesis focuses on the investigation of online customer reviews dealing with mobile shopping companion apps, future research may compare the user experience of mobile apps and mobile websites to examine whether it is worthwhile for retailers implementing dedicated mobile apps instead of offering a website responsive for mobile devices for their m-services provision.

Implications for practice

Practitioners can use the MASQ measurement scale to assess the SQ of their m-services and mobile shopping companion app and even benchmark their m-service with competitors. The dimensions and items can already give an indication on the areas considered as important for a high MASQ as expected by the customers. The derived implementation guidelines and service design requirements are especially interesting for practitioners. Retailers can try to optimize the quality of their m-services and their mobile shopping companion app according the identified 36 areas of optimization. Optimization is necessary at least for parts of the mobile apps as Rudolph et al. (2015) outline that mobile shopping companion apps bear potential for improvements concerning the implementation of new features and improvement of already existing m-services (p. 46). Providing a high MASQ mobile shopping companion app is essential for retailers fostering the in-store and online shopping at the same time. Today, customers invest 66 percent of the time they spend in m-Commerce activities on mobile devices but spend 78 percent of their money using desktop computers (Lipsman, 2017, p. 38). Converting at least some time into money spend on mobile devices will increase the revenue generated through m-Commerce. Additionally, the QCA reveals that customers tend to spend more money than intended if the mobile shopping companion app has a high MASQ and is especially easy to navigate ("This app is actually too easy... So easy to use it is going to cost me a lot of money?"). The proposed set of features can be a reference for retailers as to which features and m-services customers expect to be integrated in a mobile shopping companion app. Although each retailer should identify its required set of features individually, these suggested features and m-services can be a first indication (Rudolph et al., 2015, p. 43). Especially as customers prefer to have only one mobile shopping companion app instead of a variety of mobile apps dedicated to small sets of features.

Limitations

The present thesis involves some limitations and assumptions from a methodological and content point of view. For measuring the MASQ the disconfirmation paradigm is applied as already used by Grönroos (1984) and Parasuraman et al. (1985) for their initial researches on SQ. Indeed, SQ is observed as the difference between expected and perceived SQ by the customer. Since this time, there has been a discussion in literature on the acceptance and validity of this general paradigm as basis for measuring SQ and the applicability of single dimensions of the measurement scales (e.g., Buttle, 1996; Cronin and Taylor, 1994). As the MASQ measurement scale also applies the disconfirmation paradigm, it is also open to the criticism on the evidence for the definition of SQ as the gap between perceived and expected SQ and the focus on the service delivery only rarely takes into account the outcome of the service encounter (Buttle, 1996, p. 10). Nevertheless, the disconfirmation paradigm is also applied in the majority of scales measuring ESQ and MSQ. Thus, it is considered to be also valid in the context of MASQ.

The MASQ measurement scale is based upon extant literature on ESQ and MSQ identified in a SLR. Thus, the validity of the existing dimensions is mostly empirically proven

in previous literature. However, the transferability of the primary and secondary dimensions and the items taken from the extant literature to the context of mobile shopping companion apps is not explicitly empirically proven. Nevertheless, their relevance and validity in the context of MASQ is implicitly shown with the identification of relevant online customer reviews and the derivation of implementation guidelines and service design requirements for each of the items. Analogous, the relevance and validity is implicitly shown for secondary dimensions and items that are not taken from previous literature but derived in the QCA. Moreover, the MASQ measurement scale does not include a questionnaire or thesis paper that can be directly applied by the retailers to assess the SQ of their mobile shopping companion apps. Instead, for measuring the MASQ the extensive dimension and item descriptions have to be utilized without indicating unambiguous scale values.

To derive implementation guidelines and service design requirements, online customer reviews are analyzed in a QCA introduced by (Mayring, 2015). Using online customer reviews, a form of eWOM, as the basis for the analysis involves some limitations. Firstly, customers usually do not spend much time to provide systematic feedback but rather want to give their opinion quickly (Pagano and Maalej, 2013, p. 130). On the one hand, this feedback tends to be honest and straight, but on the other hand it can be confusing with a furious overtone. Secondly, among the authentic online customer reviews published by real customers and users of the mobile shopping companion app, there can be spam and misleading reviews (Genc-Nayebi and Abran, 2017, p. 1). Further, authors of online customer reviews act in anonymity publishing their reviews using nicknames (Trenz and Berger, 2013, p. 2). Therefore, also developers or providers of mobile apps can write online customer reviews anonymously to increase the awareness of the mobile apps in MADPs or to improve the rating of the mobile apps. This phenomenon is called "review manipulation or fraud" (Trenz and Berger, 2013, p. 3). If these fraud reviews are not identified correctly and excluded during the QCA, they are able to distract the results of the analysis. Thirdly, for complaints about problems and glitches it cannot be differentiated whether it is an issue concerning the mobile app, an issue with the customer's mobile device executing the mobile app, an intertwined third-party m-service or the customer's ability to operate the mobile app correctly. Fourthly, the 10,099 exported online customer reviews cannot be considered as a representative sample. They are just the most recent online customer reviews available for the mobile shopping companion apps implemented by Walmart, Tesco and M&S available at the MADPs App Store and Play Store. For delivering useful results, these online customer reviews have to be current because the SQ and features of the mobile apps can change rapidly with frequent releases.

Moreover, the actual methodological application of the QCA by Mayring (2015) in this thesis is based on certain assumptions and causes further limitations. During the QCA the online customer reviews are not linked to a specific version of the mobile app anymore although the version number is provided in the initial exports from the MADPs. Thus, it is assumed for the QCA that all the online customer reviews of a specific mobile shopping companion app are related to a single release of the mobile app. Taking into account the version number in the QCA would have been helpful because the mobile shopping companion apps are updated frequently with a varying SQ and set of features (Nayebi et al., 2016). Hence, each online customer review only applies to a specific release of the mobile app. Oftentimes reviewers point out the improvements compared to the previous releases of the mobile app. One user claims for instance with reference to previous releases in mind that the recent version of the M&S app "seems to be best yet". Fu et al. (2013) even proposes to specify the version number of the mobile app when analyzing mobile apps and related online customer reviews.

Although online customer reviews can be rated and reviewed in the MADPs as kind of a "quality criteria" (Mayring, 2015, p. 53), reviews rating and reviewing the analyzed online customer reviews are not taken into account for the QCA. Initially, the online customer reviews are treated as equally relevant for the QCA. These quality criteria might be an indication for the relevance of an online customer review for other customers. Hence, in the applied QCA approach online customer reviews not relevant from the perspective of other customers might influence the result of the QCA. Citing special forms or representative examples from the set of online customer reviews may involve the danger of generalizations or distortions suggesting uniformity and polarity that do not exist in the initial sample (Mayring, 2015, p. 106). Thus, citing from exemplary online customer reviews from the prototyping approach identified during the QCA might provide a wrong impression of the overall sample of online customer reviews exported from the MADPs. For this thesis, a manual process for analyzing the online customer reviews is undertaken. This process is not efficient enough for practitioners for analyzing the steadily increasing amount of ratings and online customers reviews published in the MADPs (Pagano and Maalej, 2013, p. 134). Hence, it might be of interest for providers of mobile apps to develop a fully automated process for the QCA from the crawling of online customer reviews from the MADPs to the summary of the results per category using advanced text mining tools. Applying an automated process would result in reproducible results that are not biased by personal opinions and subjective evaluations of the people executing the manual analysis. However, it has to cope with the difficulty of filtering ironic comments from the online customer reviews (Pagano and Maalej, 2013, p. 130). As the focus of the thesis lies on the implementation guidelines and service design requirements resulting from the QCA and not on the implementation of an automatic analysis process involving text mining techniques, a manual approach is followed for analyzing and categorizing the 10,099 online customer reviews from the App Store and Play Store (sec. 3.2).

Although this thesis involves mobile shopping companion apps implemented by retailers from two different countries

and culture might also have an influence on the perceived MASQ, this thesis does not differentiate among different cultures, their influences on the MASQ and its impact on the implementation guidelines and service design requirements for mobile shopping companion apps. Tsikriktsis (2002) revealed that culture has an influence on the perceived ESQ and that especially the dimensions masculinity and long-term orientation identified by Hofstede (1991) expect a higher WDQ.

7. Conclusion and Outlook

Similar to the e-service environment, SQ is an important determinant in the context of m-service in the m-Commerce environment for customer loyalty, revenue generated with these services and overall company success. This also applies for mobile shopping companion apps disseminated by retailers that also operate brick-and-mortar stores besides their electronic and mobile businesses. Mobile shopping companion apps extend the traditional and e-services of these retailers by an additional mobile channel supporting the shopping within and outside the brick-and-mortar stores using mobile technology. Overall, these mobile apps are designated to enhance the customers' shopping experience.

Reviewing the extant literature on the SQ of mobile apps in the m-Commerce context, there is only little research published dealing with the measurement of MASQ. Thus, a scale for measuring the MASQ has to draw on previous findings in ESQ and MSQ and existing dimensions need even to be adapted to the context of mobile shopping companion apps. The measurement of the MASQ is based on the customers' expectations and perceptions of the SQ offered by the mobile shopping companion app following the disconfirmation paradigm. Moreover, in the literature on ESQ, MSQ and MASQ neither a consensus is achieved on the number and nature of dimensions used for measuring the SQ nor on the general denotations of the dimensions or on their definitions. However, all the identified SQ measurement scales apply a multi-dimensional approach. Only more recent measurement scales applying a hierarchical approach commonly share the three primary dimensions interaction quality, environment quality and outcome quality. Although these scales have the framing of the primary dimension in common, the secondary dimensions and related items vary. Hence, the measurement of the SQ of mobile shopping companion apps requires a scale tailored to the m-Commerce environment and the mobile shopping companion app supporting the customer's online shopping and also enhancing the customer's in-store shopping experience. Additionally, the measurement scale needs to cover the whole shopping process from the information to the after-sales phase. Hence, the MASQ measurement scale applying a hierarchical and multi-dimensional approach for measuring the SQ of mobile shopping companion apps is developed. It consists of three primary dimensions, seven secondary dimensions and 22 related items on the most detailed level. Using this scale, the MASQ is measured by assessing the SQ of a mobile shopping companion app using the description of the items and contracting the results upwards the hierarchy.

As the MASQ measurement scale is based on the disconfirmation paradigm, the cus- tomers' expectations and perception about the offered SQ have to be taken into account. Therefore, online customer reviews of the mobile shopping companion apps by Walmart, Tesco and M&S as a form of eWOM are exported from two MADPs. These online customer reviews encapsulating the customers' expectations and perceptions of the MASQ and thus are analyzed to derive design requirements for achieving a high MASQ for mobile shopping companion apps. The design requirements are further subdivided into implementation guidelines affecting the actual design and implementation of the mobile shopping companion app and the service design requirements dealing with specification of the m-services provided through the mobile shopping companion app. Deduced from the QCA , 22 implementation guidelines and 14 service design requirements are identified as possible areas for optimizing the MASQ and achieving a high MASQ when developing mobile shopping companion apps. The areas of optimization affect the design, development, implementation, maintenance and operation of the mobile app. The QCA follows a content structuring approach as a form of a deductive category assignment. The QCA further reveals that although each retailer should decide specifically on the set of features and m-services provided in the mobile shopping companion app, a set of 16 exemplary features and m-services should be included in an arbitrary mobile shopping companion app. These features and m-services should be encapsulated in a single mobile shopping companion app and not spread across multiple m-Commerce-related mobile apps.

Future research should scrutinize and strive to validate the results of this thesis in a broader context. Firstly, as the developed MASQ measurement scale encapsulates SQ dimensions previously introduced in existing and renowned measurement scales for ESQ and MSQ, future research should explicitly and empirically test the applicability and validity of the proposed primary and secondary dimensions and items in the context of mobile shopping companion apps by measuring and comparing the MASQ of several mobile shopping companion apps. Secondly, it should be assessed if the proposed dimensions and items measure the MASQ of an arbitrary mobile shopping companion app entirely. Thirdly, the potential applicability of the MASQ dimensions and items on more general mobile shopping apps should be tested. This investigation should result in proposals for adaptions and extensions possibly required to make it applicable on general mobile shopping apps. Possible further dimensions explicitly excluded from the MASQ measurement scale deal with the quality of the delivery and the product. Fourthly, future research should extend the developed MASQ measurement scale with a questionnaire including questions and statements for directly and unambiguously assessing the SQ within each dimension and item. This summarized MASQ measurement scale should simplify the MASQ measurement for practitioners. Fifthly, the impact of the suggested imple-

mentation guidelines and service design requirements on the MASQ of mobile shopping companion apps should be tested. This test should involve the perceptions of a sample of customers on the suggested adaptions of the mobile shopping companion app and m-services. In addition, the proposed set of features should be reviewed taking into account the set of features of further mobile shopping companion apps and features and m-services requested by the customers of these further mobile apps.

References

148apps.com. App Detail: Walmart - Shopping and Saving, 2017. URL http://www.148apps.com/app/338137227/.

Aladwani, A. M. Developing and Validating an Instrument for Measuring User-Perceived Web Quality. *Information & Management*, 39(6):467–476, 2002.

Alpar, P., Alt, R., Bensberg, F., Grob, H. L., Weimann, P., and Winter, R. *Anwendungsorientierte Wirtschaftsinformatik: Strategische Planung, Entwicklung und Nutzung von Informationssystemen*. 6. Edition, Wiesbaden, Vieweg + Teubner, 2011.

Balauca, C. and Mehta, G. Exploring the Potential of Social Media Tools to Enhance Customer's Satisfaction and Increase Turnover in the Irish Accommodation Sector. In *Proceedings of the11th Annual Tourism and Hospitality Research in Ireland Conference (THRIC '15)*, Letterkenny, Ireland, 2015.

Barnes, S. J. and Vidgen, R. T. An Integrative Approach to the Assessment of e-Commerce Quality. *Journal of Electronic Commerce Research*, 3(2): 114–127, 2002.

Bauer, H. H., Falk, T., and Hammerschmidt, M. eTransQual: A Transaction Process-Based Approach for Capturing Service Quality in Online Shopping. *Journal of Business Research*, 59(7):866–875, 2006.

Bitner, M. J. Evaluating Service Encounters: The Effects of Physical Surroundings and Employee Responses. *Journal of Marketing*, 54(2):69–82, 1990.

Blut, M. E-Service Quality: Development of a Hierarchical Model. *Journal of Retailing*, 92(4):500–517, 2016. ISSN 00224359. doi: 10.1016/j.jretai.2016.09.002. URL http://dx.doi.org/10.1016/j.jretai.2016.09.002.

Blut, M., Chowdhry, N., Mittal, V., and Brock, C. E-Service Quality: A Meta-Analytic Review. *Journal of Retailing*, 91(4):679–700, 2015.

Bouwman, H., Bejar, A., and Nikou, S. Mobile Services Put in Context: A Q-Sort Analysis. *Telematics and Informatics*, 29(1):66–81, 2012.

Brady, M. K. and Cronin, J. J. Perceived Service Conceptualizing Approach Quality: A Hierarchical Approach. *Journal of Marketing*, 65(3):34–49, 2001.

Bressolles, G., Durrieu, F., and Giraud, M. The Impact of Electronic Service Quality's Dimensions on Customer Satisfaction and Buying Impulse. *Journal of Customer Behaviour*, 6(1):37–56, 2007.

Brown, M. Tesco Embraces iPhone with 'Groceries' App, 2010. URL http://www.wired.co.uk/article/tesco-app.

Bundesnetzagentur. Entwicklung des Datenvolumens im Mobilfunk in Deutschland von 2005 bis 2016 (in Millionen Gigabyte), 2017. URL https://de.statista.com/statistik/daten/studie/172798/umfrage/datenvolumen-im-deutschen-mobilfunkmarkt-seit-2005/.

Buttle, F. SERVQUAL: Review, Critique, Research agenda. *European Journal of Marketing*, 30(1):8–32, 1996.

Cai, S. and Jun, M. Internet Users' Perceptions of Online Service Quality: A Comparison of Online Buyers and Information Searchers. *Managing Service Quality: An International Journal*, 13(6):504–519, 2003.

Cao, M., Zhang, Q., and Seydel, J. B2C e-Commerce Web Site Quality: An Empirical Examination. *Industrial Management & Data Systems*, 105(5): 645–661, 2005.

Charland, A. and Leroux, B. Mobile Application Development: Web vs . Native. *Communications of the ACM*, 54(5):49–53, 2011.

Clark, B. Welcome to My Parlor: The Lure of Marketing on the World Wide Web is Great. Be Sure You Don't Get Stuck with the Wrong Approach. *Marketing Management*, 5(4):11–22, 1997.

Clarke, I. Emerging Value Propositions for m-Commerce. *Journal of Business Strategies*, 18(4):464–494, 2001.

Clarke, I. and Flaherty, T. Mobile Portals: The Development of m-Commerce Gateways. In Mennecke, B. and Strader, T., editors, *Mobile Commerce: Technology, Theory, and Applications*. Idea Group Publishing, Hershey: 185-201, 2003.

Collier, J. E. and Bienstock, C. C. Measuring Service Quality in E-Retailing. *Journal of Service Research*, 8(3):260–275, 2006.

Cooper, H. M. Organizing Knowledge Synthesis: A Taxonomy of Literature Reviews. *Knowledge in Society*, 1(1):104–126, 1988.

Cox, J. and Dale, B. G. Service Quality and e-Commerce: An Exploratory Analysis. *Managing Service Quality: An International Journal*, 11(2):121–131, 2001.

Cristobal, E., Flavián, C., and Guinalíu, M. Perceived e-Service Quality (PeSQ): Measurement Validation and Effects on Consumer Satisfaction and Web Site Loyalty. *Managing Service Quality: An International Journal*, 17(3):317–340, 2007.

Cronin, J. J. and Taylor, S. A. SERVPERF versus SERVQUAL: Reconciling Performance-Based and Perceptions-Minus-Expectations Measurement of Service Quality. *Journal of Marketing*, 58(1):125–131, 1994.

Dabholkar, P. A., Thorpe, D. I., and Rentz, J. O. A Measure of Service Quality for Retail Stores: Scale Development and Validation. *Academy of Marketing Science*, 24(1):3–16, 1996.

Dibia, V. and Wagner, C. Success within App Distribution Platforms: The Contribution of App Diversity and App Cohesivity. In *Proceedings of the 48th Annual Hawaii International Conference on System Sciences (HICSS '15)*, pages 4304–4313, Kauai, Hawaii, USA, 2015. ISBN 9781479973675. doi: 10.1109/HICSS.2015.515.

Ding, D. X., Hu, P. J. H., and Sheng, O. R. L. E-SELFQUAL: A Scale for Measuring Online Self-Service Quality. *Journal of Business Research*, 64 (5):508–515, 2011.

Eaton, J. and Bawden, D. What Kind of Resource is Information? *International Journal of Information Management*, 11(2):156–165, 1991.

EMarketer. Mcommerce's Rapid Growth Is Primarily Coming from Smartphones, 2016. URL https://www.emarketer.com/Article/Mcommerces-Rapid-Growth-Primarily/Coming-Smartphones/1013909.

EMarketer. Umsatz im Mobile Commerce in den USA in den Jahren 2011 bis 2015 sowie eine Prognose bis 2020 (in Milliarden US-Dollar), 2017. URL https://de.statista.com/statistik/daten/studie/208928/umfrage/umsatz-im-mobile-commerce-in-den-usa-und-prognose/.

Evans, J. R. and Lindsay, W. M. *Managing for Quality and Performance Excellence*. South-Western, Mason, 9. edition, 2011.

Fassnacht, M. and Koese, I. Quality of Electronic Services. *Journal of Service Research*, 9(1):19–37, 2006.

Faulkner, R. Marks & Spencer Launches iPhone App, 2012. URL https://www.drapersonline.com/marks-and-spencer-launches-iphone-app/5038606.article.

Fischer, P. and Hofer, P. *Lexikon der Informatik*. 14. Edition, Berlin Heidelberg, Springer-Verlag, 2008.

Francis, J. E. Category-specific RECIPEs for Internet Retailing Quality. *Journal of Services Marketing*, 23(7):450–461, 2009.

Francis, J. E. and Lesley, W. Exploratory and Confirmatory Factor Analysis of the Perceived Internet Retailing Quality Model. In *Proceedings of the 17th Australian and New Zealand Marketing Academy Conference (ANZMAC '02): 1791-1796*, Melbourne, 2002.

Fu, B., Lin, J., Li, L., Faloutsos, C., Hong, J., and Sadeh, N. Why People Hate Your App: Making Sense of User Feedback in a Mobile App Store. In *Proceedings of the 19th International Conference on Knowledge Discovery and Data Mining (SIGKDD '13)*, pages 1276–1284, Chicago, USA, 2013. ISBN 9781450321747. doi: 10.1145/2487575.2488202. URL http://dl.acm.org/citation.cfm?id=2488202.

Fullerton, G. The Service Quality-Loyalty Relationship in Retail Services: Does Commitment Matter? *Journal of Retailing and Consumer Services*, 12(2):99–111, 2005.

Gefen, D. Customer Loyalty in e-Commerce. *Journal of the Association for Information Systems*, 3(1):27–51, 2002.

Genc-Nayebi, N. and Abran, A. A Systematic Literature Review: Opinion Mining Studies from Mobile App Store User Reviews. *Journal of Systems and Software*, 125:207–219, 2017.

Giannakos, M. N. Absolute Price as a Determinant of Perceived Service Quality in Hotels: A Qualitative Analysis of Online Customer Reviews. *International Journal of Hospitality and Event Management*, 1(1):62–80, 2014.

Grewal, D., Roggeveen, A. L., and Nordfällt, J. The Future of Retailing. *Journal of Retailing*, 93(1):1–6, 2017.

Grönroos, C. A Service Quality Model and its Marketing Implications. *European Journal of Marketing*, 18(4):36–44, 1984.

Groß, M. Mobile shopping: A Classification Framework and Literature Review. *International Journal of Retail & Distribution Management*, 43(3): 221–241, 2015.

Gummerus, J. and Pihlström, M. Context and Mobile Services Value-in-Use. *Journal of Retailing and Consumer Services*, 18(6):521–533, 2011.

Heinonen, K. and Pura, M. Classifying Mobile Services. *All Sprouts Content*, 6(42):1–16, 2008.

Heinrich, L. J., Heinzl, A., and Roithmayr, F. *Wirtschaftsinformatik Lexikon*.

7. Edition, München, Oldenbourg Wirtschaftsverlag, 2004.

Hennig-Thurau, T., Gwinner, K. P., Walsh, G., and Gremler, D. D. Electronic Word-of-Mouth via Consumer-Opinion Platforms: What Motivates Consumers to Articulate Themselves on the Internet? *Journal of Interactive Marketing*, 18(1):38–52, 2004.

Hofstede, G. *Cultures and Organizations: Software of the Mind*. Maidenhead, McGraw-Hill, 1991. URL http://www.publidisa.com/PREVIEW-LIBRO-9780071439596.pdf.

Holloway, B. B. and Beatty, S. E. Satisfiers and Dissatisfiers in the Online Environment. *Journal of Service Research*, 10(4):347–364, 2008.

Hsu, C. *Service Science: Design for Scaling and Transformation*. World Scientific Publishing, Singapore, 2009.

Hsu, T., Hung, L., and Tang, J. The Multiple Criteria and Sub-Criteria for Electronic Service Quality Evaluation. *Online Information Review*, 36(2): 241–260, 2012.

Hu, Y. An Instrument for Measuring Service Quality in the e-Commerce Environment. In *Proceedings of the 1st International Conference on Innovative Computing and Communication (CICC '10) and Asia-Pacific Conference on Information Technology and Ocean Engineering (ITOE '10): 300-303*, 2010.

Huang, E. Y., Lin, S.-W., and Fan, Y.-C. M-S-QUAL: Mobile Service Quality Measurement. *Electronic Commerce Research and Applications*, 14(2): 126–142, 2015.

Idu, A., Zande, T. V. D., and Jansen, S. Multi-homing in the Apple Ecosystem: Why and How Developers Target Multiple Apple App Stores. In *Proceedings of the 3rd International Conference on Management of Emergent Digital EcoSystems (MEDES '11): 122-128*, San Francisco, USA, 2011.

International Organization for Standardization. *ISO 9000:2008. Management Systems - Fundamentals and Vocabulary*. ISO, Gevena, 2008.

Janda, S., Trocchia, P. J., Gwinner, K. P., and Authors, F. Consumer Perceptions of Internet Retail Service Quality. *International Journal of Service Industry Management*, 13(5):412–431, 2002.

Jun, M., Yang, Z., and Kim, D. Customers' Perceptions of Online Retailing Service Quality and Their Satisfaction. *International Journal of Quality & Reliability Management*, 21(8):817–840, 2004.

Kar, E. V. D., Maitland, C., de Montalvo, U. W., and Bouwman, H. Design Guidelines for Mobile Information and Entertainment Services: Based on the Radio538 Ringtunes i-Mode Service Case Study. In *Proceedings of the 5th International Conference on Electronic Commerce (ICEC '05): 413-421*, Pittsburgh, USA, 2003.

Kettinger, W. J. and Lee, C. C. Pragmatic Perspectives on the Measurement of Information Systems Service Quality. *MIS Quarterly*, 21(2):223–240, 1997.

Kettinger, W. J. and Lee, C. C. Zones of Tolerance: Alternative Scales for Measuring Information Systems Service Quality. *MIS Quarterly*, 29(4): 607–623, 2005.

Knote, R. and Söllner, M. Towards Design Excellence for Context-Aware Services - The Case of Mobile Navigation Apps. In *Proceedings of the 13th Internationale Tagung Wirtschaftsinformatik (WI '17): 121-135*, St. Gallen, Switzerland, 2017.

Kumar, R. A Proposed Scale of Assessing Mobile App Service Quality (MAPP-SQL). *ELK Asia Pacific Journal of Marketing and Retail Management*, 8(1): 1–11, 2017.

Kuo, T., Tsai, G. Y., Lu, I.-Y., and Chang, J.-S. Relationships among Service Quality, Customer Satisfaction and Customer Loyalty: A Case Study on Mobile Shopping APPs. In *Proceedings of the 17th Asia Pacific Industrial Engineering and Management Systems Conference (APIEMS '16): 1-8*, Taipei, Taiwan, 2016.

Ladhari, R. Developing e-Service Quality Scales: A Literature Review. *Journal of Retailing and Consumer Services*, 17(6):464–477, 2010.

Laudon, K. C., Laudon, J. P., and Schoder, D. *Wirtschaftsinformatik: Eine Einführung*. 2. Edition, München, Pearson Studium, 2010.

Lee, G. and Lin, H. Customer Perceptions of e-Service Quality in Online Shopping. *International Journal of Retail & Distribution Management*, 33 (2):161–176, 2005.

Lee, Y. E. and Benbasat, I. A Framework for the Study of Customer Interface Design for Mobile Commerce. *International Journal of Electronic Commerce*, 8(3):79–102, 2004.

Li, F. and Leng, Z. Study on the Quality of Electronic Services: Conceptualizing and Exploratory Analysis. In *Proceedings of the 4th International Conference on Wireless Communications, Networking and Mobile Computing (WiCOM '08)*, pages 1–4, Dalian, China, 2008.

Lin, Y., Luo, J., Cai, S., Ma, S., and Rong, K. Exploring the Service Quality in the e-Commerce Context: A Triadic View. *Industrial Management & Data Systems*, 116(3):388–415, 2016.

Lipsman, A. State of the U.S. Online Retail Economy in Q1 2017, 2017. URL http://www.comscore.com/Insights/Presentations-and-Whitepapers/2017/State-of-the-US-Online-Retail-Economy-in-Q1-2017.

Loiacono, E., Watson, R., and Goodhue, D. WebQual: An Instrument for Consumer Evaluation of Web Sites. *International Journal of Electronic Commerce*, 11(3):51–87, 2007.

Long, M. and McMellon, C. Exploring the Determinants of Retail Service Quality on the Internet. *Journal of Services Marketing*, 18(1):78–90, 2004.

Lu, Y., Zhang, L., and Wang, B. A Multidimensional and Hierarchical Model of Mobile Service Quality. *Electronic Commerce Research and Applications*, 8(5):228–240, 2009.

Lynch, J. G. and Ariely, D. Wine Online: Search Costs Affect Competition on Price, Quality, and Distribution. *Marketing Science*, 19(1):83–103, 2000.

Madu, C. N. and Madu, A. A. Dimensions of e-Quality. *International Journal of Quality & Reliability Management*, 19(3):246–258, 2002.

Mayring, P. *Qualitative Content Analysis: Theoretical Foundation, Basic Procedures and Software Solution*. Klagenfurt, Beltz, 2014.

Mayring, P. *Qualitative Inhaltsanalyse: Grundlagen und Techniken*. 12. Edition, Weinheim, Beltz, 2015.

Meola, A. The Rise of m-Commerce: Mobile Shopping Stats & Trends, 2016. URL http://www.businessinsider.de/mobile-commerce-shopping-trends-stats-2016-10?r=US{&}IR=T.

Microsoft. Windows App Store, 2017. URL https://www.microsoft.com/en-us/store/apps/windows?icid=CNavAppsWindowsApps.

M&S. M&S 2017 Annual Report, 2017a. URL http://annualreport.marksandspencer.com/M{&}S_AR2017.pdf.

M&S. Key Facts, 2017b. URL http://corporate.marksandspencer.com/aboutus/key-facts.

M&S. M&S, 2017c. URL https://itunes.apple.com/gb/app/m-s/id538410698?mt=8.

Mudambi, S. M. and Schuff, D. What Makes a Helpful Online Review? A Study of Customer Reviews on Amazon.com. *MIS Quarterly*, 34(1):185–200, 2010.

Nayebi, M., Adams, B., and Ruhe, G. Release Practices for Mobile Apps - What Do Users and Developers Think? In *Proceedings of the 23rd International Conference on Software Analysis, Evolution, and Reengineering (SANER '16), Volume 1: 552-562*, Osaka, Japan, 2016. doi: 10.1109/SANER.2016.116.

Nickerson, R., Muntermann, J., Varshney, U., and Isaac, H. Taxonomy Development in Information Systems: Developing a Taxonomy of Mobile Applications. In *Proceedings of the 17th European Conference on Information Systems (ECIS '09)*, pages 1–12, Verona, Italy, 2009.

Norman, R. *Service Management Strategy and Leadership*. New York, Wiley, 1984.

Pagano, D. and Maalej, W. User Feedback in the AppStore: An Empirical Study. In *Proceedings of the 21st International Requirements Engineering Conference (RE '13): 125-134*, Rio de Janeiro, Brazil, 2013.

Parasuraman, A., Zeithaml, V. A., and Berry, L. L. A Conceptual Model of Service Quality and Its Implications for Future Research. *The Journal of Marketing*, 49(4):41–50, 1985.

Parasuraman, A., Zeithaml, V. A., and Berry, L. L. A Multiple Item Scale for Measuring Consumer Perceptions of Service Quality. *Journal of Retailing*, 64(1):12–37, 1988.

Parasuraman, A., Zeithaml, V. A., and Berry, L. L. Reassessment of Expectations as a Comparison Standard in Measuring Service Quality: Implications for Further Research. *Journal of Marketing*, 58(1):111–124, 1994.

Parasuraman, A., Zeithaml, V. A., and Malhotra, A. E-S-Qual: A Multiple-Item Scale for Assessing Electronic Service Quality. *Journal of Service Research*, 7(3):213–233, 2005.

Perez, S. Walmart Goes Mobile with New Apps for iPhone & iPad, 2011. URL https://techcrunch.com/2011/11/08/walmart-goes-mobile-with-new-apps/.

Pitt, L. F., Watson, R. T., and Kavan, C. B. Service Quality: A Measure of Information System Effectiveness. *MIS Quarterly*, 19(2):173–187, 1995.

Pohl, K. *Requirements Engineering: Fundamentals, Principles, and Techniques*.

Berlin, Heidelberg, Springer-Verlag, 2010.

Put, A., Dacosta, I., Milutinovic, M., Decker, B. D., Seys, S., Boukayoua, F., Naessens, V., Vanhecke, K., Pessemier, T. D., and Martens, L. inShopnito: An Advanced yet Privacy-Friendly Mobile Shopping Application. *2014 IEEE World Congress on Services*, pages 129–136, 2014.

Rao, S. and Troshani, I. A Conceptual Framework and Propositions for the Acceptance of Mobile Services. *Journal of Theoretical and Applied Electronic Commerce Research*, 2(2):61–73, 2007.

Ravindranath, L., Padhye, J., Agarwal, S., Mahajan, R., and Al, E. AppInsight: Mobile App Performance Monitoring in the Wild. In *Proceedings of the 10th USENIX Conference on Operating Systems Design and Implementation (OSDI' 12): 107-120*, Hollywood, USA, 2012.

Reeves, C. A. and Bednar, D. A. Defining Quality: Alternatives and Implications. *The Academy of Management Review*, 19(3):419–445, 1994.

Riedl, C., Leimeister, J. M., and Krcmar, H. New Service Development for Electronic Services: A Literature Review. In *Proceedings of the 15th Americas Conference on Information Systems (AMCIS '09): 1-9*, San Francisco, USA, 2009.

Rigby, D. The Future of Shopping. *Harvard Business Review*, 89(12):65–76, 2011.

Rosen, D. E. and Purinton, E. Website Design: Viewing the Web as a Cognitive Landscape. *Journal of Business Research*, 57(7):787–794, 2004.

Rudolph, T., Nagengast, L., Melanie, B., and Bouteiller, D. Die Nutzung mobiler Shopping Apps im Kaufprozess. *Marketing Review St. Gallen*, 3 (32):42–49, 2015.

Rust, R. T. and Oliver, R. L. Service Quality: Insights and Managerial Implications from the Frontier. In Rust, R. T. and Oliver, R. L., editors, *Service Quality: New Directions in Theory and Practice*, pages 1–19. Sage Publications, Thousand Oaks, 1994. URL https://books.google.de/books?hl=en{&}lr={&}id=c3woDAAAQBAJ{&}oi=fnd{&}pg=PT7{&}dq=Service+Quality:+New+Directions+in+Theory+and+Practice{&}ots=zo3fyfqOGu{&}sig=Qaqq1088yK4ZLtlAMTrblbFHXQg{#}v=onepage{&}q=ServiceQuality{%}3ANewDirectionsinTheoryandPractice{&}f=false.

Rust, R. T. and Lemon, K. N. E-Service and the Consumer e-Service and the Consumer. *Journal of Electronic Commerce*, 5(3):85–101, 2001.

Santos, J. E-Service Quality: A Model of Virtual Service Quality Dimensions. *Managing Service Quality: An International Journal*, 13(3):233–246, 2003.

Seth, A., Gupta, H. M., and Momaya, K. Quality of Service Parameters in Cellular Mobile Communication. *International Journal of Mobile Communications*, 5(1):68–93, 2007.

Seth, N., Deshmukh, S., and Vrat, P. Service Quality Models: A Review. *International Journal of Quality & Reliability Management*, 22(9):913–949, 2005.

Sheth, J. N., Newman, B. I., and Gross, B. L. *Consumption Values and Market Choices: Theory and Applications*. Cincinnati, South-Western, 1991.

Silberer, G. *Mobile Commerce: Grundlagen, Geschäftsmodelle, Erfolgsfaktoren*. Wiesbaden, Gabler, 2002.

Sohn, C. and Tadisina, S. K. Development of e-Service Quality Measure for Internet-Based Financial Institutions. *Total Quality Management & Business Excellence*, 19(9):903–918, 2008.

Solomon, B. Shopping Apps Are Now the Fastest Growing Thing in Mobile, 2015. URL https://www.forbes.com/sites/briansolomon/2015/01/06/shopping-apps-are-now-the-fastest-growing-thing-in-mobile/{#}4b39f412f738.

Sommerville, I. *Software Engineering*. 9. Edition, Boston, Addison-Wesley, 2011.

Sower, V., Duffy, J., Kilbourne, W., Kohers, G., and Jones, P. The Dimensions of Service Quality For Hospitals: Development and Use of the KQCAH Scale. *Health Care Management Review*, 26(2):47–59, 2001.

Spreer, P. and Rauschnabel, P. A. Selling with Technology: Understanding the Resistance to Mobile Sales Assistant Use in Retailing. *Journal of Personal Selling & Sales Management*, 36(3):240–263, 2016.

Stahlknecht, P. and Hasenkamp, U. *Einführung in die Wirtschaftsinformatik*. 11. Edition, Berlin, Springer, 2005.

Stiakakis, E. and Petridis, K. Developing and Validating a Multi-Criteria Model to Evaluate Mobile Service Quality. In Martínez-López, F., editor, *Handbook of Strategic e-Business Management*, pages 935–956. Springer-Verlag, Berlin Heidelberg, 2014. doi: 10.1007/978-3-642-39747-9. URL http://link.springer.com/10.1007/978-3-642-39747-9.

Stiakakis, E., Georgiadis, C., and Petridis, K. Analyzing m-Service Quality Dimensions Using Multivariate Statistical Techniques. In *Proceedings of the 12th International Conference on Mobile Business (ICMB '13)*, number 24, Berlin, Germany, 2013. URL http://aisel.aisnet.org/icmb2013/24.

Swaid, S. I. and Wigand, R. T. Measuring the Quality of e-Service: Scale Development and Initial Validation. *Journal of Electronic Commerce Research*, 10(1):13–28, 2009.

Tan, F. B. and Chou, J. P. C. The Relationship between Mobile Service Quality, Perceived Technology Compatibility, and Users' Perceived Playfulness in the Context of Mobile Information and Entertainment Services. *International Journal of Human-Computer Interaction*, 24(7):649–671, 2008.

Taylor, D. G. and Levin, M. Predicting Mobile App Usage for Purchasing and Information-Sharing. *International Journal of Retail & Distribution Management*, 42(8):759–774, 2014.

Tesco. Tesco 2017 Anual Report, 2017a. URL https://www.tescoplc.com/media/392373/68336_tesco_ar_digital_interactive_250417.pdf.

Tesco. Contacts, 2017b. URL https://www.tescoplc.com/contacts/general/.

Tesco. History, 2017c. URL https://www.tescoplc.com/about-us/history/.

Trenz, M. and Berger, B. Analyzing Online Customer Reviews - An Interdisciplinary Literature Review And Research Agenda. In *Proceedings of the 21st European Conference on Information Systems (ECIS '13)*, pages 1–12, Utrecht, Netherlands, 2013. doi: 10.13140/2.1.1203.1361. URL http://aisel.aisnet.org/ecis2013{_}cr/83{%}5Cnhttp://aisel.aisnet.org/cgi/viewcontent.cgi?article=1306{&}context=ecis2013{_}cr{%}5Cnhttp://aisel.aisnet.org/ecis2013{_}cr/83/.

Tsikriktsis, N. Does Culture Influence Website Quality Expectations? An Empirical Study. *Journal of Service Research*, 5(2):1–39, 2002.

van Dyke, T. P., Kappelman, L. A., and Prybutok, V. R. Measuring Information Systems Service Quality: Concerns on the Use of the SERVQUAL Questionnaire. *MIS Quarterly*, 21(2):195–208, 1997.

Varshney, U. and Vetter, R. Mobile Commerce: Framework, Applications and Networking Support. *Mobile Networks and Applications*, 7:185–198, 2002.

VATM. Durchschnittliches Datenvolumen im Monat pro Mobilfunkanschluss* in Deutschland von 2009 bis 2016 (in Megabyte), 2017. URL https://de.statista.com/statistik/daten/studie/3506/umfrage/monatliches-datenvolumen-pro-mobilfunknutzer-in-deutschland/.

Verhoef, P. C., Kannan, P. K., and Inman, J. J. From Multi-Channel Retailing to Omni-Channel Retailing. Introduction to the Special Issue on Multi-Channel Retailing. *Journal of Retailing*, 91(2):174–181, 2015.

Vlachos, P. A. and Vrechopoulos, A. Determinants of Behavioral Intentions in the Mobile Internet Services Market. *Journal of Services Marketing*, 22 (4):1–38, 2008.

Vlachos, P. A., Giaglis, G., Lee, I., and Vrechopoulos, A. P. Perceived Electronic Service Quality: Some Preliminary Results From a Cross-National Study in Mobile Internet Services. *International Journal of Human-Computer Interaction*, 27(3):217–244, 2011. doi: 10.1080/10447318.2011.537207. URL http://www.tandfonline.com/doi/abs/10.1080/10447318.2011.537207.

Vom Brocke, J., Simons, A., Niehaves, B., Riemer, K., Plattfaut, R., Cleven, A., Brocke, J. V., and Reimer, K. Reconstructing the Giant: On the Importance of Rigour in Documenting the Literature Search Process. In *Proceedings of the 17th European Conference on Information Systems (ECIS '17), Volume 9: 2206-2217*, Verona, Italy, 2009. ISBN 9788861293915.

Walmart. Walmart 2017 Annual Report, 2017a. URL http://s2.q4cdn.com/056532643/files/doc_financials/2017/Annual/WMT_2017_AR-(1).pdf.

Walmart. Our History, 2017b. URL http://corporate.walmart.com/our-story/our-history.

Walmart. Walmart: In-Store & Online Shopping. Easy Reorders, 2017c. URL https://itunes.apple.com/us/app/walmart-app-shopping-savings-catcher-more/id338137227?mt=8.

Webb, H. W. and Webb, L. A. SiteQual: An Integrated Measure of Web Site Quality. *Journal of Enterprise Information Management*, 17(6):430–440, 2004.

Webster, J. and Watson, R. T. Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly*, 26(2):xiii – xxiii, 2002.

Wiegers, K. and Beatty, J. *Software Requirements*. Microsoft Press, Redmond, 2. edition, 2013.

Wolfinbarger, M. and Gilly, M. .comQ: Dimensionalizing, Measuring, and Predicting Quality of the E-tail Experience. *Working Paper: Marketing Science Institute Report*, pages 1–42, 2002.

Wolfinbarger, M. and Gilly, M. C. eTailQ: Dimensionalizing, Measuring and Predicting Retail Quality. *Journal of Retailing*, 79(3):183–198, 2003.

Xing, Y., Grant, D. B., McKinnon, A. C., and Fernie, J. Physical Distribution Service Quality in Online Retailing. *International Journal of Physical Distribution & Logistics Management*, 40(5):415–432, 2010.

Yang, K. and Kim, H.-Y. Mobile shopping motivation: An Application of Multiple Discriminant Analysis. *International Journal of Retail & Distribution Management*, 40(10):778–789, 2012.

Yang, Z., Cai, S., Zhou, Z., and Zhou, N. Development and Validation of an Instrument to Measure User Perceived Service Quality of Information Presenting Web Portals. *Information and Management*, 42(4):575–589, 2005.

Yoo, B. and Donthu, N. Developing a Scale to Measure the Perceived Quality of An Internet Shopping Site (SITEQUAL). *Quarterly Journal of Electronic Commerce*, 2(1):1–19, 2001.

Zeithaml, V. A. Service Excellence in Electronic Channels. *Managing Service Quality: An International Journal*, 12(3):135–139, 2002.

Zeithaml, V. A., Parasuraman, A., and Malhotra, A. A Conceptual Framework for Understanding e-Service Quality: Implications for Future Research and Managerial Practice. *Working Paper: Marketing Science Institute*, pages 1–26, 2000.

Zhao, L., Lu, Y., Zhang, L., and Chau, P. Y. K. Assessing the Effects of Service Quality and Justice on Customer Satisfaction and the Continuance Intention of Mobile Value-added Services: An Empirical Test of a Multidimensional Model. *Decision Support Systems*, 52(3):645–656, 2012.

Zhu, H., Chen, E., Xiong, H., Cao, H., and Tian, J. Mobile App Classification with Enriched Contextual Information. *IEEE Transactions on Mobile Computing*, 13(7):1550–1563, 2014.

Zobel, J. *Mobile Business und M-Commerce: Die Märkte der Zukunft erobern*. München, Hanser, 2001.