Journal of Data Intelligence, Vol. 3, No. 2 (2022) 278–296

EXPERT OPINIONS ON SMART RETAILING TECHNOLOGIES AND THEIR IMPACTS

ALEXANDER VOELZ
Faculty of Computer Science, University of Vienna, Waehringer Strasse 29
Vienna, 1090, Austria
alexander.voelz@univie.ac.at

PATRICK HAFNER
Faculty of Business, Economics and Statistics, University of Vienna, Oskar-Morgenstern-Platz 1
Vienna, 1090, Austria
patrick.hafner.univie@gmail.com

CHRISTINE STRAUSS
Faculty of Business, Economics and Statistics, University of Vienna, Oskar-Morgenstern-Platz 1
Vienna, 1090, Austria
christine.strauss@univie.ac.at

The share of e-commerce has been rising uninterrupted for many years, but the largest share of sales is still achieved in stationary retail. Nevertheless, many retailers are forced to address the benefits that consumers have gotten used to through digital shopping experiences. Smart Retailing is seen as a possible solution for brick-and-mortar stores to answer the challenges created by the rise of e-commerce. This study aims to present the current state of research in Smart Retailing and evaluate its potential to confront the challenges that have arisen in the industry. To do so, we built upon insights from previous works, in which we derived specific areas of impact that need to be considered when implementing Smart Retailing technologies. In this work, we substantiate our developed assessment with empirical data generated through the analysis of exploratory expert interviews. The *gain of valuable data* and the *personalization of the shopping experience* are confirmed among the positive impact factors. At the same time, *privacy concerns* and *customer acceptance risk* were the most discussed negative impact factors in the interviews. Finally, the interview findings were used to adapt the Technology Acceptance Model to the specific context of SR. Overall, this work provides more profound insight into the essential factors that need to be considered by brick-and-mortar retailers to face the increasing pressure imposed by online competition.

Keywords: Smart Retailing, Smart Retailing Technologies, Brick-and-Mortar Stores, Areas of Impact, Technology Acceptance Model

1. Introduction

Research on Smart Retailing (SR) is gaining ground in the scientific literature, mainly driven by the ongoing structural changes in the retail industry. This was preceded by the rise of e-commerce in recent decades, which led to predictions of the demise of brick-and-mortar stores. The stationary retail sector is struggling mainly because consumers have changed their buying behavior and expectations due to the influence of online retail. However, this has triggered a transformation in the sector, where increasing digitization provides a broad opportunity to deploy new and innovative technologies at the Point-of-Sale (PoS) to better

respond to the changing customer behavior [1, 2, 3]. The use of such technologies in retail is referred to as SR. This concept describes the integration of innovative technologies in an offline shopping scenario to improve the customer experience in retail [3, 4, 5, 6].

In the literature, SR is seen as a potential response of brick-and-mortar retail to the growing market share of online retail, which has been achieved through advantages in convenience, price, choice, and accessibility [1, 3, 7]. Especially through a more convenient and personalized retail service, scholars see the chance to reduce the gap between brick-and-mortar retail and e-commerce by meeting customers' expectations more appropriately [1, 2, 3]. Provided that the integration of SR at the PoS succeeds and the online and offline worlds increasingly merge, shopping in intelligent stores will become more widespread [2, 3, 8].

The paper at hand is based on [9], where we conducted a literature review to categorize Smart Retailing Technologies (SRTs) and assess their respective areas of impact. To extend our previous work and further contribute to the SR research, this study investigates empirical interview data on SRTs to support the impact factors highlighted in [9]. For this purpose, we conducted six explorative in-depth interviews with experts from the retail sector. The findings are used to substantiate our developed assumptions with empirical data. We identified the *gain of valuable data* and the *personalization of the shopping experience* as significant positive impact factors, while *privacy concerns* and *customer acceptance risk* were confirmed as significant negative impact factors. These results have led us to adapt the Technology Acceptance Model (TAM) to the specific context of SR with the aim of highlighting the crucial factors for the successful adoption of SRTs by consumers.

In Section 2 of this study, the reasons for the emergence of SR are introduced before we recap the insights from prior works. Section 3 covers the methodology of the present study, including the selection of experts and the conduction and analysis of the expert interviews. The key findings of this study are presented in Section 4, based on which we perform a context-specific adaption of the Technology Acceptance Model (TAM) in Section 5. Finally, this study's results are summarized in Section 6.

2. Theoretical Background

The theoretical background encompasses a short overview of SR and a classification of SRTs before the insights from our previously conducted literature review are presented.

2.1. *Smart Retailing*

As a result of its increasing digitization in the recent past, the retail sector is undergoing a fundamental structural change on several levels [1, 2, 7, 10]. On the one hand, consumers benefit from the possibility to quickly compare prices and the exchange of information with other consumers. This is mainly a result of the new online competition creating significantly more market offerings through lower access barriers [7], combined with ever better-connected consumers, creating substantially more market transparency [11]. Thus, brick-and-mortar retailers face massive price and supply pressure from their online competitors. Operating central warehouses enables online retailers to save considerable costs, which can subsequently be passed on to the customer and contribute to more extensive product portfolios [1].

Consumer behavior has changed significantly due to new ways of purchasing and the related benefits that digital shopping enables [1, 10, 12]. A 24/7 accessibility, and the conve-

nience of having the desired product delivered to one's doorstep, avoiding the inconveniences of conventional shopping, such as long queues, have convinced consumers early on [1, 13]. The Covid-19 pandemic has further influenced consumer behavior in favor of online retail. During shutdowns, contact restrictions have changed the shopping behavior significantly since people relied even more on ordering goods online. Accordingly, the scientific literature predicts the continuation of pandemic-induced behavioral changes [1, 12, 14].

However, the fact that the largest share of sales in 2020 was still achieved in stationary retail [15] suggests that offline and online channels will complement each other within an integrated setup in the future to ensure the best possible customer experience [16]. Consequently, it is unlikely that traditional brick-and-mortar retail will cease to exist in the near future [17]. In response, the scientific literature has brought up the idea of SR, which is discussed as a potential answer to the challenges mentioned above. SR is considered the intelligent transformation of physical stores, which aims to improve the customer shopping experience and retail processes through a composite of interactive, connective, and intelligent technologies at the PoS [4, 13, 18, 19]. Adapting to new and unpredictable circumstances through smart technologies in retail has illustrated its benefits, especially during the pandemic [6].

2.2. *Classification of relevant Smart Retailing Technologies*

Smart Retailing Technologies (SRTs) have been categorized in various ways in the existing literature. These include Inman and Nikolova [20], who put the technologies in chronological order by past, present, and future technology standards, Grewal et al. [21], who arranged them in a matrix based on convenience and social presence from the consumer's perspective, and Rieger et al. [22], who categorized them based on their technological characteristics. In [9], we performed a categorization of SRTs, which considers both customer- and retailer-oriented technologies. We built upon this categorization since the perspective of both customers and retailers needs to be considered for a holistic assessment. Accordingly, we classified SRTs based on the functional orientation to the different stakeholders into three categories, i.e., service-oriented, business process-oriented, and hybrid SRTs. A brief outline of these categories is given in the following, while a more extensive discussion can be found in [9].

2.2.1. *Service-oriented SRTs*

The categorization in [9] defines *service-oriented* SRTs as solutions primarily intended to enhance the customer's in-store shopping experience. We include mobile apps that provide customers with information during shopping and outside the physical store [23]. Consumers can expect different functions depending on the app and retailer. Personalized in-store push notifications based on beacon technologies, scanner functions for access to product-specific information, and virtual store maps with the possibility to locate specific products are just a few of the potential functions available to consumers [20, 24, 25, 26]. Additionally, smart dressing rooms and mirrors can be assigned to the service-oriented SRTs. Both technologies enable the recognition of clothing items selected by the customer and the provision of related product information, and additional customized product recommendations [8, 27]. Smart mirrors are also capable of using augmented reality to virtually portray the customers in their choice of clothing, without the necessity for the customer actually to change [5, 28].

2.2.2. *Business process-oriented SRTs*

The *business process-oriented* SRTs mainly describe technologies that aim to make retailers' business processes more efficient. Smart shelves can be considered the most prominent application in that category. They can predict out-of-stock situations on the shelves using various technologies such as RFID or weight sensors and transfer information directly to the retailer's merchandise management system so that out-of-stock situations are entirely avoided [20, 29]. Other smart shelf features such as Electronic Shelf Labels (ESL), which enable dynamic pricing, have the potential to increase the retailer's sales by making it easier to skim off the individual customer's willingness to pay [20].

2.2.3. *Hybrid SRTs*

Hybrid SRTs aim to improve both the customer experience and retailers' processes. Self-service SRTs such as smart shopping carts, self-checkout stations, and Go-Stores belong to this category. All three SRTs transfer the task of customer checkout from retail staff to the customers themselves. Smart shopping carts can track the items placed in or removed from them and thus display the cart value instantly [30, 31]. This eliminates the need to scan items at the checkout, reducing the workload for retail staff and saving customers time when leaving the store [5, 31]. Self-checkout stations transfer the whole task of scanning and checkout to the customers so that even more personnel resources are saved, whereby customers can expect fewer queues, as more checkout areas can be provided [20]. By contrast, in so-called Go-Stores, customers are automatically registered and billed via their account when entering and leaving the supermarket. Compared to the two technologies described above, Go-Stores reduce the need for staff and speed up the checkout process for customers most efficiently [2, 20]. Another technology that is also considered hybrid, although it is not a self-service technology, is digital signage. This SRT enables more individual and targeted addressing of customers, whose experience can be improved through relevant information and entertainment [32, 33, 34]. On top of that, retailers can save costs because the signage does not need to be changed manually by staff. The digital switching between advertisements allows more advertising partners to be displayed, generating larger revenue streams [33, 34, 35, 36].

2.3. *Areas of impact resulting from Smart Retailing technologies*

The following subsection recaps the derived implications from our previous study, where we provided an assessment of relevant SRT impact areas (cf. [9]). We shortly recap the essence of each of the identified impacts for better understanding. Additionally, the summarized results from that study are displayed in Table 1.

2.3.1. *Positive impacts*

As a result of the assessment in [9], we identified the following four positive impacts connected to the integration of SRTs :

- degree of disruption
- gain of valuable data
- savings in staff
- personalized shopping experience

Table 1. SRTs and related implementation impact assessment (from [9])

Area of Impact	Mobile App	Smart Mirror, Dressing Room	Smart Shelf	Smart Shop. Cart	Self-Checkout, Go-Store	Digital Signage
Positive Impacts						
Degree of disruption	low	medium	medium	medium	high	low
Gain of valuable data	high	-	high	high	high	-
Savings in staff	low	medium	medium	medium	high	medium
Pers. shopping experience	high	high	-	-	-	medium
Negative Impacts						
Cost of implementation	low	high	high	medium	high	medium
Maintenance intensity	medium	medium	medium	medium	high	medium
Error-proneness	low	high	high	high	high	medium
Privacy concerns	medium	medium	low	high	high	-
Customer acceptance risk	high	medium	low	high	high	-
Reduced customer contact	medium	medium	-	high	high	-

Degree of disruption. The aspect behind digital signage is the increase in convenience for store management and the sustainability that comes with it. However, the way retail operates will change only slightly due to the implementation of this technology. The same is true for mobile apps. These primarily have the advantage of providing additional information to customers without significantly impacting the core business model. The situation is different when considering the other technologies discussed in this paper. Implementing these at the PoS makes it possible to achieve considerable savings in human resources (e.g., with self-checkout stations, smart shopping carts, Go-Stores) or restructure entire business processes (e.g., dynamic pricing with smart shelves). This, in turn, has the effect of changing day-to-day business and creating advantages that other stores lacking these technologies may find challenging to compensate for.

Gain of valuable data. The gain of valuable data for retailers counts as one of the key benefits of SR. The implementation of self-checkout stations, Go-Stores, and smart shopping carts bring with it the recording of transaction data that, depending on the technology, can also be attributed to the shopper, making it even more valuable to the retailer. On the other hand, App tracking allows retailers to collect customer data through the mobile apps they offer, as information from website visits, search entries, and locations can be used to design and deliver personalized advertising. Possibilities to track customer behavior within stores by combining mobile apps with beacons are discussed in [26]. In addition, smart shelves have the advantage of quickly detecting or preventing future out-of-stocks through PoS-inventory data collection and machine learning. Digital signage, smart mirrors, and smart fitting rooms, in contrast, are not primarily designed to collect and store customer data.

Savings in staff. A huge benefit for the retailer is the reduction of labor associated with the implementation of SRTs and thus the reduced need for human resources. Self-checkout stations and Go-Stores are the most labor-saving solutions, as the checkout process can be handled without any staff. With smart shopping carts, a cashier is still needed. However, staff can also be reduced through faster checkout processing. Smart fitting rooms or smart mirrors

offer personalized shopping assistance, which eliminates store staff's need to perform these tasks. Nevertheless, the staff is still needed for issues that the virtual shopping assistance cannot help with. While smart shelving eliminates the need to check inventory on shelves and manually adjust price tags, digital signage can likewise relieve staff from having to change signs (including price tags) individually throughout the entire store environment. Although mobile apps may also relieve the workforce by providing the location or additional information for specific products that customers would otherwise ask store personnel for, their reduction in human resources is the lowest compared to the technologies described earlier.

Personalized shopping experience. An improved shopping experience includes tailoring the service to the customer's needs and expectations. This is mentioned by the majority of SR literature as one of the primary motivations for implementing SRTs. Smart mirrors and smart fitting rooms create unique personalized shopping assistance through algorithms that suggest suitable clothing items for the outfit selection made by the customer. Likewise, mobile apps succeed in delivering personalized content to customers through app tracking. Using digital signage, customized service can also be offered, although limited to specific customer groups (e.g., based on shopping hours or location) rather than individuals.

2.3.2. *Negative impacts*

During the assessment (cf. [9]), we identified the following six negative impacts associated to the integration of SRTs:

- cost of implementation
- maintenance intensity
- error-proneness
- privacy concerns
- customer acceptance risk
- reduction of customer contact

Cost of implementation. The cost of implementing the discussed SRTs can be grouped into three categories. Smart mirrors, smart fitting rooms, smart shelves, self-checkout stations, and Go-stores belong to the group of costly SRTs due to the supporting technologies needed to ensure their functionality. Smart shopping carts and digital signage are exceptional cases since a single unit may not cause high costs, while equipping an entire store adds up to medium costs. In comparison, the costs of developing a mobile app can be accounted to the entire set of stores, so we have attributed low implementation costs. Nevertheless, implementing new technologies always bears the risk that essential success factors are neglected during the planning phase [37]. That is why our assessment of implementation cost can only represent a rough estimate, which needs to be adjusted for individual cases.

Maintenance intensity. Many of the presented SRTs use RFID sensors or barcodes to identify products in order to perform tasks associated with them. Consequently, it can cause an intensive maintenance effort to repeatedly update the product portfolio that these technologies recognize with new and outdated products. In the case of Go-Stores, there is the additional factor that the customer is automatically billed when leaving the store so that the maintenance here is particularly intensive since the right recognition of the customer and the recording of the shopping cart are essential for the success.

Error-proneness. Where many heterogeneous technical systems interlock, there is a higher expected error rate. This is especially true for self-checkout stations, Go Stores, smart mirrors, smart fitting rooms, and smart shelves. If one of the technical systems fails, there is a high risk that the entire system becomes unusable. In the case of digital signage, multiple screens are connected within a network. However, the number of different technical systems involved is less than in the case of the SRTs mentioned above. Hence, the risk for errors can be considered moderate. On the other hand, mobile apps have a relatively low risk of failure once installed on a smartphone. Only server or Internet problems may lead to errors here.

Privacy concerns. Tracking customers' behavior and purchases inside stores is associated with high privacy concerns. This is estimated to be especially the case for self-checkout stations, Go-Stores, and smart shopping carts, for which tracking purchases is an essential part to enable the respective functionalities. Similarly, mobile apps are also associated with data protection concerns, especially if they are used in combination with beacon technology to track consumers within retail stores [26]. Nevertheless, the privacy concerns are not as high as with the SRTs described before, since the tracking and analyzing of customers' in-store behavior is not an essential functionality of mobile apps. Smart mirrors and smart fitting rooms can be assessed with a low risk of data protection concerns since they do not directly record the purchase but merely represent shopping assistance without knowing what the customer will ultimately buy. Since smart shelves and digital signage do not record any data from the customer, neither privacy nor data security concerns apply.

Customer acceptance risk. The customer's acceptance of the new technology is mainly based on the usefulness, ease of use, and assessment of how personal data is handled while using the technology. Digital signage has no risk of not being accepted by customers, as the individual is not directly involved in the execution process. The same is partially true for smart shelves since the customer may notice the impact of these two technologies but has little influence to use or reject them once in a store equipped with such technologies. Nevertheless, customers might still reject smart shelves if, for example, ELS are used for temporal price adjustments, which could lead customers to go as far as switching to another store. Therefore, there is a risk of customer acceptance for smart shelves, although low. Even though mobile apps can be classified as uncomplicated and user-friendly, as the daily use of such applications is widespread in society, they may lead to potential privacy issues if customers suspect app tracking. Additionally, retailers face the problem of generating app acceptance, which is caused by the overwhelming number of available retailing apps. Because the customer is aware that with the technologies of self-checkout stations, Go-Stores, and smart shopping carts, his purchase is tracked at any time, this can lead to significant privacy concerns on the one hand. On the other hand, the usage is not straightforward and requires a certain amount of explanation at first, unlike mobile apps, for example. The customer may associate this with effort, leading him to avoid the technology. The same applies to smart mirrors and smart fitting rooms, with the advantage that it is not the tracked purchase but rather the clothing choices made in the store, thus reducing the risk of privacy concerns.

Reduction of customer contact. Technologies are transferring many tasks to the customer so that personal contact is becoming less and less necessary. Go-Stores represent an extreme example of reducing customer contact. Customers can simply shop in the store without any contact with staff. The situation is similar with intelligent shopping carts and self-checkout

stations. Smart mirrors, smart fitting rooms, and mobile apps provide information that an employee would otherwise have provided in a personal conversation with the customer. This also reduces personal contact with customers, although to a lesser extent, as store personnel still have to remain available to deal with more complex issues. Digital signage and smart shelves, on the other hand, do not directly reduce contact with sales personnel, as this contact does not exist without the implementation of the SRT.

3. Methodological Approach

To make SR scenarios at the PoS more transparent, we discussed relevant SRTs and the benefits and challenges associated with these technologies (cf. [9]). The study at hand aims to foster and extend the generated insights through opinions gathered in the form of in-depth expert interviews. Primarily, we want to underpin the identified impact areas to consider when integrating SRTs, which were based on our literature research, with empirical data. For this purpose, we conducted explorative in-depth interviews with experts.

3.1. *Expert selection*

The selection of experts is of great importance because it significantly determines the results of the study. First and foremost, care must ensure that the selected individuals have expert knowledge in the field under investigation. Otherwise, the data quality may be negatively affected [38]. For this work, the involvement in at least one project in which SRTs were implemented in the retailing context formed the basic requirement to be fit for selection. More specifically, the experts must have held a position that significantly influenced the decisions made within the projects to be selected.

According to [39], two criteria need to be weighed against each other when selecting interview partners. On the one hand, there is the striving for variation so that there is a great potential for divergent opinions. On the other hand, a small differences between experts can ensure cross-interview compatibility of statements (cf. [39]). Although an even variation was initially aimed for when contacting experts, it could not be achieved in the end. However, there are only minor differences between the selected participants since five out of the six experts assisted retailers during the implementation of SRTs. This homogeneous characteristic of the experts increases the cross-interview compatibility of statements. Additionally, a focus was set on the Austrian retail market, which contributes even further to reduce the differences between the interview partners. In total, six explorative in-depth interviews were conducted with retail experts from Austria. The snowball sampling method was used for the recruitment of experts. An overview of the interviewed experts is given in Table 2.

Table 2. Overview of relevant characteristics of interviewed experts

No.	Company classification	Position	Time in position
I	Retail	Digital marketing specialist	2009 - 2018
II	Mobile marketing	CEO	2006 - 2018
III	App development and IT solutions	CEO	2001 - now
IV	Marketing agency	CEO	2012 - now
V	Digital PoS marketing	Managing partner	2013 - now
VI	CRM management	Senior project manager	2011 - 2019

3.2. *Explorative interviews and their analysis*

All interviews were conducted in an open manner without guiding questions to give the experts as much freedom as possible. Through this approach, potential biases resulting from guiding questions are avoided. Furthermore, unstructured interviews enable the interviewer to ask more detailed questions, depending on the focus of the experts' response and on what has already been said. Participants were assured that their answers would be treated confidentially and their identity would be kept anonymous. The resulting transcripts of the conducted interviews were imported and coded using the MAXQDA analysis software.

For the analysis of the interviews, we carried out a qualitative content analysis according to Mayring, which is particularly suitable for research on current developments [40]. The topic of SR encompasses a wide range of current issues, but the evidence in the literature is somewhat limited. This lack of data is the major reason for selecting the qualitative content analysis, as its informative value is, in contrast to quantitative methods, guaranteed even with small samples. A deductive approach is chosen for exploring and structuring this relatively novel topic. A deductive approach involves making theory-driven prior assumptions that may impact the topic under study [41].

In our case, the prior assumptions have been derived from the literature [9]. Hence, we chose the deductive technique available in the context of the qualitative content analysis, namely *structuring*. Structuring aims at extracting and classifying information from the material based on previously defined criteria [40]. In this process, a coding scheme is created before the first material run-through, which continuously provides the direction for extracting and classifying the information contained in the gathered material [41].

Since this study aims to confirm or reject the estimated importance of our previously identified impact areas, we used the individual impacts as predefined subcategories, while the positive or negative notation of the respective impact forms the main category. The definitions for the coding guide were adapted from the section on the areas of impact that result from SRTs (see Subsection 2.3.). We choose to use explorative unstructured in-depth interviews to avoid influencing the experts to mention specific impacts, as explained at the beginning of this section. The findings of the performed analysis are presented in the next section.

4. Assessment of Impact Areas through Expert Opinions

The areas of impact to consider when integrating SRTs are based on the insights derived from the literature review in [9] (cf. Table 1). For reasons of validation, we conducted interviews with retail industry experts to confirm or reject the importance of the individual impact areas.

The findings from the interviews regarding the importance of our previously identified impact areas are divided into confirmation and rejection of the positive and negative impacts. The summarized findings for the individual interviews are displayed in Table 3. Checkmarks indicate that an expert mentioned the respective impact during the interview, and an impact is written in gray if none of the interviewed experts mentioned it. The last column shows the level of independent agreement, which states the share of experts that mentioned the respective impact independent of each other. The level of independent agreement is written in bold if the majority of the experts mentioned a specific impact. In the following, we separately discuss the previously identified positive and negative impacts that were either confirmed or rejected through the conducted interviews. In this context of assessing impacts,

Table 3. Relevant impact areas for implementing SRTs based on expert opinions.

Area of Impact mentioned by Expert(s)	I	II	III	IV	V	VI	Level of independent agreement
Positive Impacts							
Degree of disruption	-	-	-	✓	-	-	1/6
Gain of valuable data	✓	-	✓	✓	✓	-	**4/6**
Savings in staff	-	-	-	✓	✓	-	2/6
Pers. shopping experience	✓	✓	✓	✓	✓	-	**5/6**
Reduced customer contact*	-	-	✓	✓	✓	-	3/6
Negative Impacts							
Cost of implementation	not mentioned						0/6
Maintenance intensity	not mentioned						0/6
Error-proneness	-	-	-	-	-	✓	1/6
Privacy concerns	✓	✓	✓	-	✓	✓	**5/6**
Customer acceptance risk	✓	✓	✓	✓	✓	✓	**6/6**
Reduced customer contact	mentioned as positive impact						

* originally classified as negative impact in [9]

we employed a classification rule according to which an impact is confirmed if it was mentioned by the majority of the interviewed experts.

4.1. *Positive impacts revised*

The *degree of disruption* was only mentioned during one of the interviews, but it was said to be of great importance in the future. The expert complained about the willingness of Austrian retailers to implement new technologies, which in return could give rise to the threat of drastic change in the retail industry. As a fictional example, the expert paints a picture of the future where Go-Stores have become standard, and all of them operate with the leading operating system of Amazon. This example illustrates that the possibility of a significant disruption increases due to the lack of willingness of retailers to incorporate SRTs into their existing business models. Nevertheless, since the degree of disruption is only mentioned by one expert, we cannot confirm the importance of this impact based on our classification rule.

Further, the *gain of valuable data* is the positive impact mentioned second-most during the interviews. Four out of six experts classify this impact as one of the greatest benefits resulting from integrating certain SRTs. This can be explained by the fact that the lack of valuable data represents a big disadvantage of brick-and-mortar retail compared to online retailers [26]. Therefore, the possibility to get insights about the behavior and habits of customers inside retail stores is rated as a major advantage that results from integrating SRTs by the experts, which confirms our literature-based assumption from previous works [9].

The possible *savings in staff* are mentioned by two out of six experts. They do so by referring to the frustrating situation of looking for products in a store and not even solving the search problem with the help of staff. According to the experts, such situations could be avoided by combining a mobile app and smart shelves to show customers the locations of desired products. Still, the interviews cannot confirm the importance of the savings in staff since it was not mentioned by more than half of the experts.

The realization of a *personalized shopping experience* is often presented in the scientific literature as a major objective for adapting SRTs [1, 2, 13, 20, 42, 43]. Consequently, this is the most mentioned positive impact in the interviews and thereby confirmed according to our classification rule. The majority of experts believe that sustainable customer loyalty will be the key factor for retailers in the future, which can only be achieved through personalizing the customer experience according to their opinion. As discussed previously (see Subsection 2.3.1. and [9]), smart mirrors, smart fitting rooms, and mobile apps have the potential to enable such a personalized shopping experience.

Reduced customer contact was initially classified as a negative impact (cf. [9]), which is why it was unexpected that three out of six experts mentioned this impact in a positive context. For once, the context of Go-Stores is seen as a positive impact, which might be available 24/7 without the need of staff and thereby addressing one of the current challenges of brick-and-mortar retail (see Subsection 2.1.). Moreover, two experts emphasize that reduced customer contact could result from services enabled through a mobile app, which provides product information or locations. But even after the conversion into a positive impact, the importance of reduced customer contact can still not be confirmed through the interviews.

4.2. *Negative impacts revised*

The *cost of implementation* and *maintenance intensity* is not mentioned during any of the interviews. This does not necessarily mean that these impacts are not of importance. It could instead be caused by the open structure of the interviews, which does not ensure that a specific set of topics are discussed during each interview. Furthermore, *reduced customer contact* was already discussed as a positive impact, so it is also not part of this section.

Error-proneness is only mentioned during one interview, in which the expert reports problems of accuracy while trying to track customers inside the store and send out promotions based on their location. Still, the majority of experts did not report similar problems during their SR technology implementation projects. Therefore, we cannot confirm that error-proneness is an important factor to consider when integrating SRTs.

The negative impact of *privacy concerns* is confirmed through the interviews since five out of the six experts mentioned this impact as a critical factor in the context of SR. These experts emphasized that annoying the customers with too many notifications or giving them the feeling of being spied on needs to be avoided. Manipulative behavior by retailers in the form of harassing notifications or excessive data collection is even seen as one of the biggest challenges in connection with the integration of SRTs. This is in accordance with the literature, where privacy concerns are discussed as a neglected factor during the implementation of SRTs [20, 44, 45]. Consequently, possible privacy concerns can be classified as one of the essential factors that need to be considered when implementing SRTs.

Finally, we present *customer acceptance risk* as the most important factor based on the experts' opinions because it was mentioned in every interview. As discussed in our previous assessment [9], customers' acceptance of new technologies is mainly based on the usefulness, ease of use, and evaluation of how personal data is handled while using the respective technology. Therefore, the customer acceptance risk is closely connected to privacy concerns, besides the strong influence of *perceived usefulness* and ease of use, as postulated by TAM (see Subsection 5.1.). The same opinion is shared by the experts, for which the customers' acceptance

of new technologies poses a great challenge in the context of SR. The need to activate specific functions or install too many apps on the smartphone, the fear of manipulative practices by retailers, and privacy concerns are all factors that can negatively influence customer acceptance, as has been mentioned by the experts as well as in the literature [20, 26, 44, 45, 46].

To summarize, among our previously identified impact areas, the expert interviews confirmed the *gain of valuable data* and the *personalization of the shopping experience* as positive impact factors. In contrast, *privacy concerns* and *customer acceptance risk* were confirmed as negative impact factors. Still, it has to be considered that this process of confirming the importance of selected impact factors cannot be deemed to be universally valid since the derived conclusions are based on explorative interviews with a small sample of mentioned experts (see. Subsection 3.1.). In the next section, we aim to address the most prominent impact factor of customer acceptance risk by adapting the TAM to the specific context of SR.

5. Technology Acceptance Model in the Context of Smart Retailing

This section addresses the impact of customers' acceptance of SRTs in the retail industry. For this purpose, a general description of the TAM and its components is provided. Afterward, the insights from the literature and the findings from the interviews are combined to identify additional influencing factors that need to be included when adapting the TAM to the specific context of SR.

5.1. *Technology Acceptance Model*

The TAM was developed by Davis [47] as an extension of the Theory of Reasoned Action. In his work, Davis designs a model in which consumer attitudes regarding acceptance of new technology are determined by the *perceived usefulness* and ease of use. Since then, the TAM and its further development [48] has become a widely used model in technology acceptance research. In [49], the authors present a systematic analysis of the use of the TAM in the context of information technologies by analyzing 101 publications from leading IT journals. In these publications, the TAM is used to examine a wide variety of systems, which the authors group into four categories. In addition to communications, general-purpose, and office systems, a quarter of the papers are assigned to the category of specialized enterprise applications. In this sense, SRTs also represent a specialized enterprise application for which the TAM is suitable. The identified literature supports this approach on SR since the TAM is often used for industry-specific or independent research [15, 18, 42, 50, 51].

The path to the *actual use* of a new technology in the TAM is represented by a multi-step process. At the beginning stands the *perceived usefulness* and *perceived ease of use* of a technology. Consumers form *attitudes toward using* a new technology based on these two factors. In the next step, the *intention to use* results from this attitude, which is followed by the *actual use* of the new technology [47]. This model is illustrated in Figure 1, which includes the direct influence of *perceived ease of use* on *perceived usefulness* that was confirmed in later works [52]. Nevertheless, the importance of *perceived ease of use* has also been questioned outright [53]. This has led to the *perceived usefulness* being given greater importance in later studies by adding a direct influence on *intention to use*. This relationship was subsequently confirmed in most studies [49] and is therefore also included in Figure 1.

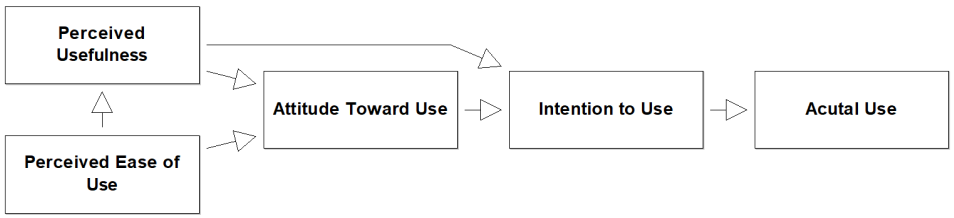

Fig. 1. Technology Accepted Model (from [47, 52]).

The TAM is usually adapted to the specific context under study by adding additional influencing factors. Such additional factors include, for example, superior functionality and market maturity of the technology [18], or customers privacy concerns [20, 44]. Other authors use additional influencing factors to describe *perceived usefulness*, and *perceived ease of use* comprehensively [15]. This work also aims at adapting the TAM to the context of SR by building upon the insights from [9] (see Subsections 2.2. and 2.3.), which will be complemented through expert interviews. The relevance of the TAM in this context is partially derived from these expert interviews and will be discussed in more detail.

Despite its widespread use, the TAM has also been criticized, as for example in [54]. The authors do not question the influence of *perceived usefulness* or *ease of use*, but the lacking consideration of additional and potentially influential factors is criticized. In response to early criticism, the original TAM was revised, and other external influencing factors were added [48]. However, even the revised model is said to lack explanatory power since the inclusion of additional factors has been shown to improve the validity of results [55]. Consequently, the most common limitation of the TAM is that no accurate predictions of *actual use* can be derived [49]. Early on, the lack of predictive power of the TAM was attributed to the fact that the *actual use* of a technology is not solely determined by the *attitude toward use* [56]. We address this criticism through a context-specific adaption of the TAM in the next subsection.

5.2. *Smart Retailing-Specific TAM Adaption*

The importance of customer acceptance risk was confirmed by the experts and has motivated us to adapt the TAM to the context of SR and thereby acknowledge the relevance of this factor for the successful integration of SRTs within the retail industry. Several other studies have already shown that the TAM is a suitable model for investigating the adaption of SRTs [15, 18]. Additionally, we use this SR specific adaption to address the previously mentioned criticism of the TAM (see Subsection 5.1.), according to which the missing inclusion of additional and potentially influencing factors leads to a lack of validity. Therefore, we aim for a context-specific adaption of the TAM to address the importance of customer acceptance risk and ensure validity by utilizing our previous literature review results combined with the insights from the conducted interviews.

Several studies attribute a direct influence of *perceived usefulness* to *intention to use*, and thus greater importance than *perceived ease of use* [49, 53]. The greater importance of *perceived usefulness* is also present in SR. For example, it was found in a study of consumer

attitudes toward apps in the retail market that user performance expectations are a crucial factor [45]. The experts also confirmed this influence by saying that it was essential to provide added value for the customers and clearly communicate the benefit.

Nevertheless, *perceived ease of use* cannot be neglected, as it is said to directly influence *perceived usefulness* in addition to its influence on *attitude toward use* [52]. The same opinion is shared by the experts, who report that simplifying usability adds significant value for customers. A corresponding challenge mentioned in the literature is the lacking will to install countless retail apps. Namely, this challenge manifests in the form of customers' desire for an overarching app [20] or the concern of having to install too many apps [45]. One possible solution to this problem is the implementation of so-called reach apps, which customers can use across several retail stores or shopping malls. A comparable approach is mentioned in the interviews, where the offering of a collaborative app by shopping streets or malls is emphasized.

Having confirmed the influence of *perceived usefulness* and *perceived ease of use*, it is now necessary to add context-specific factors to the TAM to improve the validity of the model. Against this background, customer privacy concerns are mentioned in the literature as a neglected factor [20, 44, 45] and were also identified as a major challenge in our previous study [9]. Such privacy concerns can manifest in different forms, like frustration from receiving too many notifications or the fear of manipulative practices by retailers [46]. The experts also confirm similar concerns, as discussed previously (see Subsection 4.2.).

Privacy concerns can result in several interrelated influencing factors that must be considered when assessing SR technology adaption. Regarding such attitudes toward the adaption of new technologies in retail, great importance is attributed to perceived fairness, the establishment of perceived trust or trustworthiness, and the resulting customer loyalty [20, 44]. Moreover, consumers emphasize that retailers' honest intentions are a prerequisite for customers' adoption of retailing technologies [46]. Therefore, it is crucial to consider the different manifestations of privacy concerns to study customers' adoption of SRTs in the TAM.

In summary, considering customers' privacy concerns has led us to add the influencing factors *perceived fairness* and *trustworthiness* to the TAM, as displayed in Figure 2. In general, perceived fairness can be defined as the extent to which an individual perceives the relationship with another party, in this case, retailers, as balanced and fair [57]. Conversely, such a relationship is perceived as unfair if customers feel that the benefits resulting for them are disproportionate to the effort invested or the benefits created for retailers [20, 45]. In adapted TAM, perceived fairness is primarily determined by *perceived usefulness*. To build trust and customer loyalty, the experts recommend establishing a CRM system to provide individual customer care. Consequently, the development of personalized interactions in future brick-and-mortar retail stores through SRTs is considered to be crucial [43].

Due to the unique position of perceived fairness, it was attributed a direct influence on *intention to use* in the adapted TAM, just like *perceived usefulness* (see Figure 2). In addition to perceived fairness, long-term trust-building is needed to convince customers of retailers' trustworthiness, and honest intentions [44, 46]. According to the experts, such processes are essential to establish sustainable customer relationships, which takes time and effort. To acknowledge the importance of trustworthiness for believably communicating retailers' honest intentions, we decided to grant trustworthiness an influence on perceived fairness as the final context-specific adaption of the TAM.

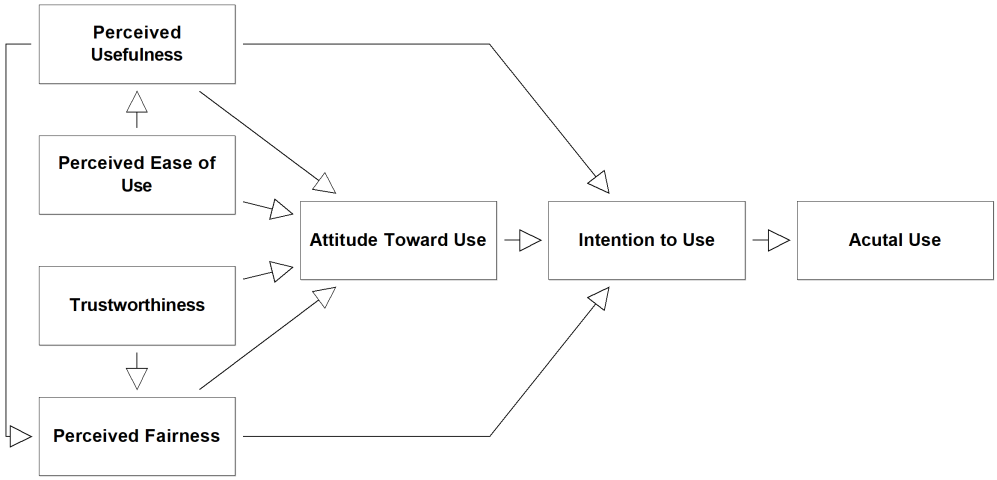

Fig. 2. Technology Accepted Model [47, 52] adapted to Smart Retailing.

6. Conclusion and Future Work

The goal of this work was to substantiate the identified influencing factors for the implementation of SRTs from previous works [9] with empirical data. For this purpose, explorative unstructured interviews were conducted with six experts from the retail industry. The transcripts of these interviews were later analyzed using the deductive structuring approach from Mayings' qualitative content analysis, which means that we used predefined categories to classify the content of the conducted interviews. In a subsequent step, we used the findings from the interviews to revise the importance of impact factor we deemed important when integrating SRTs. Namely, the the *gain of valuable* data and the *personalization of the shopping experience* were confirmed as positive impact factors by the interviews, while *privacy concerns* and *customer acceptance risk* were confirmed as negative impact factors. Based on this insight from the interviews, we adapted the TAM to the specific context of SR by adding *trustworthiness* and *perceived fairness* as context-specific influencing factors. Through this adaption, we addressed the confirmed challenge of *customer acceptance risk* which at the same time improves the validity of the TAM.

Nevertheless, several limitations of this study have to be addressed as they can represent future research possibilities. First, the interviews were conducted with Austrian retail experts, which raises the need to carry out comparable investigations in other countries and perform cross-country validations in the future. Second, the sample size of six experts is not particularly large, which is one of the reasons for selecting the qualitative content analysis, as its informative value is guaranteed even with smaller samples. Still, future studies should aim at extending the SR literature not only by qualitative but also quantitative studies since this group of methods is not yet commonly employed in the SR context. Third and last, we used the TAM to analyze the possible adaption of SRTs by consumers, which is often criticized in the scientific literature for lacking validity and predictive power. As mentioned above, we addressed these points of criticism through a context-specific adaption of the TAM. Future

studies should try to confirm the influence of *trustworthiness* and *perceived fairness* or extend the TAM by identifying more influencing factors specific to the context of SR.

The results of this paper have shown that the topic of SRTs is becoming increasingly relevant both in the literature and in practice and is thus legitimately seen as an opportunity for retailers to respond to changing consumer behavior and expectations. Nevertheless, it was shown that some essential influencing factors have to be considered on the way to an SR environment in brick-and-mortar retail. For this reason, the use of SRTs at the PoS offers a variety of further research opportunities. Future studies should pursue a better understanding of the short- and long-term benefits and consequences of different SRTs and their implementation. In this regard, the findings of this study should be supported and extended with further empirical research. In addition to the opinion of retail experts as described in this paper, the perspective of regular consumers regarding SRTs calls for further studies. Likewise, future work should not only examine SR as an overarching concept, as it would be equally interesting to analyze individual and their applications technologies separately.

The results from this paper are particularly important for managers and operators of brick-and-mortar stores, whose business activities are directly influenced by changing consumer behavior and expectations. Likewise, the study results are highly relevant for employees in the retail sector, as digitization, the associated automation of business processes, and the shifting of operational tasks to the customers significantly change job requirements [3].

References

1. Dinesh K. Gauri, Rupinder P. Jindal, Brian Ratchford, Edward Fox, Amit Bhatnagar, Aashish Pandey, Jonathan R. Navallo, John Fogarty, Stephen Carr, and Eric Howerton. Evolution of retail formats: Past, present, and future. *Journal of Retailing*, 97(1):42–61, 2021.
2. Dhruv Grewal, Anne L. Roggeveen, and Jens Nordfält. The future of retailing. *Journal of Retailing*, 93(1):1–6, 2017.
3. Eleonora Pantano and Harry Timmermans. What is smart for retailing? *Procedia Environmental Sciences*, 22:101–107, 2014.
4. Xiaojun Fan, Nanxi Ning, and Nianqi Deng. The impact of the quality of intelligent experience on smart retail engagement. *Marketing Intelligence & Planning*, 38(7):877–891, 2020.
5. Sanjit K. Roy, M. S. Balaji, and Bang Nguyen. Consumer-computer interaction and in-store smart technology (ist) in the retail industry: the role of motivation, opportunity, and ability. *Journal of Marketing Management*, 36(3-4):299–333, 2020.
6. Venkatesh Shankar, Kirthi Kalyanam, Pankaj Setia, Alireza Golmohammadi, Seshadri Tirunillai, Tom Douglass, John Hennessey, J.S. Bull, and Rand Waddoups. How technology is changing retail. *Journal of Retailing*, 97(1):13–27, 2021.
7. Ellen McArthur, Scott Weaven, and Rajiv Dant. The evolution of retailing: A meta review of the literature. *Journal of Macromarketing*, 36(3):272–286, 2016.
8. Amaradri Mukherjee, Ronn J. Smith, and Anna M. Turri. The smartness paradox: the moderating effect of brand quality reputation on consumers' reactions to rfid-based smart fitting rooms. *Journal of Business Research*, 92:290–299, 2018.
9. Patrick Hafner, Alexander Voelz, and Christine Strauss. Smart retailing technologies to counter current retail challenges - an assessment of impacts. In *The 23rd International Conference on Information Integration and Web Intelligence*, iiWAS2021, page 586–595, New York, NY, USA, 2021. Association for Computing Machinery.
10. Sabrina Helm, Soo Hyun Kim, and Silvia Van Riper. Navigating the 'retail apocalypse': A framework of consumer evaluations of the new retail landscape. *Journal of Retailing and Consumer Services*, 54:101683, 2020.

11. Behrang Rezabakhsh, Daniel Bornemann, Ursula Hansen, and Ulf Schrader. Consumer power: a comparison of the old economy and the internet economy. *Journal of Consumer Policy*, 29(1):3–36, 2006.
12. Anupam Nanda, Yishuang Xu, and Fangchen Zhang. How would the covid-19 pandemic reshape retail real estate and high streets through acceleration of e-commerce and digitalization? *Journal of Urban Management*, 10(2):110–124, 2021.
13. Eleonora Pantano, Constantinos Vasilios Priporas, and Charles Dennis. A new approach to retailing for successful competition in the new smart scenario. *International Journal of Retail & Distribution Management*, 46(3):264–282, 2018.
14. Anne L. Roggeveen and Raj Sethuraman. How the covid-19 pandemic may change the world of retailing. *Journal of Retailing*, 96(2):169–171, 2020.
15. Javier Lorente-Martínez, Julio Navío-Marco, and Beatriz Rodrigo-Moya. Analysis of the adoption of customer facing instore technologies in retail smes. *Journal of Retailing and Consumer Services*, 57:102225, 2020.
16. Andreas Mladenow, Antoaneta Mollova, and Christine Strauss. Mobile technology contributing to omni-channel retail. In *Proceedings of the 16th International Conference on Advances in Mobile Computing and Multimedia*, MoMM2018, page 92–101, New York, NY, USA, 2018. Association for Computing Machinery.
17. Peter C. Verhoef, P.K. Kannan, and J. Jeffrey Inman. 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.
18. Sanjit Kumar Roy, M.S. Balaji, Ali Quazi, and Mohammed Quaddus. Predictors of customer acceptance of and resistance to smart technologies in the retail sector. *Journal of Retailing and Consumer Services*, 42:147–160, 2018.
19. Sanjit Kumar Roy, M S Balaji, Saalem Sadeque, Bang Nguyen, and T C Melewar. Constituents and consequences of smart customer experience in retailing. *Technological Forecasting and Social Change*, 124:257–270, 2017.
20. J. Jeffrey Inman and Hristina Nikolova. Shopper-facing retail technology: A retailer adoption decision framework incorporating shopper attitudes and privacy concerns. *Journal of Retailing*, 93(1):7–28, 2017.
21. Dhruv Grewal, Stephanie M Noble, Anne L Roggeveen, and Jens Nordfalt. The future of in-store technology. *Journal of the Academy of Marketing Science*, 48(1):96–113, 2020.
22. Anne-Sophie Riegger, Jan F. Klein, Katrin Merfeld, and Sven Henkel. Technology-enabled personalization in retail stores: Understanding drivers and barriers. *Journal of Business Research*, 123:140–155, 2021.
23. Unnati Narang and Venkatesh Shankar. Mobile app introduction and online and offline purchases and product returns. *Marketing Science*, 38(5):756–772, 2019.
24. Nikita Adkar, Akshata Talele, Chinmayee Mundhe, and Anita Gunjal. Bluetooth beacon applications in retail market. In *2018 International Conference On Advances in Communication and Computing Technology*, ICACCT, pages 225–229, New York, NY, 2018. IEEE.
25. Kang Eun Jeon, James She, Perm Soonsawad, and Pai Chet Ng. Ble beacons for internet of things applications: Survey, challenges, and opportunities. *IEEE Internet of Things Journal*, 5(2):811–828, 2018.
26. Alexander Voelz, Andreas Mladenow, and Christine Strauss. Beacon technology for retailers - tracking consumer behavior inside brick-and-mortar-stores. In Christine Strauss, Gabriele Kotsis, A Min Tjoa, and Ismail Khalil, editors, *Lecture Notes in Computer Science*, volume 12923 of *Database and Expert System Applications. DEXA 2021*, pages 380–390. Springer, Cham, 2021.
27. W.K. Wong, S.Y.S. Leung, Z.X. Guo, X.H. Zeng, and P.Y. Mok. Intelligent product cross-selling system with radio frequency identification technology for retailing. *International Journal of Production Economics*, 135(1):308–319, 2012.
28. Atieh Poushneh. Augmented reality in retail: A trade-off between user's control of access to personal information and augmentation quality. *Journal of Retailing and Consumer Services*,

41:169–176, 2018.
29. Ruinian Li, Tianyi Song, Nicholas Capurso, Jiguo Yu, Jason Couture, and Xiuzhen Cheng. Iot applications on secure smart shopping system. *IEEE Internet of Things Journal*, 4(6):1945–1954, 2017.
30. G. Premananthan, B. Nagaraj, and N. Divya. Sensor based integrated smart trolley system using zigbee-experimental analysis. *Materials Today: Proceedings*, 2020.
31. G. Sharmila, J. Ragaventhiran, M. Islabudeen, and B. Muthu Kumar. Rfid based smart-cart system with automated billing and assistance for visually impaired. *Materials Today: Proceedings*, 2021.
32. Christine Bauer, Paul Dohmen, and Christine Strauss. Interactive digital signage - an innovative service and its future strategies. In *2011 International Conference on Emerging Intelligent Data and Web Technologies*, EIDWT, pages 137–142, New York, NY, 2011. IEEE.
33. Charles Dennis, Richard Michon, J. JoŠko Brakus, Andrew Newman, and Eleftherios Alamanos. New insights into the impact of digital signage as a retail atmospheric tool. *Journal of Consumer Behaviour*, 11(6):454–466, 2012.
34. Marion Garaus and Udo Wagner. Let me entertain you – increasing overall store satisfaction through digital signage in retail waiting areas. *Journal of Retailing and Consumer Services*, 47:331–338, 2019.
35. Marion Garaus, Udo Wagner, and Ricarda C. Rainer. Emotional targeting using digital signage systems and facial recognition at the point-of-sale. *Journal of Business Research*, 131:747–762, 2021.
36. Andrew Newman, Charles Dennis, Len-Tiu Wright, Tamira King, et al. Shoppers' experiences of digital signage-a cross-national qualitative study. *International Journal of Digital Content Technology and its Applications*, 4(7):50–57, 2010.
37. Reza Bandarian. Measuring commercial potential of a new technology at the early stage of development with fuzzy logic. *Journal of Technology, Management & Innovation*, 2(4):73–85, 2008.
38. Robert Kaiser. *Qualitative Experteninterviews: Konzeptionelle Grundlagen und praktische Durchführung*. Springer-Verlag, 2014.
39. Ulrike Froschauer and Manfred Lueger. *Das qualitative Interview: Zur Praxis interpretativer Analyse sozialer Systeme*. utb GmbH, 2020.
40. Philipp Mayring. Qualitative inhaltsanalyse. In Günter Mey and Katja Mruck, editors, *Handbuch Qualitative Forschung in der Psychologie: Band 2: Designs und Verfahren*, pages 495–511, Wiesbaden, 2020. Springer Fachmedien Wiesbaden.
41. Christina Ramsenthaler. Was ist qualitative inhaltsanalyse? In Martin Schnell, Christian Schulz, Harald Kolbe, and Christine Dunger, editors, *Der Patient am Lebensende: Eine Qualitative Inhaltsanalyse*, pages 23–42, Wiesbaden, 2013. Springer Fachmedien Wiesbaden.
42. Sujana Adapa, Syed Muhammad Fazal-e Hasan, Sathyaprakash Balaji Makam, Muhammad Masood Azeem, and Gary Mortimer. Examining the antecedents and consequences of perceived shopping value through smart retail technology. *Journal of Retailing and Consumer Services*, 52:101901, 2020.
43. Dalal Zaim, Aziza Benomar, and Mostafa Bellafkih. Developing a geomarketing solution. *Procedia Computer Science*, 148:353–360, 2019.
44. Gabriele Pizzi and Daniele Scarpi. Privacy threats with retail technologies: A consumer perspective. *Journal of Retailing and Consumer Services*, 56:102160, 2020.
45. Marc Cordiglia and Jean-Paul Van Belle. Consumer attitudes towards proximity sensors in the south african retail market. In *2017 Conference on Information Communication Technology and Society*, ICTAS, pages 1–6, New York, NY, 2017. IEEE.
46. Stephanie van de Sanden, Kim Willems, and Malaika Brengman. In-store location-based marketing with beacons: from inflated expectations to smart use in retailing. *Journal of Marketing Management*, 35(15-16):1514–1541, 2019.
47. Fred D Davis. Perceived usefulness, perceived ease of use, and user acceptance of information

technology. *MIS quarterly*, pages 319–340, 1989.
48. Viswanath Venkatesh and Fred D Davis. A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science*, 46(2):186–204, 2000.
49. Younghwa Lee, Kenneth A Kozar, and Kai RT Larsen. The technology acceptance model: Past, present, and future. *Communications of the Association for information systems*, 12(1):50, 2003.
50. Hye-Young Kim, Ji Young Lee, Jung Mee Mun, and Kim KP Johnson. Consumer adoption of smart in-store technology: assessing the predictive value of attitude versus beliefs in the technology acceptance model. *International Journal of Fashion Design, Technology and Education*, 10(1):26–36, 2017.
51. Eleonora Pantano and Alessandro Gandini. Exploring the forms of sociality mediated by innovative technologies in retail settings. *Computers in Human Behavior*, 77:367–373, 2017.
52. Fred D. Davis, Richard P. Bagozzi, and Paul R. Warshaw. Extrinsic and intrinsic motivation to use computers in the workplace1. *Journal of Applied Social Psychology*, 22(14):1111–1132, 1992.
53. Mark Keil, Peggy M. Beranek, and Benn R. Konsynski. Usefulness and ease of use: field study evidence regarding task considerations. *Decision Support Systems*, 13(1):75–91, 1995.
54. Mirella Kleijnen, Ko de Ruyter, and Martin Wetzels. An assessment of value creation in mobile service delivery and the moderating role of time consciousness. *Journal of Retailing*, 83(1):33–46, 2007.
55. James M Curran and Matthew L Meuter. Self-service technology adoption: comparing three technologies. *Journal of Services Marketing*, 19(2):103–113, 2005.
56. Shirley Taylor and Peter A Todd. Understanding information technology usage: A test of competing models. *Information systems research*, 6(2):144–176, 1995.
57. III James G. Maxham and Richard G. Netemeyer. Firms reap what they sow: The effects of shared values and perceived organizational justice on customers' evaluations of complaint handling. *Journal of Marketing*, 67(1):46–62, 2003.