



# **The Role of Augmented Reality in Retail Settings: A Systematic Literature Review and Research Agenda**

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## Abstract

The research on augmented reality (AR) in retail settings generally appeared from a Human-Computer Interactions (HCI) perspective in academic studies from the late 1990s. This subject gained increased attention from both academics and practitioners and established marketing and management perspectives from a technical perspective from the 2010s. Despite increasing interest and discussions on AR in retail settings, we still have no systematic understanding of the knowledge gained in retail research of AR; the intersection of AR research with retail; the existing emphasis on AR research, the underlying avenues of research and major limitations in AR literature in retail sector. This study therefore aims to analyse and synthesise the current AR literature in retail environments as well as to provide a conceptual framework. 96 journal articles across 23 years were thematically collected and analysed in order to reveal AR research themes over time and underlying research foci in different disciplines. Three research themes are identified from literature: (1) AR consumer adoption factors using technology acceptance models; (2) AR and user experience design and AR features that impact consumer behaviour; (3) AR shopping experience and value theory. The most important research discrepancies are the complexity of the HCI factors in the retail sector that influence shopping behaviour. In addition, this study provided several future research directions based on three research topics, in order to better understand the potential of AR technology in retail. The contribution of this study is synthesising the current discussions of AR research in order to provide an up-to-date view of current state of AR research foci, current challenges and future research directions, which helps to make AR a viable reality in retail settings.

**Keywords:** Augmented Reality; AR; Retailing; Technology; Systematic Literature Review

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## Chapter 1 Introduction

### 1.1 Research Background

*One day, we believe this kind of immersive, augmented reality will become a part of a daily life for billions of people.*

— Mark Zuckerberg, Founder and CEO of Facebook Inc. (2014)

Technological development changes the way retailers communicate with their customers. Augmented reality applications have a unique potential to produce value by creating convincing online and offline shopping experiences (Rafaeli et al., 2017). This thesis, therefore, aims to expose current research fields, research topics and significant research gaps in the increased reality literature (AR) in retail environments. Today, the advantages of technology innovations have been gradually aware by retailers. They are increasingly getting more attention, including fast progress in various systems, e.g. 3D virtual reality and VR headsets, interactive Augmented Reality and AR-screen displays, mobile apps etc (Papagiannidis et al., 2014; Dennis et al., 2014; Pantano, 2016).

Notably, augmented reality technology has its advantages, and the unique one is that AR can enable and add virtual elements to the real world (Javornik, 2016a). In the retail settings, it means that AR is capable of adding digital elements into the retail environment in real-time that contribute to a possible shopping experience that is immersive (Bulearca and Tamarjan 2010). The success and development in the application of AR technology have therefore been increased in the retail sector in recent years both online and offline (Jaekel, 2016) and it has been possible to carry out studies in a much more natural environment (Javornik, 2016b). In its promotional campaigns, many retailers, including Sephora, eBay and IKEA, have adopted AR (Scholz and Smith, 2016).

However, while retailers are hastily future-proofing their AR applications, consumer uptake of AR stays notably sluggish and nevertheless feel overwhelmed with AR (Heller et al., 2019). Customers frequently strain to envision online commodities in their intended settings. They are displeased when, for instance, the sofa that initially appealed in images does not match their home decor (Hilken et al., 2018). Some consumers would also miss the opportunity to view and experience the products directly from the actual

shop environment, customer service and interaction with shopping assistants (Hilken et al., 2018).

Retailers are gradually starting to leverage AR applications that enable omnichannel experiences to address these challenges (Brynjolfsson et al., 2013). AR has indeed made an appearance in the marketing ecosystem, with ever-expanding retail utility (Javornik, 2016a). Retailers, such as Sephora and L'Oreal, launched their AR software as an AR mirror, enabling their customers to make up without actually making up (Jaekel, 2016). Other major retailers like eBay and IKEA have also introduced various kinds of AR interfaces which will allow their clients to experience their products more realistically and vicariously (Archer, 2016). Virtual content such as product images, animations and features are incorporated by AR in a special and interactive way into the physical world in real-time of customers (Azuma et al., 2001). AR compensates, by providing relevant information in an immersive or enhanced experience, for the absence of a direct consumer viewing and handling facility (MacIntyre et al., 2001; Pantano and Servidio, 2012; Papagiannidis et al., 2017). Therefore this is the advantage of AR (Poushneh, 2018); It can deliver a robust shopping experience simulation that allows consumers more effectively assess the products (Kim and Forsyth, 2008a) and reducing uncertainty when making purchase decisions (Pantano et al., 2017; Papagiannidis et al., 2017). Therefore, AR is transforming the ways that customers experience in the physical and virtual worlds (Flaviá et al., 2019).

It is thus likely to modify a wide range of consumer activities, including product searches and testing (Javornik, 2016a). With its increasing use, the need to gain a deeper and better understanding of AR's customer shopping potential is constantly increasing (Scholz and Duffy, 2018). The global AR market is expected to be \$56.8 billion by 2020 (Statista, 2018), with Fortune predicting \$120 billion in revenues generated by that time (Fortune, 2015). With this increase, it is more and more important to explore the influence of AR on the customer shopping journey (Javornik, 2016a). This data also reflect the high aspirations of AR technology in the future. However, there are very limited insights looking into the use of AR in retail settings as it still in its early stage.

Despite these developments, current AR experiences seemingly fail to impress customers (Hilken et al., 2018). Although customers suggest an increased purchasing likelihood via

existing AR applications, about 51% still cite retailer inability to fully exploit the technology as it stands (Digital Bridge, 2017). A primary reason ascribed to the inadequate performance is that retailers still cannot leverage digital online technology to successfully integrate and match offline consumer experience (Accenture, 2016). Inflationary expectations will lead to a failure of initial AR systems and software will only be of benefit if retailers can prioritise actual needs of their consumers (Hilken et al., 2017), such as more productive and pleasant shopping experience that reduces confusion in decision-making (Dacko, 2017). Consumers still have to be convinced that technologies are a must instead of just a technology jacket (Javornik, 2016a). In addition, even with the advent of cheaper hardware, widespread acceptance has not been achieved, suggesting that customers are still struggling to understand the value of using AR technology (Goldman Sachs, 2017). More specifically, the current adoption as a chicken and egg dilemma is characterised by Goldman Sachs (2017), as AR providers (retailers and developers) are reluctant to develop content if the consumer adoption is low and, converse, consumer adoption is low if the content is limited. Consequently, existing AR implementations may not be a bellwether in the interests of long-term success and retailers face a significant risk that consumers will accept AR solutions (Hilken et al., 2017). Therefore, it underlines why it is so crucial to examine the role of AR in retail settings also it is potential comprehensively (Javornik, 2016a; Dacko, 2017), and thus can provide insights into further improving AR's shopping experience. Although it was introduced in retail research to affect consumer decision-making (in terms of product selection) (Pantano et al., 2017), the potential impact of the augmented reality (AR) in retail environments remains at an early stage.

## **1.2 Research Aim**

This thesis aims to synthesise the existing literature in the field of augmented reality in a retail context to provide current foci of AR research, as well as to draw a conceptual framework to frame the basis for a future research agenda.

## **1.3 Research Focus and Objectives**

AR technology are increasingly applied in retail settings, and its rapid development has attracted growing academic research attention, as well as further developments and applications (Javornik, 2016; Dacko, 2017). AR has been introduced since the 1960s,

however, only over the past decade has there been enough work to refer to AR as a research field. Azuma published a survey about AR, described the current state of AR and summarised the development up to that point. Since then, AR research's growth and progress were getting remarkable development. However, AR research in a retail context has traditionally grown from an initial focus on Human-Computer Interaction (HCI) perspective (Pantano and Servidio, 2012), only more recently has there been a more essential consideration and attention in the field of marketing and management perspective (Poncin and Mimoun, 2014; Javornik, 2016a; Poushneh and Vasquez, 2017; Dacko, 2017). The studies are fragmented due to their voluntary nature and ambiguity. A fragmented body of existing literature and limited evidence of realistic retail use of AR will lead to a lack of consistent consumer research foundations in the future. A fragmented academic literature on augmented reality from two separate viewpoints results in a substantial heterogeneity which leaves room for incorporating previous findings in consumer research. While this can be clarified by its interdisciplinary nature of AR research, there remains a pressing need for a crucial examination and synthesis of the current state and key current debates in AR research and applications in retail to frame future directions for a research agenda. Thus, systematic reviews can be one of the most efficient ways of incorporating such a broad fragmentation of literature, according to Rousseau et al., (2008). In addition to helping synthesise fragmented current research results, a systematic structural literature review of literature provides recommendations on possible directions for future research agendas as well (Petticrew, 2001).

Accordingly, the research objectives of this study include the following:

1. To critically review the AR literature in retail settings including examining any important issues and the current state of AR research to synthesise and integrate them from different fields.
2. To evaluate identified AR research foci and critique the most significant gaps within these research themes.
3. To conceptualise a framework for the research field in terms of AR in a retail context based on the review and draw upon this synthesis to outline a future research agenda.

Consequently, this literature review provides the following contributions:

1. It critically synthesises and examines current debates on AR research in retail settings from different disciplines including marketing and management perspective and Human-Computer Interaction (HCI) perspective.
2. It summarises three AR research themes in a retail context from segregated extant literature, and identifies the most crucial gaps within current AR research.
3. It creates a conceptualised framework upon this synthesis to frame a future research agenda, and it highlights the virtual elements of AR essential for consumers' AR experience that may provide the catalyst for future study.
4. A comprehensive view of the emerging advantages and challenges of AR adaptation in retail is drawn, it provides opportunities, directions, and avenues for the future research in this increasingly essential subfield of retail studies in order to make AR applications financially viable.

#### **1.4 Research Methodology**

A systematic literature review about AR on consumer aspects will be conducted for the period between 1997- 2019. This systematic literature review mainly focused on papers from 2014 in order to reflect the current state of AR research, as there is a surge increase of AR literature from this year to present day. Including earlier work (1997 onwards) will however be permitted for making historical comparisons. 80 percent of the articles have therefore been published since 2014. This study provides the basis for the identification of research recommendations on customer reactions to AR in retailing. The key sampling method was a protocol that outlines academic databases, search terms and philtres the beginning of the study. The following databases have been chosen for their excellent work within the academic research community to reduce the impact of database biases: Google Scholar, Elsevier, Emerald, Springer, Scopus and the Web of Science on their journal web pages. Specifically, the author looked into the marketing and retailing journals (such as Journal of Retail and Consumer Service, Journal of Fashion Marketing and Management, Journal of Business Research, Technological Forecasting & Social Change) as much AR literature has been published in them and the nature of AR research

is in technology as well as management and marketing. The resource collection process ascertained technological and consumer related search terms such as augmented reality or AR, retailing, consumer behaviour, customer experience, etc; as presented in Dacko (2017), Papagiannidis et al., (2017), Hilken et al., (2018), Bonetti et al., (2018) and Xue and Parker (2019). Literature collection will be taking between March 2019 and August 2019, subsequently 96 crucial journal papers were collected. Each key search terms were sought start from Google Scholar. The collection of this literature review began with the latest publications of AR research and the work going back in time with high quality journals which were published in credible academic journals or platforms (Hilken et al., 2018). These relevant articles were downloaded and stored in Mendeley in PDF format. The key papers cited were identified during journal analysis, and then located and reviewed for subsequent download.

### **1.5 Chapter Summary**

Augmented realities (AR) that describe its ability to embed virtual elements with physical world contexts are a huge concern to retail research (Carmigniani et al., 2011; Javornik, 2016a). The early adoption of AR applications in the retail settings is the main reason for this. In addition, the usage of AR is increasing as both online and offline retailers are adopting it in order to enhance consumers' shopping experience (Hilken et al., 2018; Pantano et al., 2015). It can reshape customer experience and provide significant benefits both for consumers and retailers (Scholz and Duffy 2018; Dacko 2016). While there are also some unsatisfied experiences related to AR. Therefore, this thesis will provide academic literature review with a comprehensive insight into how AR could impact customer experience in retail settings and what the optimal experience will be triggered by AR. Moreover, this literature review also defined the most significant research gaps in AR for specific project research that answer critical questions that are necessary for technological breakthroughs. This thesis conducts a critical literature review of previous literature related to AR with customer experience in order to facilitate a clearer and better understanding of AR in retail settings. Moreover, the literature review is comprehended as content analysis. Selected literature was analysed and categorised in order to identify underlying research themes within AR research outside of explicit research focus. A detailed explanation of the methodology takes place in next chapter in order to show how the methods will be chosen and how the literature will be collected

and analysed. Subsequently, a detailed and comprehensive literature review into AR research were conducted critically in next few chapters. Furthermore, the main research gaps were presented. In the end, the author generated a conceptual framework and future research agenda are presented.



## Chapter 2 A Brief History of AR

### 2.1 The Evolution of AR Applications

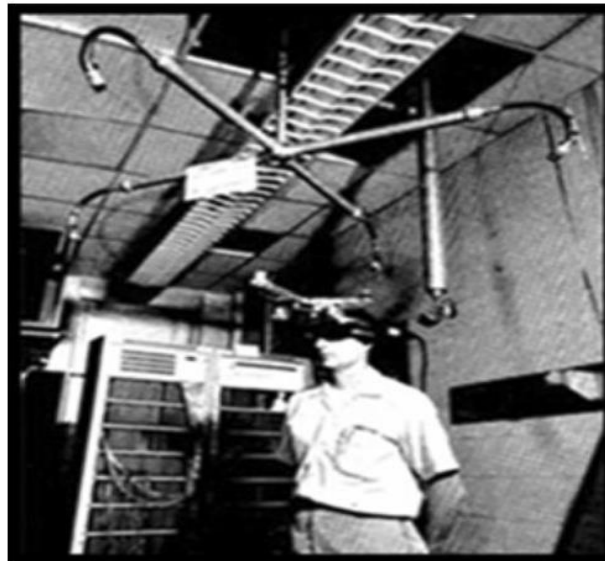
With Javornik (2016b) indicating that the initial systems of AR emerged in the 1950s through cinematography, AR is not relatively new. However, AR just garnered further focus in the 1990s when computer science and its implementation had become more prevalent. Table 2.1 shows the short history of AR.

**Table 2.1. A Brief History of AR Evolution**

Time	Developers	Progress
100 Years Ago	L. Frank Baum	<ul style="list-style-type: none"> <li>The notion of AR was first put forward, with the indication of an electronic display that covers data with real life known as a 'character marker' (Johnson, 2012)</li> </ul>
1950s-1962	Morton Heilig	<ul style="list-style-type: none"> <li>AR's initial systems were established through cinematography during the 1950s; Morton identified AR's special cinema characteristics, in which he thought of a cinema as a pursuit that seeks the viewer's attention onto the senses using all of his senses efficiently (Carmigniani et al., 2011)</li> <li>Morton labelled the AR as "Sensorama" in 1955, indicating it as the cinema of the future that preceded digital computing in 1962 (Carmigniani et al., 2011)</li> </ul>
1968	Ivan Sutherland	<ul style="list-style-type: none"> <li>The foremost AR's real prototype system was established (Carmigniani et al., 2011)</li> </ul>
1970s-1980s	NASA, the Aviation Industry	<ul style="list-style-type: none"> <li>Wearable devices and digital displays through AR continued to progress (Javornik, 2016)</li> <li>Some researchers began conferring that AR has several benefits versus VR, including using less power (Carmigniani et al., 2011)</li> </ul>
1990s	Caudell and Mizell	<ul style="list-style-type: none"> <li>Proposed a term in the field of aviation by performing an AR assistance scheme for harness-using workers (Azuma, 2001; Carmigniani et al., 2011)</li> </ul>
1994	Paul Milgram and Fumio Kishino	<ul style="list-style-type: none"> <li>Described a so-called reality-virtuality continuum which extends to both real and virtual environments (Carmigniani et al., 2011)</li> </ul>
1997	Ronald Azuma	<ul style="list-style-type: none"> <li>Composed a first review of AR by imparting a wholly recognised description, indicating it as uniting both real and virtual environments whilst being both listed as three-dimensional and collaborative in real time</li> </ul>
2000	Bruce Thomas	<ul style="list-style-type: none"> <li>Progressed wearable computers and mobile AR, making them usable for the first time (Azuma et al., 2001; Preece et al., 2015)</li> </ul>

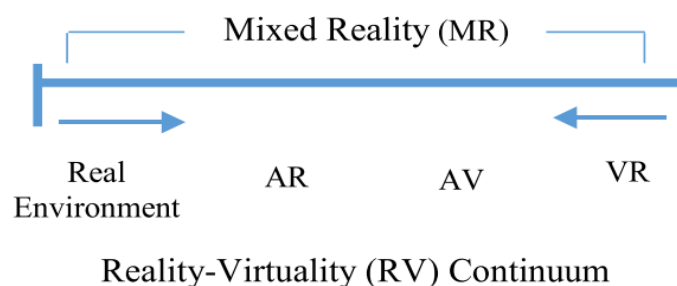
Alongside AR's progress way back in the 1950s, the foremost AR's real prototype arose in 1968 when Ivan Sutherland facilitated 3D visualisation through an ocular see-through

head-mounted display as shown in Figure 2.1 (Carmigniani et al., 2011). This is the world's foremost AR system (Javornik, 2016).



**Figure 2.1 Head-Mounted Display by Sutherland**

Despite this, AR's progress was not fully realised until the 1990s, when the innovativeness of technology has skyrocketed by means of intensifying internet bandwidth and decreased charged (Ross and Harrison, 2016); alongside this progress, AR followed suit. Fumio Kishino and Paul Milgram (1994) then described a so-called reality-virtuality continuum as something that extends to both real and virtual environments (Carmigniani et al., 2011) as illustrated in Figure 2.2.



**Figure 2.2 The Reality-Virtuality Continuum according to Kishino and Milgram**

The said continuum begins with a person's real and local world. This develops by means of AR and a layer of a Computer Generated Imagery (CGI) of a digitally-stored data with a view of the actual world. This goes on further to augmented virtuality (AV) until it eventually turns to virtual reality (VR), in which the real world's surroundings are substituted by a fantasy, imaginary or a virtual one (Ross and Harrison, 2016).

By the 1990s, mobile AR as well as wearable computers had arisen and were utilised for first time, with AR developing an intensified focus in computer science, as associated with 3-D technology, mobile technology and virtual reality (Azuma et al., 2001; Van Krevelen and Poelman, 2010). From this, innovation has been put in place in aspects spanning gaming, retail, military, navigation, medicine, education, and tourism. This is despite early AR forms being not quite vigorous, economical or adequately instinctive for widespread implementation and have the capability to be utilised by normal users through proposing instinctiveness and adaptability, both being vital aspects on technological engagement (Davis et al., 1989; Pavlou, 2003). Despite this, circumstances had shifted compared to the 1990s when AR was still in its early form. Innovative technology, lowered expenses, heightened flexibility and transferability of AR and its contribution to the current digital world alongside geolocation systems, near-field communication (NFC), and global positioning system (GPS) have progressed the function and significance of AR (Javornik, 2016a). The present digital background renders the distribution of AR for marketing within several aspects of potential users, particularly in mobile, online and retail. For instance, the foremost AR's commercial application was in 2008 through the automobile field by means of a 3-D mock-up (Watson et al., 2018). With this, several AR systems have been developed, including Google Glass and other virtual annotations, content augmentation, virtual try-ons, projection mapping, and even holograms (Javornik, 2016a). The move towards a digital phase has facilitated AR into encompassing beyond niche productions with influence amongst consumers, particularly on both mobile and retail perspectives (Javornik, 2016b; Poushneh and Vasquez-Parraga, 2017). The increasing widespread availability of smartphones has also definitely managed to increase awareness of mobile AR applications (Dacko, 2017). Therefore, the utilisation of AR in the retail industry happens in several aspects of consumers' lives whether through physical, online, or mobile (Carmigniani et al., 2011; Javornik, 2016; Bonetti et al., 2018). Table 2.2 details the present AR applications in the retail industry.

**Table 2.2 Augmented Reality Applications in Retailing**

Name (Launch time)	Applications	Environment	Function
Converse (2010)	Shoe Sampler	Online	Virtually try on shoes on AR app
Mr. Spex (2011)	Virtual Mirror	Online	Customers can try sunglasses online with the camera on their phones
Topshop (2011)	AR Mirror	In Store	Virtually try clothes on in store
Uniqlo (2012)	AR Magic Mirror	In Store	Virtually try clothes on in store
Yihaodian (2012)	AR Virtual Store	Online	Virtually shop in grocery shop on mobile phone
IKEA (2016)	Catalogue App	Online	Virtually place furniture on clients' home and see how it actually look like
Charlotte Tilbury (2018)	Magic Mirror	In Store	Virtually try make up on without actually putting on
American Apparel (2018)	AR app	Online	Check the availability in store
Lacoste (2018)	LCST AR app	Online	Virtually try shoes on

Table 2.2 provides recent examples of retailers ' AR technologies across several retail sectors. Dacko (2017) has shown a number of potential benefits for retailers from AR applications such as allowing customers to practise virtual clothing and makeup, which can improve the conversion and return rate. While Huang and Liao (2015) argue that the AR experience provides customers a wide range of values and advantages such as

entertainment value, ease of use and speeding up the procurement decision-making process. AR is able to stimulate static shelf display (e.g. the Walgreen app) and to help drive store footprints by offering a more immersive and engaging experience. In addition, Dacko (2017) indicated that AR devices make shopping more personalised (for example the Converse app). Scholz and Smith (2016) argued also that AR can deliver unrivalled benefits for an integrated marketing campaign by demonstrating how goods fit into customer homes (e.g., the IKEA catalogue) and retailers benefit from the creation of apps for individuals, such as smartphones. Nevertheless, though AR shows many potential retailers' benefits, AR literature has been more focused on market adoption and only examined the effect that AR has had on customer response quite recently (e.g. Watson et al., 2018; Poushneh et al., 2018).

## **2.2 Chapter Summary**

This chapter summarised the development of AR technology since the 1950s and the use of AR in retail. AR is emerging in retail industry and getting more and more attention from the academia. However, as discussed above, the literature of AR in retail is still fragmented. It is evident that the subject of AR is interdisciplinary and has various disciplinary origins that range from technology aspect to management and marketing aspects. Thus the next chapter introduces the methodology of this thesis in terms of how to conduct systematic literature review related to AR in retail settings.

## Chapter 3 Methodology

### 3.1 Introduction

The literature of augmented reality (AR) in retail settings is getting substantial academic attention (Scholz and Duffy, 2018). Indeed, the integration of technology is especially important since retailers can offer added value proposals to their customers to generate optimal customer experience with virtual-physical touch points (Kumar and Bakan, 2015) and influence shopping behaviour (Javornik, 2016). The use of AR allows consumers to play a more independent and dynamic role in their shopping experiences (Olsson et al., 2013), which results in higher perceptions of value (Dacko, 2017). Therefore, consumer-end industry such as retail can provide their customers with improved experiences by applying AR. Despite the potential of AR in retail, there is no consensus in the literature on the AR and the literature is still fragmented due to AR in retail, which is still in its infancy and early stage. This fragmentation makes it difficult to gain coherent information for academics (Rousseau et al., 2008). As a result, the fragmented literature needs to be integrated through a thorough review of the broad spectrum of studies, since the impact of AR in the retail context has not yet been systematically reviewed. The literature is still limited in quantity, and no major reviews of the field have been presented. Only a few that attempt to review part of the AR literature were found (Javornik, 2016; Bonetti et al., 2018; Xue and Parker, 2019; Lee, 2018; Hilken et al., 2018). However, the emphasis of these papers is more on discussing current role of AR as an enabler of Omni-channel experience without mentioning in retail settings, but they provide limited insights as they focus on only very limited coverage of AR issues and current research foci. While they fail to address current research foci of AR in retail context and synthesise relevant literature. Hence, a comprehensive synthesised literature review and research agenda that accounts for current AR research foci in retail settings and future research is needed and were conducted in this thesis. Systematic reviews can be one of the best ways of resolving the widespread disintegration of literature (Briner et al., 2009). Moreover, the flexible and liberal processes of research can vary considerably with the research aim (Berrang-Ford et al., 2015). Considering that there are no specific guidelines for conducting a systematic literary analysis (Rousseau et al., 2008), authors are probably given considerable flexibility to define keywords, sorting criteria and collection of documents, depending on research questions. Such

versatility helps to ensure that researchers have a full view of the previous literature in accordance with their respective research goals.

The key hurdle commonly encountered by researchers in systematic literature review is ensuring that they have considered all significant past studies for an organised synthesis (Kitchenham et al., 2009). Hence, this research employs a systematic means in gathering data and analysing literature. The systematic literature review method mitigates biases from researchers with regard to inclusive or exclusive researches, as well as vividly conducting the performance of review scope by means of transparency (Karaosman et al., 2017). Therefore this chapter discusses the systematic literature review approach as well as the performance of the whole review process.

### **3.2 Literature Review Approaches**

Systematic reviews is one of the present means in synthesising literature based on a research query (Baird, 2018). Another typical literature review approach is the narrative integrative review. Definitely, a distinct goal in such review is to condense all the literature without introducing any viewpoint (O'Connor and Sargeant, 2015). This review might intend to abridge the literature and not to advocate a certain view; as illustrated by Cooper et al. (2009), the intention of the review is to produce evidence that is impartial from a viewpoint, also less likely to be influenced by bias or its own biased outlook, which is known as a collective review according to Gough et al. (2012). The most typical aggregative review types are meta-analyses, systematic reviews, and scoping reviews. These reviews are frequently concentrated on the need since the intention is to recapitulate everything (O'Connor and Sargeant, 2015). Instances of aggregative reviews usually depict the relative efficiency of a treatment, the relational degree of exposure to a certain disease, the features of diagnostic tests, approximations of disease pervasiveness, or researched topics in a certain field. If the review's intention is to perform an aggregative review of study summary, there is a probable compilation of researches on veterinary medicine, depicting their extent but neglecting to steer readers on perceiving the approaches or depicting the existing ones. However, this kind of review does not truly deliver its intent (Ibid.). Regardless, systematic and narrative integrative reviews are the most typical review means in performing a literature review (Ibid.). Table

3.1 provides the systematic review process, alongside a comparison to narrative integrative review.

**Table 3. 1 Systematic review process, with comparison to steps on systematic reviews with narrative reviews (O'Connor and Sargeant, 2015)**

Steps	Systematic review	Narrative integrative review
Pre-Step: Create a review and develop a systematic analysis protocol	Required. Methodological content experts necessitated the guarantee of identification of heterogeneity sources. Experts on research synthesis guarantee that methods on bias reduction are utilised	Not required
Step 1: Conduct the questions of the review	Required	Usually impertinent since review is either expert opinion or has broad scope.
Step 2: Conduct comprehensive research search	Required	Not required
Step 3: Selection of relevant studies based on search results	Required	Not required
Step 4: Collection of information from relevant studies	Required. Practicability usually restricted in reporting means applied by main researches.	Not required
Step 5: Determine the risk of bias in relevant studies	Required. Practicability usually restricted in reporting means applied by main researches.	Not required
Step 6: Synthesis of results	Required. Quantitative means are needed, and qualitative means are highly suggested founded on the nature of the review question.	Quantitative assessment not plausible. Typically narrative and qualitative by nature.
Step 7: Presentations of results	Required, a record of aspects of included researches and heterogeneity sources	Often restricted to recording citations, and readers might require gathering papers.
Step 8: Interpretation and	Required	Often general, as this is the primary intent of the review.



The above table discusses distinctions between systematic review and narrative integrative review. As illustrated, the former must be conducted through a predetermined search plan. This plan must permit search completeness to be evaluated. As depicted by Kitchnham and Charters (2007), conducting a systematic literature review has several reasons. The most popular is to sum up the current evidence of a technique or procedure so as to summarise the empirical evidence for the benefits and disadvantages of a certain agile process. This research's intent is to integrate existing state-of-art of literature review on the augmented reality (AR) aspect based on retail consumer involvement in retail settings, including a conceptual framework encompassing pertinent studies on AR's retail applications and studies. Hence, this literature review has its distinct questions and generates a background of existing studies on AR to determine existing research gaps and allows a framework for upcoming studies. Thus, this research employs systematic literature review method for the literature review.

### 3.3 Overview of Systematic Literature Review

One of the early studies conducted by Petticrew and Roberts (2006) identified that systematic literature reviews are the methods which can make sense of a wide range of information then contribute to the answer regarding to what works and what does not. Moreover, it has been found that systematic literature reviews are certainly one of the most common methods to social research (Webb and Roe, 2007; Littell et al., 2008). These reviews intend to determine and examine all accessible research data pertinent to a question. They may be necessarily formal, quantitative or qualitative syntheses of perceived information (Glasziou et al., 2003). Whether they comprise a research area or a subject, they usually consist substantial information; therefore they tend to consume time. Despite this, they are significant in referencing the research development on a subject area while providing plans for upcoming studies, taking note of theoretical, topical and methodological inclinations (Truong, 2014).

The most important source of evidence in systemic literature reviews are probably peer reviewed journal documents (Carins and Rundle-Thiele, 2014). Project reports and other publication forms are likewise important since they impart sensible data and realistic occurrences (Truong and Dang, 2017). For instance, in assessing the implementation impact of programme results and the aspects influencing such implementation, in addition to existing academic literature, Durlak and DuPre (2008) have deliberated additional project articles. With regard to retailing AR, Hilken et al., (2018) evaluated published, peer-reviewed researches as well as publicly accessible information and trend papers in order to assess the main causes of the impact of AR on retail customer experiences on an omni-channel environment. Hence, systematic literatures are an observational study that are employed in assessing and summarising the subject matter of several types of literature (Glasziou et al., 2003).

Systematic literature reviews are apparently applied as a research means in one's right (Truong and Dang, 2017). Nevertheless, they may be likewise integrated alongside other means of study to improve the authenticity of the research outcomes by mitigating biases. In certain situations, such means are clearly defined, including Xue et al., (2019)'s application of the content analysis method in assessing AR e-commerce studies published between 2001 and 2018. For some reviews, these methods may be deduced inferred in the investigation and summary of the outcomes (Hilken et al., 2018). Regardless, systematic literature reviews generally use a predetermined procedure which constitutes a defined objective set with fixed eligibility criteria for researches; a systematic search to locate all relevant documents, as well as a formal analysis and review of the features and findings of the papers included (Petticrew and Robets, 2006). On the other hand, biases by the reviewer possibly limits choices on data gathering, analysis, and elucidation in support of the research hypothesis (Littell et al., 2008). Clarke (2007) discusses an objective systematic literature review wherein all pertinent researches have been ascertained before outcomes can impact inclusion-based choices. This can override publication problems and certain biases in which on-hand knowledge of the study outcomes might impact the inclusion choices of the reviewer (Clarke, 2007). Despite this, it should be remarked that systematic literature reviews are not dissimilar from other social science research means in which the application value of a certain process relies on the abilities and knows how of the researcher and necessary

consideration of the whole method. Thus, to mitigate biases in this research, identified pieces are already included or excluded from analysis after a quick initial checking of the content. To elevate the research's consistency, journals, databanks and the references on individual studies were checked by the author in order to increase the reliability of this literature review. Cited references on the reviewed papers may be utilised as secondary sources, but did not bring forth several further resources, thus indicating the consistency of the research. Based on the aforementioned procedure, 96 articles were determined.

### **3.4 Process of Systematic Literature Review**

This research obtained a systematic literature review on a retail-based research concerning AR. This review method offers shared insights into fields and sub-fields by means of conceptual synthesis (Trentfield et al. 2003) and is disputed as being objective, reproducible, unbiased, transparent, and rigorous (Boell et al., 2015). It provides a procedure that objectively determines, chooses, and investigates papers. Thus, it comes up with a synthesis that describes the knowledge depth in the subject (Watson, 2015).

#### **3.4.1 Search Strategy**

The review of literature begins with planning and defining the review procedure. This strategy is undertaken through recommendations of the systematic literature (Luca and Suggs, 2010). It is carried out on both electronic databases and other applicable sources including research registers, journals, and reference lists gathered from the main researches. Biases on publication must be ensured as mitigated, thus all positive, negative and void outcomes have to be considered. The overall search procedures is detailed, ensuring transparency, replication and potential for further analysis (Watson, 2015).

#### **3.4.2 Study selection**

The choice of the sample is used to determine and choose the most relevant studies on the basis of the search papers (Luca and Suggs, 2010). This procedure is conducted through a study selections criteria that comprise both inclusion and exclusion benchmarks and based from the research question. Since it is comprised of several stages, selection criteria must be freely interpreted such that a study recognised by the digital and manual search can be apparently excluded solely through abstract or title (Luca and

Suggs, 2010). The succeeding step is to harness inclusion and exclusion standards from practical aspects including authors, settings, language, journal, subjects or participants, sampling method, research design, publication date and others. At times, scholars apply a third step in the selection procedure through a specific quality assessment (Kitchenham and Charteers, 2007).

### **3.4.3 Study Quality Assessment**

The quality of the determined main studies are investigated, which aids in transforming both inclusion and exclusion criteria (Luca and Suggs, 2010). This is focused on three aspects: external validity, internal validity and bias performance measurement device or tool is adopted to assess quality. This measurement instrument is simply a specification of aspect that must be assessed in each research. The main researches are assessed based on the checklist constraints, while the degree of quality is gauged through the quality tool (Kitchenham and Charteers, 2007).

### **3.4.4 Data extraction**

This phase is designed to accurately record collected data from the main research forms of data extraction such information are extracted and kept in determined forms (Kitchenham and Charteers, 2007). Repetitions must be evaded in this step. Data extraction from non-published or follow-up work need to be reported and uncertainties must be elucidated with the respective researchers (Tranfield et al., 2003). There are two stages are included in this stage, the first one is preliminary and the second one is secondary analysis.

#### **3.4.4.1 Preliminary analysis**

The first analysis of the search results is known as the preliminary analysis. Its aim is to gather applicable and pertinent researches based on the proposed research question. First this is performed by reading the study's abstract because it is a brief and succinct version of the whole research (Kitchenham and Charteers, 2007). After the perusal of the abstract, a choice is applied if further reading of the paper will enable adequate hints and responses to proposed question. If several hits as generated based on the input search keywords, this analysis is the preliminary filter process for analysis (Tranfield et al., 2003).

#### **3.4.4.2 Secondary analysis**

The secondary analysis was applied after the preliminary analysis identified the necessary hits on the rest of the paper (Tranfield et al., 2003). In here, the paper's headings and sub-headings are perused. The applicable part of the study enabling hints and responses to the research question is underscored and investigated in a more in-depth. This provides a thorough understanding of the whole paper.

#### **3.4.5 Data Synthesis**

Data synthesis allows for ordering and condensing the outcomes of the included main researches. Gathered data are synthesised to produce the outcomes of the analysed main studies. This step realistically provides the response to the proposed research question (Kitchenham and Charteers, 2007). The gathered responses may not arise from one study alone. The eventual answer can be crafted from clues in various papers and the extraction can be conducted through several resources. All sources need to be identified and listed as necessary for referencing purposes.

Answers to the questions may be investigated and extracted from diagrams, graphs or theoretical claim evidence (Kitchenham and Charteers, 2007). Some kinds of data synthesis procedures include quantitative synthesis, descriptive synthesis, and meta-analysis. Integrated data are then presented through several approaches, including the funnel plot and forest plot. The former aids in determining the scope of biases in publication (Tranfield et al., 2003).

### **3.5 Research Design**

Systematic review is conducted by adopting Kitchenham and Charters's (2008) rules in performing a Systematic Literature Review. Three main stages are employed in this system: review planning, review conducting, and finding reporting (Johnsen et al., 2017).

#### **3.5.1 Review Planning**

The study begins with determining the necessity for a review and creating a procedure with all steps, questions, inclusive and exclusive criteria, and analysis methods. The

necessity for this kind of review was illustrated in the foregoing motivation. The succeeding sections gives a background on the specific review steps.

### ***3.5.1.1 Data Source and search strategy***

The first step of review planning is keyword identification, which select the studies related to the research objectives and aims. A systematic search approach was applied to identify potential studies. First, comprehensive searches were conducted of online databases, including Google Scholar, Elsevier ([www.sciencedirect.com](http://www.sciencedirect.com)), Emerald ([www.emeraldinsight.com](http://www.emeraldinsight.com)), Springer ([www.springerlink.com](http://www.springerlink.com)), Scopus ([www.scopus.com](http://www.scopus.com)), Mintel, Web of Science (Truong, 2014; Xue et al., 2019; Luca and Suggs, 2010).

The resource collection process were ascertain technological and consumer related search terms such as augmented reality or AR, retailing, consumer behaviour, customer experience, etcetera; as presented in Dacko (2017), Papagiannidis et al., (2017), Bonetti et al., (2018), Hilken et al., (2018) and Xue and Parker (2019). Adequate search outcomes may be ensured via supplementing keywords, say 'browsing' in the VR context. Snowball sampling shall be conducted in compliance with the accepted guidelines for review to discover literature that is far more comprehensive and advanced, than if procured via protocol-driven search strategies that are usually afflicted with preconceived notions (Jalali and Wohlin, 2012; Kitchenham and Charters, 2007). Thus, the keyword search terms were used in the resource collection process were identified as presented in those authors study which was presented above such as Augmented reality (AR), retailing, consumer behaviour, customer experience etc. Table 3.2 shows the search keywords used in the resource collection process.

**Table 3. 2 Literature review search terms**

Keywords	References
<b>AR technology in Retail</b>	<ul style="list-style-type: none"> <li>• Augmented Reality</li> <li>• AR</li> <li>• Technology Retail</li> <li>• Retailing</li> <li>• Virtual environment</li> <li>• Augmented reality retailing</li> <li>• Interactive technologies</li> <li>• Smart technologies</li> <li>• Smart retailing</li> <li>• Virtual Reality</li> <li>• Augmented reality marketing</li> <li>• Innovation retail</li> <li>• Smart retail/retailing</li> </ul>
<b>Consumer Responses to AR</b>	<ul style="list-style-type: none"> <li>• Consumer perception</li> <li>• Consumer responses</li> <li>• Satisfaction</li> <li>• Consumer behaviour</li> <li>• Purchase intention</li> <li>• Consumer purchase behaviour</li> <li>• Shopping experience</li> <li>• User experience</li> <li>• Motivations</li> <li>• Customer experience</li> <li>• Decision making</li> <li>• Purchase Satisfaction</li> </ul>

The terms used for searching in the process of collecting resources were identified as retail AR technologies and consumer AR technologies; presented in Bonetti et al, (2018), Xue et al., (2019), Dacko (2017) etc. These were established by an in-depth analysis of reading AR literature. Furthermore, these key words could help the author to search more extensive literature related to AR in retail. Indeed, as these search terms are across different research domains including Human-Computer Interactions (HCI) and Marketing and Management perspectives, it helped the author to better understand which disciplines are under researched and to investigate the literature within AR more comprehensively.

Literature collection will be taking between March 2019 and August 2019, resulting in 96 pivotal journal articles was collected. Starting with Elsevier ([www.sciencedirect.com](http://www.sciencedirect.com)) as this is one of the major databases to be used to research for related articles, such as those provided by major publishers, each of the search terms will be sought. Selecting high-quality journals from academic sources which focus on AR field and clearly related to present study and also provide study results (e.g. Hilken et al., 2018). Thus, keyword searches were executed on the websites of prominent marketing journals (Journal of Business Research, Journal of Retailing and Consumer Service, Journal of Interactive Marketing and Journal of Retailing), and journals relevant to the HCI perspective (Computers in Human Behavior, Technological Forecasting & Social Change). These high quality journals were determined based on the SJR journal ranking as they are all ranked in Q1 or Q2 which means the impact of these journals are essential and reliable. These prominent business journals were searched and collected from credible online databanks such as Elsevier or Web of Science. Furthermore, these journals were also rated and listed by the Association of Business Schools (ABS) in the ABS Academic Journal Guide 2018 as the AJG is a guide to the range and quality of journals in which business and management academics publish their research to give scholars greater clarity as to which journals to aim for, and where the best work in their field tends to be clustered (CABS, 2018). Thus the author only selected journals included in the AJG guide and under the marketing and technology categories regarding AR research in a retail context. Indeed, as Webster and Watson (2002) stated the major contributions are likely to be in the leading journals, only articles published by prominent business journals were considered for the initial sample.

To focus on most recent articles in the domain of AR in a retail setting, the present study will identify the year 1997 as the starting point as Azuma first conducts a survey of augmented reality including AR application in different industries and future research directions which indicating AR in retail also suggested the need of calling research for AR in different discipline such as marketing and management in 1997 and tracked articles up until 2019. The pioneer of AR is back to Sutherland's work in the 1960s, however, only over the past decade has there been enough work to refer to AR as a research field until 1997 when Azuma published a survey concerning AR which defined the field, described many problems and summarised the developments up to that point. AR's growth and progress have been remarkable afterwards hence the author picked 1997 as the start of



this literature review. The literature review was mainly focused on articles that are from 2014 onwards because from that time to present day there was a rapid increase on AR research in retail settings, which can also reflect the current state of research concerning AR. After 1997, Azuma et al., (2001) later suggested the definition of Augmented Reality which has been widely accepted and used in research. 2014 was used as a cut off because the attention of academic research towards AR applications in retail starts to grow and more and more research were done afterwards (Pantano, 2014; Yaoyuneyong et al., 2014; Liao, 2015; Cuomo et al., 2015; Javornik, 2016a, 2016b; Pantano et al., 2017; Rese et al., 2017; Dacko, 2017; Bonetti et al., 2018; Xue et al., 2019). As research in this field is still quite novelty which studies are relatively new and growing. Therefore, the literature search during the analysis process must continue in order to be kept up-to-date.

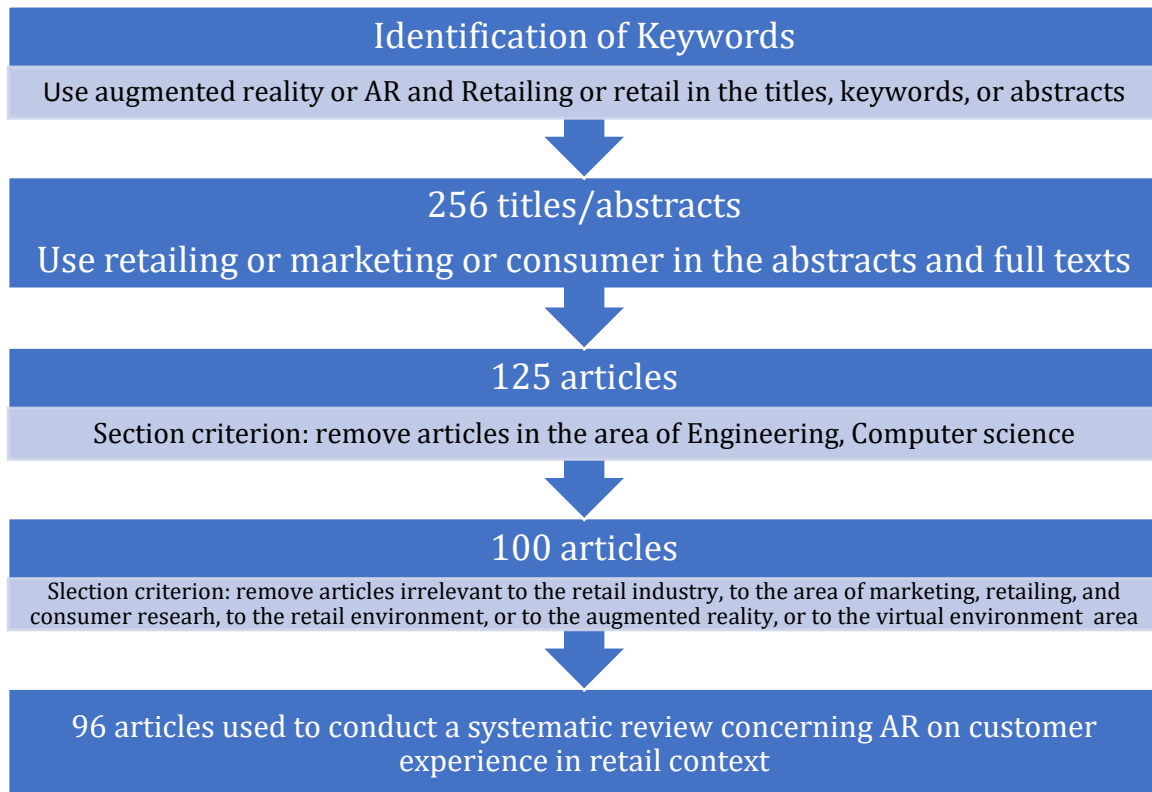
Papers deemed relevant which are concerning augmented reality in retail context were downloaded and saved in Mendeley in PDF format. The key papers cited were identified during journal analysis, and then located and reviewed for subsequent download. The snowball-sampling trail having been exhausted, another search term shall be explored similarly, and so on. Additional search engines will also be deployed to identify and locate all sources, as also for continual updates even during the analysis process. The resource collection phase admitted in both academic sources and industry sources, as in journal articles, conference documents, periodicals and theoretic books and industry reports from reliable and high credibility source such as Mintel, Statista etc, thereby ensuring a strictly scientific focus in the paper.

Since the aim of this thesis was to review all papers on customer experience in retail in the field of augmented reality, the author chose search criteria covering both the augmented reality (AR) and consumer areas (retailing and retail). In the titles, keywords and abstracts of articles in the database, the search terms were carefully checked. The above-mentioned database is complete for the academic publication because it contains a wide range of multidisciplinary, peer-reviewed research papers and is used for numerous systemic review studies (Karaosman et al. 2017). Moreover, these databases include a great number of journals on augmented reality in retail, such as Journal of Retailing and Consumer Services, Computers in Human Behavior, Journal of Interactive Marketing, Technological Forecasting and Social Change, which need to be taken into

consideration in the analysis. This review focused on journal articles, conference papers, book reviews, industry reports etcetera in order to facilitate a comprehensive systematic literature review concerning AR in retail. This step resulted in 256 research articles.

### ***3.5.1.2 Study selection criteria and procedure***

The second phase consisted of a reduction in the initial list of 256 articles, reviewing the importance of the abstract and the entire product text with common keywords retail or retail or marketing or consumer, and deleting the papers that concentrated on other industries. This move led to 125 full texts specific to the retail sector. In the third step of this study, articles were selected relating to marketing, consumer research and computer-human interactions (HCI) aspects. Articles in Engineering, Computer Science, have therefore been removed, resulting in 100. In the fourth step of the study, selected 100 full texts were carefully read to ensure that the articles were genuinely focused on enhanced retail products and customer experience. Several articles have been removed because of their irrelevance to consumer research, the retail environment or augmented reality. The final 96 research articles were used to conduct a systematic review concerning augmented reality in retail context. The research process is shown in the Figure 3.1 within the flow chart.



**Figure 3. 1 Flow chart of the research process**

Thus, the final 96 research articles were used to categorise and create the taxonomic scheme of this study. The key papers cited were identified during journal analysis, and then located and reviewed for subsequent download.

### **3.5.1.3 Study quality assessment**

A quality assessment of the study is performed to investigate the rationality of the involved researched studies. Staples and Niazi (2007) indicated that it is highly perplexing to establish the magnitude of the threats on rationality that have been dealt by the researchers. Definitely, such assessment is conducted through criteria involving research article structure. The probable chief study research article is assessed based on its structure, particularly its Introduction, Research Method, Results, and Conclusion. The responses to the questions are examined in each probable research as follows.

**Introduction:** Does the study's introductory part impart an overall background on retail's AR?

**Research Method:** Does the study concisely describe the methods employed?

**Results:** Does the journal article identify the applicable results? Are the results useful with regard to the established questions?

**Conclusion:** Does the article properly state both affirmative and negative conclusions? Does it likewise state the existing limitations throughout the research?

Hence, the researcher's verdict on the papers by means of their keywords, abstracts, titles and contents' contextual significances, as well as publication and arrangement of the studies were also conducted. Therefore, in choosing the applicable research paper on AR, all shortlisted papers through aforementioned steps need to be perused to ensure that the chosen ones are applicable to AR based on a retail perspective.

### **3.5.2 Review conducting and finding reporting**

Through NVivo 12, a thematic analysis is performed on the chosen AR-related researches. All chosen literature are placed in the NVivo software, utilising it in arranging them chronologically. All researches are then investigated, with the key words coded. The author applied relevant words from key words which used for searching journals to code selected literature within NVivo, for example, augmented reality, retailing, consumer behaviour. Started from open coding, disaggregated literature into conceptual units with labels. Followed by axial coding and selective coding, the author put the data back together by connecting the categories and the sub-categories and found the relationships between selected literature concerning AR research in retail as well as the key research foci within AR literature. The results were presented in the following chapters. Despite general success of manual coding in conventional literature reviews, the innovativeness of thematic analysis software can enable a more vivid and greater insight into the available information. Consequently, the said software is used to come up with various figurative charts to indicate the research subjects or inclinations from reviewed literature which generates a greater conception on data synthesis. Manually coding and review conducting through NVivo 12 are likewise used as aids in report finding. Sources were thematically investigated based on paper concentrations, recommendations formulated, gaps and limitations emphasised, main findings, examples, respondents and technology.

### 3.6 Chapter Summary

This chapter outlined the systematic review approach which will be carried out in the present study and the review process. 96 journal articles were selected from academic sources also industry sources such as Google Scholar using technological and consumer related search terms (e.g. augmented reality or AR, retailing, consumer behaviour, customer experience), in order to discover literature that is far more comprehensive and advanced. The study used content analysis method to critically analyse the selected papers in order to uncover the most prominent gaps related to AR and future research agenda in the field of AR in customer experience. The content analysis uses coding method to analyse the literature in NVivo 12. A selected literature review about AR on consumer aspects will be conducted for the period from 2014 to 2019. Furthermore, the earlier work from 1997 were also included as it would allow the author to draw historic and holistic comparisons. However, 80% of the articles were from 2014 onwards. The next chapter will present and analyse the literature selected as well as the findings from the literature based on the research methodology outlined in this chapter.

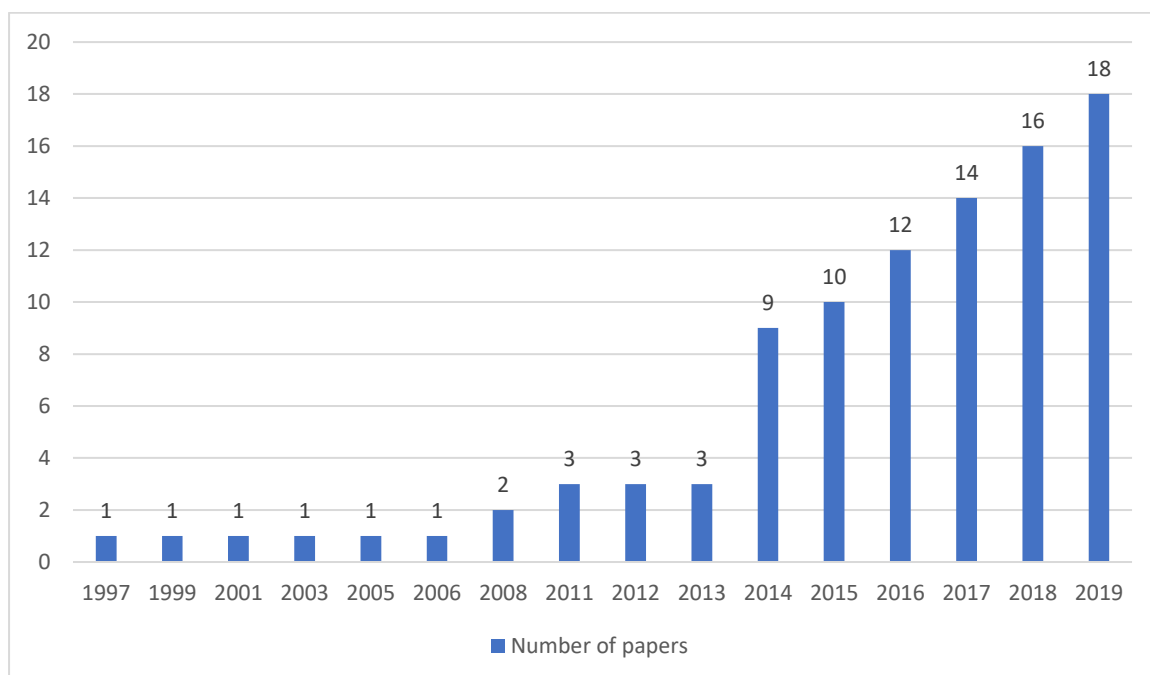
## Chapter 4 Overview of reviewed literature: Descriptive synthesis and analysis

### 4.1 Introduction

The present chapter discusses the papers in terms of their study stream and publishing source and their publication year to show the current focus of the AR research in retailing. To achieve a longitudinal study of the development of augmented reality research in retail literature, the resulting data used for analysis consisted of articles between August 1997 and February 2019, the basic body of literature identified comprises 96 papers. Moreover, this chapter introduces a brief history of AR evolution and current AR applications in retail.

### 4.2 Distribution across the time period and main journals

The search identified 96 papers of related AR research in retail context. Figure 4.1 shows the allocation of publications in the researched period (1997-2019).



**Figure 4. 1 Distribution of publications per year across the period studied**

Figure 4.1 depicts an upward trend in published works. The number of articles on augmented reality in retail has been steadily growing since its introduction from 1997, including a significant upsurge from the 2014 to the present day. While 1990s are the years of publication where works were sought, the first published paper concerning

augmented reality application in retail and the definition of AR were from the year 1997. Only saw 8 published articles related to AR research in retail context between period 1997 and 2010, but the period between 2011 and 2013 saw the beginning of growth for the discipline with 9 published articles, a trend which continued substantial growth during the period between 2014 and 2019 with 79 published articles. Therefore, work focusing on the augmented reality in the retail context intensified after 2014, indicating that this sector is relatively new, but increasing. For instance, in the years before 2010, only one paper in retail were found each year that concentrated on AR. Over the last five years, nine, nine, eleven, twelve, and fifteen research articles have respectively been published in this area. The frequency of contributions to this topic therefore increases. This was mainly because after the 2010s, AR applications are receiving more and more attention, the development of AR was rapid during that period which allows lower cost wearable AR applications to be applied (Javornik, 2016). Moreover, the mobile technology was increasingly developed which provided more opportunities for mobile AR applications to be adopted by retailers (Javornik, 2016; Dacko, 2017). Thus, more research and publications were done as AR research getting more academic attentions as well as the advancement of technology from the period of 2014 to present day. As the technology is keep developing, the AR research in retail settings is keep growing which can be seen from the chart as well. The analysis results show that articles come from different journals but mainly focusing on marketing and business journals. Figure 4.2 summarises top 8 journals that these research have been published the most related to AR research including 45 articles.



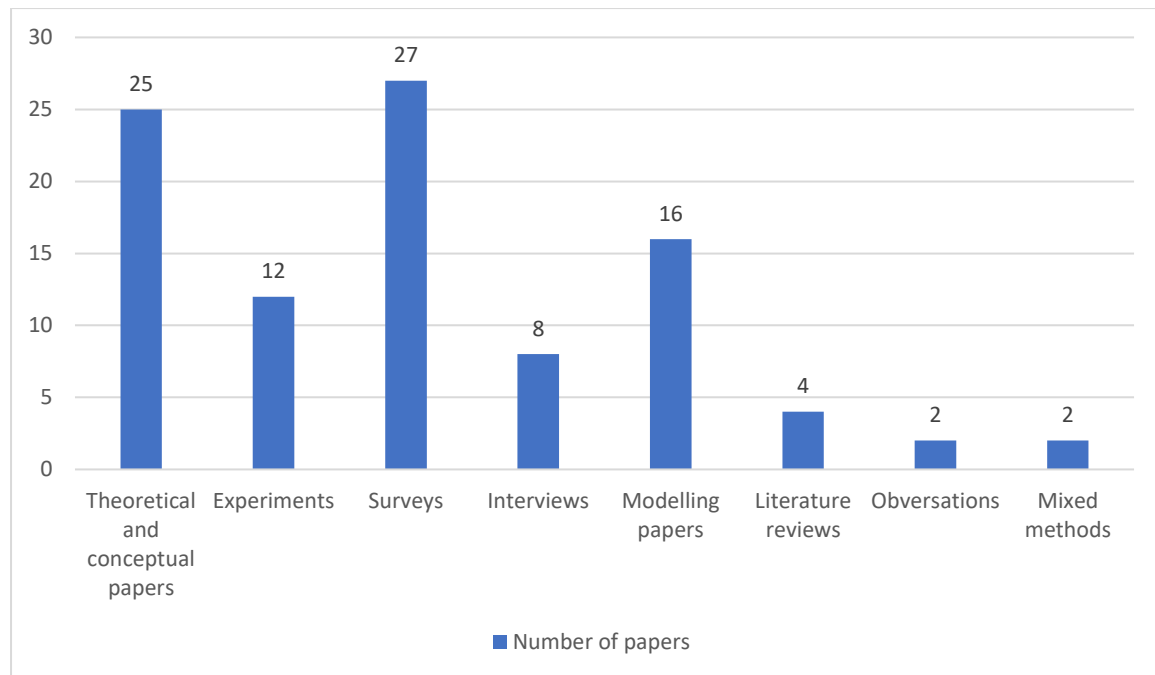
**Figure 4. 2 Overview of the research articles published by Journal**

The largest sources are the *Journal of Retailing and Consumer Services* (13 articles) and *Technological Forecasting and Social Change* (6 articles) and *Journal of Business Research* (6 articles), followed by *Journal of Research in Interactive Marketing* (5 articles) and *Computers in Human Behaviour* (5 articles), *International Journal of Retail and Distribution Management* (4 articles), *Journal of Retailing* (3 articles), and the *Business Horizons* (3 articles). As shown in figure 3.2, 45 papers have been published in the retail and consumer behaviour field, which demonstrate the main area of concern. Nevertheless, only about half the research were published in retail marketing and consumer papers while the rest were published by other industry sectors and fields outside the business domain, for example in advertising, psychology, tourism and engineering. This discrepancy indicates that the topic of AR was obtained from different journals and audiences and considered relevant for various research steams in the retail industry. Furthermore, it has been observed that AR research published in different journals under different research domains, for instance, 5 papers published in Computer in Human Behaviour and 6 are published in Technological Forecasting and Social Change which are under technology domain, and other are published in marketing and management domain, it highlights a critical finding that the nature of AR research in retail is inter-disciplinary.



### 4.3 Research Methodologies Applied

The papers are categorised according to their research methodologies in order to provide an overview of the types of studies carried out (see Figure 4.3). The surveys, interviews, theoretical and conceptual papers, case studies and literature reviews and modelling papers distinguish the research methodologies. Figure 4.3 shows how the papers are assigned to the research methodologies.



**Figure 4. 3 Research methodologies employed**

As can be seen, more than half of studies (57 per cent), in particular surveys, modelling papers used quantitative methodology. However, it emerged that there is a significant percentage of qualitative studies (43 per cent), followed by conceptual papers (26 percent), interviews (11 per cent), reviews and observations (6 per cent). Before 2014, most published articles are theoretical and conceptual papers and more empirical work start to increase after 2014. Surveys and Modelling papers (e.g. Pincon and Mimoun, 2014; Huang and Liao, 2015; Pantano et al., 2015) appear earlier than qualitative studies (e.g. Scholz and Duffy, 2018; Poushneh and Vasquez-Parraga, 2017). It is not surprising as AR research is still on its early stage and more papers were focusing on the AR consumer adoptions and AR design which were conducted by surveys and different models. Qualitative empirical work is receiving less attention. From a methodological perspective,

empirical studies on augmented reality in retail have been diverse and rich. However, theory-based research is quite limited. The above figure shows that conceptual papers and surveys are the most frequently used type of papers (53 papers). These included not only papers on the implications of AR but also papers in which the authors developed new applications and early frameworks. The most common form of data collection was quantitative surveys. The qualitative methods were followed by interviews with participants (8 studies). Different methods have therefore been applied for data collection and analysis, including in-depth interviews, surveys, observations from participants, secondary material, etc. 22 papers are theoretical and conceptual papers which are not empirical and, rather, theoretical or logical. 4 Literature review articles attempted to review existing discussions in order to include issues relating to motivations, applications and AR implementation. For a novel, emerging field, this is not surprising, and continues into the large portion of surveys papers (27) and modelling papers (16). These quantitative methods allow the field to be researched and provided empirical evidence (Bryman and Bell, 2015). Indeed, these quantitative studies prove the potential and impact that AR technology in retail and also provided extensive future research directions to be explored. On the other hand, qualitative studies are mainly based on interviews and secondary sources such as Scholz and Duffy (2018)'s study they conducted interviews to understand how AR could enable consumer-brand relationships, which can be explained by the novelty of the topic. Interview is one of the most popular data collection methods within qualitative studies. However, only 8 papers were conducted by qualitative methods where participants were interviewed by researchers, and 2 papers used a qualitative observation method. Thus, more qualitative studies are needed for future studies as analyses of a qualitative nature could gain a deeper understanding concerning AR benefits and its real value in a retail setting (Dacko, 2017). Indeed, qualitative data enables the researcher to understand how participants interpret their experiences and what meaning they give them (Merriam, 2014). Last but not least, there were only 2 papers conducted mixed methods as they both provided empirical work as well as collected participants' point of view with AR experience which highlights the advantages of conducting mixed methods for AR research in order to get more efficiency and effectiveness of academic breakthroughs for this new emerging technology. Furthermore, based on the last section that the inter-disciplinary nature of AR research, it is crucial to use different research methods to explore AR in order to gain a deep and

better understanding of the real potential of AR in retail settings, especially combine both qualitative and quantitative methods to get a more comprehensive view (Dacko, 2017).

#### 4.4 Context of the Reviewed Articles

Table 4.1 shows the context of reviewed articles. In the majority of articles, it was discovered that augmented reality work throughout retail was analysed in a consumer market sense; only 10 of 96 papers specifically take business-to-business context into consideration. In particular, 5 papers research the public sector, and 9 articles in their scope are neutral.

**Table 4. 1 Context of the reviewed articles**

Study context	Article counts and percentages
Business-to-business (B2B) market	10 (11%)
Business-to-consumer (B2C) market	72 (75%)
Public sector	5 (5%)
Neutral	9 (9%)
Total	96 (100%)

Table 4.1 shows that most of the articles related to AR in retail are within Business to consumer (B2C) context, which highlights that majority of the AR research have examined in a consumer marketing context and business context is still very limited. It shows current AR research focuses on consumer adoption and consumer's response toward AR applications in a retail setting (Scholz and Duffy, 2018). Thus it somehow explained the reason why AR applications are still quite overwhelmed to some customers and not becoming mainstreams in retail yet as there are quite limited insights from industry such as AR developers and retailers. AR in retail is still in its early stage hence there is a need for more deeper and comprehensive insights in terms of AR developer and retailer to gain a better understanding of AR in retail and address the lack of knowledge in the literature (Dacko, 2017).

#### 4.5 Developments of AR research and applications in retail

AR applications have been more widespread with the vast distribution of personal mobiles, enabling consumers to purchase with AR, thus augmenting involvement and

fulfilment (Dacko, 2017; Javornik, 2016b). The first of these applications contain virtual try-on, and collaborative displays that impart data involving products, marketing and settings (Bonetti et al., 2018). Hence, AR has the capability to enhance customers' conception of products, elevate involvement and improving shopping experience observations, thus optimistically influencing brand and retailer awareness, and eventually impact customer behaviour (Huang and Liao, 2015). Table 4.2 outlines a timeline of the progress of AR researches on a particular retail setting, signifying the disciplinary derivations of the study.

**Table 4. 2 Timeline of AR research in Retail**

Time	Authors	Research Focus
1990s	Brody and Gottsman (1999)	Examination of applications in augmented commerce.
2000s	Sukaviriya et al., (2003)	Interactive technology in physical retail environment.
	Bulcarca and Tamarjan (2010)	Form of experiential marketing.
2010s	Pachoulakis and Kapetanakis (2012)	Fun factor in virtual fitting rooms.
	Pantano and Servidio (2012)	Improve consumer's perception of the shopping experience.
	Cuomo et al., (2014) Rese et al., (2014)	Increasing the chances of buying in terms of moment of purchasing, products availability and customisation.
	Tabusca (2014)	Mobile AR; Increasing adoption in retail.
	Scholz and Smith (2016)	Design; Consumer engagement - immersive AR.
	Hilken et al., (2017) Poushneh and Vasquez-Parraga (2017)	Enhance Online service experience; online decision making process; Enable retail settings.
	Scholz and Duffy (2018)	AR reshapes the mobile shopping experience and create meaningful consumer-brand relationships.

Studies on retail-based AR applications reveal that it has been identified as enabling experiential marketing (Bonetti et al., 2018; Bulearca and Tamarjan, 2010). Definitely, initial AR researches probed its purpose in augmented commerce by means of shopping agents, to connect gaps between digital and conventional commerce (Brody and Gottsman, 1999). AR studies during the 2000s utilised in a physical retail setting by means of interactive presentations, projected users collaborating alongside steerable

innovation and eliciting info on the marketing, product, and locations (Sukaviriya et al., 2003), underscoring both its hedonic and functional features. Foremost AR applications on retail involve virtual try-on by means of virtual models – personalised or otherwise – to replicate the form of apparel product groups in a bodily appearance, rotating it on both front and rear views and can be broadened (Lee et al. 2006). The continuing advantages for AR varied, from being seen as an exclusive advertising component (Woods, 2009), to promoting affirmative consumer brand connections (Owyang, 2010) and to approving the customer through the development of an experiential result in value (Chou, 2009). Research by Bulearca and Tamarjan (2010) further found that businesses and brands should take advantage of AR because it means enhanced product loyalty, based on an online and in-store study showing consumer positive reactions to technology and associating them with retailers, and being increasingly inclined to work in retail outlets that support AR (Pantano, 2015).

By 2010, AR has been explored further in association with its purpose in e-shopping. Research by Kang (2014) on the use of AR in e-shopping clothing found that the utilitarian prospects of consumers – including comfort, financial, social and emotional values – are related to intent and hedonic results, whereas expectation does not. Other papers have manifested the influence of AR on consumer experience, contentment, development of realistic perception and generally a wholesome, fun and customised experience that is useful for consumers (Bonetti et al., 2018). Pachoulakis and Kapetanakis (2012) further noted that usage of AR as a virtual fitting room within a consumer’s phone or computer enables them to digitally look how an apparel fits upon them at home (Kumar and Bakan, 2015); this was viewed as causal to the ‘fun’ side of retail (Pachoulakis and Kapetanakis, 2012).

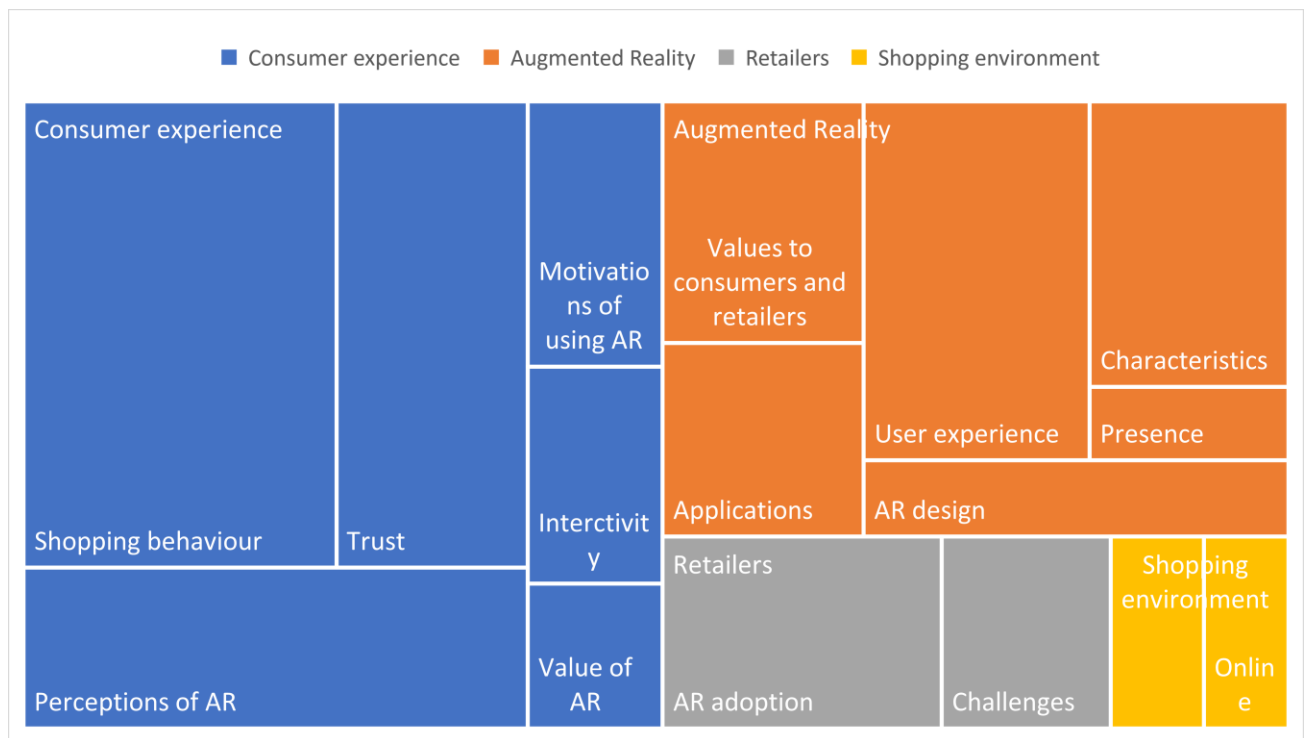
Consequently, a massive progress of mobile AR took place, riding the wave of the prevalence of tablets, smartphones, and other personal mobile innovations (Craig, 2013; Javornik 2016). With this, the retail industry has supported AR (Centric Digital, 2016), as many prominent brands on furniture (e.g. Rese et al., 2014), eyewear (e.g. Poushneh and Vasquez-Parraga, 2017), watches (e.g. Yim et al., 2017), and beauty (e.g., Scholz and Duffy, 2018) have put forward AR applications that customers may utilise through their own devices. Many of these implementations use the magic mirror model AR (Scholz and

Smith, 2016), in particular, by overlapping digital product with client face and body (Yim et al., 2017), which provides a noticeable evaluation and analysis of their products (e.g. Barrier et al., 2015). Through progressive advancement by incorporating computer vision and body recognition, in which artificial data on the surroundings and its objects are overlapped within the real setting (Chen and Cheng, 2009), the data about the underlying consumer's real perspective becomes more collaborative and digitally customised. Mobile AR enables data from the consumer's real world as greatly free from place and time limitations (Dacko, 2017). Researches on retail mobile apps utilising AR depict that take-up is determined to be extensive with its considerable user approval based on affirmative experience and benefits among retailers (Dacko, 2017). Likewise, large AR mirrors of stores comprise a type of AR application (Craig, 2013). For example, Charlotte Tilbury, a beauty brand from the UK, enabled AR as a walled 'magic mirror' (Sheehan et al., 2018). Consumers may go to the store and present themselves in front of the mirror. The latter then utilises AR to scan facial image to allow the former to look through themselves with some of the brands' iconic features in a short span of time, without even wearing any physical makeup. Likewise, fashion retailer Topshop's virtual mirror allows users to stand with a camera in front and look through a virtual replica of themselves on an adjoining screen (Sheehan et al., 2018).

In all, a study by Scholz and Smith (2016) highlighted the importance of retailers in the use of immersive AR, creating interactions that create value to their product along with enhanced customer engagement. The technology is capable of generating attractive, amusing, and realistic experiences (Poushneh et al., 2018). It produces a simulated shopping setting, as if users are just in a real store, with online shoppers relishing the whole experience (Tang et al., 2004; Wojciechowski and Cellary, 2013). Past researches indicated the progress of AR study and purposes in retail for both offline and online, including physical store, mobile and website. To sum up, AR puts forward innovative systems providing customers the opportunity to virtually interact with items and as instruments in developing their insight in retail shopping experience (Pantano et al., 2017).

#### 4.6 Current Research Focus on AR

Figure 4.4 displays the main research areas explored in the reviewed papers to demonstrate the main focus of AR research in retail. Such subjects in the hierarchy map represent the current knowledge of AR technology, retailers, consumers and shopping experience in the field of shopping.



**Figure 4. 4 Hierarchy chart of current research foci**

The most significant results of this study are how the most important research is based on consumer experience (blue) and augmented reality (orange). In view of the literature work concerning technology shown in Table 3.2. When testing the distribution of research from the above statistics, a convergence takes place since 2014 on the need to understand the human factors of AR in retail. Such issues have been illustrated regularly for more than a decade, but are still unresolved.

Significantly, 23 studies state consumers are positive about AR research as it is an emerging technology that producing a critical novelty impact (Pantano et al., 2017) and provided specific benefit such as efficiency and better shopping value (Huang and Liao, 2015) that will increase consumers' satisfaction (Poushneh et al., 2017) or consumer-

brand relationships (Scholz and Duffy, 2018), which further lead to enhance the customer experience (Flavian et al., 2019; Hilken et al., 2018). However, there are few limited but critical negative aspects related to AR. A few studies indicated that AR is still overwhelming to customers and can be a gimmick (Javornik, 2016a; Hilken et al., 2018). Indeed, from technology perspective, AR technology is still in its early stage as there are still some issues with AR applications such as low quality of the real world (Scholz and Smith, 2016). There are only very limited studies mention about the negative aspects of AR applications in retail however these cannot be neglected. It may be difficult for retail customers to imagine or use AR systems (Morgan, 2017). In addition, customers also differ widely from each other in their opinions on the advantages and the degree to which they feel confident of using AR software (Hilken et al. 2017). Thus there is a pertinent need for researchers to explore more related to negative impact of AR applications in retail in order to develop a better understanding of AR's potential in retail, identify the root cause of unpleasant AR experience and improve it.

The second most significant result is that 41% of all articles indicate that retailers need to get a better understanding of how to adopt AR applications and the features that affect customer experience. These have been classified into augmentation (media richness, environment embedding) (Javornik, 2016; Hilken et al., 2017), interactivity (Parise et al., 2016; Yim et al., 2017), personalisation (Dieck et al., 2015; Parise et al., 2016), vividness (Yim et al., 2017), perceived informativeness (Dieck et al., 2015; Rese et al., 2014), user experience (Poushneh and Vasquez-Parraga, 2017) and content co-creation (Scholz and Smith, 2016). In short, the researchers stated that the interactivity and more dynamic, richer or customised formats for presentation as key features of AR were given to customers (Javornik, 2016; Yim et al., 2017).

The third major result related to AR value theory. The AR value for both customers and retailers through various shopping channels must be examined in order to understand customer preferences and explore what kind of experience they provide. It is commonly held that the positive interactions of AR offer customers a combination of functional and hedonic interest, improved decision-making and positive acts like buying and word-of-mouth (Hilken et al., 2017). Seven papers also found that the mechanisms that underlying these effects constitute the indicators of reality of the experiences: cognitive



and emotional fitness (Parise et al., 2016), loyalty (Ross and Labreque, 2017), fidelity (Javornik, 2016b; Parise et al., 2016), immersion (Parise et al., 2016; Yim et al. 2017) and spatial presence. Some studies have shown that general flow and immersion feelings can help explain the benefits of AR usage (Yim, et al., 2017). In addition, Hilken et al., (2017) underlined an AR-specific process through which the customer gets a sense that digital objects are spacious; in other words, consumers suspend their disbelief in using AR and are persuaded that they really seek to communicate with a true pair of sunglasses. Nevertheless, there is little customer insight into the graphical or verbal processing of information and data protection concerns regarding the use of new technology (Hilken et al. 2017).

#### **4.7 Chapter Summary**

This section examined the papers in relation to their study source and publication and their publication year. Articles are published in various journals but in eight specialised and general audience-oriented marketing and consumer journals in particular. The time distribution graph shows an increase in published works, especially in retail research from 2014 to the present day. The research process began by sorting and reading papers chronologically from the earliest to the latest. It helped to know the author about the subject, create a sense of structure and to understand how concepts have developed over time on the research of augmented reality in the retail sector. Furthermore, this chapter revealed the used of methodologies and context of reviewed literature. Last but not the least, this chapter critically revealed current research focus related to AR in retail and identified a few important outcomes. Thus, the next chapter will introduce the findings of this thesis in terms of underlying research themes from reviewed AR literature.

## Chapter 5 Findings: Underlying Research Themes in the AR Literature

### 5.1 Introduction

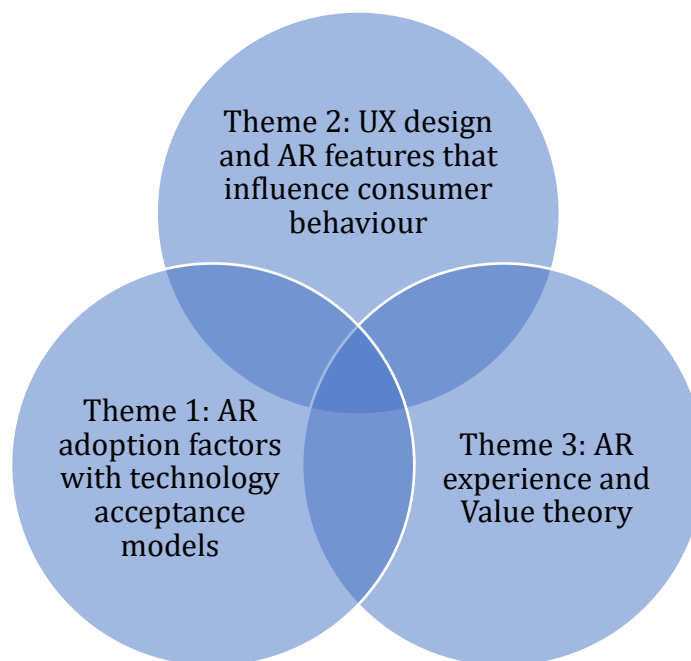
After comprehensive systematic literature review with topic of Augmented Reality in Retail Settings, the following research themes emerged.

**Research Theme 1:** *AR adoption-based factors with technology acceptance models*

**Research Theme 2:** *AR user experience design and AR features that influence consumer behaviour*

**Research Theme 3:** *AR shopping experience and value theory*

Figure 5.1 (a Venn diagram) is given below to help visualise the research topics. All research topics overlap in some stages, where this thesis identifies three main pathways of research. In the following section, the research paths were proposed. This segment outlines the three research topics separately and addresses recent progress on each research topic.



**Figure 5. 1 Research themes in the literature on Augmented Reality in Retail**

## 5.2 Underlying Themes under augmented reality in retail research

In order to better analyse and reveal the underlying research themes related to AR in retail, and also based on the overview of the literature above, this section discusses the three major research themes in more detailed. The results of these reviewed literature indicated that these research articles could be categorised into three research themes and is shown in Table 5.1. This table does not include all reviewed articles but highlights critical studies within certain research themes with empirical evidences.

**Table 5. 1 Reviewed Results of Research Themes**

Research Themes	Articles
Research Theme 1: Focus on AR adoption-based factors with technology acceptance models	Lee et al., 2006; Pantano and Servidio, 2012; Rese et al., 2014; Huang and Liao, 2015; Rese et al., 2017; Pantano et al., 2017.
Research Theme 2 : Focus on AR user experience design and AR features that influence consumer behaviour	Huang and Liu, 2014; Huang and Liao, 2017; Poushneh and Vasquez-Parraga, 2018; Javornik, 2016a; Javornik, 2016b; Beck and Crie, 2018; Hilken et al., 2017; Yim et al., 2017; Yaoyuneyong et al., 2016; van Noort et al., 2012; Jin, 2009.
Research Theme 3: Focus on AR shopping experience and value theory	Dacko, 2017; Olsson et al., 2013; Poncin and Mimoun, 2014; Hilken et al., 2017; Hilken et al., 2018; Poushneh, 2018; Kim and Forsythe, 2008; Javornik, 2016b; Scholz and Duffy, 2018; Watson et al., 2018.

## 5.3 Research Theme 1: Focus on AR consumer adoption-based factors with technology acceptance models

In researches involving AR, one of the most perceived essential themes was highly focused on adoption-based aspects, employing traditional technology acceptance models (TAMs) (Pantano and Servidio, 2012; Huang and Liao, 2015). Former studies on AR was most noticeable in Human-Computer Interaction (HCI) literature (Javornik, 2016a), thus it is quite normal that most studies had contemplated on adoption issues (Rese et al.,

2016) relying on the technology acceptance model (TAM) of Davis (1989) and its alternatives. While the said model has relatively more modern expansions, it has typically been signified as a main element in measuring differences between innovations that both customers and groups are anticipated to utilise, and which they will accede and utilise (Bonetti et al., 2018). Hedonic and utilitarian properties are specifically analysed in conjunction with TAM (Huang and Liao, 2015; Rese et al., 2017; Javornik, 2016b). The expected usefulness of technology (PU) in enhancing user experiences and perceived ease-of-use (PEOU) in the implementation of a specific scheme are among the main causes. PU and PEOU aim to encapsulate more utilitarian characteristics of AR, while observed enjoyment is utilised to portray hedonic values. Definitely, many studies have determined that enjoyment and experiential value impact behaviour of customers in virtual settings (Lee et al., 2006; Kim and Forsythe, 2008). Therefore, since marketing and retailing AR have been applied only relatively recently, the TAM model can be a viable means in depicting acceptance and upcoming usage objectives (Rese et al., 2017). Table 5.2 shows 14 studies that concerning consumers' adoption of AR in retail. As this section mainly focusing on AR with technology acceptances models within reviewed literature hence this table added the theory column in order to highlights the theories that have been applied in AR research.

**Table 5. 2 Research on the consumers' adoption of AR in Retail**

Research	Theory/ Model	Application	Variables
Lee et al., (2006)	<b>TAM</b>	Virtual try on	PU, PEOU, PE, AT, BI, Utilitarian and Hedonic Variables
Kim and Forsythe (2008)	<b>TAM</b>	Virtual try on	PEOU, PU, PE, BI
Pantano and Servidio (2012)	HCI Model	Immersive Store	PEOU, PU, PE, Satisfaction, Perception
Domina et al., (2012)	<b>TAM</b>	Immersive Website	PE, PEOU, Perceived Control
Spreer and Kallweit (2014)	<b>TAM</b>	AR app	PEOU, PE, PU, BI

Poncin and Mimoun (2014)	Store Atmospherics	Virtual try on	Perceived Store Atmosphere, Satisfaction, Shopping Value
Huang and Liao (2015)	<b>TAM</b>	Virtual try on	PEOU, PU, PE, Presence, Aesthetics
Kim and Hyun (2016)	<b>TAM</b>	Navigation	BI, PU, Service Quality, Information Quality
Javornik et al., (2016)	N/A	Virtual try on	BI, Augmentation, PEOU
Javornik (2016a)	Media Effects	Virtual try on	BI, Cognitive and Affective responses, Flow
Pantano et al., (2017)	<b>TAM</b>	Virtual try on	Information Quality, Aesthetic Quality, Interactivity, PU, PEOU, PE
Rese et al., (2017)	<b>TAM</b>	AR apps	PI, PEOU, PU, PE, AT, BI

Several studies employed a theoretical research model that concerns retail-related AR. Based on the hedonic features, most of them encompassed perceived enjoyment (PE) or playfulness as an assessed element. Huang and Liu (2014) discussed the fact that AR's highly interactive potential exceeds conventional retailer interactions, for example through analysis of the product. In their citation to Fogg (2003), AR should be seen as the convincing technology that provides experience rather than practical technology and which suggests that it is the hedonic quality of AR that is likely to be distinguished from other digital technologies (Javornik, 2016b). Furthermore, Bonetti et al., (2018) imparted that AR aids in mitigating the observed risks in cognition rooted from doubts in unobserved products and respective combinations. Likewise, virtual contact prior to online purchase can provide product info that nearly represents the data gathered from directly investigating it, which encourages mental imagery (Poncin and Mimoun, 2014). Heller et al., (2019) further determined that AR's advantage is augmenting ease of processing of mental imagery among customers. On the other hand, concentrating on AR's utilitarian side by focusing on increased content alongside functional information and echoed in constructs including perceived informativeness (PI) or information quality was quite unusual. Similar with Rauschnabel and Ro (2016), it looks like sensible to apply

a basic “quite clear and structured” TAM model with an extension to PE. As Huang and Liao (2015) identified, while PU and PEOU have been classified as the most critical components that urge consumer acceptance of AR innovation, adding experiential value (Dacko, 2017) constructs including perceived enjoyment is likely an enhancement of the explanatory influence of TAM.

In addition, using conventional TAM with its usefulness, ease of use, and attitude (Davis 1989) to apply a more broad context of interactive innovations, including aesthetic performance, data quality, interactivity and response times (see section 4.3) in accordance with the theory of user experience (Olsson and Salo 2011; Olsson et al. 2013). TAM was used to determine the role of online and mobile shopping (Kim, 2012), because new shops depend on immersive instruments (Pantano and Servidio, 2012) and multimedia systems to deliver services during physical sales (Kim et al., 2011). Additionally, TAM partnerships with virtual technologies, including digital trials (Lee et al., 2006; Kim and Forsythe, 2008) and systems that were based on AR, are often known to develop (Rese et al., 2017). Truly, Pantano (2014) believed that in the implementation of such systems, they should note the new developments of technology, and attempt to be innovatively active, instead of being realistically passive. Therefore, succeeding work by Pantano et al., (2017) initiates new survey lines for upcoming research trends toward the prevalence of retail-based AR by expanding the TAM (Davis, 1989; Pantano and Servidio, 2012; Baum and Spann, 2014) with added constructs in connection with particular AR main aspects. These elements may be applied in progressing new interactive schemes and marketing management plans.

### **5.3.1 Summary of Research Theme 1**

A large part of the previous AR literature focuses on adoption-based variables, using traditional TAM model. Most of studies exploring different constructs from TAM model with AR applications in order to examine the consumer adoption of new technology and the adoption factors, drawing on the TAM and its variants. Indeed, consumer technology acceptance has been examined in most cases with respect to adoption of digital trials as non-personalised and customised versions (Fiore et al., 2005; Kim and Forsythe, 2008; Merle et al., 2012), but also as AR-enriched versions (Rese et al., 2017). But the emphasis

was less on technical features but on functional and hedonic ideals, risk or physical trust (Yang and Wu, 2009; Merle et al. 2012). TAM was further developed with more constructions to provide a more robust framework in order to better understand the potential of new technologies such as AR for consumer adoption. The variables are taken from the existing literature, align with previous studies in innovation adoption and technology management in the retail context (i.e. Papagiannidis et al., 2014; Rese et al., 2014). Additional structures of AR systems are applied to TAM models, for example information reliability, interactivity, personalisation. Considered to be the most critical factors in fostering the consumer adoption of AR technologies (Huang and Liao 2015), the perceived usefulness (PU) and perceived ease of use (PEOU) are the exploratory forces of TAM. In general, an understanding of the use of new technologies such as AR is important if consumers are to receive positive reactions that contribute to the adoption of technology, because otherwise they will be able to reduce PU, PEOU, intuition and irritation and disappointment (Lee et al., 2012). The researchers have started to explore their characteristics and their function in shaping utilitarian and hedonic values to gain a clearer understanding of the influences of AR technology on consumer behaviour, and how this affects intention, not just limited in adoption. Nonetheless, it is important to research the extension of TAM models with more mechanisms relevant to the Amplified Reality software to better understand AR characteristics and their role in creating a compelling customer experience or quality, and to clarify what AR attributes must provide to improve the experience of customers (Poushneh and Vasquez-Parraga, 2017).

#### 5.4 Research Theme 2: Focus on AR user experience design and AR features that influence consumer behaviour

Table 5.3 highlights how AR user experience (UX) has evolved over time from reviewed literature.

**Table 5. 3 AR user experience design research**

Topic Area	Studied Issues	Authors
	AR enables simulation of a user of a product's characteristics on a website in an online purchase.	Fiore et al., (2005)

<b>AR User Experience Design</b>	How AR systems and applications are applied in retails and other industries, and how these AR collaborations influence user experience (UX). Privacy issues and quality of AR applications surface.	Carmigniani et al., (2011)
	A developed awareness of probable end <b>users' expectation</b> on AR UX design; it is expected to be highly multi-dimensional and influenced by several parts of core technology hence it is likewise significant to probe how to grasp them by <b>design solutions</b> .	Olsson et al., (2013)
	AR enables users to impart their <b>personalised experiences</b> on social media, thus developing playfulness	Huang and Liu (2014)
	AR has a high ability to enable distinctive roles on UX but they also have to <b>design AR UX</b> that considers their communications goals, aim on audience features, content management plans, triggers and others2	Scholz and Smith (2016)
	Probed AR's impact on retail UX and its consequent impact on <b>user satisfaction and user's willingness to buy</b> .	Poushneh and Vasquez-Parraga (2017a)
	AR allows an increase of users' abilities to absolutely fulfil their needs. Further, <b>augmentation quality</b> and <b>user's ability</b> stores personal data for privacy contentment.	Poushneh (2018)

The above table emphasises the studies that concentrates on AR and UX design. They all impart a typical view; however, what is vital is that several focus on AR UX or aspects that influence customer behaviour. Past researches have commonly imparted AR UX design and the influence of particular AR characteristics on customer behaviour. There is an



existing tendency and development on UX design has been widely spread over time (Scholz and Duffy, 2018). This is in contrast with more extensive research focus as discussed in Chapter 4. Hence, while the literature may seem to relate to a several subjects, a union on the monetary AR application in retail aspect is of greater prevalence compared to the progress on technical and experience advantage.

Alben (1996) states that UX is a common notion about why people use an interactive product: how they feel in their hands, how well they function, what they feel in their hands, how well it suits their interests and how much it blends into the whole context in which it is used. Therefore, it is a particular integration of related product features, an individual collaborating with the product, and where an individual collaborates with the product (Scholz and Duffy, 2018). The UX of AR applications has developed prominence from past AR studies (e.g., Poncin and Mimoun, 2014; Yaoyuneyong et al., 2016; Hilken et al., 2017; Beck and Crie, 2018; Poushneh, 2018). Poushneh and Vasquez-Parraga (2017b, p. 230). For instance, Hassenzahl and Tractinsky (2006) related such notion as involving an inner state of the consumer, brand characteristics and use sense. Whilst past studies have generated several sensitivities on AR UX, it has highly concentrated on customers' instantaneous responses on AR substance, as highlighted in their immediate background. Scholz and Duffy (2018) realised that when customers are utilising AR applications at home, either hedonic or utilitarian aspects of UX are more vital to them. According to recent research, AR can offer a convincing UX (Poushneh and Vasque-Parraga, 2017).

Despite this, an earlier study by Olsson et al., (2013) indicated that the UX of AR can be multi-dimensional and influenced by a widespread set of design facets and innovations. Definitely, Scholz and Smith (2016) disputed that retailers must ensure their communications goals and the UX that they intend to provide when designing AR experience. Poushneh (2017) highlighted the UX concept is multifaceted and must mirror hedonic, pragmatic, and aesthetic features. Hence, past AR studies have probed several features of UX, such as Hilken et al., (2017) denoted utilitarian and hedonic values to influence users' behaviour and answers to AR applications. With respect to augmentation quality, the hedonic and aesthetic quality of Poushneh and Vasquez-Parraga (2017b) is an essential product feature that impacts UX of AR apps. While significant, such insights signify particular properties of a consumer's journey –chiefly acquiring product info –

through isolated incidents of AR app exposure. Meanwhile, certain facets of app and augmentation quality (Poushneh, 2018) do not realise consumers' hopes which cause UX problems and may result to dissatisfaction (Scholz and Duffy, 2018).

To sum up, research reveals that UX entails consumer involvement and setting association that stems from the user interactions on an environment, product, and brand. These generate a full nature involving emotional, cognitive, social, affective and physical reactions to a shopping setting (Xue et al., 2019). While AR marketing studies involving US has primarily concentrated on AR app aspect (Scholz and Duffy, 2018) which probed users' reactions to AR content and how they respond to AR application rather than on the brand or retailer after their AR purchase. Only few researchers such as Scholz and Duffy (2018) gave vital discernments on how consumer-brand associations can be fostered with AR. Indeed, AR studies are still into a whole awareness as AR potential for users and retailers are still quite few. Javornik (2016b) mentioned the importance of moving beyond such fragmented customer responses and giving customers more comprehensive insight into the quality of AR experience, including the necessity of further comprehending retail/brand-involved reactions (Scholz and Duffy, 2018), rather than app-related ones, which can be attained with AR.

#### 5.4.1 AR Features

To analyse the likely impact of AR technologies on retail customers, recent studies have taken into account their key characteristics. They noted such characteristics with specific focus on interactivity, modality, immersion, vividness and augmentation. The next sections discuss them in detail involving retail setting based from literature. Table 5.4 highlights the core AR characteristics that impact AR user experience and purchase behaviour.

**Table 5. 4 AR's core characteristics based on reviewed literature**

AR Characteristics	Authors
Interactivity	Fiore et al., 2005; Javornik, 2016b; Parise et al., 2016; Yim et al., 2017; Poushneh, 2018;
Augmentation	Javornik, 2016b; Watson et al., 2018;

Immersion	Huang and Liao, 2015; Javornik, 2016a,b; Huang and Liao, 2017;
Vividness	Yim et al., 2017
Personalisation	Dieck et al., 2015; Parise et al., 2016

This table illustrates the main AR core characteristics that can influence user experience (Watson et al., 2018; Scholz and Duffy, 2018). They are: Interactivity, Augmentation, Immersion, Vividness, and Personalisation. The next sections specifically discuss them.

#### **5.4.1.1 Interactivity**

Interactivity has studied on a widespread basis. Fiore et al. (2005) imparted that it interests and engages users, thus developing an affirmative affective reaction. Several studies have investigated how experiential value is developed by its ability to generate flow, i.e. by involving users with interactive qualities in a highly absorbent state (Javornik, 2016b). As technology innovates, said features becomes an even more central part of the purpose. Truly, Poushneh (2018) imparted that AR and other interactive innovations are capable of producing 3D content in various styles, directions, and colours. With interactivity absent, AR cannot generate a lively output, hence it will only be two-dimensional or stationary and AR is comparable to an obsolete innovation that disengage user interaction (Poushneh, 2018). Hence, these authors remarked enabling interactivity on customers, as well as a richer, more vivid, or more customised presentation as crucial characteristics of AR (Parise et al., 2016; Yim et al., 2017).

#### **5.4.1.2 Augmentation**

Javornik (2016a) contended that AR's ability to develop immersive happenings is by its essential augmentation feature. He disputed that AR has its uniqueness with its tendency to develop physical reality or to connect physical settings with virtual features. He remarked that AR is not just another one of the interactive innovations as its facility to augment or transform visual realistic representation generates a more immersive flow in contrast to other similarly interactive occurrences. Truly, his research alongside Poushneh and Vasquez-Parraga (2017) help in illustrating the significance of

augmentation in fostering playfulness, immersion, and excitement, ensuing an improved experiential value creation (Watson et al., 2018).

#### **5.4.1.3 Immersion**

Javornik (2016a, b) realised that good augmentation allows for a ‘flow’ experience that consequently propels consumers’ responses. The tendency to generate flow – whole immersion into a virtual user experience – has been probed from several other perspectives. Huang and Liao (2015), for example, considered the role of AR in creating a multisensorial flow as two sensory aspects: self-location and the haptic picture (touch generation). They realised that these AR characteristics foster a first-person perspective and a sense of self-localisation, thereby creating a true experience through the vivid and practical embodiment of spatial views (Huang and Liao 2015). Huang and Liu (2014) probed if the influential consequences of media richness (environment replications), narrative (cause and effect models), and presence (object simulations) vary .

#### **5.4.1.4 Vividness**

The capacity of a software to create an environment of sensory mediation is defined as vividness (Steuer 1992). It combines the meaningful experience of real objects, the unconscious of dreaming, with hallucination (Lee, 2004). Other authors also reaffirm that the idea is realness, richness or realism (Sadowski and Stanney, 2002). From the technical point of view, vitality is defined as evolving by the breadth, indicating the value and width of information characterised by media consumers, denoting a variety of sensory scopes a media can produce (Li et al., 2002). Yim et al., (2017) realised that AR gains through a mechanical aspect of vividness that can create varied affirmative customer assessments by means of augmented immersion. However, he further contended that if AR is deprived of its vividness, the substance of media novelty, its total effectiveness becomes declined.

#### **5.4.1.5 Personalisation**

Personalisation involves relaying expertise and solutions through consumers’ in-store attitude, including product search, comparison, and desire to check out; alongside more conventional factors such as specified inclinations, online actions, and demographics

(Parise et al., 2016). Olsson et al., (2013) noted that personal significance and personalisation of AR interface are vital since AR represents very immersive and particular facets that can alter the very manner of how someone observes his world and expresses what info the user is capable of experiencing and what values are connected with it. Truly, Olsson et al., (2013) contended that users' prospects consist of personalisation of AR substance as it is observed as somewhat general which is anticipated from AR and other new innovations. Dacko (2017) imparted that AR can develop a system of providing personalised pre-buying assessments. As consumers become more insistent, they are more likely to anticipate services or products that provide for particular needs. For example, AR retail apps of a few show brands providing personalisation include shoe fitting as well Converse's sports show AR application that allows consumers to select various sneaker models from a register and then "try them on" practically. Tabusca (2014) gave an insight that a user directly points the AR interface on his feet and the chosen model appears on their feet. Moreover, Parise et al., (2016) revealed that emotional triggers is a main factor behind shoppers' follow-up visits on a store, as well as brand loyalty. Such triggers are personalised occurrences as exactly offered by AR.

#### **5.4.2 Summary of Research Theme 2**

It is perceived that AR UX and characteristics that impact consumer involvement from Human-Computer Interaction (HCI) outlook and scholars from HCI setting were the proponents of the debate on the source of AR UX design and facets that influence consumers. Regardless, after 2010s, consumer and marketing literature have begun manifesting interest in discussing the matter. Researchers (e.g. Javornik, 2016a,b; Poncin and Mimoun, 2014; Parise et al., 2016; Olsson et al., 2013, etc) began a probe of AR UX design and its captivating experience alongside AR characteristics to impact consumer attitude. Truly, it is noteworthy how AR UX design research shows that high value and interactive AR interface, ease of access, personalised experience, allowing consumers to store their personal data and user-inclined applications are vital in influencing customer experience. Hence, core AR characteristics need to be utilised or pondered when considering AR's interface or its application design. Likewise, some conventional and online studies have revealed that personalisation, interactivity and other characteristics

facilitate the association between customer reaction and retail experience (Eroglu et al., 2001; Morrin and Chebat, 2005; Chang et al., 2011). Javornik (2016b) further contended that HCI aspect denoted augmentation as a pertinent AR idea. An earlier study by Azuma et al., (2001), for example, stressed the problems such as eye strain with AR, data density perception and realism can affect the user's experience, which might have a straightforward influence on its adaptation with regard to retail. Generally, the principles of HCI including functionality, usability, content, aesthetics, and feel fascinate both emotions and senses (Dix, 2009; Preece et al., 2015) which can develop a probe customer experience alongside technology by delivering a more vivid illustration of consumer usage of particular innovations. To put shortly, innovation-related concerns including augmentation, accessibility, and content have far less explicit marketing impact, however hurdling such issues can promote toward a developed AR design and mitigate issues such as poor quality and gaps on physical and visual attributes. Regardless of this research subject been desired for more than 10 years, the unique HCI theory alongside AR needs to be further tackled since it continues to be uncommon within the AR perspective. This suggestion can enhance value and realistically and affirmatively influence consumer attitude by means of more suitable and upgraded AR design within commercial subjects such as Sephora Visual Artist AR app (Scholz and Duffy, 2018).

### **5.5 Research Theme 3: Focus on AR shopping experience and value theory**

In addition to AR design and technology acceptability modelling issues, AR shopping experience and value theory are another key research. AR literature provides a wide range of research in the potential of AR and how it impacts on consumer behaviour or reactions (Dacko, 2017; Flavian et al., 2019). Studies show that the perception of customers relates to customer engagement and environmental interactions within a company, culture and brand. The use of AR in the retail sector also shows the entire shopping experience (Poncin and Mimoun, 2014). The holistic essence of the answer to the shopping experience for AR is cognitive, emotional, affective, social and physical (Flavian et al. 2019). AR's ability to allow customers to digitally try (i.e. environmentally integrate) their online services offers increased knowledge (Huang and Liao, 2015), visually appealing experience (Poushneh and Vasquez-Parraga, 2017). Thus, the following sections introduces AR to improve shopping experience and also the

motivations and values of using AR in retail context that have been revealed from reviewed literature. Table 5.5 summarises research concerning to the effects of AR on customer experience and a variety of contingency factors.

**Table 5. 5 Selected literature on the effects of AR on customer experience**

Customer Experience	Authors	Findings
Cognitive and emotional fit	Parise et al., 2016	<ul style="list-style-type: none"> <li>Digital AR stimuli can provide emotional and cognitive content that enables shoppers to have personalised experience according to their needs and requirements for information.</li> </ul>
Flow	Javornik, 2016b; Parise et al., 2016	<ul style="list-style-type: none"> <li>AR has the potential to improve flow between customer contact points;</li> </ul>
Immersion	Parise et al., 2016; Yim et al., 2017	<ul style="list-style-type: none"> <li>AR has the ability to convert to a completely new level because of the wealth of immersion it offers the user;</li> </ul>
Spatial presence	Hilken et al., 2017	<ul style="list-style-type: none"> <li>The impact of spatial presence on expectations of utilitarian value is stronger for clients who are able to process information orally and not visually.</li> </ul>
Hedonic value	Dacko, 2016; Dieck et al., 2015; Hilken et al., 2017; Olsson and Salo, 2011; Poncin and Minmoun, 2014; Rese et al., 2014; Yim et al., 2017	<ul style="list-style-type: none"> <li>User's expectations of the hedonic quality that motivates and/or can even assess this usefulness when accepting new interactive technologies;</li> <li>The hedonic benefit of an improved perception system attracts customers who found the new system available for basically wearing their glasses fun and useful.</li> </ul>
Learning information	Dacko, 2017; Marionva et al., 2017; Parise et al., 2016	<ul style="list-style-type: none"> <li>Developed a better understanding of the nature of AR and possible directions for knowledge learning;</li> <li>Some users are also interested in gathering data from AR systems, including friends and family references.</li> </ul>
Satisfaction	Dacko, 2017; Parise et al., 2016; Poncin and Mimoun, 2014; Ross and Labrecque, 2017	<ul style="list-style-type: none"> <li>The overall satisfaction with AR shopping apps is relatively high;</li> <li>Further exposure to these aspects could be paid to the growing proliferation of AR shopping devices, which then also lead to overall customer loyalty in a retail environment.</li> </ul>
Utilitarian value	Dacko, 2016; Dieck et al., 2015; Olsson and Salo, 2011; Olsson, 2013; Poncin and Mimoun, 2014; Rese et al., 2014; Yim et al., 2017	<ul style="list-style-type: none"> <li>The extent of the utilitarian value of this technology influences the customer's use of AR technologies offered by retailers;</li> <li>The spatial presence effect on expectations of utilitarian principles is more pronounced for consumers who favour verbal information processing.</li> </ul>

**Contingency Factors that impact consumer experience**



Privacy concerns	Poushneh and Vasquez-Parraga, 2017; Olsson et al., 2013	<ul style="list-style-type: none"> <li>• Past AR developments, such as Google Glass, have caused privacy concerns to be overwhelmed;</li> </ul>
Style-of-processing	Hilken et al., 2017	<ul style="list-style-type: none"> <li>• Customers' style-of-processing and privacy concerns are relevant boundary conditions in terms of the evaluation of AR consumer experience.</li> </ul>
Trade-off between value and price	Poushneh and Vasquez-Parraga, 2017	<ul style="list-style-type: none"> <li>• User satisfaction is measured by an evaluation of the output value relative to the data.</li> </ul>
Use of AR at home vs. in public	Rauschnabel and Krey, 2017	<ul style="list-style-type: none"> <li>• The use of AR applications can generate different consumer experience in various environments.</li> </ul>

Table 5.5 highlighted the studies related to effects of AR on customer experience. This shows that current research in AR focuses on the effect of AR on customer experience and what kind of customer experience AR can provide. Because current AR applications differ in terms of how they provide embedding, the results may vary accordingly (Hilken et al., 2018). In the panel, the researchers share a common opinion, as well as reviewing the reviewed literature, that an excellent AR-experience provides consumers with a balance between utilitarian and hedonic ideals, improved decision making, and positive behaviour intentions like purchasing and word-of-mouth intentions (Poushneh and Vasquez-Parraga 2017; Yim et al., 2017). The literature also indicates that evaluations of perception truth are the mechanisms behind the results (flow, immersion, cognitive and emotional fit, fidelity). Several research have demonstrated that general flow and immersion sensations can explain the benefits of AR adoption (Parise et al., 2016; Yim et al., 2017). Hilken et al. (2017) have more recently underlined an AR-specific process through which consumers have a sense of digital object's spatial presence. In other words, customers suspend their disbelief while implementing the AR-specification and are persuaded they actually try to communicate with an actual product. Nevertheless, limited insight has been provided into the relevant limits of the AR shopping experience including customer choices for visual or verbal information processing or concerns about the confidentiality of the use of new technologies (Poushneh and Vasquez-Parraga, 2017). Furthermore, the next sections revealed and analysed the findings that from the reviewed



literature concerning to AR shopping experience and customer experience relevant downstream consequences with value theory.

### **5.5.2 How AR enhance shopping experience**

For example, early study by Tabusca (2014) presented real-life examples of AR that are all directly aimed at retail cases and indicated that the AR application to further improve shopping experience would be a good idea. Tabusca (2014) also argued that AR would definitely become the next trend for mainstream retailers to improve their existing shopping experience. For example, in a retail environment some customers do not buy online because they lack product information that makes purchasing decisions risky in their opinion (Kim and Forsythe, 2008a). In fact, a lack of experience with feeling, experiencing, smelling, and evaluating a particular item makes the assessment of the pleasure and buying decisions difficult and could have a negative impact (Merle et al., 2012; Blazquez 2014). Nonetheless, AR may provide additional products (Lu and Smith, 2007) and provide positive shopping experience for customers (MacIntyre et al., 2001). The additional information allows customers to evaluate products in greater detail (Kim and Forsythe, 2008a) to ensure more assurance in decision-making (Oh et al., 2008). Studies have also shown that AR is a tool to boost consumer awareness of shopping experience by widening shopping options in terms of buying time, quality of goods and personalisation (Cuomo et al., 2014). In addition, AR also provides additional information to help customers make decisions with regard to visual information, text, audio and simulated interactions (Papagiannidis et al., 2017). For example, previous studies indirectly explored consumer buying AR experience, highlighting how AR applications have the ability to let consumers to get a more detailed understanding of products (Dacko, 2017) and increase purchase intentions (Beck and Crie, 2018).

Indeed, Kim and Forsythe (2008) have indicated that the AR experience in shopping enables consumers to communicate seamlessly with digital goods, thereby enhancing the perception of products and potentially their corresponding brand image, thus enhancing customer buying intentions. Javornik (2016) found that users are also more likely to find out that the shopping experience is more enjoyable, because the AR app lets them try more, and they feel less obliged to buy. Not only was it digital Cruz et al., (2018) found that the use of AR could also boost shopping experience in large retail stores.

However, Scholz and Duffy (2018) argued that, even if customers view AR shopping favourably, they may not be comfortable or appreciate the value of the shopping experience. Indeed, van Esch et al. (2019) found that the innovative approach to shopping was not significantly influential in the brand attitude of the participants. It can be difficult for customers to grasp the difference between shopping in the augmented world and reality. In addition, AR's market acceptance is surprisingly slow (Fink, 2017) due to the large gap in consumer expectations about the advantages of AR technology or to the degree of comfort in using these advantages (Hilken et al., 2017). Recent research has found that only a small number of customers think the AR applications are 'worthy to recommend' (Rese et al., 2017). Heller et al. (2019) therefore indicate that the acceleration of AR development rapidly obsolesces organisational problems, although consumer rates face persistent difficulties. Researchers like Poushneh and Vasquez-Parraga (2017) have therefore suggested that retailers develop protocols to guide consumer shopping behaviours. One way to do that is to ensure the touch is part of the experience. In addition, the perception of AR shopping should be focused on the psychophysiological aspects of the process to achieve customer acceptance (van Esch et al., 2019; Scholz and Smith, 2016). Only when retailers can address the real needs of their consumers – such as more productive and pleasant shopping experiences that reduce ambiguity in decision-making – can innovation of technology deliver value (Dacko, 2017).

### **5.5.3 Motivation in AR shopping**

The most recent research has explored motivations and reactions of customers in AR marketing (e.g. Beck and Crie, 2018; Poushneh, 2018; Yim et al., 2017; Hilken et al., 2017; Javornik, 2016b). Both utilitarian and hedonic motivations were recognised to encourage the behaviours and reactions of customers to that AR (e.g., Hilken et al., 2017; Yim et al., 2017).

#### **5.5.3.1 Utilitarian motivations**

Rauschnabel et al., (2015) indicated that the use of AR glasses (e.g. Google Glass) is probably to be understood as utilitarian motivations, for example for improving efficiency of life and for social signalling consequences (e.g., inclusion or unique signs, according to the personal characteristics). Further work by Rauschnabel et al., (2019) combined practical, instrumental and functional advantages with utilitarian advantages.

Improved knowledge by Poushneh and Vasquez-Parraga, (2017) indicates that the utilitarian motivators of the integrated shopping experience can be used by AR to digitally seek (i.e. environmentally embedded) digital offering (Poncin and Mimoun, 2014).

#### ***5.5.3.2 Hedonic motivations***

For AR games like Pokémon Go, psychological advantages (e.g. enjoyable), as well as hedonic and social effects, are more widely spread (Rauschnabel et al., 2017). Many researchers have emphasised that AR has the ability to make the simultaneous shopping experience more enjoyable and playful (Huang and Liu, 2014; Javornik, 2016a). Moreover, Javornik (2016b) argued that AR tends to provide a more hedonic than utilitarian experience. In this respect, the shopping motivation of the consumer seems likely to lead to differential emotional responses and results. Hedonic satisfaction, such as relaxation, pleasure, perception and sensory enhancement, is the principal concern of customers with hedonic shopping motives (Babin et al., 1994). The focus is on enjoying the experience (Childers et al., 2001) and therefore, we expect hedonic consumers to be satisfied more than consumers with lower hedonic motivations with the rise.

#### ***5.5.3.3 Summary***

It is likely that the difference in what motivates adoption is due to the activities that users perform in conjunction with AR software (Javornik, 2016a), but also to the types of AR applications (Scholz and Duffy, 2018). For example, Rese et al., (2017) found that hedonic (i.e., enjoyment) relative importance to utilitarian (i.e. information) varies between marker-based and marker-less AR applications. Indeed, Scholz and Duffy (2018) indicated the latter types of apps that are common in mobile retail as digital trial applications, particularly in terms of their practicality, helpfulness or usefulness. The research therefore suggests that although both utilitarian and hedonic elements promote shopping within AR environment, utilitarian factors are more prevalent for customers (Scholz and Duffy, 2018). Such results were consistent with other research (Dacko, 2017), which found that practical problems were the key gain customers would derive from AR applications by analysing the actual and planned use of AR Shopping apps in real-life situations. On the other hand, Researchers such as Javornik (2016b), Huang and Liao (2015), suggested that AR would possibly be more hedonic than utilitarian. Javornik

(2016b) indicated that customers with hedonic shopping reasons can use these innovations more thoroughly to improve their experience. As Arnold and Reynolds (2012) have argued, consumers who look for hedonic experiences with stronger hedonistic motivations seem to find them and have a stronger experience. It therefore appears likely that hedonic shoppers would benefit more from the AR experience. Furthermore, Watson et al. (2018) have found that customers who are more interested in hedonic satisfaction are more satisfied with the augmented experience. Nonetheless, this is one of the few studies to examine how vary consumer traits can lead to different outcomes. Although some studies explore the impact of hedonic versus utilitarian reasons on shopping (To et al., 2007; Arnold and Reynolds, 2012), research have been limited in examining whether hedonic motivations have a moderating effect on experiential retail (Fiore and Kim, 2007).

#### 5.5.4 AR customer experience-relevant consequences

From the observation of selected literature, it reveals that a compelling AR customer experience can occur vary consequences, such as enhanced decision making process and positive behavioural intentions, e.g., purchase and word-of-mouth intentions, and also positive brand and application perceptions (e.g., Hilken et al., 2017; Javornik, 2016a, b; Poushneh and Vasquez-Parraga, 2017; Yim et al., 2017; Heller et al., 2019; Dacko, 2017; Parise et al., 2016). Thus, the Table 5.6 shows selected literature on AR customer experience-relevant consequences that occurred by AR's potential value.

**Table 5. 6 Selected Literature on AR customer experience-relevant consequences**

Experience-relevant consequences		Authors	Findings
Decision making	Decision comfort	Hilken et al., 2017	<ul style="list-style-type: none"> <li>AR experience is <b>strengthened and decisions are more relaxed</b> when consumers feel that they really seek to communicate with the goods.</li> </ul>
	Purchase confidence	Dacko, 2017	<ul style="list-style-type: none"> <li>AR apps will benefit almost entirely from a shopping experience, with more detailed product information, more selection and <b>greater buying trust</b>, the opportunity to "check" and see samples of product prior to purchase and more customised items.</li> </ul>
	Purchase satisfaction	Dacko,2017	<ul style="list-style-type: none"> <li>The results show that <b>improved purchasing satisfaction is a major consequence</b> of the use of AR Shopping apps and that this is expressed in several</li> </ul>

			retailer-specific benefits of the AR app, including enhanced sales chances, word of mouth, in-store visits and customer satisfaction.
	Risk	Alimamy et al., 2017	<ul style="list-style-type: none"> <li>The results show that the perceived risk dimensions of those who used AR have been <b>significantly reduced</b>.</li> </ul>
<b>Behavioural intentions</b>	Engagement	Parise et al., 2016; Alimamy et al., 2017	<ul style="list-style-type: none"> <li>The effect of augmented reality (AR) helped co-create interest and <b>drive positive brand lengagement</b> with a high level of customer satisfaction.</li> </ul>
	Loyalty	Dacko, 2017	<ul style="list-style-type: none"> <li>AR shopping apps can create fun customer experiences to ensure <b>high satisfaction and loyalty</b>;</li> <li>Greater customer satisfaction is also suggested as the key consequences of the use of AR, accompanied by improved retail loyalty.</li> </ul>
	Purchase intention	Dacko, 2017; Hilken et al., 2017; Javornik, 2016b; Parise et al., 2016; Yim et al., 2017	<ul style="list-style-type: none"> <li>Enhanced perception of value for the AR-based increase in service translates into marketing behavioural responses by purchasing purpose;</li> <li>Studies showed a good link between immersion and consumer learning and buying intentions;</li> </ul>
	Re-use	Dieck et al., 2015; Olsson and Salo, 2011; Rauschnabel and Krey, 2017; Rese et al., 2014	<ul style="list-style-type: none"> <li>Results indicate that consumers will most likely reuse AR apps to help shoppers;</li> <li>AR interfaces can provide enjoyable experience that consumers have shown an interest in using an improved AR software again.</li> </ul>
	Retention	Dacko, 2017; Javornik, 2016b; Parise et al., 2016; Poncin and Mimoun, 2014	<ul style="list-style-type: none"> <li>Gamification has been used for several years in online marketing of AR systems that create loyalty and retention;</li> <li>AR technology enhances ad efficiency by creating a new impact, which attracts the attention of customers, improves fun, <b>improves the retention</b> of product knowledge and creates more favourable marketing attitudes.</li> </ul>
	Word-of-mouth	Dacko, 2017; Hilken et al., 2017; Javornik, 2016b; Heller et al., 2019	<ul style="list-style-type: none"> <li>The intention of shopping people to use the AR application again to spread the word of mouth, was indicative of their intentions to spread the WOM over the application and also highly desired to use it again.</li> </ul>
<b>Brand and application perceptions</b>	Attitude towards application	Javornik, 2016b; Yim et al., 2017; Scholz and Duffy, 2018	<ul style="list-style-type: none"> <li>The research presented show that customers plan to engage in the AR programme and have a positive attitude to it;</li> <li>The greater media usefulness to consumers and the greater media pleasure to the consumer when using AR, leading to a more positive attitude towards AR;</li> <li>The degree to which immersive AR apps are and how realistic or real the digital content looks is related to important results variables such as user satisfaction, AR device behaviour and readiness to buy.</li> </ul>

	Motivation	Beck and Crie, 2018; Javornik, 2016a; Huang and Liao, 2017	<ul style="list-style-type: none"> <li>• Consumers with hedonic shopping motivations can use such technologies more fully to enhance their experience.</li> </ul>
	Brand attitude	Javornik, 2016b; Scholz and Duffy, 2018	<ul style="list-style-type: none"> <li>• Virtual experience, as well as direct product experience, contributes to the same brand behaviour, but the virtual experience offers better brand awareness (cognitive response) than direct experience; <ul style="list-style-type: none"> <li>• By strengthening the brand's role, AR applications may help promote more than transactional relationships between customers and brands.</li> </ul> </li> </ul>

In summary, Table 5.6 indicates that with enhanced AR customer experience, there will be a number of positive consequences. Indeed, it shows that AR relocated to commercial retail from laboratory (Rese et al., 2016), allowing customer analysis and decision-making with greater certainty (Kim and Forsythe, 2008). AR can have a positive effect on consumer behaviour, including better decision-making, better behavioural behaviours, and stronger product and application perceptions by generating increased customer experiences. Javornik (2016a) noted that the performance of the augmentation is the most important feature of AR retail technology to recognise its impact on consumers. Dacko (2017) points to the ability of AR interfaces to improve purchasing comfort and buying satisfaction which help the customer make his or her decisions better. What's more, AR shopping apps are able to help consumers reduce their purchasing risk, which increases decision-making (Alimamy et al. 2017). In addition, it is found that it also has the potential to influence consumer behavioural intentions following AR enhancing consumer decision-making. For example, studies have demonstrated a positive correlation between immersion and learning for consumers and purchasing intentions (Dacko, 2017; Javornik, 2016b; Hilken et al., 2017). Indeed, it is also said that consumer learning from augmented reality applications will enhance their brand knowledge in order to boost customer retention (Parise et al., 2016) which leads to consumer engagement and loyalty retention (Dacko, 2017). There are also other potential benefits from AR's behavioural intentions in terms of word of mouth (WOM), and it has been revealed that shoppers' behavioural intentions for using AR again and spread word of mouth in the application are the strongest (Dacko, 2017; Hilken et al., 2017). Indeed, it

has been found that some literature do share a common view that an enhanced and compelling AR shopping experience would enhance consumers' decision making and lead to some positive behavioural intentions such as word-of-mouth (WOM) intentions (Poushneh and Vasquez-Parraga, 2017; Hilken et al., 2017; Yim et al., 2017). Greater AR shopping experience would drive positive word-of-mouth (WOM) which is also beneficial to the retailers (Eyuboglu, 2011). In contrast, a recent work by Rese et al., (2017) came up with another idea which also mentioned above that there is only limited customers considering it is worthy to recommend AR applications to their friends or family. This suggests that retailers need to get a clearer and deeper understanding of how AR enabled purchasing decisions allow retail customers to connect with each other, sharing their experience to speed up the positive reputation effect of Augmented Reality (Heller et al., 2019). In addition, there are studies also show that AR can shape the perceptions of the brand and application and improve the attitude of consumers to the brand (Javornik, 2016; Yim et al., 2017; Huang and Liao, 2017; Beck and Crie, 2018; Scholz and Duffy, 2018).

### **5.5.5 The Values of using AR to Consumers and Retailers**

Earlier work by Pantano and Naccarato (2010) claimed that advanced technologies, such as AR, typically add value in three areas: retail advantages such as increased speed in consumer education; improvements in point of sale service; and positive effects on customer shopping experience. Using AR provides users with a wide range of values and advantages (Kim and Forythe, 2008; McCarthy and Wright, 2004), such as entertainment value, ease of use and speed up the decision-making process (Huang and Liao, 2015).

AR systems offer the desired experience effectively in order to ensure their understanding of consumer interest (Dacko, 2017). Moreover, Dacko (2017) found that AR provides consumers one or more new, experiential advantages, such as comprehensiveness, demonstration capabilities, trialability and individualism, to the degree that a customer does not usually experience the unique shopping experience (Huang and Liu, 2014; Rashid et al., 2014). Dacko (2017) also suggested that mobile AR is capable of adding value for retailers. Retail settings are becoming increasingly valuable for customers, which will allow them to purchase uncertainties, maybe even more



frequently than shopping quality and other shopping benefits (Dacko 2017). Poushneh (2018) indicated that AR creates value and increases the shoppers' perceptions (Yim et al., 2017) and the happiness of shoppers (Huang and Feng, 2014). Indeed, Bonetti et al. (2019) found that customers want AR to be used as a hedonic value to tell the retailer's storey more thoroughly and remind them of the retailer's characteristics and values through in-store experience. It allows the AR application via current and emerging retail channels capable of generating value through compelling buying experience (Rafaeli et al. 2017). In general, studies have shown that applications of AR in retail could create compelling AR experiences to break the clutter and create consumer interest (Huang and Liao, 2015; Scholz and Smith, 2016; Dacko, 2017). Yim and Park (2019) also argue that AR can give consumers greater value. AR technologies also have the ability to potentially enhance the conversion rates for products ranging from clothing to makeup (Dacko, 2017). Furthermore, AR technology can be used to reduce retailers' costs and reduce the return rate (Dacko, 2017). The smartphone AR shopping software enables consumers, for instance, to measure the width and height of real-life spaces seen from the phone target and to create a very detailed image of furniture with respect to the rest of the actual environment (Baier et al., 2015). Since then, some retailers of furniture launched mobile AR applications that help "home the goods" before real purchases take place (Tabusca, 2014).

For retailers, inventory control and lack of communication with goods in these regiments represent one of the most serious challenges for many brick and mortar retailers. In a more virtual environment, AR shopping apps can be used for revitalising these items by increasing physical inventory and management costs (Dacko, 2017). For example, American home improvement company Lowe is equipping shoppers with iPads in some specifically built stores to create a space that is packable with Lowe's products' for the unique aspect of VR. Then shopper uses Lowe's Augmented Reality technology on their smartphones to fine-tune his selection of layout and home inventory (Johnson, 2014). This would make it much easier for retailers to engage consumers and for retailers to manage and revitalise extensive inventories when they return home (Dacko, 2017). What's more, AR can also provide a tool for providing personalised pre-purchase evaluations (Dacko, 2017). For example, for certain shoe brands which offer such



personalisation, AR applications not only involving shoe fitting, but also allow consumers to personalise their shoe style and virtually try shoes on such as the show brand Converse.

However, Dacko (2017) also claimed that the use of AR is not without disadvantages or constraints in the user's buying experience. He found that most AR app users have suggested one or two disadvantages, indicating that further changes need to be made to fulfil most user requirements in order to create values both for customers and retailers. In addition, Heller et al., (2019) indicated that retailers need to understand better how AR support buying decisions promote communication between retail customers in order to produce AR values. Dacko (2017) also indicates that AR can add value to retailers in other respects, although they receive less coverage in literature and industry studies, such as higher perceived service levels.

### **5.5.6 Summary of Research Theme 3**

Most previous AR research have been focusing on AR customer experience and its relevant experience consequences including AR value research. The literature shares a common view that AR has the potential to provide a compelling customer experience which lead to positively impact consumers' decision making and their behavioural intentions. On the other hand, there is also some contradict including the effects on word-of-mouth. Dacko (2017) indicated that AR consumers share strong intention to use AR app again and share it. However, Rese et al., (2017) argues that consumers still have doubts about recommending AR to their friends. It therefore encourages work to learn more about how purchasing decisions assisted by AR promote communication between retail customers who share information to speed up the high perception effect of augmented reality technology (Heller et al. 2019). AR's effect on offline channel interactions is not currently addressed in the literature as the new literature focuses on technology adoption, use evaluations and affective consumers' answers (Olsson et al. 2013; Rese et al. 2014). Research is limited on how AR can help improve consumers ' buying experience (Poushneh and Vasquez-Parraga, 2017) and how AR can improve customer satisfaction and value (Ross and Labrecque, 2017).

## 5.6 Chapter Summary

This chapter conducted the findings from reviewed literature of AR and divided them into three themes: Theme 1: focus on AR adoption-based factors with technology acceptance models; Theme 2: focus on AR user experience design and AR features that influence consumer behaviour; Theme 3: focus on AR shopping experience and value theory. These research streams were identified from the AR literature and reported above. The AR research started from the nature of Human-computer interaction (HCI) theory, the direction of it turns into consumer and marketing research with the need of AR adoption. From the above findings it can be seen that an analysis of its different disciplinary origins is important. The topic of study is obviously interdisciplinary and varied academic areas, from engineering to management and marketing. The scattered existence of the AR work in a retail environment undoubtedly derives from these different angles. To establish a more detailed discussion on established research gaps and address a future research programme, further analysis of this fragmented research background is needed. Thus the next chapter will address the research gaps from these themes on AR literature

## Chapter 6 Discussion: Identified Research Gaps

### 6.1 Introduction

This thesis has synthesised over two decades worth of research with 96 articles related to augmented reality technology in retail environment in an effort to increase our understanding of AR research in retail setting. On the basis of a systematic review of 96 studies, this study has included conceptual and empirical investigation of the concepts and value outcomes of the AR technology. This thesis contributes to the ongoing discussion on AR in marketing by offering a structured overview of AR research. Thus in this section, the main results of this review and the associated research gaps in the reviewed literature are discussed. This section shows identified gaps in current knowledge about the AR and retail sector in order to uncover the most prominent research gaps in AR. For future research, these significant gaps identified in the following sections need to be further explored in order to gain a better understanding of the application of AR technology in retail settings (Dacko, 2017; Yim et al., 2017). Indeed, as an emerging technology, AR brings its important challenges for consumer studies and makes the case for further investigation of the questions evoked below (Javornik, 2016). Responding to these questions would improve our existing knowledge of the influence of AR technology to consumers' shopping experience and would enable practitioners to develop AR interfaces more effectively and avoiding gimmicky applications (Javornik, 2016; Dacko, 2017; Scholz and Duffy, 2018). Therefore, the following sections introduce identified research gaps within three research themes regarding AR literature.

### 6.2 Discussion of Research Theme 1

*Research Theme 1: Focus on AR adoption-based factors with technology acceptance models*

One of the most focused research themes is AR adoption-based factors, using traditional technology models (TAM). These studies looking into different elements of TAM model with the adoption of AR applications to examine the consumer adoption of new technology and the adoption factors, drawing on the TAM and its variants. Indeed, as AR is a fresh research area, most scholar use TAM model to explore the consumer adoption with new technology. Therefore, TAM was expanded to include additional elements for a

more specific and detailed model to better understand AR's potential in consumer adoption.

In addition, the latest literature on AR on the implementation of immersive and innovative technologies in the retail environment focuses mainly on consumers' adoption of AR on the basis of the extension of the TAM, which are focused on the perceived ease of use, usefulness and attitude as drivers of consumer behaviour, to use certain technologies, including AR technologies. The findings illustrate factors affecting marketing and retail adoption of AR. However, most prominent studies focusing on the constructs of TAM when they exploring consumer adoption of augmented reality technology rather than adding more constructs from technology characteristics perspective (e.g., Lee et al., 2006; Huang and Liao, 2015). One big shortcoming in the literature is the lack of control on the adoption of AR by customers. There are 29 papers on technical characteristics in the field of modelling technology acceptability, including interactivity, enhanced augmentation and interaction. Only few studies have included AR adoption characteristics of AR in the TAM framework as main structures (e.g. Pantano et al., 2017). Certain variables will affect customer decision-making, as well as those previously identified by TAM, given the nature of the augmented reality enriched retail environments. Wixom and Todd (2005), for instance, identified the significance of system performance to influence consumer acceptance and included the system's adaptability, usability, and time for response to customer requests. Digital communication between products can be incorporated into 3D animation, with increased experience to make up for lack of real contact with the products (Papagiannidis et al., 2017). Therefore, these findings show that the expansion of the conventional TAM with more constructs related to specific AR core features such as vividness and interactivity is crucial.

Since 2016, researcher have been concentrating on consumer adoption of AR with TAM. The key factors are the PU of the technology to improve the operation of the consumer and the perceived ease of use of a particular system. Consumer adoption of AR technology has been a new topic of research since 2016 and therefore a longer emphasis and a well-developed framework are needed. An understanding of the use of AR by users is crucial for obtaining user positive reactions leading to the adoption of technology, as PU, PEOU, intuitiveness can otherwise be reduced and irritation and unsatisfactory may occur (Lee

et al., 2012). It is therefore crucial for scholars to gain a deeper understanding of AR characteristics as structures and their role in creating value and how this affects consumers rather than merely seeking their adoption. An expanded TAM model relating to AR technology helps to better understand the AR characteristics that will affect the adoption of new technologies by customers and AR's role in creating persuasive customer experience.

Therefore, there is the lack of knowledge of extending the TAM model to provide more mechanisms related to the fundamental features of AR technology to improve the perception of AR's potential in the retail sector. Finally, the majority of previous studies concerning TAM acceptance of AR for shopping and experimental results have been produced in labs, not in real life retail environments.

## **6.2 Discussion of Research Theme 2**

*Research Theme 2: Focus on AR user experience design and AR features that influence consumers behaviour*

The other most resounding call for AR research in recent years is how to design effective AR interface from the traditional Human-Computer Interaction (HCI) theory considering AR features that impact consumers. While analysts and business practitioners have been aware of the AR user experience layout and AR technologies, relatively little research has been done to evaluate the ways in which AR applications are more effectively and ideally optimised to make a positive impact on consumer experience.

Research topic 2 shows that AR UX design originated from HCI viewpoints, and HCI researchers were the pioneers in opening the conversation about the roots of AR technology and AR functionality. Since the 2010s, AR research focuses on marketing and consumer literature (e.g. Javornik, 2016a, b; Poucin and Mimoun, 2014; Dacko, 2017; Olsson et al., 2013; Pantano et al., 2017). Such studies have started to explore the creation of AR user experience with AR features to affect customer experience. However, 50 percent of all papers indicate that knowledge about AR design still lacks. Many consumers still find it difficult to use AR or overwhelming with the AR interfaces (Hilken et al., 2018). Nevertheless, Rese et al., (2017) also point out that AR applications have been

recommended by only a very limited number of customers. Thus it reveals that research has failed to address the knowledge of AR design with AR features to impact consumer behaviours. Only limited research look in to AR design with AR features to impact consumers (Yim et al., 2017). Yim et al., (2017) focus on interactivity and vividness to see how AR technology can effectively impact e-commerce. The research avenue 1 proves that in the current AR literature, one of the most significant underlying themes is AR design. 36 papers indicate that AR application design is important to consumers and it directly impacts the adoption of AR applications to consumers and retailers. It reveals that more consumer-friendly user experience should be designed to impact consumer behaviours.

High quality and interactive AR interface, personalised experience, easy to access, letting consumers to keep their personal information and user-friendly applications were important to impact consumers' experience. Thus, these core AR features should also be considered when imply AR design. Such findings help the author to consider which areas are being explored for beneficial technical applications in the way the current literature on AR stresses the retail and technological aspects of AR, but neglects the needs and problems of the consumer. AR receives that attention in retail environments, but work was incapable of meeting the phenomenon in the perspective of design.

In conclusion, the review shows that one of the key research fields of AR user experience with AR characteristics has yet to be explored. Some reports that call for AR development for analysis, while many papers on retail and innovation have concentrated on design (e.g. Javornik, 2016; Scholz and Smith, 2016). In order to better understand AR technology and to design a better AR interface, it is important to focus on Human Computer Interaction (HCI) in the field of AR features. HCI concepts, such as functionality, usability, aesthetics, content, look, feel and attraction to senses and emotions in general (Preece et al., 2015). Therefore, the more technology related issues such as accessibility, augmentation, the less direct impact of AR content on marketing influence, however it would help enhance the AR design and reduce quality issues to overcome these challenges. Existing AR marketing research usually rely on the concepts of HCI for virtual synchronisation between digital and physical entities in an immediate context (e.g. Camigniani et al., 2011). Despite the fact that more than ten years of research have passed,

the traditional HCI theory required to deal with AR is still frightened inside AR literature. A more detailed understanding of AR relies on HCI definitions in the AR characteristics for a more advanced AR user experience, such as improved augmentation quality (Poushneh, 2018) and vividness of context in AR (Yim et al., 2017).

#### **6.4 Discussion of Research Theme 3**

##### *Research Theme 3: Focus on AR shopping experience and value theory*

Research theme 3 looks into AR customer experience and its relevant experience consequences (e.g., Dacko, 2017; Hilken et al., 2017). From the findings of research theme 3, it can be observed that prominent research indicate that AR technology is capable of delivering customer experience that has a beneficial effect on the decision-making and behavioural desires of customers.

The review of research theme 3 demonstrates that the most called for research areas are the lack of AR's influence in retail in Omni-channel environment, the lack of knowledge related to word-of-mouth, the limited understanding of key attributes of AR to provide compelling experience, failure to understand how AR is associated with revenue, lack of understanding of how AR can provide customer satisfaction and quality, lack of understanding of consumer privacy issues with respect to new technology.

Firstly, AR's influence on the offline retail environment has not been explored as prevailing AR literature is focused on TAM model, user evaluations and customer responses in offline environments (Olsson et al., 2013). Hilken et al., (2018) call for an urgent research of the influence of AR in the Omni-channel of retail as it is a key element of AR to incorporate virtual information into the physical environment of customers. Thus there is a lack of insight into which information modalities (for example, text, images, videos) and their combinations are best used to improve customer experience. Furthermore, 43 studies suggest that AR can affect the shopping experience of consumers and then contribute to behavioural intentions. There is, however, a lack of knowledge about which variables are important for converting particular AR attributes and allowances into successful customer experience evaluations. Third, it is crucial to explore the effect of AR on retailers as well not only from the consumer perspective, but also to

provide retailers with a better understanding of how AR-supported purchase decision-making facilitates interaction between retail customers and still other ways in which AR can add value to retailers, although it receives less coverage in AR-related literature. Additionally, speaking of the value of AR, there is not only a lack of knowledge of insights into the AR value to retailers, but also how AR creates value links to sales. It is suggested that more insights concerning of consumer responses to AR, as well as understand related behavioural intentions and motivations within different sales channel. Furthermore, there are some contingency factors that may impact AR consumer experience such as privacy concerns (Olsson et al., 2013). However, there is little insight into the applicable boundary conditions of AR's privacy concerns related to using AR applications. In addition, while AR systems are more advanced than VR in terms of privacy, they do not protect users' privacy, which could allow others to access or display users' data (Carmigniani et al., 2011). This can therefore be a disadvantage as regards to the privacy and security of personal information of the users.

## 6.5 Chapter Summary

This chapter reveals research gaps identified from reviewed literature. The most unaddressed research areas are demonstrated from 3 different research themes. From research theme 1, there is lack of knowledge concerning AR technology acceptance modelling with more constructs including AR core characteristic and what would influence consumer's adoption. From research theme 2, there is lack of knowledge of AR UX design related to AR features from traditional HCI theory. From research theme 3, there are lacks of knowledge of AR impact on Omni-channel retail environment, the lack of key factors of AR which lead to positive customer experience, the lack of value theory of understanding how AR link to retail sales, the limited knowledge of the influence of privacy concerns when using AR. Such findings show that numerous studies call for research AR design and experience, while many publications on the retail and technology fields concentrate on the design side, emphasising the significance of the interdisciplinary nature of the AR research subject. The next chapter introduces future research agenda related to three research avenues.



## Chapter 7 A Conceptual Framework and Future Research Directions

### 7.1 Introduction

The findings of this systematic review have several effects on the future development of empirical researches in a retail environment on AR technology. In this section, the author develops a conceptual framework to cover all the arguments discussed within chapters 5 and 6 of the above literature review. From two perspectives, the idea of such could be interesting. First, it summarises over 20 years of AR research within retail context and combines different views on AR research into one conceptual model; second, other researchers may embrace the model in their research projects and, where necessary, integrate it into new empirical research. Possible future research directions and questions using the applicable methodology are then proposed in this chapter, based on the three research avenues mentioned in the previous chapter. The first research avenue is the factors that impact the adoption of AR with Technology acceptance modelling (TAM). The second research theme is focusing on AR user experience design and AR features that influence buying behaviour. The third research is AR shopping experience and value theory.

Although these pathways for research are not empirically covered by this thesis, the author believes that in the near future, researchers could attempt to cover such research avenues by means of the proposed directions and questions to enhance the literature on AR in the retail context. This study provides a detailed and critical literature review for AR research within the retail context, based on a systematic analysis and synthesis of key research debated on AR and retail applications. This synthesis, explores and separates relevant and current research discussions in different areas into three pathways. It therefore sets out a clearer conceptual framework to identify future directions for research and sets out a research agenda that could serve as the catalyst for this process.

*Research theme 1: Focus on AR adoption-based factors with technology acceptance models*

*Research theme 2: Focus on AR user experience design and AR features that influence consumer behaviour*

## **7.2 Towards a Conceptual Framework**

This section aims at conceptualising the field, a first step towards building a theory (Weick, 1995). Meredith (1993) describes this as a philosophical conceptualisation based on the review of research papers relating to AR. The volume of previous articles on AR research in retail (e.g. Dacko, 2017; Pantano et al., 2017; Hilken et al., 2018) shows that there is no new knowledge and that further research is still needed at the same time. Current research foci of AR research including how AR user experience design in HCI theory which based on AR features (Olsson et al., 2013; Scholz and Smith, 2016; Poushneh, 2018), AR consumer adoption based on Technology Acceptance Models (Kim and Forsythe, 2008; Spreer and Kallweit, 2014), AR shopping experience and its value (Parise et al., 2016; Dacko, 2017; Hilken et al., 2017). These three research foci were emerged from reviewed literature and provided a comprehensive view of current key debates of AR research in retail settings.

However, after reviewing the literature, the author noted that this field of research has ample room for theory building since there are not many applicable theories in AR research in retail context. Javornik (2016) states that more empirical and theoretical research needs to be done. As chapter 4 indicates, most AR studies have concentrated on applied research and model creation, with little regard to basic theories, principles or frameworks. Only 25 of the studies were quantitative with empirical evidences, with the remaining 74 percent without theories or empirical evidences in the study. In the 25 papers, 13 adopted the Technology Acceptance Model (TAM) (e.g., Huang and Liao, 2015; Kim and Hyun, 2016; Pantano et al., 2017), 3 adopted the theory of User Experience (Olsson et al., 2013; Poushneh and Vasquez-Parraga, 2017; Poushneh, 2018). Two more articles have been written on Situated Cognition Theory (Hilken et al., 2017; Hilken et al., 2018). Dacko (2017), Poncin and Mimoun (2014) and Watson et al., (2018), respectively, used experiential value theory, the Store atmospherics model and the Stimulus-Organism-Response System (S-O-R). The study by Scholz and Duffy (2018) supported the concept of the relationship between consumer and brand. The current scarcity of rigorous and theory-based work in AR retail studies can be explained by the existence in

the exploratory process still very much missing established theories (Javornik, 2016). In the reviewed literature, the author has found that AR studies are primarily aimed at understanding consumer behaviour and adapting and modifying technology to the various applications.

### **7.2.1 The Technology Acceptance Model (TAM)**

In order to test electronic and online shopping commitments (Kim, 2012), modern virtual technical shops (Pantana and Servidio, 2012) and interactive applications for physically dispersed products, technological acceptance model (TAM) was used. Moreover, the TAM relationships were widely established in digital trials (Lee et al., 2006; Kim and Forsythe, 2008) and AR (Rese et al., 2016). The TAM claims that the purpose to use is defined by perceived usefulness and ease of use (PEOU), which then contributes to useful behaviour (Davis, 1989). One of the key factors is the perceived usefulness of software in enhancing the activity of the user and its perceived ease of use (PEOU). PU and PEOU try to capture AR's more utilitarian functions. The perceived enjoyment, on the other hand, is used to capture hedonic values. Huang and Liu (2014), for instance, found out that satisfaction and experience affect consumers' actions in virtual environments. In AR study, both utilitarian and hedonistic aspects were therefore discussed in conjunction with TAM (Huang and Liao, 2015; Rese et al., 2017; Javornik, 2016). It also seems fair, in line with Rauschnabel and Ro (2016), to use a "pretty clear and organised" basic TAM template and to extend it with PE. Thus, Huang and Liao (2015) indicated that the incorporation of experiential value (Dacko, 2017), such as perceived enjoyment (PE) buildings, would seem to improve TAM's explanatory power, while PU and PEOU were considered the most crucial features to encourage consumer adoption of AR technologies.

### **7.2.2 Augmented Reality Technology Characteristics**

Due to the nature of the enriched retail environment, in addition to those already defined by TAM, other variables may affect consumers' conduct intent or decision-making. Wixom and Todd (2005) denote the value of process reliability for shaping customer acceptance, including the ability for the programme to respond to product requests, usability and response time. It could involve virtual interaction with products by animating 3D, which offers augmented experience in order to compensate for a lack of

real touch on the product (Papagiannidis et al., 2017). As regards graphics, digital imagery vividness and realism promote sensory perceptions and the development of the mental imaging system by positively influencing the trust of the consumers resulting from the experience of the AR system (Cheng et al., 2014; Choi and Taylor, 2014). TAM was further expanded with more constructs to suggest a more detailed framework in order to better understand AR's market acceptance potential. Nevertheless, the emphasis was less on the technical characteristics but on functional and hedonic interest, risk or physical esteem (Merle et al., 2012). The variables have emerged from the existing literature consistent with previous studies on TAM in retail setting research (e.g. Pantano, 2014; Rese et al., 2014). A few more constructs were added to TAM model with AR systems including AR features such as interactivity, personalisation. Furthermore, from reviewed literature with AR research, studies have proved that other AR features would impact consumers' experience and behaviours within AR systems, for instance, vividness (Yim et al., 2017), personalisation (Parise et al., 2016), simulated physical control (Hilken et al., 2017), content co-creation (Scholz and Smith, 2016). It highlights the importance of beginning to examine AR characteristics and their role in the creation of consumer experience and their role in the generation of values, and how these impact buying intentions to better understand the effects of AR technology on consumer behaviour in retail environments. In fact, the geolocation and personalisation capabilities of AR in retail and consumer services allow the delivery of more accurate the tailor-made marketing messages to consumers, leading to more positive attitudes, increased confidence and consequently greater purchase intention (Javornik, 2016).

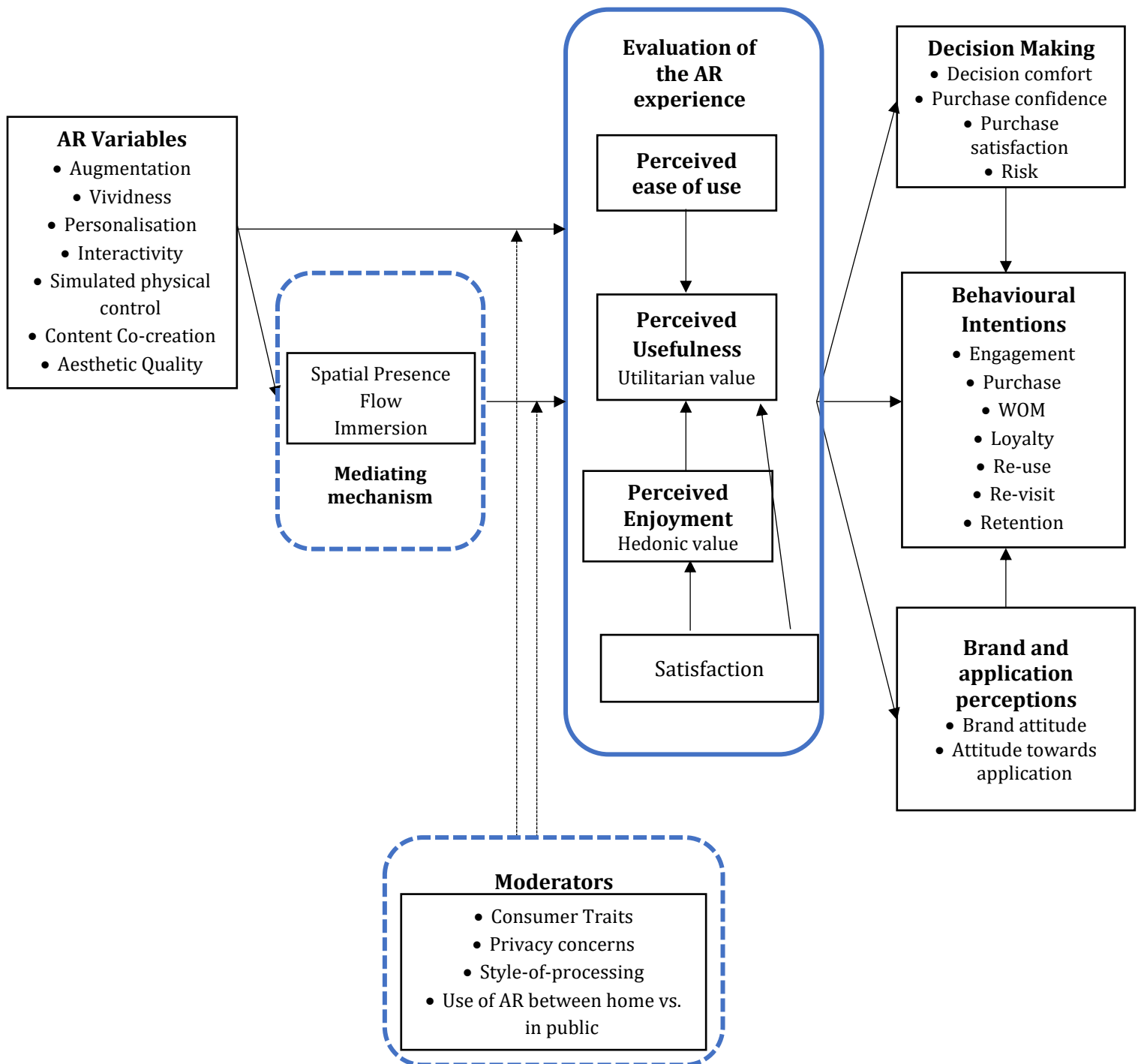
### **7.2.3 Contingency Factors**

Consumer concerns regarding the collection and use of personal information by marketers remain relevant (Martin et al., 2017), especially regarding AR technology (Dacko, 2017). Google Glass's failure may have been due to questions about its consequences for confidentiality (Downes, 2013). Due to the use of facial recognition or spatial tracking, risk and vulnerability expectations are significant because of AR technology and can adversely affect the implementation of AR in consumer experience. Nonetheless, the results from the AR literature suggest that privacy issues could impact the consumers' attitude toward AR applications and could affect consumer adoption

(Hilken et al., 2017). Furthermore, Hilken et al., (2017)'s study showed that the consumer's processing style may be different and different consumer experiences may be affected. From Poushneh and Vasquez-Parraga (2017)'s study, it can also be found that trade-off between value and price within AR system can also impact consumers' AR experience. In addition, using AR in different environment may occur different results. Raushnabel and Krey (2017) compared the use of AR at home to the use of AR in public.

#### **7.2.4 Towards a Conceptual Framework**

Usability was a common barrier to the use of from the review. In marketing and retail settings, Davis (1989)'s TAM model, where ease-of-use (PEOU), perceived utility (PU), are the major factors in determining usage behaviour. Implementing AR features as vividness and personalisation could extend the TAM model and give key insights into AR's role and characteristics in creating compelling customer experience and value explain what qualities AR needs to offer to enhance the customer experience (Poushneh and Vasquez-Parraga, 2017). The research gaps identified in this thesis have therefore led to a conceptual framework for future research within TAM model (Figure 7.1).



**Figure 7. 1 A conceptual framework to summarise AR's consumer behaviour, adoption and values in retail settings within TAM framework**

As shown in Figure 7.1, there are five aspects of the Framework: AR feature, mediating mechanisms, moderators, assessment of AR experience and experience outcomes. The concept of AR features to begin the system is not new and was introduced by Pantano et al., (2017) in the proposed system as a research model. Indeed, several researchers have examined how the interactive trait generates experiential value by, for example, immersing consumers with interactive features in a highly absorbing state through their ability to create flux (Javornik, 2016; van Noort et al., 2012). These virtual elements were deemed important as the findings above have shown that AR characteristics are quite essential for AR user experience design as well as improving the customer experience (Dacko, 2017; Yim et al., 2017; Hilken et al., 2018). However, one significant deficiency in the AR literature is the lack of AR design based on AR traits. Many studies above calling for research AR shop design based on these key virtual elements, while user experience design aspect has been the focus a lot of papers for both retailing and technology nature. It shows that AR as an emerging technology, even though it has been introduced since the 60s, it has not been paid much attention until the late 90s. AR design in retail settings is also an emerging research topic from 2014, thus it highlights the importance of future studies and more academic attentions in order to better improve consumers' experience by AR and making AR viable rather than just a gimmick (Javornik, 2016a). AR developers need to consider various AR characteristics that might impact consumers' perception or evaluation of shopping experience when developing AR platforms for retailing. These virtual elements are not unique, but joins the growing body of research calling for extending TAM model for more constructs with AR applications and for better theory building regarding AR in retailing in order to develop more socially acceptable AR platforms (Javornik, 2016a; Pantano et al., 2017; Rese et al., 2017). Thus, this framework have highlighted the importance of AR traits and the lack of theory-based research in AR in retail settings.

Furthermore, Javornik (2016a) also claimed that AR's ability to offer immersive experience is attributable to its augmentation. The increase is unique because it enhances the physical reality with virtual elements. Indeed, the importance of the increase in promoting immersion, playfulness and excitement that results in improved experience value creation can be found from the study by Javornik (2016), Poushneh and Vasquez-Parraga, (2017) and Watson et al., (2018). In addition, Yim et al., (2017) argue that AR

has the mechanical attribute of vividness that can contribute to diverse positive consumer reviews by that immersion. This emphasises the importance of vividness as one of the features of AR, as if the essence of media newness would be diminished without vividness, the total effectiveness of AR. In terms of personalisation, Olsson et al., (2013) have found that the personalisation of the AR interface is significant because of the highly immersive and personal aspects that AR can change how users perceive the world and determine what information the user can about the environment or experience and its meaning. This stresses that users expect the AR experience to be customised from AR technology. The versatility of AR applications can offer customers a digital check of goods that give them more data and a visually attractive experience (Poushneh and Vasquez-Parraga, 2017); for instance, this relieves the consumer's mental strain to visualise how a couple of shoes look then they are worn. The associated physical regulation of AR varies from conventional internet-based user control (Javornik, 2016b) and allows consumers to physically and playfully test digital products even if the bid is not present physically (Rosa and Malter, 2003). Therefore, AR can facilitate an effective and pleasant experience because virtual physical controls correspond with consumer behaviours that are naturally incorporated and embodied with AR. In short, the literature review shows that a high-quality and interactive AR interface, personalised experience and user-friendly applications are important for impacting the experiences of consumers. This has shown that interactivity and a vivid, rich or high-person style of presentation are the key features of AR technology (Javornik, 2016b; Hilken et al., 2017). This core AR feature is therefore to be applied or considered when AR application is implied. A distinct psychological disorder is defined in spatial presence in which an individual neglects the part played in the interaction by technology (Lombard and Snyder-Duch, 2001), and the researchers interpret the spacious presence as a shift in AR in his study Hilken et al. (2017). Spatial presence is a cognitive sensation, consciously experiencing different frequency and possessing insightful meaning and positive valence; on the contrary (not present feeling) it expresses itself as a negative condition of dissociation (Schubert, 2009). Spatial presents thus strengthen the media effect (Wirth et al., 2007) and can clarify the effect of AR-based application on consumer interest perceptions. For example, as flow mediates the effects of perceived changes in consumer affective reactions or behavioural intentions, and AR may boost customer contact flow (Javornik, 2016b). What's more, Parise et al., (2016) and Yim et al., (2017) argued that AR characteristics will produce a



range of positive customer reviews by raising immersion and that AR also could lead to a whole new conversion level by the rich immersion it provides to users. This highlighted the significance of immersion as a mediating mechanism.

The AR experience is evaluated in a TAM model focused on ease of use (PEOU), usefulness (PU), enjoyment (PE) (Davis, 1989) and satisfactions to integrate specific aspects of AR core features, such as interactivity, personalisation, vividness, virtual physical control, based on the concept of user experience (Olsson et al., 2013; Javornik, 2016). The perceived usefulness and perceived ease of use aim at capturing the more functional characteristics of AR and to capture perceived enjoyment in hedonic interest. Huang and Liao (2015) argued, in reality, that while the most important factors for consumer adoption of AR technologies have been regarded by PU and PEOU, the addition of experience-based quality constructions such as PE would seem to improve TAM's explanatory power. Various articles argued that the impact of PE and experience quality on customer behaviours in virtual settings (Kim and Forsythe, 2008; Huang and Liu, 2014). Summing up, it is important to explore the role of AR technology in generating utilitarian and hedonic value and how that impacts the intentions of the consumer to better understand the effects of AR technology on consumer behaviour. Several articles have also shown that AR features can lead to users' satisfaction and increase their feeling for satisfaction (Parise et al., 2016; Dacko, 2017; Poushneh and Vasquez-Parraga, 2017).

AR experiences can be seen from the reviewed literature, with varying effects, among which increased decision-making and different behavioural intentions such as buying and word of mouth intentions and positive perceptions of brand application (e.g. Hilken et al., 2017; Javornik, 2016a; Yim et al., 2017). It has also been found that AR has the potential to affect the consumer's behavioural intentions after enhancing customer decision-making, such as through decision comfort.

There are nevertheless always some emergency factors, including consumer trait, privacy concerns, style-of-processing and use of AR in a different environment, which could affect AR's effects on consumer behaviour. Recent AR developments, such as Google Glass, have contributed to overwhelming privacy concerns (Hilken et al., 2017). Consumers are confidential and expected to have access to AR applications which do not

require their information to be shared (Olsson et al., 2013; Poushneh and Vasquez-Parraga, 2017). Therefore, the privacy concerns of consumers are important border conditions for evaluating the AR experience. Moreover, several studies on traditional and online formats found that the relationship between retail environments and consumer response has been moderated by characteristics like the shopping style (Chang et al., 2011; Lee et al., 2006; Morrin and Chebat, 2005). In addition, the intensity and direction of relations between and consequences of the AR environment may be influenced by customer characteristics (Fiore and Kim, 2007). Nonetheless, very few studies have considered consumer characteristics within the scope of AR.

Third, from Rauschnabel and Krey (2017) and Scholz and Duffy (2018)'s studies the author found that the use of AR application in different environments can generate different consumer experience; which may occur different outcomes. Last but not the least, customers' difference on style-of-processing are also relevant conditions in terms of the evaluation of AR consumer experience (Hilken et al., 2017). The success of brand visualisation depends on the dispositional style of the consumer (Wyer et al., 2018). Different styles of processing different product data can therefore take place in AR experience. For example, in some studies (e.g. Pantano et al., 2015; Rese et al., 2014), the usability or PEOU seemed to be the greatest challenge and the greatest gain in others. Nonetheless, the overall conclusion from the studies showed that AR improved user satisfaction, motivation and communication.

Three research subjects within AR research are synthesised, which have been successfully updated in the marketing and retail contexts. Applying the TAM model to contexts such as AR in retailing could offer a fundamental insight into the ideal factors and effects of AR interactions for the highest performance. Similarly, research into the AR area is interdisciplinary in nature, from the fields of technology to the field of marketing and management. The theoretical limitations found in this analysis contributed a conceptual framework for future research within TAM (Figure 7.1). A future research agenda can be drawn up. Through the systematic review of literature, it has been possible to recommend a number of options for further study such as calling for more studies explicitly to address usability issues not only for customers but also for retailers. This part will be explored in further detail in the following sections.

### 7.3 Addressing Research Theme 1

From research theme 1 it can be seen that it is critical for researchers to extend TAM model with more constructs that related to the augmented reality technology itself in order to better understand AR features and their role in creating compelling customer experience so be able to explain which optimal factors or attributes AR needs to provide when adopting or provide to enhance AR experience. However, technological characteristics were less in the focus and businesses are still failing (e.g. Google Glass) adopting effective AR application for consumers. Therefore, additional research that studies the provider of AR shopping applications, including retailer and developer perspectives, to enable consumers' comparisons to AR is also beneficial. For example, Dacko (2017) found that a small survey carried out by the developers of the mobile AR-shopping app providers with similar questions to users of mobile AR-shopping apps reveals that app providers agree far less than users that users have to provide too many personally identifiable information. Meanwhile, mobile developers accept far more encouragingly that such devices are difficult to use and often insufficiently incorporated into a user's shopping. In addition, future research should investigate the reactions and expectations of the consumer improved by AR technology from a managerial perspective. In reality, combining forces and expertise in designing marketing and retail strategies that effectively improve and enhance customer buying experience by integrating viewpoints, exchanging perspectives and awareness of the consumer's features on adoption of AR would provide a great way to tackle technical barriers and implementation criteria, required developments and market trends. Thus, extending TAM model by adding more constructs including AR core technological characteristics and more views from AR developer and retailer would be important for future research towards consumers' adoption of technologies like AR. However, although wearable AR applications increase and help improve the shopping experience, there is a possibility that AR will become more a novelty that is only for customer interest and not a viable solution. Therefore, AR applications are taken by only a limited amount of retailers (Javornik, 2016) and are costly and time-consuming only for special marketing campaigns because of technology while their return on investment is perhaps minima. Consumers also found it quite overwhelmed and they do not seem likely to share AR application to their friends (Heller et al., 2019) due to the cost and the imperfection of the technology as its still on its infancy stage for the adoption in retail. Thus for further

research, researchers should try to explore the key factors of these phenomena from AR features including different disciplines. Furthermore, as more and more AR technologies are being introduced to mobile devices, this could lead to increased consumer support by making AR more socially acceptable, comfortable, easy to communicate and natural (Carmigniani et al., 2011; Poushneh and Vasquez-Parraga, 2017).

#### **7.4 Addressing Research Theme 2**

Based on the critical systematic literature review about research them 2, it reveals that there are still a lot questions concerning AR user experience design and AR features that are yet answered. It is crucial though that the majority of articles within reviewed literature centre on user experience design or factors that influence purchasing behaviour.

Research emphasises the significance of designing more effective and improved customer friendly shopping platforms to ensure successful retail acceptance and deployment of AR. As discussed above, a common understanding and co-operation are therefore necessary to develop a more effective AR interface (Javornij, 2016; Dacko, 2017). AR work relies on various disciplines, for example marketing, retail and Human Computer Interaction (HCI). Research topic 1 reveals that many of the studies that call for the experience of research designers AR, while the aspect of AR design focuses on many items for retail and technology. It highlights that although AR is the emerging new technology, researchers have only been looking at it since 2014, though it has been used for a long time. AR UX design is an ongoing research topic from 2016, which needs further continued focus and a well-developed framework. AR developers need to consider various influence factors that might impact consumer's user experience when developing AR interface for retailers specifically in AR features. Understanding how these features could actually affect user's perceptions (i.e. emotional and cognitive) towards AR interfaces joins the growing body of research calling for developing a better, more effective, and more efficiency AR platforms (e.g. Scholz and Smith, 2016; Javornik, 2016). In addition, a calling for a better understanding of AR technology in retail as its still in its infancy.

### 7.5 Addressing Research Theme 3

Research theme 3 reveals that the literature shares a common view that AR has the potential to provide a compelling customer experience which lead to positively impact on consumers' decision making, their behavioural intentions and brand perceptions. However, as AR research is still at its infancy, there are still a lot uncovered topics need to be explored more. The necessity to develop Omni-channel strategies is advanced as digital and mobile channels as various customer contact points are interchangeable. In this respect, AR systems are committed to playing an important role to influencing the experience of the customer throughout the customer journey. Nevertheless, AR's research still has to be examined on offline channel experience, as prevailing AR literature is based on technology adoption, user evaluation and consumer affective reactions in offline environments (Dieck et al., 2014; Olsson et al., 2013; Rese et al., 2014). In order to maintain the promising position of AR, research is required that expands our understanding of AR in the context of the omni-channel. In current research, for example, the impact of AR was largely assessed in terms of perceived value, satisfaction and purchasing and recommendations. A broader range of variables should be included beyond these widely use evaluation criteria for future research. Since customers use a mix of channels for purchasing decisions, it appears appropriate to assess how AR has an impact on both elements and the actual behaviour of the customer's decision making process. Furthermore, there is a need to know more about the best ways of knowledge and its combinations to enhance the AR experience through various channels. In addition, the effects on WOM are also conflicting as Rese et al., (2017) and Heller et al., (2019) argue that customers still have reservations regarding recommending AR to their friends. It means more work into AR-supported procurement decisions facilitate interaction between retail clients who share their experiences with other companies in order to improve AR technology's positive reputation impact. In addition, as mentioned earlier in Research Theme 3, a number of studies have explored how hedonic and utilitarian motivations influence the actions of consumers, studies that investigate the moderating effects are still minimal. From the results, it is useful to research how motivations or experiential interest vary in different contexts between different product characteristics with different shopping motivations. Furthermore, minimal work can be done to show what attributed AR needs to offer for better shopping experience (Poushneh and Vasquez-Parraga, 2017) and how AR enhances customer satisfaction and value (Ross and

Labrecque, 2017). Thus it is critical to focus research on what are vital factors of AR that can actually enhance customer experience and create values for both consumers and retailers. Last but not the least, as mentioned before there are some contingency factors that might affect AR experience and consumer's behavioural intentions, for example, privacy concerns (Hilken et al., 2017; Poushneh and Vasquez-Parraga, 2017). More work will therefore be required to examine the emerging adoption and use of AR technology by customers and to explore the possibility of addressing perceived obstacles such as privacy concerns to draw important management implications from these insights.

## **7.6 Chapter Summary**

This chapter introduced a conceptual framework within AR research and generated some future research directions from three different research themes. The broad research focus shows the increasing importance of understanding the advantages of AR over conventional forms of media interaction such as videos and images. This chapter thus sets out a clearer conceptual framework for the location of future research and highlights a research agenda that could serve as a catalyst for this process. Indeed, since AR technology is still in its infancy, exploration of AR technology and its value in the retail sector should be useful in these future research directions. The author hopes that the conceptual framework will direct the theory to better understand AR, as well as potential retailers to create effective AR applications. There are also some limitations within this thesis, thus the next chapter will introduce the conclusions of this systematic literature.

## Chapter 8 Conclusions

This study aims to critically review the previous literature systematically on the augmented reality in retail settings and suggest future research directions in a conceptual framework which generated from the literature review. As the research concerning AR in retail settings remains in the early stage, current literature has not addressed this subject, and AR in retail, therefore, can be seen as an under researched field in the areas of HCI and Marketing. The broad yet disintegrated academic literature on AR within the retail context yields significant fragmentation. This thesis, therefore, has the potential to make original contributions to literature by synthesising fragmented literature, observing current research themes, identifying research gaps and proposing future research directions within a conceptual framework. To achieve the research objectives, keywords were searched, reviewed manually and analysed to identify literature for systematic literature review. In doing so, this study presents current research trends and three main avenues of AR research as directions for future research.

The first research theme is still an ongoing debate on substantially on consumer adoption-based factors of AR, using technology acceptance models (TAM). TAM was expanded to include more constructs to suggest a more comprehensive framework to gain a better understanding of consumer's adoption of AR. However, there is still space for future studies adding more constructs that related to AR such as AR features and their role in creating compelling customer experience or value and be able to explain which attributes AR needs to provide to enhance AR experience. What's more, it is critical to have more substantive and theory-based research as there are limited AR research within retail context had theories present. Thus future studies need to explore AR applying more theory-based and could also use the conceptual framework that generated from this systematic literature review within TAM for future research directions. Applying more theory-based research to a context like retailing could provide critical insights into the optimal valuable attributes that AR experience should be for the highest efficiency. Similarly, it could also be beneficial for research in retail or any other sectors where business is still resisting AR platforms to adapt TAM, breaking down facets of ease-of-use and usability to examine the reasons that could potentially drive the adaption. The second research theme has been observed in the study of AR user experience design and AR features that influence consumer behaviour. The debate on the origin of augmented



reality emerged among Human-Computer Interaction (HCI) perspective, and researchers were the pioneers in opening up the debate of augmented reality on user experience design and features that impact consumers, but after the 2010s, marketing and consumer literature have started showing interest in taking the discourse forward. Although previous research has discussed AR user experience design and AR features to influence consumer behaviours, there is still lack of insights of AR's core characteristics towards AR UX design to affect consumers' shopping experience. Or which attributes of AR could actually effectively develop an efficient AR platform as this is one of the issues that have been identified from this review. Thus, it has resulted in a conceptual framework for future research that is set within TAM (Figure 7.1). In addition, this review also suggested that researchers should combine both marketing and technology perspectives while looking into this research theme. Indeed, AR traits are crucial for AR UX design and AR developers would also need to consider consumers' perceptions in order to create an AR interface with better efficiency and effectiveness. It would not only be beneficial to the development of AR research, including different fields as its nature of interdisciplinary but also crucial to technological breakthroughs. The third research theme is a discussion on the study of the AR shopping experience and value theory. The debate on AR's shopping experience is full of controversy, including positive and negative views with various important implications for AR's customer experience. All things considered, as a result of the interdisciplinary nature of the subject and the various academic fields of research, the fragmented nature of AR academic and application research arose, ranging from Human-Computer Interactions (HCI) to marketing and management contexts. International scholars are focusing on exploring its application and consumer adoption in retail (research trend 1), AR UX design and AR features (research trend 2) and on understanding how AR impact consumer experience and its value (research trend 3).

Based on these three current research subjects, the following theoretical structure and primary research directions have been discussed in the literature. First, a conceptual research framework was generated within the TAM model composed of five aspects: AR features, mediating mechanism, moderators, evaluation of AR experience and experience outcomes. Thus from the review and the conceptual framework, they were able to suggest several avenues for further research agenda. To examine AR features with AR UX design joins the growing body of research calling for developing a better and more effective, and



more efficiency AR platforms. Second, to extend TAM model with more constructs such as AR features and gather views from both AR developer and retailer perspectives to enable comparisons with AR adoption from consumer perspectives. This will, therefore, allow marketing and retail strategies and enhance the shopping experience of customers by exchanging views, sharing experiences and awareness of the traits consumers towards the adoption of AR, with the goal of better tackling technical barriers and implementation requirements and the necessary innovations. Third, it would be useful to explore AR shopping experience and its value in retail between different consumer traits or different contexts. Besides, the value of AR on retail consumer experience needs to be explored, and it needs long-awaited research. Still, it remains ambiguous and illuminates the need to investigate the field of study, for instance, which attributes AR has to offer to enhance the shopping experience.

Last but not least, this work is expected to contribute to AR literature in retail settings. It considers AR research from a technology perspective as well as consumer behaviour in marketing perspective for the first time by offering a conceptual framework and future research agenda. This study indicates that AR has the possibility to improve retail customer experience and provides a better context for the detection of future research inquiries and contribute to retail literature on augmented reality; however, the heterogeneity nature of AR is used as a marketing tool demonstrates the need to consider and adapt technology to the needs of each sector such as gaming, education, medicine etc. The scope of the search terms used for AR and the number of sources used in the search are also limited within this literature review. This systematic literature review of AR in retail settings summarised the current state of research and ongoing research foci concerning AR. This review's outcomes, contributions, and subsequent implications indicate that a systematic review of Augmented Reality Technology in retail settings is long overdue. Despite the limitations, this thesis showed a comprehensive view of benefits and challenges of this emerging technology in the retail industry and highlighted a better view of the state of research and provided complete justification for increasing more and more academic attention into AR research within retail settings.

## References

Accenture (2016), Expectations vs experience: the good, the bad, the opportunity. [online] Available at: [www.accenture.com/us-en/insight-expectations-vs-experience-good-bad-opportunity](http://www.accenture.com/us-en/insight-expectations-vs-experience-good-bad-opportunity) [Accessed on 15 Nov, 2018].

Alben, L., (1996). 'Defining the criteria for effective interaction design', *Interactions*, 3(3), pp.11–15.

Alimamy, S., Deans, K., Gnoth, J., (2018), 'An empirical investigation of augmented reality to reduce customer perceived risk", in Rossi, P., Krey, N., (Eds), *Proceedings of the Academy of Marketing Science and Marketing Transformation: Marketing Practice in an Ever Changing World AMSWMC 2017 Developments in Marketing Science*, Springer, Cham, pp. 127-135.

Archer, S., (2016). *Snapchat has taken a lead in one of the most disruptive areas of tech.* [online] Business Insider. Available at: <https://www.businessinsider.com/snapchat-takes-lead-in-disruptive-area-of-tech-2016-6?r=US&IR=T> [Accessed on 30 August, 2019].

Arnold, M.J., Reynolds, K.E., (2012). 'Approach and avoidance motivation: investigating hedonic consumption in a retail setting', *Journal of Retailing*, 88(3), pp. 399-411.

Azuma, R., Behringer, R., Julier, S., Macintyre, B., (2001). 'Recent Advances in Augmented Reality', *IEEE Computer Graphic Applications*, 21(6), pp. 34-47.

Azuma, R.T., (1997). 'A Survey of Augmented Reality', *Presence: Teleoperators and Virtual Environments*, 6(4), pp. 355–85.

Babin, B.J., Darden, W.R., Griffen, M., (1994). 'Work and/or fun: measuring hedonic and utilitarian shopping value', *Journal of Consumer Research*, 20(4), pp. 644-656.

Baier, D., Rese, A., Schreiber, S., (2015). 'Analysing online reviews to measure technology acceptance at the point of sale — the case of IKEA. In: Pantano, E. (Ed.), *Successful Technological Integration for Competitive Advantage in Retail Settings*. Hershey PA, IGI Global, pp. 168–189.

Bailey, A.A., Pentina, I., Mishra, A.S., Ben Mimoun, M.S., (2017). 'Mobile payments adoption by US consumers: an extended TAM', *International Journal of Retail & Distribution Management*, 45(6), pp. 626–640.

Bauer, M., Gaskell, G., (2002). *Qualitative Researching: With Text, Image, and Sound*. Sage Publications

Baum, D., Spann, M., (2014). 'The interplay between online consumer reviews and recommender systems: an experimental analysis', *International Journal of Electronic Commerce*, 19(1), pp. 129–162.

Beck, M., Crie, D., (2018). 'I virtually try it... I want it! Virtual Fitting Room: A tool to increase on-line and off-line exploratory behaviour, patronage and purchase intentions', *Journal of Retailing and Consumer Services*, 40, pp.279-286.

Berrang-Ford, L., Pearce, T., Ford, J.D., (2015). 'Systematic review approaches for climate change adaptation research', *Regional Environmental Change*, 15, pp. 755-769.

Blazquez, M., (2014). 'Fashion shopping in multichannel retail: the role of technology in enhancing customer experience', *International Journal of Electronic Commerce*, 18(4), pp. 97–116.

Boddy, C. (2005a), "Projective techniques in market research: valueless subjectivity or insightful reality? A look at the evidence for the usefulness, reliability and validity of projective techniques in market research", *International Journal of Market Research*, 47(3), pp. 239-254.

Boell, S.K., Cecez-Kecmanovic, D., (2015). 'Systematic in Literature Reviews in IS', *Journal of Information Technology*, 30(2), pp. 161-173.

Bonetti, F., Warnaby G., Quinn, L., (2018). 'Augmented Reality and Virtual Reality in Physical and Online Retailing: A Review, Synthesis and Research Agenda', *Augmented Reality and Virtual Reality*, pp. 119-132, Springer International Publishing: Switzerland.

Breidbach, C.F., Brodie, R., and Hollebeek, L., (2014). 'Beyond virtuality: From engagement platforms to engagement ecosystems', *Managing Service Quality*, 24(6), pp.592–611.

Briner, R.B., Denyer, D., Rousseau, D.M., (2009). 'Evidence-based management: concept cleanup?', *The Academy of Management Perspectives*, 23, pp. 19-32.

Brody, A.B., Gottsman, E.J., (1999). 'Pocket bargainfinder: A handheld device for augmented commerce', *Paper presented at the International Symposium on Handheld and Ubiquitous Computing*.

Bryman, A. and Bell, E. (2015) *Business Research Methods*. 4th edn. Oxford: Oxford University Press.

Brynjolfsson, E., Hu, Y.J. and Rahman, M.S. (2013), "Competing in the age of omnichannel retailing", *MIT Sloan Management Review*, 54(4), pp. 23-29.

Bulearca, M., Tamarjan, D., (2010). 'Augmented Reality: A sustainable Marketing Tool', *Global Business and Management Research: An International Journal*, 2 (2-3), pp. 237-252.

CABS, (2018). The purpose of the Academic Journal Guide. [Online] Available at: <https://charteredabs.org/academic-journal-guide-2018/> [Accessed on 27 Feb, 2020].

Carins, J., Rundle-Thiele, S.R., (2014). 'Eating for the better: A social marketing review (2000–2012)', *Public Health Nutrition*, 17(7), pp. 1628-1639.

Carmigniani, J., Furht, B., Anisetti, M., Ceravolo, P., Damiani, E., Ivkovic, M., (2011). 'Augmented Reality Technologies, Systems and Applications', *Multimedia Tools and Applications*, 51, pp.341-377.

Centric Digital, (2016). How Sephora is Revealing the Future of Augmented Reality in Fashion. [Online] Available at: <https://centricdigital.com/blog/augmented-reality/how-sephora-is-revealing-the-future-of-augmented-reality-in-fashion/> [Accessed on 29 April, 2019].

Centric Digital, (2017). How Augmented Reality Could Help Retailers Increase Revenue. March 20th, 2017 [Online] Available at: <https://centricdigital.com/blog/augmented-reality/how-augmented-reality-could-help-retailers-increase-revenue/> [Accessed on 29 April, 2019].

Chang, H.J., Eckman, M., Yan, R.N., (2011). 'Application of the Stimulus-Organism-Response model to the retail environment: the role of hedonic motivation in impulse buying behavior', *The International Review of Retail, Distribution and Consumer Research*, 21(3), pp. 233-249.

Chen David, C.-W., Cheng John, C.-Y., (2009). 'Understanding consumer intention in online shopping: a respecification and validation of the DeLone and McLean model', *Behaviour & Information Technology*, 28 (4), pp. 335–345.

Cheng, L.K., Chieng, M.-H., Chieng, W.H., (2014). 'Measuring virtual experience in a three-dimensional virtual reality interactive simulator environment: a structural equation modelling approach', *Virtual Reality*, 18(3), pp. 173-188.

Childers, T.L., Carr, C.L., Peck, J., Carson, S., (2001). 'Hedonic and utilitarian motivations for online retail shopping behavior', *Journal of Retailing*, 77(4), pp. 511-535.

Chi, T., (2018). 'Understanding Chinese consumer adoption of apparel mobile commerce: an extended TAM approach', *Journal of Retailing and Consumer Service*, 44, pp. 274–284.

Choi, Y.K., Taylor, C.R., (2014). 'How do 3-dimensional images promote products on the internet?', *Journal of Business Research*, 67(10), pp. 2164-2170.

Chou, H.J., (2009). 'The effect of experiential and relationship marketing on customer value: A case study of international American casual dining chains in Taiwan', *Social Behaviour and Personality*, 37(7), pp. 993–1007.

Clarke, M., (2007). Overview of methods. In C. Webb & B. Roe (Eds.), *Reviewing research evidence for nursing practice: Systematic reviews* (pp. 3–8). Malden, MA: Blackwell.

Clarke, D.W., Perry, P. and Denson, H., (2012). 'The sensory retail environment of small fashion boutiques', *Journal of Fashion Marketing and Management*, 16(4), pp. 492–510.

Cooper, H.M., Hedges, L.V., Valentine, J.C., (2009). *The Handbook of Research Synthesis and Meta-analysis*. Second Edition. Russell Sage Foundation, New York.

Craig, A.B., (2013). *Understanding augmented reality: Concepts and applications*. Waltham: Morgan Kaufmann.

Crue, E., Orts-Escolano, S., Gomez-Donoso, F., Rizo, C., Rangel, J.C., Mora, H., Cazorla, M., (2018). 'An augmented reality application for improving shopping experience in large retail stores', *Virtual Reality*, 23(3), pp. 281-291.

Cuomo, M.T., Tortora, D., Metallo, G., (2014). 'In store augmented reality: retailing strategies for smart communities', *Mondo Digit*, 13, pp. 49.

Dacko, S.G., (2017). 'Enabling smart retail settings via mobile augmented reality shopping apps', *Technological Forecasting and Social Change*, 124, pp. 243-256.

Davis, F.D., (1989). 'Perceived usefulness, perceived ease of use, and user acceptance of information technology', *MIS Q.* 13 (3), pp. 319-340.

Davis, F.D., Bagozzi, R.P., Warshaw, P.R., (1989). 'User acceptance of computer technology: a comparison of two theoretical models', *Management Science*, 35(8), pp. 982-1003.

Dennis, C., Brakus, J., and Alamanos, E., (2014). 'The wallpaper matters: Digital signage as customer experience provider at the Harrods (London, UK) department store', *Journal of Marketing Management*, 29(3-4), pp. 338-355.

Dieck, T., Claudia, M., Jung, T., (2015), 'Atheoretical model of mobile augmented reality acceptance in urban heritage tourism', *Current Issues in Tourism*, 21(2), pp. 154-174.

Digital Bridge (2017), *Augmented reality – changing the face of retail*. [Online] Available at:<http://digitalbridge.eu/download-our-new-report-augmented-reality-changing-the-face-of-retail/> [Accessed on 11 Nov, 2018].

Dix, A., (2009). 'Human-computer interaction', In L. Liu & M. Tamer Ozsu (Eds.), *Encyclopedia of database systems* (pp. 1327-1331). US: Springer.

Domina, T., Lee, S.-E., MacGillivray, M., (2012). 'Understanding factors affecting consumer intention to shop in a virtual world', *Journal of Retailing and Consumer Services*, 19, pp. 613-620.

Downes, L., (2013). *What Google Glass Reveals About Privacy Fears*. [Online] Harvard Business Review. Available at: <https://hbr.org/2013/05/what-google-glass-reveals-abou> [Accessed 31 Oct. 2018].

Durlak, J.A., DuPre, E.P., (2008). 'Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation', *American Journal of Community Psychology*, 41, pp. 327-350.

Eroglu, S.A., Machleit, K.A., Davis, L.M., (2001). 'Atmospheric qualities of online retailing: a conceptual model and implications', *Journal of Business Research*, 54(2), pp. 177-184.

Eyuboglu, E., (2011). 'Augmented reality as an exciting online experience: is it really beneficial for brands?', *International Journal of Social Science and Humanity Study*, 3(1), pp. 113-123.

Fink, A., (1998). 'Conducting research literature reviews: from paper to the internet', Thousand Oaks: Sage.

Fink, C., (2017). *Why Consumer Adoption of VR And AR Will Be Slow*. [Online] Forbes.com. Available at: <https://www.forbes.com/sites/charliefink/2017/12/13/why-consumer-adoption-of-vr-ar-will-be-slow/#2aee43a359f9> [Accessed 31 Oct. 2019].

Fiore, A.M., Kim, J., Lee, H.H., (2005a). 'Effect of image interactivity technology on consumer responses toward the online retailer', *Journal of Interactive Marketing*, 19(3), pp. 38-53.

Fiore, A.M., Jin, H.J., Kim, J., (2005b). 'For fun and profit: Hedonic value from image interactivity and responses toward an online store', *Psychological Marketing*, 22(8), pp. 669-694.

Fiore, A.M., Kim, J., (2007). 'An integrative framework capturing experiential and utilitarian shopping experience', *International Journal of Retail & Distribution Management*, 35(6), pp. 421-442.

Flaviá, C., Ibáñez-Sánchez, S., Orús, C., (2019). 'The impact of virtual, augmented and mixed reality technologies on the customer experience', *Journal of Business Research*, 100(2), pp. 11-35.

Fogg, B.J., (2003). 'Persuasive Technology: Using Computers to Change What We Think and do', Kaufmann, San Francisco, CA.

Fortune. (2015). AR, VR will generate \$150 billion in the next five years. [Online] Available at: <https://fortune.com/2015/04/25/augmented-reality-virtual-reality/> [Accessed 30 July. 2019].

Glasziou, P., Irwig, L., Bain, C., Colditz, G., (2003). *Systematic reviews in healthcare: A practical guide*. Cambridge: Cambridge University Press.

Goldman Sachs (2017). Virtual & Augmented Reality. [Online] Available at: <https://www.goldmansachs.com/insights/pages/technology-driving-innovation-folder/virtual-and-augmented-reality/report.pdf> [Accessed 30 Oct, 2019].

Gough, D., Thomas, J., Oliver, S., (2012). 'Clarifying differences between review designs and methods', *Systematic Reviews*, 1, pp. 28.

Green, S., Higgins, J.P.T., Alderson, P., Clarke, M., Mulrow, C.D., Oxman, A.D., (2008). Introduction. In J. P. T. Higgins & S. Green (Eds.), *Cochrane handbook for systematic reviews of interventions* (pp. 3–10). Sussex: Wiley.

Grenon, P., Smith, B., (2011). 'Foundations of an ontology of philosophy', *Syntheses*, 182(2), pp.185-204.

Grewal, D., Roggeveen, A.L., Nordfält, J., (2017). 'The future of retailing', *Journal of Retailing*, 93 (1), pp. 1-6.



Hassenzahl, M., Tractinsky, N., (2006). 'User experience – a research agenda (Editorial)', *Behaviour Information Technology*, 25(2), pp. 91-97.

Heller, J., Chylinski, M., De Ruyter, K., Mahr, D., Keeling, D.I., (2019). 'Let Me Imagine That for You: Transforming the Retail Frontline Through Augmenting Customer Mental Imagery Ability', 95(2), pp. 94-114.

Hilken, T., Heller, J., Chylinski, M., Keeling, D.I., Mahr, D., de Ruyter, K., (2018). 'Making omnichannel an augmented reality: the current and future state of the art', *Journal of Research in Interactive Marketing*, 12(4), pp. 23-36.

Hilken, T., Ruyter, K., Chylinski, M., Mahr, D., Keeling, D., (2017). 'Augmenting the eye of the beholder: exploring the strategic potential of augmented reality to enhance service experiences', *Journal of the Academic Marketing Science*, 45, pp. 884-905.

Hopp, T., Gangadharbatla, H., (2016). 'Novelty effects in augmented reality advertising environments: The influence of exposure time and self-efficacy', *Journal of Current Issues & Research in Advertising*, 37(2), pp. 113–130.

Huang, T.-L., Feng, H.-L., (2014). 'Formation of augmented reality interactive technology's persuasive effects from the perspective of experiential value', *Internet Research*, 24 (1), pp. 82–109.

Huang, T.-L., Hsu-Liu, F., (2014). 'Formation of augmented reality interactive technology's persuasive effects from the perspective of experiential value', *Internet Research*, 24 (1), pp. 82–109.

Huang, T.-L., Liao, S., (2015). 'A Model of Acceptance of Augmented-Reality Interactive Technology: The Moderating Role of Cognitive Innovativeness', *Electronic Commerce Research*, 15(2), pp. 269-295.

Hunt, S.D., Hansen, J.M., (2009). 'The Philosophical foundations of Marketing Research: for Scientific Realism and truth', In Pauline Maclaran, Michael Saren, Barbara Stern, & Mark Tadajewski, eds. *The SAGE Handbook of Marketing Theory*. London: SAGE Publications, pp.112–126.

International Data Corporation. (2017). *Worldwide Spending on Augmented and Virtual Reality Expected to Surpass \$20 Billion in 2019, According to IDC*. [Online] Available at: <https://www.idc.com/getdoc.jsp?containerId=prUS44511118> [Accessed on 30 Oct, 2018].

Jaekel, B., (2016). 'Sephora's Virtual Artist Brings Augmented Reality to Large Beauty Audience', [Online] Available at: <https://www.luxurydaily.com/sephoras-virtual-artist-brings-augmented-reality-to-large-beauty-audience> (Accessed at: October 17 2018).

Jalali, S., Wohlin, C., (2012). 'Systematic literature studies', In proceeding of the ACM-IEEE International Symposium on Empirical software engineering and Measurement – ESEM '12 (p.29). New York, USA: ACM Press.

Javornik, A., (2016a). 'Augmented reality: Research Agenda for Studying the Impact of its Media Characteristics on Consumer Behaviour', *Journal of Retailing and Consumer Services*, 30, pp. 252-261.

Javornik, A., (2016b). 'It's an Illusion, but It looks Real! Consumer Affective, Cognitive and Behavioural Responses to Augmented Reality Applications', *Journal of Marketing Management*, 32(9), pp.987-1011.

Jin, S.-A.A., (2009). 'The roles of modality richness and involvement in shopping behavior in 3D virtual stores', *Journal of Interactive Marketing*, 23, pp. 234–246.

Johnsen, T.E.; Miemczyk, J.; Howard, M. A systematic literature review of sustainable purchasing and supply research: Theoretical perspectives and opportunities for IMP-based research. *Ind. Mark. Manag.* 2017, 61, 130–143.

Johnson, J., (2012). 'The Master Key: L. Frank Baum Envisions Augmented Reality Glasses in 1901', *Mote & Beam*.

Johnson, L., (2014). *Lowes Tests 3D Technology Booths—First Concept Out of Retailer's Innovation Lab*. [online] Available at: <http://www.adweek.com/news/technology/lowe-s-tests-3d-technology-booths-158263> [Accessed 24 Feb. 2019].

Kang, M. J.-Y., (2014). 'Augmented reality and motion capture apparel e-shopping values and usage intention', *International Journal of Clothing Science and Technology*, 26(6), pp. 486–499.

Karaosman, H., Morales-Alonso, G. and Brun, A. (2017). 'From a Systematic Literature Review to a Classification Framework: Sustainability Integration in Fashion Operations', *Sustainability*, 9(1), p. 30.

Kim, H.C., Hyun, M.Y., (2016). 'Predicting the use of smartphone-based augmented reality (AR): does telepresence really help?', *Computers in Human Behavior*. 59, pp. 28–38.

Kim, J., Forsythe, S., (2007). 'Hedonic usage of product virtualization technologies in online apparel shopping', *International Journal of Retail & Distribution Management*, 35(6), pp. 502–514.

Kim, J., Forsythe, S., (2008a). 'Sensory enabling technology acceptance model (SE - TAM): a multiple - group structural model comparison', *Psychological Marketing*, 25(9), pp. 901 - 922.

Kim, J., and Forsythe, S., (2008b). 'Adoption of virtual try-on technology for online apparel shopping', *Journal of Interactive Marketing*, 22(2), pp. 45–59.

Kim, K.K., Shin, H.K., Kim, B., (2011). 'The role of psychological traits and social factors in using new mobile communication services', *Electronic Commerce Research Applications*, 10 (4), pp. 408–417.

Kitcheham, B., Brereton, O.P., Budgen, D., Turner, M., Bailey, J., Linkman, S., (2009). 'Systematic literature reviews in software engineering – a systematic literature review', *Information and software technology*, 51, pp. 7-15.

Kothari, C.R., (2009). *Research Methodologies: Methods and Technique* 2nd ed., New Dehli: New Age Publications.

Kumar, N., Bakan, S., (2015). 'A real time virtual fitting room application', *International Engineering Research Journal (IERJ)*, 1(4), pp.122–125.

Lee, K.M., (2004). 'Presence, Explicated', *Communication Theory*, 14(1), pp. 27–50.

Lee, H.-H., Fiore, A. M., Kim, J., (2006). 'The role of the technology acceptance model in explaining effects of image interactivity technology on consumer responses', *International Journal of Retail & Distribution Management*, 34(8), pp. 621–644.

Lee, H., (2018). 'Consumer Experiences, the key to surviving in an Omni-channel environment use of virtual technology', *Journal of Textile and Apparel, Technology and Management*, 10(3), pp. 24-37.

Lee, K.C., Chung, N., (2008). 'Empirical analysis of consumer reaction to the virtual reality shopping mall', *Computers in Human Behavior*, 24, pp. 88–10.

Lee, L., Meyer, T., Smith, J.S., (2012). 'Reinventing the customer experience: Technology and the service marketing mix', *International Journal of Service management: The new paradigm in retailing* (pp. 143–160). New York: Springer.

Lemon, K.N., Verhoef, P.C., (2016), 'Understanding Customer Experience throughout the Customer Journey', *Journal of Marketing*, 80 (6), pp. 69-96.

Liao, T., (2015). 'Augmented or admented reality? The influence of marketing on augmented reality technologies', *Information, Communication & Society*, 18(3), pp. 310-326.

Li, H., Daugherty, T., Biocca, F., (2002). 'Impact of 3-D Advertising on Product Knowledge, Brand Attitude, and Purchase Intention: The Mediating Role of Presence', *Journal of Advertising*, 31(3), pp. 43–57.

Littell, J. H., Corcoran, J., Pillai, V., (2008). *Systematic reviews and meta-analysis*. Oxford: Oxford University Press.

Lombard, M., Snyder-Duch, J., (2001). 'Interactive advertising and presence: a framework', *Journal of Interactive Advertising*, 1(2), pp. 56–65.

Lu, Y., Shana, S., (2007). 'Augmented Reality E-commerce Assistant System: Trying while Shopping', *International Human-Computer Interaction. Interaction Platforms and Techniques*. Springer Berlin Heidelberg, pp. 643–652.

Luca, N. R., Suggs, L.S., (2010). 'Strategies for the social marketing mix: A systematic review', *Social Marketing Quarterly*, 16(4), pp. 122-149.

Luca, N. R., Suggs, L.S., (2013). 'Theory and model use in social marketing health interventions', *Journal of Health Communication*, 18(1), pp. 20–40.

Lu, Y., Smith, S., (2007). 'Augmented reality e-commerce assistant system: trying while shopping', *Lecture Notes of Computer Science*, 4551, pp. 643–652.

MacIntyre, B., Bolter, J.D., Moreno, E., and Hannigan, B., (2001). 'Augmented reality as a new media experience', In: *Augmented Reality, Proceedings: IEEE and ACM International Symposium on*, pp. 197–206.

Marinova, D., de Ruyter, K., Huang, M.H., Meuter, M.L., Challagalla, G., (2017), 'Getting smart: learning from technology-empowered frontline interactions', *Journal of Service Research*, 20(1), pp. 29-42.

Martin, K.D., Borah, A., Palmatier, R.W., (2017). 'Data privacy: effects on customer and firm performance', *Journal of Marketing*, 81(1), pp. 36-58.

McCarthy, J., Wright, P., (2004). 'Technology as Experience', The MIT Press, Cambridge, MA.

McCormick, H., Cartwright, J., Perry, P., Barnes, L., Lynch, S., Ball, G., (2014). 'Fashion retailing—past, present and future', *Textile Progress*, 46(3), 227–321.

Meredith, J., (1993). 'Theory building through conceptual methods', *International Journal of Operations & Production Management*, 13(5), pp. 3–11.

Merle, A., Senecal, S., St-Onge, A., (2012). 'Whether and how virtual try-on influences consumer responses to an apparel web site', *International Journal of Electronic Commerce*, 16, pp. 41–64.

Morgan, B., (2017). 3 Examples Of How Augmented Reality Improves The Customer Experience. [Online] Available at: <https://www.forbes.com/sites/blakemorgan/2017/08/14/3-examples-of-how-augmented-reality-improves-the-customer-experience/#7b4a9d4250da/> [Accessed on 25 Aug, 2019].

Morrin, M., Chebat, J., (2005). 'Person-place congruency: the interactive effects of shopper style and atmospherics on consumer expenditures', *Journal of Service Research*, 8(2), pp. 181-191.

O'Connor, A., Sargeant, J., (2015). 'Research synthesis in veterinary science: Narrative reviews, systematic reviews and meta-analysis', *The Veterinary Journal*, 206(3), pp. 261-267.

Oh, H., Yoon, S.-Y., Shyu, C.-R., (2008). 'How can virtual reality reshape furniture retailing?', *Clothing Textile Research Journal*, 26 (2), pp. 143–163.

Olsson, T., Salo, M., (2011), 'Online user survey on current mobile augmented reality applications', 10th IEEE International Symposium on Mixed and Augmented Reality (ISMAR) in Basel, Switzerland, *IEEE, New York, NY*, pp. 75-84.

Olsson, T., Lagerstam, E., Kärkkäinen, T. and Väänänen-Vainio-Mattila, K. (2013), "Expected user experience of mobile augmented reality services: a user study in the context of shopping centres", *Personal and Ubiquitous Computing*, 17(2), pp. 287-304.

Owyang, J., (2010). 'Disruptive technology—the new reality will be augmented', *Customer Relationship Management Magazine*, 32(2), pp. 32–33.

Pachoulakis, I., Kapetanakis, K., (2012). 'Augmented reality platforms for virtual fitting rooms', *The International Journal of Multimedia and Its Applications*, 4(4), pp. 35.

Pantano, E., (2014). 'Innovation drivers in retail industry', *Journal of Information Management*, 34, pp. 344–350.

Pantano, E., (2015). 'Successful Technological Integration for Competitive Advantage in Retail setting', *International Journal of Information Management*, 34(3), pp. 344-350.

Pantano, E., (2016). 'Benefits and risks associated with time choice of innovating in retail settings', *International Journal of Retail and Distribution Management*, 44(1), pp. 58-70.

Pantano E., Gandini, A., (2017). 'Exploring the forms of sociality mediated by innovative technologies in retail settings', *Computers in Human Behavior*, 77, pp. 367-373.

Pantano, E., Naccarato, G., (2010). 'Entertainment in retailing: the influences of advanced technologies', *Journal of Retailing and Consumer Services*, 17, pp. 200–204.

Pantano, E., Rese, A., Baier, D., (2017). 'Enhancing the online decision-making process by using augmented reality: A two country comparison of youth markets', *Journal of Retailing and Consumer Services*, 38, pp. 81-95.

Pantano, E., Servidio, R., (2012). 'Modeling innovative points of sales through virtual and immersive technologies', *Journal of Retailing and Consumer Services*, 19, pp. 279–286.

Papagiannidis, S., Pantano, E., See-To, E., and Bourlakis, M., (2013). 'Modelling the determinants of a simulated experience in a virtual retail store and users' product purchasing intentions', *Journal of Marketing Management*, 29(13–14), pp. 1462–1492.

Papagiannidis, S., Pantano, E., See-To, E., Dennis, C. and Bourlakis, M. (2017). To immerse or not? Experimenting with two virtual retail environments. *Information Technology & People*, 30(1), pp. 163–188.

Papagiannidis, S., See-to, E., Bourlakis, M., (2014). 'Virtual test-driving: the impact of simulated products on purchase intention', *Journal of Retail and Consumer Service*, 21 (5), pp. 877-887.

Parise, S., Guinan, P.J., Kafka, R., (2016), 'Solving the crisis of immediacy: how digital technology can transform the customer experience', *Business Horizons*, 59(4), pp. 411-420.

Pavlou, P.A., (2003). 'Consumer Acceptance of Electronic Commerce: Integrating Trust and Risk with the Technology Acceptance Model', *International Journal of Electronic Commerce*, 7, pp. 101-134.

Petticrew, M., (2001). 'Systematic reviews from astronomy to zoology: myths and misconceptions', *British Medical Journal*, 322, pp. 98.

Petticrew, M., & Roberts, H. (2006). *Systematic reviews in the social sciences: A practical guide*. Malden, MA: Blackwell.

Poncin, I., Mimoun, M.S.B., (2014). 'The Impact of 'E-atmospherics' on Physical Stores', *Journal of Retailing and Consumer Services*, 21(5), pp. 851-859.

Poushneh, A., Vasquez-Parraga, A.Z., (2017a). 'Customer dissatisfaction and satisfaction with augmented reality in shopping and entertainment', *Journal of Consumer Satisfaction, Dissatisfaction Complain Behavior*, 30, pp. 1-22.

Poushneh, A., Vasquez-Parraga, A.Z., (2017b). 'Discernible Impact of Augmented Reality on Retail Customer's Experience, Satisfaction and Willingness to Buy', *Journal of Retailing and Consumer Services*, 34, pp.229-234.

Poushneh, A., (2018). '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, pp. 169-176.

Preece, J., Sharp, H., Rogers, Y., (2015). Preece, Jenny, Helen Sharp, and Yvonne Rogers. *Interaction Design-beyond human-computer interaction*. John Wiley & Sons, UK.

Rafaeli, A., Altman, D., Gremler, D.D., Huang, M., Grewal, D., Iyer, B., Parasuraman, A., De Ruyter, K., (2017). 'The future of frontline research', *Journal of Service Research*, 20 (1), pp. 91-99.



Rashid, Z., Pous, R., Melia-Segui, J., Morenzi-Cinos, M., (2014). 'Mobile augmented reality for browsing physical spaces', *Ubicomp'14 Adjunct*, Seattle, Washington, ACM, pp. 155–158.

Rauschnabel, P.A., Brem, A., Ivens, B.S., (2015). 'Who will buy smart glasses? Empirical results of two pre-market-entry studies on the role of personality in individual awareness and intended adoption of Google Glass wearables', *Computers in Human Behavior*, 49, pp. 635–647.

Rauschnabel, P.A., Krey, N., (2017), 'Virtually enhancing the real world with augmented reality holograms: use and gratification perspective: an abstract', in Krey, N. and Rossi, P. (Eds) *Proceedings of the Academy of Marketing Science and Back to the Future: Using Marketing Basics to Provide Customer Value. AMSAC 2017, Developments in Marketing Science*, Springer, Cham, pp. 623-623.

Rauschnabel, P.A., Felix, R., Hinsch, C., (2019). 'Augmented reality marketing: How mobile AR-apps can improve brands through inspiration', *Journal of Retailing and Consumer Services*, 49, pp. 43-53.

Rauschnabel, P.A., Ro, Y.K., (2016). 'Augmented reality smart glasses: an investigation of technology acceptance drivers', *International Journal of Technology Marketing*, 11(2), pp. 123–148.

Rese, A., Baier, D., Geyer-Schulz, A., Schreiber, S., (2017). 'How augmented reality apps are accepted by consumers: a comparative analysis using scales and opinions', *Technological Forecasting & Social Change*, 124, pp. 306-319.

Rese, A., Schreiber, S., Baier, D., (2014), 'Technology acceptance modelling of augmented reality at the point of sale: can surveys be replaced by an analysis of online reviews?', *Journal of Retailing and Consumer Services*, 21(5), pp. 869-876.

Rosa, J.A., Malter, A.J., (2003). 'E-(embodied) knowledge and e-commerce: how psychological factors affect online sales of experiential products', *Journal of Consumer Psychology*, 13(1-2), pp. 63-73.

Ross, H.F., Harrison, T., (2016). 'Augmented Reality Apparel: An Appraisal of Consumer Knowledge, Attitude and Behavioural Intentions', In System Sciences (HICSS), *IEEE 2016 49th Hawaii international Conference*, pp. 3919-3927.

Ross, S.M., Labrecque, L.I., (2017), 'Does a Hologram give an Encore? Authenticity in mixed reality: an abstract', paper presented at the Academy of Marketing Science Annual Conference.

Rousseau, D.M., Manning, J., Denyer, D., (2008). 'Evidence in Management and Organizational Science: Assembling the Field's Full Weight of Scientific Knowledge through Syntheses', *The academy of management annals*, 2, pp. 475-515.

Sadowski, W., Kay, S., (2002). 'Presence in Virtual Environments', in *Handbook of Virtual Environments: Design, Implementation and Applications*. Kay M. Stanney, editor. Mahwah, NJ: Lawrence Erlbaum Associates, pp. 791-806.

Scholz, J., Duffy, K., (2018). 'We Are at home: How augmented reality reshapes mobile marketing and consumer-brand relationships', *Journal of Retailing and Consumer Services*, 44, pp. 11-23.

Scholz, J., Smith, A.N., (2016). 'Augmented Reality: Designing immersive experiences that maximize consumer engagement', *Business Horizons*, 59(2), pp. 149-161.

Schubert, T.W., (2009). 'A new conception of spatial presence: Once again, with feeling', *Communication Theory*, 19(2), pp. 161-187.

Sekaran, U., Bougie, R., (2016). *Research Methods for Business*. 7th ed. West Sussex: Wiley.

Sheehan, A. (2018). *How These Retailers Use Augmented Reality to Enhance the Customer Experience*. [Online] Shopify. Available at: <https://www.shopify.co.uk/retail/how-these->

[retailers-are-using-augmented-reality-to-enhance-the-customer-experience/](#) [Accessed on 30 Oct, 2018].

Spreer, P., Kallweit, K., (2014). 'Augmented reality in retail: assessing the acceptance and potential for multimedia product presentation at the PoS', *Transactions on Marketing Research*, 1(1), pp. 20–35.

Statista. (2018). *Global augmented/virtual reality market size 2016-2023* | Statista. [Online] Available at: <https://www.statista.com/statistics/591181/global-augmented-virtual-reality-market-size/> [Accessed 30 Oct. 2019].

Staples, M., Niazi, M., (2008). 'Systematic review of organizational motivations for adopting CMM-based SPI', *Information and Software Technology*, 50(7-8), pp. 605-620.

Steuer, J., (1992). 'Defining virtual reality: dimensions determining telepresence', *Journal of Communication*, 42, pp. 73-93.

Stoyanova, J., Brito, P.Q., Georgieva, P., Milanova, M., (2015). 'Comparison of Consumer Purchase Intention between Interactive and Augmented Reality Shopping Platforms through Statistical Analyses', *IEEE International Symposium on Innovations in Intelligent Systems and Applications (INISTA)*, pp. 1–8.

Sukaviriya, N., Podlaseck, M., Kjeldsen, R., Levas, A., Pingali, G., Pinhanez, C., (2003). 'Augmenting a retail environment using steerable interactive displays', *Extended Abstracts on Human Factors in Computing Systems*, pp. 978–979.

Tabusca, A., (2014). 'Augmented reality – need, opportunity or fashion', *Journal of Information System Operation Management*, 8(2), pp. 1–11.

Tang, A., Biocca, F., Lim, L., (2004). 'Comparing differences in presence during social interaction in augmented reality versus virtual reality environments: an exploratory study', *Proc. PRESENCE* 204–208.

To, P., Liao, C., Lin, T., (2007). 'Shopping motivations on internet: a study based on utilitarian and hedonic value', *Technovation*, 27(12), pp. 774-787.

Tranfield, D., Denyer, D., Smart, P., (2003). 'Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review', *British Journal of Management*, 14(3), pp. 207-222.

Truong, V. D., Garry, T., Hall, C.M., (2014). 'Social marketing as the subject of doctoral dissertations', *Social Marketing Quarterly*, 20(4), pp. 199–218.

Truong V.D., Dang N.V.H., (2017) Reviewing Research Evidence for Social Marketing: Systematic Literature Reviews. In: Kubacki K., Rundle-Thiele S. (eds) *Formative Research in Social Marketing*. Springer, Singapore.

van Esch, P., Arli, D., Gheshlaghi, M., Andonopoulos, V., von der Heide, T., Northey, G., (2019). 'Anthropomorphism and augmented reality in the retail environment', *Journal of Retailing and Consumer Services*, 49, pp.35-42.

Van Krevelen, D.W.F., Poelman, R., (2010). 'A Survey of Augmented Reality Technologies, Applications and Limitations', *International Journal of Virtual Reality*, 9, pp. 1-20.

van Noort, G., Voorveld, H.A.M., van Reijmersdal, E.A., (2012). 'Interactivity in brand web sites: cognitive, affective, and behavioral responses explained by consumers' online flow experience', *Journal of Interactive Marketing*, 26(4), pp. 223–234.

Waring, T., Wainwright, D., (2008), 'Issues and Challenges in the Use of Template Analysis: Two Comparative Case Studies from the Field', *The Electronic Journal of Business Research Methods*, Vol. 6 (1), pp. 85-94, available at [www.ejbrm.com](http://www.ejbrm.com).

Watson, A., Alexander, B., Salavati, L., (2018). 'The impact of experiential augmented reality applications on fashion purchase intention', *International Journal of Retail & Distribution Management*.

Watson, R., (2015). 'Beyond being Systematic in Literature Reviews in IS', *Journal of Information Technology*, 30(2), pp. 185-187.

Webb, C., & Roe, B. (Eds.). (2007). *Reviewing research evidence for nursing practice: Systematic reviews*. Malden, MA: Blackwell.

Weber, R.P., (1990), "Basic Content Analysis", Sage Publications, CA, USA.

Webster, J., Watson, R.T., (2002). 'Analysing the past to prepare for the future: Writing a literature review', JSTOR.

Weick, K.E., (1995). 'What Theory is Not, Theorizing Is', *Administrative Science Quarterly*, 40(3), pp. 385-390.

Wirth, W., Hartmann, T., Böcking, S., Vorderer, P., Klimmt, C., Schramm, H., et al., (2007). 'A process model of the formation of spatial presence experiences', *Media Psychology*, 9(3), pp. 493-525.

Witmer, B.G., Singer, M.J., (1998). 'Measuring Presence in Virtual Environments: A Presence Questionnaire', *Presence: Teleoperators and Virtual Environments*, 7(3), pp. 225-240.

Wixom, B.H., Todd, P.A., (2005). 'A theoretical integration of user satisfaction and technology acceptance', *Information System Research*, 16(1), pp. 85-102.

Wojciechowski, R., Cellary, W., (2013). 'Evaluation of learners' attitude toward learning in aries augmented reality environments', *Computing Education*, 68, pp. 570-585.

Wolny, J., Charoensuksai, N., (2014), 'Mapping customer journeys in multichannel decision- making', *Journal of Direct, Data and Digital Marketing Practice*, 15 (4), pp. 317-326.

Woods, A. (2009). Augmented reality: Reality check. *Revolution Magazine*, 1, pp. 36-39.

Wyer, R.S., Hung, I.W., Jiang, Y., (2008). 'Visual and verbal processing strategies in comprehension and judgment', *Journal of Consumer Psychology*, 4(18), pp. 244-257.

Xue, L.C., Parker, C.J., McCormick, H., (2019). 'A virtual reality and retailing literature review: Current focus, underlying themes and future directions', *Augmented Reality and Virtual Reality*, Springer Nature Switzerland.

Yang, H.E., Wu, C.C., (2009). 'Effects of image interactivity technology adoption on e-shoppers' behavioural intentions with risk as moderator', *Production Planning & Control*, 20(4), pp. 370-382.

Yaoyuneyong, G., Foster, J.K. and Flynn, L.R., (2014). 'Factors impacting the efficacy of augmented reality virtual dressing room technology as a tool for online visual merchandising', *Journal of Global Fashion Marketing*, 5(4), pp. 283–296.

Yim, M.Y.-C, Chu, S.-C., Sauer, P.L., (2017). 'Is Augmented Reality Technology an Effective Tool for E-commerce? An Interactivity and Vividness Perspective', *Journal of Interactive Marketing*, 39, pp. 89-103.

Yim, M.Y.-C., Park, S.-Y., (2019). "I am not satisfied with my body, so I like augmented reality (AR)" Consumer responses to AR-based product presentations', *Journal of Business Research*, 100, pp. 581-589.

Zuckerberg, M., (2014). Post on Oculus VR Acquisition Lyrics [Online] Available at: <https://genius.com/Mark-zuckerberg-post-on-oculus-vr-acquisition-annotated/> [Accessed on 18 July, 2019].