

Stockholm School of Economics

NDH900 Bachelor's thesis

Academic year 2022

Augmented Reality in Retail

A customer-centric business implementation framework

Augmented Reality (AR) implementation in retail is growing significantly over the past few years. But how can retailers implement AR applications successfully? This research aims to contribute to solving this question, by providing a circular customer-centric framework to implement AR applications in the Business-to-Customer (B2C) operations. To be able to provide a meaningful and real-life applicable schema, a multi-faceted qualitative data collection approach was selected, including focus group interviews, and semi-structured interviews with industry experts. The outcome is a circular flow model that includes seven key stages: 1) *Need recognition*; 2) *Validation*; 3) *AR implementation Strategy*; 4) *Development*; 5) *Implementation*; 6) *Measure*; and 7) *Evaluation*. The study is aimed to suggest an AR implementation framework that will contribute to the successful implementation of the customer-centric AR practices, which in turn will benefit the overall customer experience. Additionally, we want to initiate the discussion and further research around customer-centricity within AR implementation strategies.

Keywords: *Augmented Reality, innovation, customer experience, customer-centricity, technology acceptance model, agile software development, retailing.*

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Date submitted: 19/5 - 22

Acknowledgment

We would like to thank Alexander Mafael for his unconditional support, guidance, and meaningful contributions during our research project. We are also extremely grateful to all the industry experts we interviewed, it was a pleasure and inspiration to hear you. And last but not least, thanks to all our classmates and relatives for their support.

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1. Introduction

Technological development has accelerated over the past decades. The retail industry is going through a massive shift towards digitalization and omnichannel experiences, with the implementation of existing and new technologies with the ultimate goal of improving customer experience (CX), increasing loyalty, and boosting sales (PWC, 2021). A powerful technology gaining popularity is Augmented Reality (AR) which “allows a person to interact with virtual objects overlaid on real-time images” (Panconesi et al., 2021). AR integrates the real-world environment with digital layers through the camera of digital devices such as wearable headsets, AR glasses, or portable devices such as smartphones or tablets (Farshid et al., 2018). There are a lot of examples of AR that an average person may interact with in everyday life, for example, Snapchat filters, Warby Parker’s glasses virtual try-on, IKEA Place (Apple, n.d.), or even Live View in Google Maps.

In retail, AR has increasingly been implemented across stages of the customer journey in different industries, such as fashion, furniture, grocery, electronics, and many others. For instance, IKEA, the international Swedish furniture retailer, launched in 2017 its own AR-powered application, called “IKEA Place”. It offers customers an AR-enabled application where users can visualise virtual true-to-scale 3D products of the IKEA assortment through their electronic devices, in the comfort of their homes before going to the store. Alternatively, it can be used also while being in the store helping customers to visualise a product by rendering true-to-scale 3D products (Figure 1).

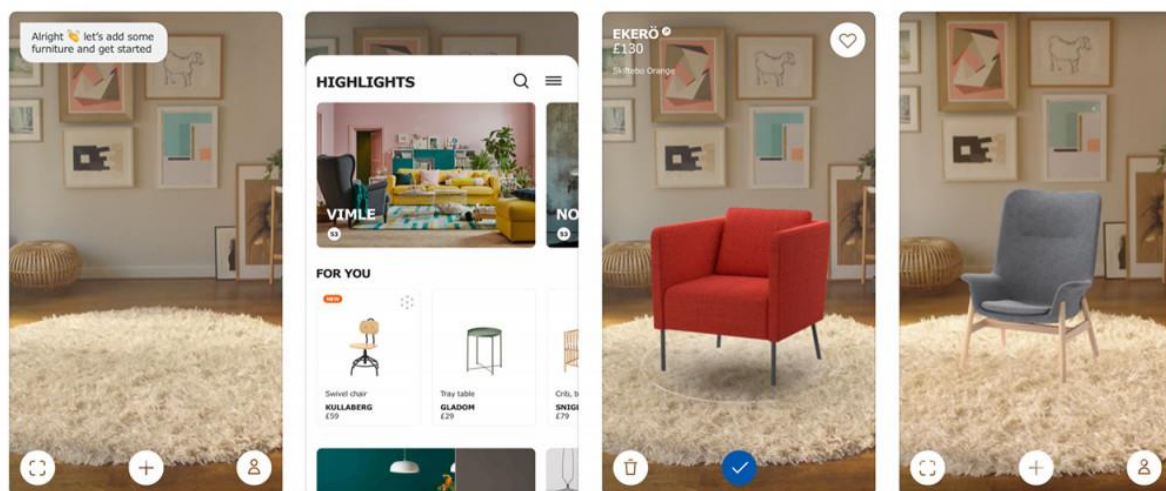


Figure 1: Ikea Place app - Native Augmented Reality application.

This technology enables its users to interact with products in an innovative way, providing a more exciting and immersive journey to the customer experience. This has been proven to positively impact customer satisfaction, engagement and boost sales (Raska & Richter, 2017). Although the AR market is expected to reach \$198 billion in 2025 and several industry leaders have started implementing the technology, little is known about how businesses can implement AR applications successfully. Having an implementation strategy gives higher returns and benefits, as it decreases the uncertainty that new technology implementations are associated with, as well as mitigates possible arising costs due to lack of guidance (Brandtner et al., 2014). Furthermore, AR is no different from most retail-implemented technology, as its goal is to deliver value to consumers and solve their needs. Therefore, a customer-centric implementation model will further maximise the customer-delivered value with maximum return to the businesses.

Current research primarily focuses on the customer acceptance of AR and factors that contribute to it, and the implementation of AR considering its technical features. However, little research investigates the customer perspective during the implementation journey. Therefore, the aim of this thesis is to fill this gap by providing a circular customer-centric framework for businesses to implement AR applications in their Business-to-customer (B2C) operations. To be able to bring a meaningful and real-life applicable schema, a multi-faceted qualitative data collection approach was selected, including a literature review, focus group interviews, and semi-structured interviews with industry experts. As a result, a seven-step circular flow model with implementation insights and customer-centricity is developed and discussed as well as its business implications. This paper also highlights the importance of customer-centric focus in businesses and the role of AR in retail.

1.1. Background

Technology has been the enabler of change, revolutionising all aspects of our society. In retail, all components have evolved with the core aim of providing cutting-edge customer service and experiences. Technology has facilitated customers to access enormous amounts of data with the touch of a screen, blurring the line between online and physical touchpoints and therefore emerging new challenges and opportunities to provide seamless and more attractive experiences (Piotrowicz & Cuthbertson, 2014).

This has progressively contributed to the shift of control and power from retailers to consumers, converting them into the core of every enterprise. Businesses have increasingly modernised their approach from being product-centric to customer-centric, with the ultimate reward of loyalty, retention, and building competitive advantage (McGinn & Mullen, 2021). In accord with Phil Gerard, author of *Customer Centricity “A present and future priority”* book, customer centricity is an ideal business model as it focuses on the customer but involves the entire business organisation to think of ways to create positive customer experiences, this will, in turn, favour the company’s interest (Geldart, 2020). Also, he emphasises the importance of first, having a strategic and intentionally planned customer experience, prioritising the customer *right from the start*, and highlighting that all steps, processes, and decisions are to be in their favour. As a matter of fact, The Temkin Group released a report which states that “a moderate increase in customer experience will generate an average revenue increase of \$823 million over three years for a company with \$1 billion in annual revenues.” Customer centricity and cross-functional teams are of special interest for technological application developments such as AR applications, since companies and developers may focus mainly on functionalities, performance, and efficiency without maintaining the customer in mind during its development.

Building a customer-centric enterprise that places the demands and wishes of every single customer in the centre of value creation implies much more than investing in advanced technologies. Firms have to build not organisations and structures to produce customised services, but organisations and structures for customers. With the customers at the centre, human beings can then focus on being creative (Tseng & Piller, 2003)

As mentioned before, the digital transformation in retail is evolving the customer experience, and more customers are prioritising experiences above all else when choosing between brands (Aussant, 2022). Based on a PWC (2018) report, the key aspects customers value the most in their shopping experiences and that businesses should have as main goals when implementing new components to their journey, *are speed, convenience, consistency, friendliness, and human touch*.

When it comes to retail, technology has enabled remarkable transformations and shaped new ways businesses could interact with customers to stay competitive. However, as technology gets more sophisticated, the consumer's expectations go up exponentially (Hopping, 2018). Lately, customers expect seamless, personalised, and immersive technologies to be part of their

shopping journey, consequently, the boundaries between the human, digital, physical, and virtual realms are blurring as customer experience becomes more immersive (Stanhope & Warner, 2020). According to Futurum Research (2020), “the brands who want to be successful in customer experience will have to adapt their technology models to become more agile and to rely more on automation and smart and immersive tech”. An increasing number of forward-seen businesses from different industries have started implementing AR tech in different stages of the customer journey, in order to keep up with the digitalization transformation and provide cutting-edge customer experience. AR applications release new opportunities to provide a unique customer experience, increase satisfaction and reduce expenses. In detail, AR “provides a real-time direct or indirect view of a physical real-world environment that has been enhanced/augmented by adding virtual computer-generated information to it” (Panconesi et al., 2021).

The AR industry has gained interest over time, it is valued at \$6.87 billion in 2020, and has a growth expectancy of over \$26 billion by 2025 (Statista, 2022). In a study made by Forrester 2020, in the next two years, 63% of the sampled customers expect virtual visits today and 69% think they will use the technologies (Stanhope & Warner, 2020). The forecast is promising, making big players, such as Apple, Google, and Microsoft, get involved in the development of mobile-first technologies as there are already 3.5 billion smartphones in the world today that are able to support AR applications (Loftis, 2021). Hence, is it relevant for businesses to understand how mobile AR applications could enable innovative and futuristic ways to interact with customers, and most importantly learn how to implement mobile AR applications in the most efficient and successful way possible.

1.2. Problem Definition and Purpose

The Global AR market is expected to grow to \$85.47 billion by 2026, with a compound annual growth rate (CAGR) of 37.66% (Renub Research). Technology gains more and more popularity across different industries, and especially in retail, it is used across different customer journey steps through different channels. Worldwide Business Research reports that 64% of executives are reluctant to integrate AR due to budget barriers and 55% are lacking internal resources. Indeed, AR integration into the business can be cost-intensive. Depending on the technology, its purpose, and complexity, the costs can exceed \$300,000 and above, reports ITRex Group. Therefore, how can retailers most efficiently integrate AR into the

business, without carrying costs, aligning internal resources with the technology development, gaining competitive advantage, and importantly – delivering customer value.

The purpose of this paper is to shed light on the existing lack of a comprehensive customer-centric framework for retailers to implement AR technologies in their business. In order to gather an exhaustive understanding of the technology and its implementation implications, this study engages in a multi-faceted qualitative data collection approach, including focus group interviews, and semi-structured interviews with industry experts. The goal is to bridge existing AR implementation research with the advantages of customer-centric and agile methodologies to create a comprehensive model that will initiate further discussion and research around successful AR implementation strategies and critical factors.

2. Literature Review

In order to explore how retailers can implement AR while maintaining a customer-centric approach, we first construct a basic conceptual background of the technologies in question, including the meaning and boundaries that reality-enhancing technologies impose. This not only entails AR applications but also associated technologies such as Augmented Virtuality (AV), Mixed Reality (MR), Virtual Reality (VR), and Extended Reality (XR).

Further on, we explore the variables influencing customer acceptance of AR applications and potential barriers to the successful implementation of AR. Moreover, we will look into technology implementation practices to understand different methodologies for integrating technology in retail. To finish the literature review, we discuss the role of customer-centricity in retail and AR practices.

2.1. Enhancing Reality with Technology

In 1994 was first introduced the reality-virtuality continuum or the Extended Reality (XR) spectrum by Milgram et al., (1995). It graphically represents the spectrum of technologies that make possible the interaction of the real world and virtual world (Figure 2). It has been cited in thousands of types, mainly during the research and development of virtual and augmented reality applications. This continuum engages only with the sight sense, meaning that considers only visual aspects of both realities, therefore it does not account for sound, smell, haptics, or taste (Skarbez et al., 2021). The virtuality continuum ranges from fully immersive technologies to real environments with virtual objects, in other words, it encompasses the Real environment,

Augmented Reality (AR), Augmented Virtuality (AV), and Virtual Reality (VR) technologies. Across research, Mixed Reality (MR) has been described in different ways, but Milgram and Fumio Kishino defined it as an “environment as one in which real-world and virtual world objects are presented together within a single display, that is, anywhere between the extremes of the virtuality continuum.”

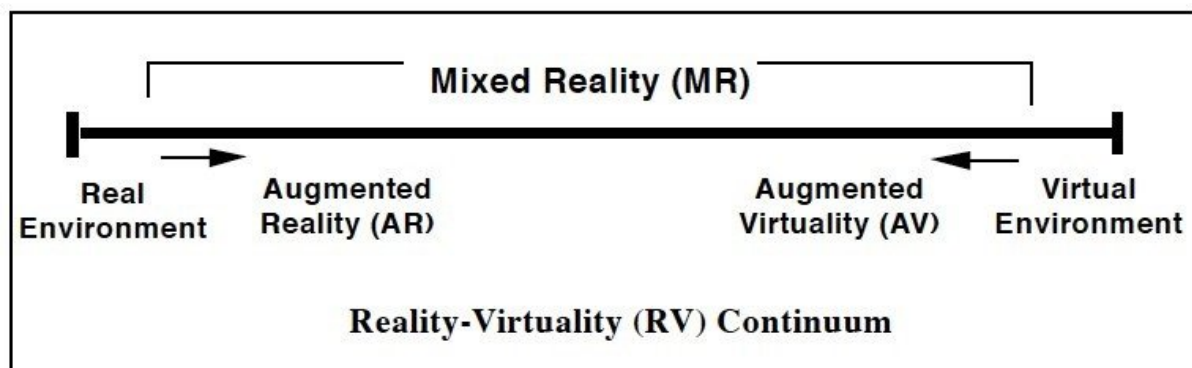


Figure 2: Milgram's Reality-Virtuality Continuum

From left to right, the first component in the continuum (Figure 2), is the Real Environment which represents the neutral starting point of what we all know as reality or physical objects. Continuing moving to the right, the adjacent AR and AV technologies can be found. Both are enclosed in what is referred to as Mixed Reality (MR). Last but not least, on the right extreme, it is the completely Virtual Environment where VR technologies are used.

Mixed Reality

As previously mentioned and referred to in the Reality-Virtuality continuum (Figure 2), MR englobes both AR and AV, where AR is closer to the real world and AV is closer to a fully virtual environment. To avoid misconceptions and confusion, they have been explained separately further below.

Overall, MR refers to the cutting-edge technologies that attempt to influence the human perception of an experience by either adding a virtual object to the real world (AR) or bringing real objects to the virtual world (AV) (Ziker et al., 2021). On one hand, AR applications add a computer-generated object to the real world. An example in beauty retailing could be the recently launched Sephora's Virtual Artist mobile application, which enables users through 3D facial recognition and AR tech, to interact in real-time and try-on products that can be purchased from Sephora (Figure 3). On the other hand, AV adds objects from the real world to

completely virtual environments. A common example of the latter is in the gaming industry when players project themselves and participate in a virtual world.

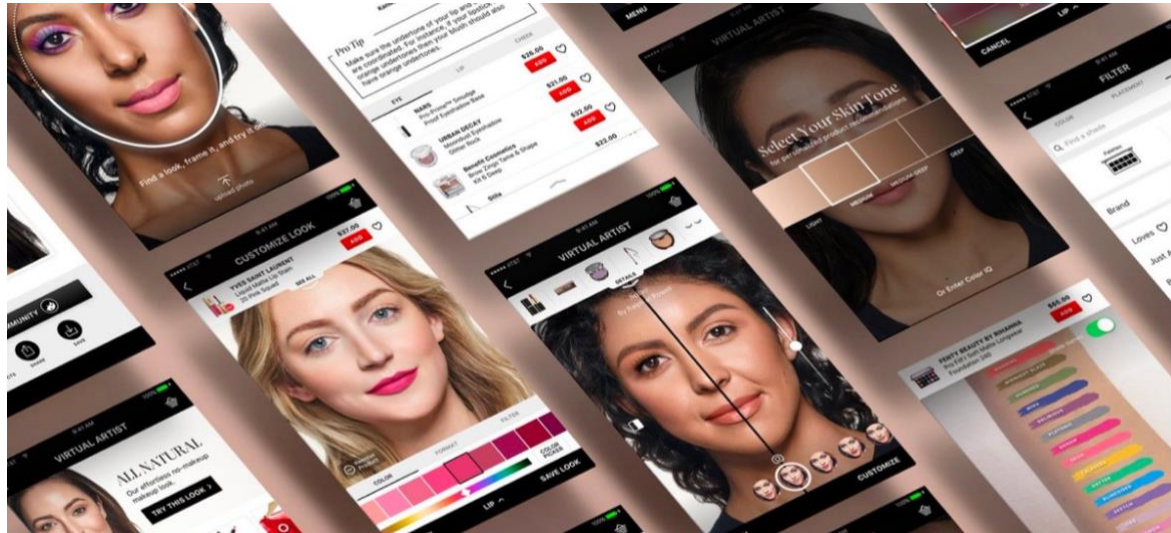


Figure 3: Sephora Virtual Artist application

By definition, AR systems interact in real-time directly or indirectly with the physical real-world overlaying information onto it (Berryman, 2012). It is also known for enhancing or augmenting the reality by adding computer-generated information to it through a wide range of hardware, such as smartphones, tablets, computers, TVs, digital mirrors, headsets, lenses, or AR fitting rooms. The main purpose of this technology is “to simplify the users’ life by bringing virtual information not only to their immediate surroundings but also to any indirect view of the real-world environment, such as live video stream” (Ryoo & Winkelmann, 2021). For instance, some interesting existing AR applications in retail are the IKEA Place app, Gucci’s try-on virtual shoes at home function, and Nike’s in-store customizable AR projection of sneakers. AV technologies, on the other hand, have been much less explored in comparison to studies on VR and AR (Gonzales et al., 2021). They refer to the applications that bring real-life components to purely virtual environments, augmenting the virtual experience. The most common implementation is in the gaming industry as of now.

Virtual Reality

VR technologies enable users to immerse themselves in a completely virtual environment blocking any interaction with the real world (Ziker, et al., 2021). Usually, to be able to experience this level of deep engagement headset equipment is needed. Often, due to the high equipment cost this technology generates, it is mostly used in gaming and workplace training. However, there are some emerging retail applications of VR such as Metaverse, Nike in-store

supply chain tours, and in-store product showings. Overall, "AR is often contrasted with VR. While both AR and VR enhance a consumer's overall experience, VR replaces reality by building upon a fully artificial digital environment, such as an animated scene or photograph" (Berman & Pollack, 2021).

2.2. Augmented Reality in Retail

Although AR technologies first emerged around 1957 by Morton Heilig, it was just in the last ten years that they have followed a prominent development trend (Riar et al., 2021). The increasing maturity of AR technologies has been mainly in the gaming and education industries. However, the retail industry has recently started to join the trend, and many new innovations and applications with AR technologies have been seen. The retail industries most engaged in AR applications are fashion, cosmetics, furniture, and decorations, as the main attribute of AR is to provide a realistic view of the product before buying it, saving them shopping time and possible transportation costs.

When it comes to digitalization in retail, e-commerce has become a key touchpoint for businesses. Indeed it provides new ways to interact with customers and expand the traditional in-store business model. Still, customers face some limitations when shopping online, such as product presentation, inability to try products, information richness, and multidimensional experientiality (Riar et al., 2021). For this reason, an increasing number of businesses have started exploring mobile AR technologies as it represents an innovative way to decrease these challenges and tackle the product-related risks and uncertainty, while still providing a unique shopping experience (Lavoye et al., 2021).

AR can be implemented through a wide range of retail practices while reaching out to consumers on different shopping journey steps. Those practices include branding and marketing, sales channels, after-sale customer service, virtual try-on, customer-as-designer, virtual training, and workflow management (Boletsis & Karahasanovic, 2018). Not only is the range of AR-enabled practices broad, but also consumer-delivered value and benefits are undoubted. Some of those benefits are time-saving through increased convenience, a better quality of information presented, interactivity, increased satisfaction, a sense of trust, media enjoyment, increased immersion, and attitude towards the retailer, and importantly, increased willingness to purchase (Berman & Pollack, 2021). As of today, the majority of research and existing AR applications for retail are mainly mobile-first. This makes sense due to its

convenience, reduced cost for developing AR features compared to AR hardware, and abundance of mobile devices in the customer base (Riar et al., 2021). In terms of in-store retailing, AR technologies are also used to enrich product information but mainly to attract customers and spark their curiosity, making their in-store shopping experience more engaging (Riar et al., 2021).

Overall, AR seems to be a promising alternative to improve consumers' ability to absorb product information more efficiently, facilitate the decision-making process and potentiate shopping experiences (Dacko 2017; Huang & Liao 2015). These outcomes can be achieved through different AR application types.

Augmented Reality itself is a diverse, complex, and multi-layered field, and there are many different existing types of approaches and applications. For the purpose of building a holistic understanding of AR technologies, we will briefly describe the current AR types from a high hierarchy level. According to Peddie, J. 2017, there are two main AR systems that should count with a camera combined with a display, those are wearables and non-wearable systems. On one hand, non-wearable systems or also called, Near-to-the-eye displays (NEDs) primarily range from mobile devices (smartphones, tablets, notebooks, weapons, etc.), stationary devices (TVs, PCs, plays, etc.), to head-up displays (projection views). On the other hand, wearable systems include any device that has to be put on, such as headsets and helmets, for instance, Microsoft Hololenses.

2.3. AR Acceptance and Implementation

Factors influencing AR acceptance

AR technology in the retail industry is a relatively new phenomenon, and therefore research regarding AR acceptance and implementation is scattered. When looking into what value AR provides and the factors influencing acceptance of the technology, most research focuses on the Technology Acceptance Model (TAM), (Surendran, 1996), as the center of discussion. Through time the model has been adapted accordingly as new retail practices evolved and new technologies emerged. TAM was proposed in 1989 with the purpose of providing the explanation and reasoning about external factors that influence the user's behavioural intention to use the introduced technology (Davis, 1989). The original model looks at how external variables such as Perceived Usability (PU), Perceived Ease of Use (PEOU), Attitude towards (AT), and Behavioural Intention to Use (BI), (Figure 4), impact the actual intention to use (U)

the technology. As the research evolved, the model was adjusted to add extra variables influencing the PU and PEOU, which are the key components of the model (Legris et al., 2003).

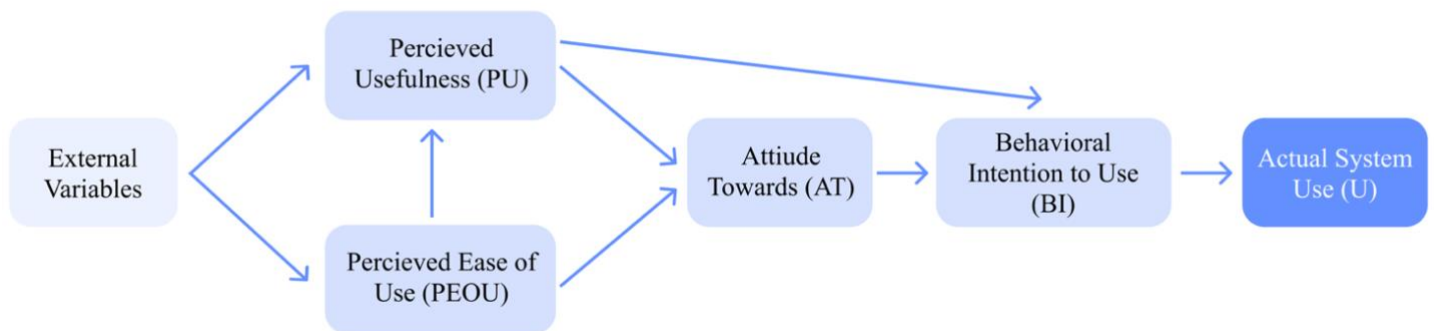


Figure 4, Technology Acceptance Model

Currently, in retail-related research TAM is mainly used to describe the internal and external variables that influence the acceptance of a particular technology. Such relevance of TAM in the AR field is due to the importance of considering factors influencing technological acceptance by consumers (Alam et al., 2021) and understanding the barriers to successful implementation. With regards to AR mobile technology, the intention to use AR apps and visit online/offline stores is predicted by users' trust in the AR app (Kang et al., 2022). Therefore, to increase trust, AR apps have to be designed to solve customer needs and provide a great user experience (Kang et al., 2022). In some contexts, perceived ease of use and perceived usefulness of the technology significantly affect the intention to use the AR technology (Alam et al., 2021). Further, another study shows that perceived enjoyment of the AR impacts the store choice and quality of the shopping experience (Pantano & Servidio, 2012). One more discussed factor affecting acceptance is perceived augmentation of the technology, as it impacts store repatronage intentions, however, not purchase intentions (Javornik, 2016). The intention of e-commerce to adopt AR in the first place is positively related to consumer readiness, among other factors (Chandra & Nanda Kumar, 2018). All mentioned factors, such as perceived usefulness, perceived ease of use, user trust, perceived enjoyment, perceived augmentation, and consumer readiness, can influence the adoption of AR from not only a positive perspective, but also a negative one, and eventually become barriers for providing value to consumers. As highlighted by Chandra & Nanda Kumar, 2018, before implementing AR technology, retailers

should consider environmental contexts, such as consumer readiness and current competition. Overall, factors influencing consumer and business acceptance are necessary to consider when developing AR technology as they will consequently impact the adoption of AR applications.

Technology implementation practices

As we have shown above, a lot of studies explore the AR adoption within retail from the perspective of customer intention to use the technology, repatronage of the online/offline store, attitudes towards the technology, and other factors influencing acceptance of the AR. However, very little research looks closely into how and when the technology should be integrated into the retail business. There exists exhaustive information technology implementation research that regards a broad range of technological systems and is generally non-specific to one technology. For example, the agile software development method focuses on development through the feedback loop cycles in close partnership with customers (Highsmith, 2001). The practice of agile software development is widely spread, Annual State of Agile Survey, reports that agile adoption grew to 86% in 2021 among software development teams, compared to 37% in 2020. It is so common in software development because it aims to deliver technology to consumers as soon as possible to test it and process continuous improvement cycles (De Raedemaeker et al., 2020).

Agile Manifesto was created in 2001 by Jim Highsmith and other practitioners in order to create principles that will become common ground in agile practices (Appendix 1). In addition, the manifesto stands on the shoulders of four values:

1. **Individuals and interactions** over processes and tools
2. **Working software** over comprehensive documentation
3. **Customer collaboration** over contract negotiation
4. **Responding to change** over following a plan

These values and the first two principles highlight the importance of continuous value delivery to the customer through the software and acceptance of changing requirements, even in the late development stages (Beck et al., 2008). That implies not only close team cooperation but also customer connection and constant feedback collection about the technology and customer needs. Agile Manifesto adheres to cooperation between the software development team and the consumer and integrates the importance of tight collaboration between these two parties into the agile model (Figure 5) (Abrahamsson et al., 2010).

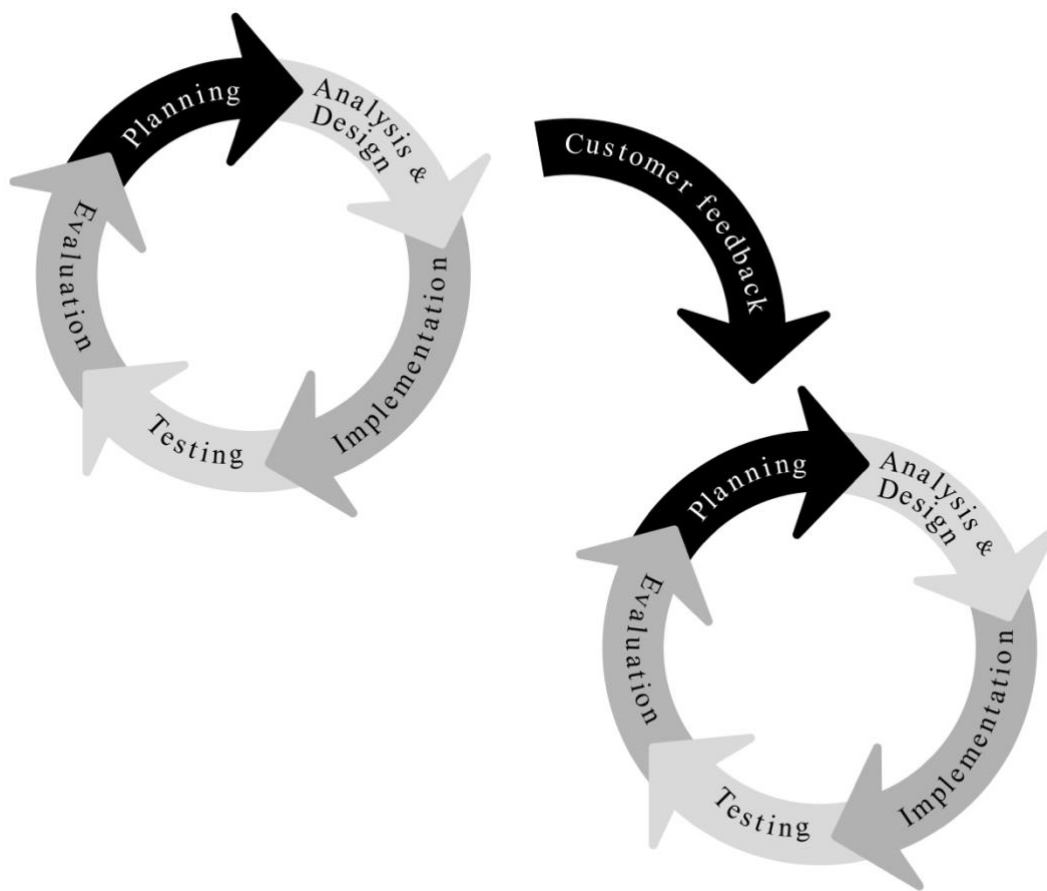


Figure 5, *Agile Software Development*

In terms of existing AR implementation models in the business, a six-step pathway was developed by Berman & Pollack (2021): (1) determine AR objectives within the firm's marketing strategy; (2) choose appropriate products, channels, and target markets for AR; (3) select among AR application types; (4) design AR apps; (5) evaluate alternative AR organisational formats; and (6) measure the success of AR programs (Figure 6). Such clear steps will help businesses understand the purpose of AR implementation in their operations and guide them all the way through application design to success measurement.

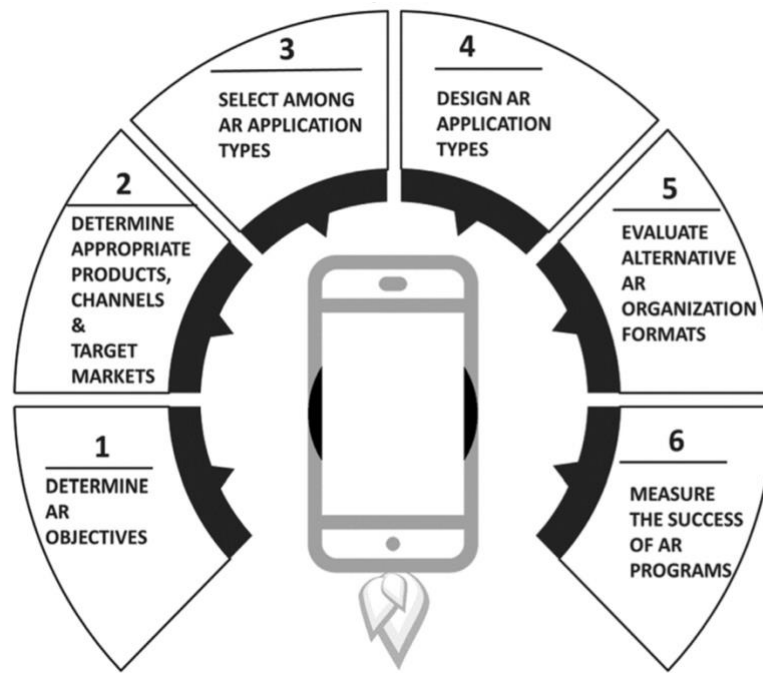


Figure 6, *Pathway for implementing AR*, (Berman & Pollack, 2021)

AR applications directly influence customers' behavioural intentions, therefore, to provide a competitive user experience and deliver value through AR, retailers should consider customers' psychological behaviour that will impact their intentions (Hsu et al., 2021). Software development, according to agile practices, requires constant improvement through customer feedback, in order to ensure long-term value delivery and a constant technological improvement cycle. On the other hand, in the existing AR implementation model, most focus is put on ensuring the right technical and strategic decisions to launch successful AR applications. Currently, there is no model that brings together both worlds: a customer-centric approach that will focus on value delivery and technical features of the AR.

Customer-centricity in Retail

Customer-centricity is not a new concept in the business literature and has been broadly discussed and debated on what contribution the customer-thinking approach can bring to the table. Fader, 2011, defines customer-centricity as a fundamental strategy that can align offered products and services with consumers' needs and wants. Fader, 2011, also highlights that in the world of customer-centricity, it is the loyal customers who matter the most as they are the key to a company's long-term profitability. Authentic customer-centricity has not been yet implemented in practice (Gummesson, 2008), and a big number of companies do not yet seem

to be interested in integrating the customer-centric strategy into their businesses, losing on a lot of benefits (Fader, 2011). Customer-centricity helps to generate a loyal customer base, who are “less price-sensitive, more likely to spread the word about the company, and more forgiving of the firm’s occasional digressions”, and consequentially such customers are more valuable to the firm (Parniangtong, 2017). Furthermore, introducing new offerings to long-term customers, who are the main focus of the customer-centric approach, is less costly (Parniangtong, 2017), which is especially relevant for AR implementation, which can be associated with high costs in the first place. The customer-centric approach implies delivering value to consumers in return for financial benefits (Gummesson, 2008).

To compete for customer attention in such a highly technologically disruptive environment, retailers must adopt a customer-centric approach (Gupta & Ramachandran, 2021). Competitive advantage through customer-centricity is based on the creation of a loyal customer base and increasing customer lifetime value (Parniangtong, 2017). Unfortunately, oftentimes after successful implementation of the technology that the customer appreciated and found to be valuable, the further focus lays on developing what had caused previous success rather than the customer-centric system needed to replace it or improve it (Hart, 1999). Customer centricity is a clear key aspect in developing AR apps that will provide consumer value, and potentially positively impact not only perceived usability, ease of use, and attitudes but also patronage and purchase intentions. No matter what channel customers use, they are seeking great experiences (Topper, 2012), therefore, technological implementation or improvement strategies have to be customer-centric and reflect customer value. Drucker, 1954 wrote that it is not what a business produces that is of first importance, but rather the value the customer perceives from the product, and that perception will determine the future of the business and whether it will prosper. Augmented reality is no different from other business operations and values, therefore should be driven by consumer experience, rather than just technology (Scholz & Smith, 2016).

In short, our goal is to contribute to existing work on AR and software implementation by combining existing theoretical models with findings of qualitative interviews with industry representatives and customer focus groups.

3. Method

3.1. Qualitative Approach

For the purpose of answering the research question, this study engages with a multi-faceted approach to gather information and current market insights. We chose the qualitative method to be appropriate to gain a deep understanding of the technological field and its role in retail. The qualitative method is commonly used when the purpose of the study is to generate the theory, rather than test it (Bryman & Bell, 2011), which fits the goal of this thesis of introducing a customer-centric AR model, generated through studying current implementation practices with the help of key informants. The reason for choosing key informants as a part of a qualitative method is their ability to provide deep information that can impact and contribute to the outcomes (Payne & Payne, 2004). Such in-depth knowledge can be acquired only from key informants as they are believed to have the necessary social position to provide expertise, which cannot be qualified and collected from the general public (Parsons, 2011; Payne & Payne, 2004).

Furthermore, a qualitative study is aimed to represent the shifting and constantly emerging environment of the studied topic (Bryman & Bell, 2011), where technological transformations and practices are constantly emerging. While the quantitative approach uses deductive reasoning to test hypotheses generated based on existing theories (Bryman & Bell, 2011), the topic investigated in this paper, which is AR implementation, is lacking existing comprehensive theories, and therefore requires inductive reasoning to complement the literature and generate a customer-centric implementation model. Through inductive reasoning, our study used existing knowledge and observation of the current reality in order to produce a generalised view of the current practices inferring finding existing literature and creating a model for further theoretical and practical investigation (Hayes et al., 2010; Bryman & Bell, 2011).

More specifically, our study consists of the following qualitative data collection methods: four semi-structured interviews with industry experts, and two focus group interviews with consumers. These methods were implemented to draw prudent conclusions on how retailers can implement AR while maintaining a customer-centric approach. Conducted interviews with

key informants and focus groups were audiotaped and transcribed to conduct a qualitative analysis of received information (Parsons, 2011). In order to analyse information

An additional benefit that the selected study approach provides is its increased flexibility and spontaneity during the research process (Mack et al., 2006). Having flexible and open discussions was crucial to understanding how retailers and field experts currently implement AR in businesses and facilitating deeper discussion based on a specific case. In order to contribute to AR implementation practices and research, the question “how” is particularly important to investigate (Yin, 2009). By conducting a study with key informants, we ensure that they are not representing the general population, but rather provide narrow expertise within the field (Parsons, 2011).

3.1.1. Semi-structured Interviews

Semi-structured interviews are conducted with an interview guide on a specific topic, however, the interviewee has the freedom to in answering the questions, which can be followed up by additional questions that initially were not included in the interview guide (Bryman & Bell, 2011). The goal of semi-structured interviews is to create experts’ professional and honest perspectives on the field (Milena et al., 2008). Interviewed experts during semi-structured interviews act as key informants, whose social position gives them specialist knowledge within a specific field (Payne & Payne, 2004). For the purpose of this paper, key informants were chosen based on the criteria of having the most knowledge from a technological and retail perspective, as the goal is to gain expert representation, rather than the general population (Parsons, 2011).

Four semi-structured interviews were performed with experts, by asking a set of questions regarding their industry-related experience with AR and its implementation (Appendix 2). The questions were created with the purpose to get insights into AR implementation practices key informants to consider the most crucial ones, and what common mistakes and challenges they face during the digital journey, to analyse and account for those aspects when generating customer-centric implementation models. Furthermore, questions considered the view of experts on consumer willingness for innovative technology in order to understand the degree of customer importance in their practices. Questions were also designed to view experts’ perspectives on AR development and the direction the technology is moving into, to align their predictions with the present market estimations and beliefs. During the interviews, a

predetermined set of questions was complemented with additional situational questions, based on discussion, to deepen understanding of the topic and get occasional clarifications. In order to ensure that key informants did not excessively impact the direction of the conducted research, the predetermined set of key questions was strictly followed throughout every interview (Bryman & Bell, 2011). It is important that selected key informants have to represent a mix of perspectives and reflect different sides of the discussed topic (Parsons, 2011). Therefore, selected experts come from different backgrounds such as pure AR/VR start-up, AR virtual design experience solutions, furniture retailing, and software companies working with retailers. All this knowledge helped to create a comprehensive picture of different perspectives ranging from pure tech to retail occupations.

This in the attempt to gather a holistic overview from business perspectives on the development, implementation, advantages, and challenges of AR in retail, and also to further complement the customer angle collected from the focus group interviews.

All participants granted consent to disclose their names and occupation.

Alloverse (company 1)

The first interviewed participant was *Nevyn Bengtsson* – CEO & Co-founder of a Alloverse collaborative open-source application for the metaverse. Currently, they build, maintain, and sell software platforms for work and training in virtual reality at a distance for customers all over the world. Its mission is to “lay the foundation for the future of the “3D internet” by building an open infrastructure for collaborative apps in VR” (Alloverse, 2021). Nevyn Bengtsson is a passionate programmer with an inspiring professional background as a developer of Spotify’s iOS app developer and the UX platform Lookback.

Dxme (company 2)

The second participant was *Tomas Stocksén*, a CEO and Co-founder Dxme – a virtual design experience in the form of AR, which allows customers to virtually design anything from a T-Shirt to a paddle racket with the help of an AR headset. After an immersive design process, the product would be customised, printed, and delivered in less than five minutes. The idea was created with the goal of not only providing a more interactive experience for consumers but also contributing to more sustainable and waste-free fashion industry. Tomas Stocksén also has experience in working with immersive business transformation of 3D/AR/VR and sustainability for the multinational fashion retailer H&M.

IKEA (company 3)

Then, the third participant was *Daniel Banjanin*, Country Digital Product Leader of IKEA, a leading furniture retailer. IKEA does extensive work within technological adoption in retail and after Covid-19 started shifting its business model to a more innovative one by engaging in digital transformation (Harvard Business Review, 2021). Daniel Banjanin's main tasks focus on making the shopping experience smoother and improving digital product presentation. Through customer journey analysis, he is working on finding digital tech that can improve retail business performance. With extensive IT and tech development experience, Daniel Banjanin has deep knowledge of what is needed to make technology successful in the retail business.

Microsoft (company 4)

Lastly, we had the pleasure of discussing with *Linda Pimmeshofer* Director of Business Development at Microsoft, a giant American multinational technology corporation that offers computer software, consumer electronics, personal computers, and related services (Microsoft, 2022). Microsoft association with technology is evident, and when it comes to Augmented, Mixed, and Virtual Reality developments, they are widely recognized for their variety of headsets, such as the HoloLenses. Linda Pimmeshofer works with retailers, start-ups, and tech companies exploring and mapping possibilities of technological transportation and business improvement with the help of technology. She is also closely engaged with creating and improving customer experience through technology and has expertise in guiding retailers through digital journeys.

Participant	Company	Role	Industry/Relevance
Nevyn Bengtsson	Alloverse	CEO & Co-Founder	AR/VR/application development/UX
Tomas Stocksén	Dxme	CEO & Co-Founder	3D/AR/VR/IT and sustainability in fashion retail.
Daniel Banjanin	IKEA	County Digital Product Lead	Tech implementation (assessment)/AR/3D/IT, tech management
Linda Pimmeshofer	Microsoft	Business Development Director	AR/IT/digital transformation

Key informants' summary table

Further in the text we will refer to case study participants as Company 1-4 to facilitate readability.

3.1.2. Focus Group Interviews

Focus groups are a research technique that involves organised discussions with a selected group of individuals to gain information about their views and experiences on a topic (Gibbs, 1997). They are characterised for being similar to a group discussion, with the assistance of a moderator that leads the discussion with the purpose of “bringing everyone in, preventing dominance and steering the group away from irrelevant areas” (Ritchie & Lewis, 2003). Focus groups are described as synergistic, in the sense that the groups work together (Stewart & Shamdasani, 1990). The group interaction is explicitly used to generate data and insights (Morgan, 1997). However, researchers express different opinions and critiques regarding the methodology and its risks. This technique can create a similar real-life discussion where participants are interacting with and influencing each other, as they do in everyday life (Krueger & Casey, 2000). However, moderators of the focus group have to be mindful that some participants are not comfortable with expressing their opinions, due to the social discomfort which can lead to less open discussion (Milena et al., 2008). In order to mitigate such risk, throughout the interviews we encouraged participants to express their own views and experience, giving them the opportunity to ask questions to each other, seek clarification, and comment, bringing the discussion to deeper and more considered levels (Ritchie & Lewis, 2003).

Based on the guidelines on developing successful focus groups suggested by the Qualitative Research Practice book, two groups of five people each were gathered to perform two separate interviews of approximately one and a half hours each. The participants were diverse, with different ages, sex, and cultural background, with the aim of gathering a more holistic perspective. For the time efficiency and convenience of all participants, the interviews were held virtually and recorded after everyone present had granted permission. For the purpose of the interviews, fifteen open questions were prepared beforehand, with the ultimate objective to investigate various aspects related to AR in retail from the customer perspective. The questions were created with the goal of aligning consumer technological awareness and willingness to use AR with what key informants believe about the consumers. Furthermore, questions were

designed to investigate how consumers view their shopping journey of the future and what role technology has to play in it (Appendix 3).

4. Results and Analysis

In the following section of the paper, we aim to present the results gathered from the 2 qualitative data collection methods described previously, perform analysis and lastly build a comprehensive AR implementation framework.

As mentioned previously this study engaged in two methods to gather information, four industry experts' semi-structured interviews, and two focus group interviews. This was with the purpose of, first, gathering a basic understanding of the AR technologies, their application in retail, existing AR business implementation frameworks, and what aspects retailers should consider when implementing these technologies in their customer experience offer. Second, we consider it necessary to gather cutting-edge expertise from industry leaders with some type of AR experience history, with the aim of providing innovative value to existing literature and building a new AR implementation framework based on real business perspective. Thirdly, conducting two focus groups interviews with participants with customers-like profiles was done with the ambition to have a perspective on the current awareness of AR and related technologies, their willingness to use it now vs in the future, and what factors they consider as decisive to implement this tech in their shopping journeys. This was relevant as customer-centricity is a key aspect of this research, therefore gathering a customer-like view was advantageous.

Overall, the ultimate goal of this research is to fill the existing lack of AR business implementation guidance with a customer-centric focus, therefore the customer and business perspectives in relation to AR technologies and their application in retailing have been aligned.

4.1. Business Interviews

Future of retail and AR

The vision for a futuristic retail environment in upcoming years is something that unites a lot of AR/VR enthusiasts, practitioners, and researchers. We asked interviewed experts about how they view the next years of the XR, and specifically, AR development. Most of the interviewers, without any previous communication, agreed on one thing – while virtual reality

will remain a niche industry for a narrow group of consumers, gamers, for example, AR has the potential to replace smartphones and computers. “I think VR will continue to be a niche that is fun for games and various forms of industrial and medical applications. But AR is going to be big-big”, as mentioned Company 1. This is mainly connected to the nature of both technologies and the additional setup needed to use them. Because VR completely immerses the user in the virtual world, technology does not have many implications in real-life and its daily activities. AR technology can be implemented through different mediums, such as smartphones, tablets, computers, and one of the most promising technologies – AR glasses. Smartphones and other common devices are already widely used for AR integration and interaction; however, the destiny of AR glasses cannot be fully anticipated at this point and case study respondents had different beliefs on that point. Company 1 believes that in the upcoming future AR glasses will substitute both smartphones and computers that we use on a daily basis. Company 2 said that because technology is still developing now, it is hard to say when AR glasses will be widely used by businesses and consumers but highlighted that in the upcoming future “maybe the combination of different technologies will be used. But mobile [technology] in the first place.”

We also explored beliefs about how the future of retail shopping experiences will look for consumers and what role AR plays in it. The future can take different turns, and not only tech companies, but also retailers can steer the development towards a better direction. All interviewees expressed a belief about the need for collaboration among, firstly, tech companies to create the missing hardware, “they [tech companies] need to put all their effort into creating the best technology”, – said Company 3. Secondly, the retailer should also put their efforts together and create collaborative ways of delivering an AR customer experience. These collaborations can take different unexpected forms and formats, such as a shared metaverse shopping mall, or AR stores. The idea of shared AR/VR space for retailers threatens the possible competitive advantage that these technologies could provide. However, as Company 4 said “one brand can get value from other brands as they are driving the same people.”

Implementation of AR technologies

When asked about AR implementation practices, challenges, and factors to consider, case study participants have provided their own views on the best practices and key learning outcomes from AR implementation so far. Each key informant approached the questions through the prism of their own experiences, business practices, and industry characteristics.

Both Company 3 and Company 4 stressed the importance of customer interaction and need recognition in order to successfully implement AR into the business. “We lose millions when it [the technology] is not coming from customers' needs”, – said Company 3, which highlights that customer-centricity can help not only in delivering a good customer experience but also save the company from financial losses. He added, “Collaboration between the customer and the retail is key.” When talking about key implementation aspects, Company 4 said “Showcase: test in small scale and measure. Test [the technology] and learn”, implying the necessity of validating the technological solution with consumers, as “[...] you never know what customers really need.” A similar perspective about the cruciality of talking to stakeholders was expressed by Company 3, when discussing the implementation process of AR. Company 1, on the other hand, addressed the gravity of the role of AR in the business and the value definition for the consumer. “What is the value they [retailer] want to do with it?”, – he said and added that depending on the degree of integration of AR into business, that can be done in different ways and require different resources and development strategies, “If they [retailers] want to have AR in their webshop, I bet there will a lot of companies providing those services. That I guess will be a small investment in paying for the service. If they want to integrate AR into the business model, they have to become more of a tech company.”

Challenges of AR implementation

When asked about the biggest challenges and mistakes managers do when implementing AR, Company 2 mentioned “It is very easy to shoot down ideas, because you do not see numbers directly. Continue to try and fail fast, but still have a belief that you are moving in the right direction. You need to have patience with innovation.” At the same time, Company 3 again highlighted the importance of what customers have to say and creating a “team working close to customer and management.” Working with the management team is also another challenge that commonly arises during the implementation process, because “When moving to new tech everyone needs to be aligned and work together”, – said Company 3 and added, “We need to build a business case presenting what is needed and what will be gained. Go to every team and align with them the way we should do.” Company 4 aligned on the same thought that oftentimes the organisation is not aligned with the IT department. And when the organisation is not aligned “they [the retailer] haven’t done their corporate work. When you build innovation, you have to align with the back-end IT department. Enterprise often doesn’t think of the next step, they just test. And when they think it’s done, just push it to the IT department that can’t do anything about it”, – said Company 4.

Do customers really need AR solutions?

Interviewed experts work with different types of customers and therefore have different customer interactions and insight into consumer readiness and willingness to use AR solutions. Company 1 shared their experience of pitching itself to investors and said that “there is very strong curiosity, but no intention to invest in it. On the personal level, people think it is super exciting and interesting, but on the business level people are a lot more careful.” Insights of respondent from Company 2 into customer willingness come from the AR presentations with H&M Group, where they have introduced clothes re-design solutions in two set-ups: through AR glasses and in 2-dimension via iPad. During the demonstration, the AR-glasses station was always filled with a line of people, while the 2D redesign solution did not attract as much customer attention. In order to understand that customers are ready for technological innovation, Company 3 shared their experience of introducing the technology slowly and gradually in order to “make customers understand it, and not think it is weird.” Company 4 was most positive about consumer readiness saying, “Young people are so willing to use the technology and they want it, but it’s a shift. We are more digital than we think we are. I think we are underestimating the customer a bit. But depending on the brand and customers you have, you need to deliver both [AR solution and traditional solution].”

4.2. Customer Interviews

Awareness of Augmented Reality technologies

Among the studied group of customer-like profiles, the notion of what AR is, what it entails, and how it could impact their shopping journey was relatively low. In numbers, only 10% of participants had a notion of a relative concept of AR. After providing some visual representation of what AR technologies could look like, both in terms of equipment and well-known applications in retail, such as the IKEA Place app and H&M smart mirror, 60% responded they have seen the technology previously, but only one person has used it.

This participant tried on the IKEA Place app in the bedroom with the purpose of visualising some desired furniture for the space. The participant mentioned that she prefers to shop for furniture and big items online as they are complex to transport, measure, and imagine how they would fit in the place. Since that represents an issue for her, she decided to try on IKEA’s Place app, declaring, “It was unexpectedly useful especially for me since I have a hard time figuring out measures and decoration from basic product images offered online”, additionally, “Also I

don't have a car, so when I order from IKEA it is great to be sure what to buy". This example reflected the usability and value that the app provided to the user, IKEA understands that when it comes to furniture it gets complicated the shopping decision as there are several factors customers have to consider until reaching the final purchase. Therefore, by implementing AR technologies, they were able to facilitate the online shopping journey by tackling common barriers and needs among the customers, regarding, for example, product visualisation, product interaction, increase convenience, and increasing excitement due to technology innovation.

Willingness to try AR tech in their shopping journey

Willingness to try AR applications during the shopping experience reached 80% of the consensus. Most of the participants agreed with excitement and openness they would use the technology, however, unanimously a decisive factor for such implementation was the perceived usefulness of the application. They stated that AR seemed interesting and even "cool" to try, but what would really influence the usage, is the value it provides, how meaningful, necessary, and relevant it is, the performance of the application, and the time efficiency of usage. During one of the focus group interviews, a participant said, "Would this really help me solve the issues I encounter, or would I just lose my time?". Also, "As of now is not super included in many shopping experiences, even though this is changing substantially. I haven't used it because feels a bit premature and niched." Additionally, as an interesting fact, the participants were asked about willingness to pay extra for a product after engaging with AR technologies. Surprisingly, they declared to be open to paying an average of 5% more of the initial product price if the AR application truly contributed to facilitating the decision-making and made the shopping process more engaging. In fact, one mentioned, "Depending on the functionalities and limitations, I am willing to pay a bit more, about 5%". This reflects the customers' willingness to adapt to new technologies, however, pinpoints the importance for businesses to understand and prioritize customers' perceptions and needs, rather than purely technological innovations.

The overall impression among the focus group discussions is that willingness to try new technologies such as AR is high, but it is strongly dependent on the performance expectations, usefulness, reputation, and the value it could provide. Even though is a small group of the target customers, this demonstrates the potential acceptance of AR technologies in the customer journey. Also, their responses were aligned with AR growth expectations and key informants' opinions.

5. General Discussion

This analysis aims to describe and establish connections between the literature review and the empirical findings of the interviews. The analysis will be structured into 4 different areas; customer-centricity, agile implementation models, why a strategy is key for successful implementation, and lastly propose a customer-centric AR implementation model based on all previously gathered information.

When it comes to the customer centricity, evidence has been found that it represents a key aspect in developing AR applications, as by maintaining a close relationship with customers, businesses can gather key insights into customer needs and expectations, making it possible to bring relevant value, and impact not only perceived usability, ease of use, and attitudes but also patronage and purchase intentions (Topper, 2012). The importance of having a main focus on the customer, rather than the product or technology has been discussed by a lot of researchers (Drucker, 1954), supported by agile methodologies and also by interviewed key informants, for the purpose of this study. Consistently, industry experts agreed that maintaining close interaction with customers is beneficial for both business and customers as businesses can base their decision-making on customer insights, satisfying their needs and expectations. This would create a more intimate relationship with customers, valuable data on their behaviours could be gathered, as well as prevent financial losses that may arise when the technical implementation is not coming from customers' needs.

Overall, when AR application in retailing is the matter, case study representatives emphasised the importance of maintaining customer relationships as a core, as well as the relevance of continuous testing during the technology development process. “Get the need to the team, develop a solution, go back to the customer, get feedback, go back to the team and build it”, – said Company 3 about the crucial steps of the technology development process. Through such an approach retailers can create not only highly functioning technological solutions, but also co-create value together with a customer and build meaningful relationships (Barnes, 2003).

Moreover, through the interview sessions, we concluded the importance of acquiring an agile methodology in order to not only stay close with the customer but also with the whole organisation to facilitate the delivery of a customer-centric product that is aligned through all corporate structures. For example, in order to create a scalable solution, you need to have agility

in the IT department in order to “bring the innovation from the outside, test it fast and throw it away or scale it after”, – said Company 4. Studies also show that it is beneficial for managers to have constant awareness about the development process and share their feedback with the development team. In such cases, the final admiration of the developed technology and developers’ satisfaction will be higher (Ilieva et al., 2004). Consequently, projects with agile development methods show a 42% higher productivity level, than the traditional (Ilieva et al., 2004).

Through agile software development retailers can focus on technological development through constant feedback loops in tight corporation with the customer, with the goal of delivering the solution fast, testing it fast, and, if successful, proceeding with improvement and customer co-creation (Highsmith, 2001; De Raedemaeker et al., 2020). This implies close team cooperation, customer connection, and collection of feedback on the technology.

As demonstrated previously, agile software development's main principles align with what industry experts identified as key success factors for the implementation of AR technologies. Therefore, agile principles and interview insights will be adopted as a core model for the design of the customer-centric AR business implementation framework. However, while agility covers overall general key success factors that are necessary for implementing any kind of technological innovation, it does not address AR-specific actions that are needed to be considered for successful AR integration. According to findings from Boston Consulting Group, only one of ten firms manage to implement AR well in the marketing strategy, while nine out of 10 are planning or already using AR (Bona et al., 2018). Another study found that 51% of surveyed companies did not start planning for AR/VR implementation yet (Jabi, 2018), which can indicate that companies are hesitant in approaching strategic planning of AR development. New innovation implementation and digital tools may bring uncertainty about the outcome and effectiveness of their integration into the business, which could contribute to the hesitance of businesses to integrate AR technologies into the business. A way to tackle such uncertainty is by first designing an implementation strategy that will guide the business through the process (Brandtner et al., 2014).

A lot of companies are still questioning the value and benefits AR can bring to their businesses (Berman & Pollack, 2021), however considering the growth predictions of the AR market and its increasing implementation across industries, soon enough retailers will face the problem of

integrating technology into business and adjusting to the new reality. After recognising the value, executives will face the situation where they are still lacking concrete AR-specific guidelines, as already now companies are struggling with resource and budget allocation for the implementation of new technology. Having a strategy is an airbag that will decrease the amount of trial and error as well as save time and money for the retailer. For these reasons, in the following section of this paper, an AR implementation framework will be presented, with the main inspiration on customer centricity and agile implementation principles that have been tailored to AR-specific implementation. This with the objective to facilitate business implementation by providing general but still business-applicable stages with key focus areas as they vary depending on the need, AR role in the business, and internal resources available for development.

5.1. AR Implementation Model

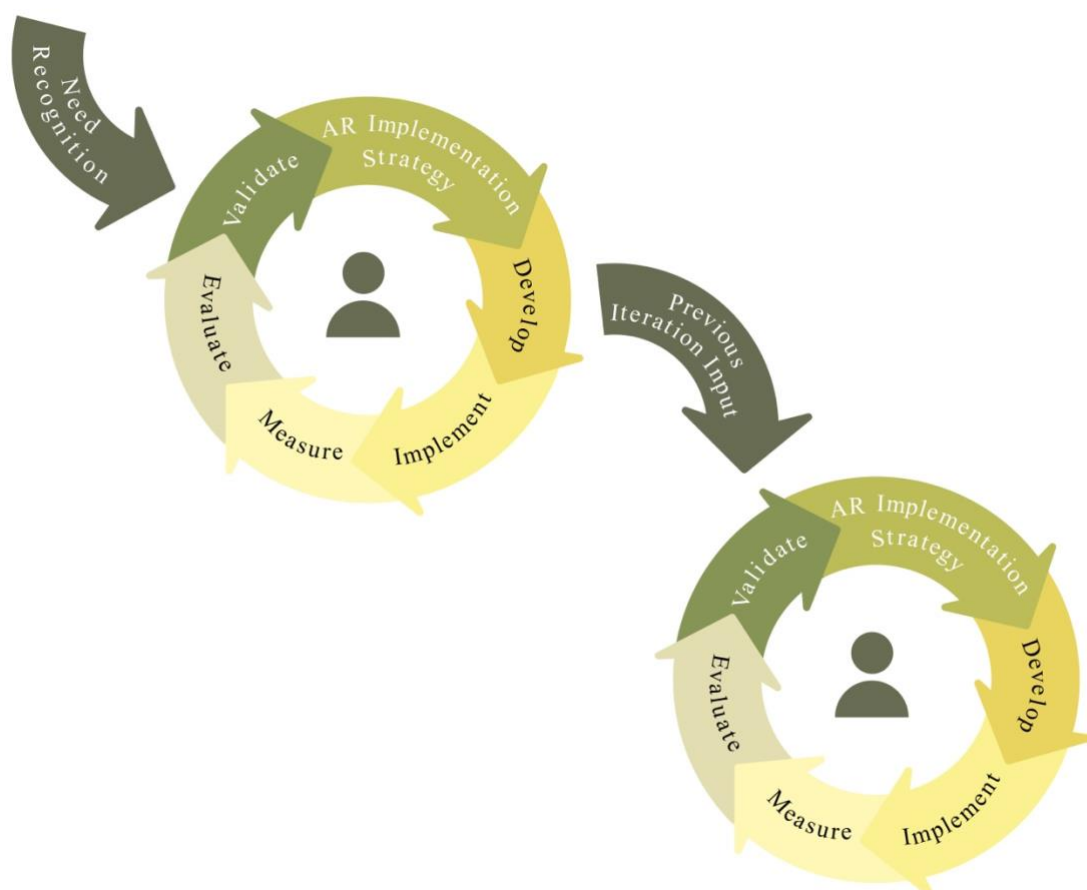


Figure 7 , customer-centric Augmented Reality implementation framework.

The proposed framework will consist of a circular-shaped 7 steps process (Figure 7): (1) Need Recognition, (2) Validation, (3) AR implementation Strategy, (4) Development, (5) Implementation, (6) Test & Measure, and (7) Evaluation.

(1) Need Recognition

From a business perspective, it is key to focus on understanding the customer to better align the product/service with their desires and needs, instead of prioritising purely innovation implementations. This is aligned with the customer-centricity approach, which suggests focusing on understanding customer needs regarding the features of products and customer-company interactions embedded in business processes, to ultimately increase satisfaction and corporate success (Kreuzer et al, 2020). By identifying customer needs, it becomes possible to provide more accurate, faster solutions, and create greater value. As Company 3 stressed the problematic loss of millions of Swedish kronor when creating a product or solution that is not coming from the customers' needs. Therefore, properly fulfilling this step can save a lot of resources and prevent companies from creating a product that will have no use for consumers.

With inspiration from (Wood & Mattson, 2014), and their model on how to determine customer needs in the developing world, this stage will be divided into 3 steps: *Prepare, Collect, and Understand*.

First, the business should *Prepare* by doing research and analysis on what the customer journey looks like and most importantly, develop a set of questions that will guide the team in the search for answers to those questions. For example, 1) what challenges occur during the shopping journey, 2) where do customers make the most complaints?, 3) what are the main pain points for customers?, 4) what do consumers are lacking in the shopping journey and occasionally seeking it from competitors?

Second, businesses should proceed to *Collect* the information that may help answer the previous set of questions. Based on Wood & Mattson (2014) model and conducted case study interviews, we suggest that information collection can be carried out in the next ways: (a) studying and gathering information about the problem through customer support services, in-store interactions, or website feedback, (b) observing customers through their shopping journey and identifying challenges and potential improvements, (c) discussing with the target group, asking them, for example, what they think about the offer and what they identify as pain points

through qualitative methods, and (d) by organising experiments with a sample of the target group and collecting information to be studied afterward.

Thirdly, it's time to *understand*, make sense of the collected information, and assess if it answered the previous set of questions. Here the team should intend to find intention-behaviour gaps, identify relations among the answers from different customers and find commonalities, and discuss aspects that contradicted assumptions made (Wood & Mattson, 2014).

(2) Validation

In this stage, the business has the opportunity to achieve 2 major goals depending on the model iteration they are in. In the first iteration of the suggested model, the main objective is to make sure the team accurately understands the actual need. Also, here is where the business should assess: (a) what is the best way to solve the need, and (b) whether AR could potentially solve it. This can be done through direct discussion with the customer and the internal team. This step is key to preventing unnecessary development expenses, identifying monetizable needs, and decreasing the probability of failure of the project (Wood & Mattson, 2014).

(3) AR Implementation Strategy

After identifying and validating the customer need, and subsequently evaluating if AR technologies would be a suitable solution for it, it is time to design the AR implementation strategy. This step is to tailor the strategy based on some business-specific aspects, such as business size, available resources to invest, objectives and desired benefits of the AR application, type of AR application, marketing considerations, target audience, etc.

a. Determine AR application objectives

First, the retailer has to determine what are the desired objectives of the AR application from both customer and corporate perspectives that will ultimately satisfy the needs. Depending on the customer need identified in the previous steps, AR implication can take place in different stages of the shopping journey and in a variety of retail practices (Boletsis & Karahasanovic, 2018). Those practices together with the recognized need will determine objectives AR fulfils from the customer and business perspective, such as improving shopping convenience, information communication, product perception, increasing satisfaction, profits and sales, brand awareness, word of mouth, and generating excitement, decreasing product return rates.

For example, by integrating AR into branding and marketing practices, the main objectives among others can be increased brand salience, word of mouth (WoM), and store patronage intentions. When offering AR for virtual try-on practice the goal could be to increase the smoothness and convenience of the shopping journey, purchase intentions, and overall satisfaction.

b. Select AR system type

Once the objectives have been established, it is time to decide what type of AR system aligns the best with the business model, objectives and practices to achieve. Referring back to the existing AR systems, there are wearable systems such as headsets and helmets; non-wearables such as smartphones, tablets, TVs, PCs, plays, etc; and head-up displays as projection views.

c. Assessment of resources for development

Then, the business has to estimate internally the resource at hand to determine what is the most beneficial course of action for development. In other words, does your business have the resources needed to adopt an in-house development approach or should you outsource?. The main things the company has to consider when making a decision about the development method are the team needed, associated costs, and the future strategic importance of AR for the business. As a rule of thumb, if AR is aimed to be tightly integrated into the business model and has significant strategic importance, retailers should strongly consider in-house development and acquisition of necessary human and intellectual resources, if they are absent in the first place. For the smaller AR applications that do not directly impact core business operations, retailers should consider if there is an existing team with the knowledge needed and time capacity for the development of AR applications. If this is not the case, outsourcing should be considered, taking into account potential expenses of outsourcing vs hiring an in-house development team, as here financial and human resources are the key, however, the talent is costly. For AR applications the carrying cost would also depend on the features and the time it takes to develop, therefore those factors should be also taken into account when evaluating two alternatives.

Another strategic practice that gained popularity and was mentioned during an interview with the Company 2 is a cooperation between big resourceful enterprises with smaller tech-focused companies that have relevant knowledge, ideas, solutions, and entrepreneurial drive to

innovate. If financial resources allow, the acquisition of a smaller tech/AR firm can be considered based on the degree of the strategic weight of AR (Berman & Pollack, 2021).

(4) Development

After forming the AR strategy to follow, it is time to proceed to develop the AR application. By this stage, the business should know what type of AR application will be done, what objectives will have, and whether it will be developed in-house or by outsourcing.

Depending on the iteration of the model, this stage would represent either the development of a Minimum Viable Product (MVP), which is the version of the AR application that will allow the business to demonstrate and evaluate its value to the customers with the least effort invested (Moogk, 2012); or developing any adjustment or improvement that can come up along customer needs, likes and expectations evolve.

In this step, it is key to maintain a customer-centered development and think of ways to make it convenient, easy to use, user-friendly, consistent, and time-efficient. These aspects were identified as the ones customers value the most in their shopping experience by PWC's 2018 report on customer experience. Speed, convenience, and meaningful contribution to the shopping were also disclosed to be of key importance by the customer focus group interviews executed to contribute to this research.

Regardless of the development method decision taken in the previous step, regarding in-house or outsourced development, the tech team should follow agile cooperation in tight connection with the customer and different business units within the organization. If in-house development is the goal, the tech team should be aligned with other units on the matter of objectives and goals of the future technology. Moreover, communication should be conducted with potential scalability in mind, if the following implementation will be successful. This is crucial because if not considered from the initial development stage, it will be challenging, if not impossible, to scale AR applications that are not designed to be scaled. In the study conducted by BCG, 42% of advertisers mentioned their inability to reach the audience at scale as one of the biggest barriers to increasing AR investments (Bona et al., 2018). However, to the belief of Bona et al., (2018), there is already a great amount of AR users, therefore such barriers are perceived, rather than real. The reason for that, as mentioned by Company 4 during the case study

interview, can be a failure to create inner agility and design solutions for scalability together with the IT department.

The same principles apply to AR development through outsourcing. The management team should assure the same agile work with the development team in the third-party company through regular feedback and clear communications about the objectives. This can be harder to achieve due to work culture differences and the inability to directly cooperate with the development team.

(5) Implementation

When the product is ready for release, the business should decide on what launch strategies it wants to adopt. According to Easingwood & Harrington, (2022), there are common steps the launch and re-launch strategy could have: market preparation, targeting, positioning, and execution step. However, they emphasized the need to focus not only on the initial product launch but also on the possible future re-launches as it brings new opportunities for development and improvement.

When it comes to high-tech products, the focus should be on communicating the practical benefits and leveraging their uniqueness, cleverness, and potential uses. More specifically to AR applications, when it comes to market positioning, the business could focus on providing *pre-launch information* and *educating the customer target*. This with the aim to create curiosity and attract early adopters as they will give the application credibility. It would also create awareness and excitement by communicating its usefulness, potential uses, and how it would solve their needs.

As a follow on, the business should proceed to position the AR application, determining how it wants it to be seen. To do so, is suggested by Easingwood & Harrington, (2022) to *emphasise the technological superiority* and how such technology is the most useful and clever implementation to solve the customer need. This triggers the target to build a representation of what the application is, its potential, and why they should use it.

Then the final stage is the execution when the AR application is ready for the market. Since the use of AR technologies is evolving progressively and new ways to implement it are being discovered, the business should focus on conveying the *generic benefits of the technology*, as

well as *establish tactical alliances* with for example influencers or media experts that help catch customers attention. On top of that, the consultancy McKinsey based on previous successful launches suggested the businesses establish a cross-functional launch department to orchestrate activities across team functions.

Implementation activities can differ in the first, second, and subsequent iterations of the suggested AR implementation model. That is because while the first implementation round can imply small MVP or beta testing, the following implementations might be performed on a broader scale involving more users, marketing, and related launch activities. The differences in the iterations will be explained at the end of the model to avoid confusion.

(6) Measure

This section is aimed to focus on testing and measuring the performance of the AR application from a business perspective, this is necessary to assess how well the application is reaching the objectives and the impact it has on the customer experience and revenues. The selection of metrics for this step is arbitrary to each business, as it depends on the type of AR application, the scale of the application, industry type, what information the business values the most, etc. However, some relevant metrics that can help assess the performance are:

a. Percentage of active users in the AR experiences

Active users are the number of customers that have activated and engaged with the AR application. This is a simple still powerful metric that will reflect if the target is getting attracted to the application and found it useful. A way to count it is by keeping track of the number of unique users by day, week, or month. To calculate it, it is needed that the business establishes the criteria that define an active user, determines the period of observation, and finally collects the number of unique visitors that comply with the previously defined criteria.

b. Click-Through Rate (CTR)

This metric is applicable to digital applications, as it represents the ratio of how often users see a specific feature of the AR application and end up clicking it, this is commonly done by advertising or organic search results. This may reflect how helpful and relevant customers find the new functionalities, and it can be calculated by comparing clicks vs impressions: $clicks \div impressions = CTR$

c. Time spent or 'Dwell Time'

Understanding how long each user spends in each functionality of the AR application is key to spotting possible areas of improvement. If the time spent on certain functionality is short, it might reflect the inability to satisfy customer expectations, this can be due to, for instance, lack of user-friendliness, confusion, long loading times, etc. It is great to constantly look at the average session duration (ASD), as it represents the time spent using certain features on average. It can be calculated by the *total duration of all sessions ÷ total number of sessions = ASD*. By tracking this, the business will be enabled to pinpoint which features, products, or categories are seeing the most engagement pre and post AR implementations.

d. Conversion Rates (CR)

This is key to assessing the real impact of AR application in your business, as it represents how AR truly influences purchase decisions among the target customers. One way to track this metric is by comparing the percentage of active users, e.i the one engaging with certain products through AR applications, and the actual purchases of such products. More specifically, *people purchasing a certain product after using the AR application ÷ number of users interacting with the AR application × 100 = CR*.

e. Return Rate

One of the commonly known benefits of AR applications is that customers can try and interact with the product before buying it, reducing the uncertainty and the possible return rates due to dislike or the product not aligning with their expectations. Therefore, a way to actually measure its impact on the business would be by comparing prior and post AR implementation, the percentage of users that returned products after engaging with the AR application. This is relevant to assess the impact of AR in the business and if it has improved or deteriorated the returns rate.

f. Customer Lifetime Value (CLV)

By calculating this metric, the business could get a picture of the overall expected income from a customer during the entire relationship. This provides insights into how customers interact with the business and how effective is the offer. To accurately calculate overall Lifetime value, first is needed to integrate customer records to recreate their journey, sum the revenue gained

in each touchpoint and then scale it over the lifetime of the customer: *Customer value x average customer lifetime = CLV*

On top of that, in this stage of testing and measuring, it is key to maintain a close relationship with customers and collect as much data as possible through, for instance, customer surveys assessing satisfaction, gathering feedback from the AR features to assess performance, usefulness, user-friendliness, possible future developments that could facilitate the shopping journey, etc.

(7) Evaluation

After gathering customer insights and feedback, it is time to evaluate them. Evaluation is a stage to not only assess the success or failure of the AR applications but most importantly to make sense of the data and understand the “why” of the outcome. From this step, the business can use the findings to enhance the way objectives are being achieved, assess the cost-effectiveness of the initiative, and plan a more effective and efficient improvement path that can deliver the most value to the customers.

Next steps

As shown in figure (7), after the evaluation stage, the model proposes proceeding to the validation step again, starting with the second circle and following iterations. The purpose of this pathway is to give the business the opportunity to, once again, validate the plan and next steps founded from the evaluation stage. For instance, in the hypothetical scenario where the business finds that users are spending a short period of time on the application and determined that the best way to improve that metric is by providing, for example, more guidance of how-to-use the application, then by going through the validation step again the business can confirm with customers if the proposed solution would solve the founded issue. The ultimate goal of going through validation and the following stages again is to maintain the customers as the main focus, interacting with them and understanding what their desires and challenges in the shopping journey are. Also, to assess whether the offered AR solution actually addresses those needs. This agile methodology with AR and customer focus would decrease possible costs and time expenditure for features that customers may find to be useless in the shopping journey or even complicate it.

From then, the flow of ideas and improvements should follow the previously explained stages, to implement a constant-improvement culture in the business with continuous engagement with customers. Another difference to consider in the second and following iteration cycles is what the implementation stage should look like depending on the development progress and maturity of the AR application. That is, in some cases, at the beginning of the implementation journey technology has to be implemented on a smaller scale and for a smaller audience, in order to introduce innovation slowly and eliminate most technical and business problems, before the technology reaches the masses. After implementing the MVP or beta version in the first round, the second iteration can include a bigger sample set of users, additional functionality test, or even a full launch, depending on the business type, the complexity of the AR application, and test results from the first iteration.

6. Conclusion

The purpose of this study was to investigate how businesses in the retail industry could implement Augmented Reality (AR) technologies within their B2C operations in the most suitable way to evolve their customer experience. To this end, we investigated acknowledged technology implementation models, customer centricity as key strategic advantage, best practices, and recommendations from key informants, as well as, customer insights regarding awareness and willingness to use AR technologies. To address the question, a circular AR implementation model with customer centricity focus has been provided.

Managerial Implications

The results of our research underpin key recommendations for management in the retail industry. We propose the following stages to be considered when implementing AR technologies in the business, such phases should be comprehended as a continuous pathway to adopt a constant-improvement culture during the process.

1. *Need recognition:* Any business decision should come from the customer, therefore the first step in this model is to understand them, their desires, and the need to better ideate and align the offer, instead of prioritising purely innovation implementations.
2. *Validation:* From an early stage the business should talk to the customer to corroborate that the team accurately understands the customer's needs. Also, to assess what is the

best way to solve it, and most importantly whether AR could potentially be a proper tool to address the need. This is necessary to prevent redundant development expenses, identify monetizable needs and decrease the probability of failure of the project.

3. *AR implementation strategy*: In this step, the business has to build a tailored path to follow during the implementation of AR applications. Some of the aspects that are encouraged to be considered are: determining AR application objectives, selecting AR system type, assessment of resources for development, and place of development, e.i in-house or outsource.
4. *Development*: Here the business can develop the Minimum Viable Product (MVP) to evaluate its value to the customer with the least effort and investment. Further on, it will represent an opportunity to develop any adjustments needed that have been identified from customer feedback and product performance evaluations. The key is to keep customers focused and guarantee convenience, ease of use, user-friendliness, and consistency. Also, regardless of the development place, it is essential that the tech team follows agile cooperation, keeping a tight connection with the customer and different business units within the organisation.
5. *Implementation*: When the product is ready for the market, the business should decide on launch and re-launch tactics to adopt. The common steps the strategy should follow are market preparation, targeting, positioning, and execution. Based on the stage, tactics such as providing pre-launch information, educating the customer target, emphasising technological superiority and communicating genetic benefits can be implemented.
6. *Measure*: Testing and measuring the performance of the AR application from a business perspective is necessary to assess how well the application is reaching the objectives and the impact it has on the customer experience and revenues. Some metrics are: Percentage of active users in the AR experiences, Click-through rate (CTR), Conversion Rates (CR), Time spent or 'Dwell Time', Return Rate, Customer Lifetime Value (CLV), and running customer surveys to gather more specific insights.
7. *Evaluation*: Evaluate the success or failure of the AR applications and make sense of the data by understanding the "why" of the outcome. By doing so, the business can plan

on how to enhance the way objectives are being achieved, assess the cost-effectiveness of the initiative, and ideate more effective improvements that deliver the most value to the customers.

Theoretical contributions

This paper contributes to understanding how businesses, particularly retailers, can implement AR technologies in their B2C interactions while maintaining a customer-centric approach. To do so effectively, the importance of customer-centricity and agile implementation models has been considered. Particularly, this paper contributes to current AR implementation research by suggesting an extension to the model by Berman & Pollack, (2021), by adding a customer centricity focus and agile methodology to enhance customer interaction during the development process. Furthermore, the purpose of our research is to initiate further discussion around customer-centric AR implementation in businesses.

Limitations and further research

This research has been limited by the small-scale amount of interviewed key informants, as a bigger sample group could potentially provide deeper insights into current implementation practices and challenges related to AR technology. Another limitation to this paper is the lack of key informant interviews from a company that has not yet implemented AR technology, as such perspective could provide a better understanding of reasons why they have not implemented AR and what they deem to be challenging.

Future scholars could also confirm this study by testing the provided AR implementation framework in a real-life setting. This with the aim to validate the effectiveness of the model to create the benefits associated with customer centricity and agile methodology. Moreover, the results of this study could be *extended* by exploring the relevance of the suggested model across omnichannel experiences. Additionally, further studies can *review* the applicability of the suggested model for other related immersive technologies, such as VR applications.

Appendix

Appendix 1 – List of Agile Principles

Principle Nr.	Principle
1	Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2	Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3	Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4	Businesspeople and developers must work together daily throughout the project.
5	Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6	The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7	Working software is the primary measure of progress.
8	Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9	Continuous attention to technical excellence and good design enhances agility.
10	Simplicity: the art of maximizing the amount of work not done--is essential.
11	The best architectures, requirements, and designs emerge from self-organizing teams.

12	At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.
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Appendix 2 – Business Semi Interview Questions

Question nr	Opening questions
1	How can AR be implemented in retail?
2	Do you think AR will become big and be widely used?
3	What resources are needed to implement AR?
4	How willing and ready consumers are to use the technology?
5	What biggest mistakes do managers make and what challenges do they face during technological implementations?
6	How do you think retail shopping will look in the future?
7	What are your thoughts about the future of AR vs VR?
8	What capabilities have to be considered when implementing technologies such as AR?
9	What companies are most interested in such technology?
10	How do companies know if they need to invest in AR technologies?
11	Do you think AR is applicable to big companies or more entrepreneurial new innovative?
12	Where the retail is right now in this space? What are current capabilities?
13	How well retailers do their research before implementing AR?

Appendix 3 – Focus Group Questions

Question nr.	Opening Questions
1	Have you ever heard of Extended reality?
2	Have you ever heard of Augment reality?
3	Have you ever heard of virtual reality?
4	Have you ever seen/used AR technology?
5	If yes, describe the type of AR technology you have used and the setting you used it in.
6	How willing are you to these AR/VR when shopping?
7	How willing are you to pay extra for a T-Shirt that you have designed yourself via AR?
8	I believe my shopping experience would be improved by the usage of AR technologies

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