

Augmented Reality Signalling in Fashion Retail:

An experimental study on AR's impact on brand equity

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**AUGMENTED REALITY SIGNALLING IN FASHION RETAIL:
AN EXPERIMENTAL STUDY ON AR'S IMPACT ON BRAND EQUITY**

ABSTRACT

Augmented reality (AR) has attracted considerable attention across the fashion industry. AR's burgeoning prominence and implications for the consumers' shopping journey, has contributed to a considerable body of research. Nevertheless, AR's potential to strengthen fashion retail brands is insufficiently researched. Furthermore, AR's distinct types of applications – magic mirrors within stores, and virtual fitting rooms across online channels – have only been studied separately. This study utilises a novel approach in inquiring the effect of various AR types on brand equity through the signalling perspective. Scholars discussed the interrelatedness of brand equity and signalling theory, however the avenue for further applying this link to AR, offers insights on how brand attachment can be attained, and user-brand interactions be elevated. The unifactorial experimental design adopted, allowed studying people perceptions of fashion brands, following their exposure to different levels of AR signals. This research also aims to shed light on the mediation role of customer-brand engagement on AR signalling and brand equity. Further, the moderating roles of shopping orientation and personal innovativeness are explored. Taken together this study addresses the following research question: How does the signalling of fashion retailers' extensiveness of AR use, impact brand equity, and what are the roles of customer-brand engagement, personal innovativeness and shopping orientation?

To answer this question, 218 valid responses were obtained through experimental survey, where four distinct scenarios were developed, detailing levels of AR adoption signals on the fashion retailer American Vintage' website. It was demonstrated that the mere signal of retailers' AR adoption may not contribute to either brand equity or customer-brand engagement. Regardless of the significant interaction between customer-brand engagement and brand equity attained, AR signals lacked association with these constructs. Secondary analysis revealed that non-location AR signalling approached significance with brand equity – a notion valuable exploring in future research. Additionally, shopping orientation exhibited no moderating role on the direct effect, which pertains to signals' inability to transmit AR's value. Finally, evidence for personal innovativeness as moderator on AR signalling and customer engagement was not attained, yet the findings pointed to a potential direct effect between personal innovativeness and brand engagement, which future research could examine. The paper concludes with managerial implications and limitations of the approach taken.

KEYWORDS: *augmented reality, brand equity, shopping orientation, personal innovativeness, customer-brand engagement.*

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1. Introduction

'...commodities are fungible, goods tangible, services intangible, and experiences memorable...'

- Joseph Pine and James Gilmore (1998, para 6)

Today's widely technological world has prompted the emergence of deeply personalised and transformative interactions with brands (Joseph Pine & Gilmore, 1998, para 9). Indeed, the nature of goods being mostly universal and standardised has initiated a response from brands to be in a lookout for customising their services and providing inherently tailored experiences. The increasing importance of customer experiences is more apparent than ever before, due to the multitude of touchpoints users have with companies. In fact, the customer journey has overseen further complexification as marketers utilise both conventional and the substantially growing new media channels to distribute their messages and accomplish their objectives (Batra & Keller, 2016, p.122). This multichannel presence coupled with the adoption of novel technologies is expected to lay the foundation for a more elevated customer-centred experience led by seamless interaction and immersion (Hoyer et al., 2020, p.58). This pursuit is particularly noticeable in one of the fastest growing industries globally - fashion retail.

The fashion industry has overseen a great amount of technological adoption, coming in particular from the implementation of Augmented Reality, hereinafter AR. AR concerns an interactive experience, enabling the modification of reality through the overlay of virtual enhancements, which is manifested through virtual apparel try-ons (Song et al., 2020, p.1215). AR's novelty has the potential to redefine customer journeys in the fashion industry, as it enables for merchandise interactions in various contexts (Hoyer et al., 2020, p.57).

There exist a plethora of articles detailing the incorporation of AR, its opportunities, implications and its beneficial aspects concerning the shopping journey, from a consumer's point of view (Chen. et al., 2022, p.500-503; Dacko, 2017, p.254; Poushneh & Vasquez-Parraga, 2017, p.232; Watson et al., 2020, p.444). Nevertheless, the scholarly work capturing the retailer's perspective or literature revolving around AR's brand-related outcomes has not yet received considerable attention (Haumer et al., 2020, p.369; Prasad et al., 2022, p.15). Furthermore, little is known about how the use of AR affects people's perceptions of the company employing it (Rauschnabel et al., 2019, p.44). More particularly, the relationship

between AR and brand equity is scarcely researched (Haumer et al., 2020, p.369). This study will therefore investigate the effect of AR use on brand equity.

From a brand perspective, AR emerges as a compelling avenue for strengthening brand attachment and elevating user-brand interactions (Rejeb et al., 2023, p.730). In fact, Plotkina et al. (2021, 784) assert that the mere presence of AR into a brand's toolkit signifies the brand's commitment to enhancing the customer experience, consequently shaping consumers' perceptions and attitudes. This signifies the essence of employing signalling theory as a building base for this thesis. Signalling theory suggests that the use of AR may have a positive impact on perceived company commitment to providing an enhanced customer experience. This corresponds to increased levels of brand equity, due to the additional value that AR creates. Companies in the fashion retail segment fight fiercely for increased brand equity, as it allows them to attain a sustained competitive advantage (Kumar et al., 2018, p. 117, 123; Wu & Dong, 2022, p.220).

When reviewing the existing literature in the field, a notable pattern emerged across scholars' approach in studying AR. The scholarly work drew their attention on investigating the benefits of AR adoption for either the online (Haumer et al., 2020, p.369; Ivanov et al., 2022, p.1918) or the offline retailing context (Bèzes, 2019, p.98; Ogunjimi et al., 2021, p.2) individually. While extant research has investigated how each type of AR influences consumers and organisations, Javornik (2016, p. 258-259) highlights that further research is needed on the interplay between the two types and their effects towards the brand. Apart from Plotkina et al., (2021., p.782) who have extensively focused on studying the two types of AR applications - location and non-location based, no other paper was found to investigate multiple types of AR adoption at once. The existing notion of exploring AR from a singular perspective, rather than as an all-encompassing construct has informed the aim of this paper - to investigate the extensiveness of AR use and its effect on the brands, signalling its adoption. Hence, it is pertinent to investigate the extent to which the retailer's signalling of different varieties of AR applications would affect their brand equity. Further, this study also aimed to address the existing literature gap concerning the insufficiency of knowledge of AR's effect on brand-related outcomes (Plotkina et al., 2021, p. 782). As such, the paper set out to investigate how the signalling of AR's various forms of applications affects brand equity (Wu & Dong, 2022).

This study also investigates personal innovativeness, shopping orientation, and customer-brand engagement as factors influencing this relationship. A retailer's enhanced degree of AR adoption correlates with higher customer-brand engagement, where this

increases brand equity (Kim et al., 2021, p.461). Personal innovativeness, reflecting a consumer's willingness to embrace new technologies, can hinder acceptance of AR solutions offered by brands (Bonetti et al., 2018, p.127; Rejeb et al., 2023, p.735). The reason behind this stand in the notion that technologically educated consumers are more likely to form positive attitudes towards an innovation-driven company, leading to their increased interactions with it (Plotkina et al., 2021, p.791). This paper further posed that shopping orientation is also relevant, as AR's immersive and interactive properties can contribute to both hedonic and utilitarian value (Rauschnabel et al., 2019, p.45; Kumar et al., 2023, p.118). As such depending on one's shopping intents and orientations, the signalling of AR adoption would prompt the formation of distinct expectations across users and their perceived value of AR and the company itself (Plotkina et al., 2021, p.791). More precisely, individuals with hedonic motivations would exhibit favourable attitude towards brands' AR innovation initiatives, as of their lookout for pleasurable brand interactions (Plotkina et al., 2021, p.791; Mimoun et al., 2022, p.8). The same should be true for those that have a utilitarian shopping orientation, as of their perceived value of AR contributing to an informative and functional shopping experience.

As the impact of AR on brand equity in fashion retail remains understudied, this hinders retailers' willingness to invest in this technology (Plotkina et al., 2021, p.782; Wu & Dong, 2022, p.220). This paper, therefore, aims to address the limited understanding of how the use of AR may be valuable at a corporate level, considering individuals' customer characteristics. This study addresses the following research question:

How does the signalling of fashion retailers' extensiveness of AR use, impact brand equity, and what are the roles of customer-brand engagement, personal innovativeness and shopping orientation?

1.1. Theoretical and practical relevance

This study's scientific relevance stands in its particular focus towards utilising the Signalling Theory. Given the limited body of research examining AR's impact on brand equity (Dropulic et al., 2022, p.287; Haumer et al., 2020, p.380), the signalling perspective was never applied in this context before. As such, this paper aims to extend the existing knowledge and address this apparent research gap by also stimulating new avenues for academic discussion, by adding on a differentiated and never explored perspective through signalling.

Moreover, this paper aims to further aid the academic literature by comparing different levels of AR adoption, unlike the plethora of past literature (Ivanov et al., 2022, p.1918; Ogunjimi et al., 2021, p.2), while also investigating whether the signalling of AR's omnichannel integration hold positive brand related outcomes for fashion retailers.

Apart from its theoretical relevance, this thesis also holds value in terms of practical dimensions. The findings of this paper are intended to assist practitioners within the retail sector and more specifically the fashion retail industry, by enabling for thorough comprehension of how consumers respond to different types of AR signalling coming from retailers. This study draws particular attention on individuals' behavioural outcomes and their impact towards a company striving to innovate its services through AR, which is of crucial importance for retailers of today. Thus, this study will aid practitioners in their pursuit to build stronger brands, by providing them with the necessary knowledge and awareness of their target audiences' needs. Such guidance is valuable for retailers, as it would not only enable them to better engage with their consumers, but also to better formulate their strategic branding ventures. As such, insights on how extensively AR can best be used for corporate reputation purposes and for which customer groups, are deemed as the main implications that the findings of this study are expected to convey.

1.2. Chapter outline

This thesis is structured into five distinct chapters, each intended to comprehensively detail the rationale and steps taken, behind addressing the research question set out. Chapter two lays out the theoretical foundation by thoroughly examining the existing knowledge on the topic of interest, along with introducing the research constructs and hypotheses. Chapter three concerns the study's methodological corpus, where justifications are presented regarding the choice of methods and research design deployed. The fourth chapter provides a description of the collected data, along with the results obtained from the statistical analysis, determining whether the hypotheses were sustained. The fifth and final chapter facilitates a critical discussion of this thesis' main research findings and elaborates on their importance, while positioning them across already attained academic knowledge. Subsequently, the section details the theoretical and practical implications, followed by the study's limitations and suggestions for future research. Finally, the research question is answered.

2. Theoretical Framework

2.1. Augmented Reality

AR is a technology that enables the modification of the user's physical surroundings through superimposing virtual elements like images, graphics, audio, and videos (Flavian et al., 2019, p.549). This blending of the physical and digital worlds, termed 'phygitalisation,' is achieved by displaying virtual elements on external devices such as screens or head-mounted displays (Bèzes, 2019, p.92).

AR adoption is prevalent across a range of industries, spanning from video games and interior design to beauty, self-care, and notably, fashion retail (Chen et al., 2022 p. 498). Its versatility stems from the tool's capacity to immerse users in an extended reality, which stimulates their interest to explore a given product on a new sensory level, by trying it on their 'physical' selves (Chen et al., 2022 p. 498). Notably in retail, this technology opens up opportunities for enhancing the shopping experience through intuitive product assessments and improved visualisation techniques (Caboni & Hagberg, 2019, p.1133). Not only that, but AR interfaces presenting a given product in a functional, yet engaging manner, is considered of significant business value, as it can be further used as a point of differentiation (Porter & Heppelmann, 2017, p. 54).

For the scope of this study, the attention will be specifically directed towards AR applications within the fashion retail industry. This choice is motivated by the transformative role AR has played in reshaping the traditional shopping experience (Ylilehto et al., 2021, p.663) and its projected growth in the industry (Global Data, 2021, p.5). Retailers are increasingly turning to AR and VR to enhance customer value and sustain their engagement amidst the ongoing digital disruptions. Notably, those tools are expected to boost the global retail GDP to \$204 billion by 2030, with AR being the main economic contributor (PwC, 2019, p.6, 13).

2.1.1. Augmented reality in Fashion retail

AR as a tool is gaining significant traction in the fashion industry with its three distinct applications currently being in use, namely, online web based, in-store and mobile apps (Caboni & Hagberg, 2019, p.1130). Similarly to the approach taken by Plotkina et al. (2021, p. 785), this paper will distinguish those three main applications of AR into two broad categories, based on the location where the augmented experience occurs. As such, AR applications encompassing experiences happening virtually or online through either a mobile or a computer device would be regarded under the category of *non-location-based AR*

applications. Whereas all augmented experiences occurring within the physical surroundings of a brick-and-mortar store will be referred to as *location-based AR applications*.

In the realm of online shopping, retailers often utilise AR either on their websites or throughout their mobile applications. Both of these AR applications exhibit somewhat similar characteristics - allowing customers to have an immersive shopping experience with the possibility to try on clothes from the comfort of their homes (Caboni & Hagberg, 2019, p.1131, 1132). This is made possible by a computer camera for web AR applications, or through a handheld device's live camera for mobile applications, which capture customers' bodily movements and features, overlaying clothing accordingly (Caboni & Hagberg, 2019, p.1130,1132; Sekhavat, 2017, p.1041). To put this into perspective, for non-location-based AR applications, the screen therefore plays a role of an AR mirror which clearly displays the selected visual cues by the user and immediately highlights how particular merchandise fits onto one's body (Caboni & Hagberg, 2019, p.1131). The technology not only permits for the better visualisation of one's appearances, but also conveys a real fitting room experience, induced by an improved and visually centred approach for assessment of apparel.

In contrast, the location-based AR applications concern the utilisation of smart mirrors across the physical retail spaces. This application, often referred to as a 'virtual fitting room' or 'smart mirror fashion technology' (SMFT) is a self-service machine, capturing shoppers' bodies and enabling a digital try on of clothes (Ogunjimi et al., 2021, p.2). This machine, functioning as a two-way mirror with a wide electronic display and sensors behind it, enables shoppers to stand in front of it and choose from a variety of items to try on in live time. The visualisation is then represented in a 360 degree, allowing for an accurate assessment of how particular outfits would look on one's body from a variety of angles (Ogunjimi et al., 2021, p. 3). SMFT application is considered of particular interest for some fashion retailers as it fosters a more engaging and convenient shopping experience (Wang et al., 2023, p.3). Eliminating the step of physically trying on clothes, while also providing an immediate access to given product's features and availability, reduces long queuing times and plays a role in bettering the in-store experience (Wang et al., 2023, p.2; Ogunjimi et al., 2021, p. 3).

2.2. Customer-brand engagement

The concept of customer-brand engagement is intricate and diverse, with numerous interpretations offered by scholars (Lourenço et al., 2022, p.1). While some definitions view it as either uni- or bi-dimensional, the prevailing conceptualisation embraces a multi-

dimensional approach, encompassing cognitive (thoughts), affective (emotional), and behavioural (activation) aspects (Rasool et al., 2020, p.96). This paper, thus adopts one of the most common and comprehensive definitions of the term, as proposed by Hollebeek et al. (2014, p. 154) - “A consumer's positively valanced brand-related cognitive, emotional and behavioural activity during or related to focal consumer/brand interactions”. It should be noted that customer-brand engagement concerns both current and prospective clients’ degree of interactions and connections with a brand without necessarily encompassing one’s immediate intent to purchase from it (Vivek et al., 2014, p.401). As such engagement depicts a psychological and emotional state reached after various encounters with a brand and its offerings (Riley, 2020, p.347). Customer-brand engagement is intrinsically personal and includes one’s feelings and behaviours towards the brand, together with their level of connectedness with it (Brodie et al., 2011, p.260; Vivek et al., 2014, p.406).

The common narrative of more and more businesses to elevate their touchpoints with consumers through utilising technological advancements within their operations and services, has drawn scholars' attention to better understand customers’ engagement with brands (Rasool et al., 2020, p.96; Rather et al., 2018, p.323). To put this into perspective, Kim et al (2021, p.454) highlighted that the reliance on advanced technology within the service context minimises the psychological gap for customers, thereby amplifying their immersion in the experience. Specifically, in the context of AR application within the retail segment, there has been a noticeable shift from consumers being passive observers to actively engaged participants. This shift is attributed to AR's capacity to actively involve consumers in the shopping process, by immersing them in visually captivating experiences where they can first handedly interact with 3D products (McLean & Wilson, 2019, p. 221).

2.3. Brand equity

In general terms brand equity concerns the associated added value a particular brand brings to a product/service (Erdem & Swait, 2001, p.132). However, its multifaceted nature allows for it to be viewed either through economic - financial value of the brand (Simon & Sullivan, 1993, p. 29), or behavioural lenses - perceptual value of the brand (Aaker, 1996, p.105). This paper, however, will only focus on the latter, which encapsulates the intangible value and strength of a brand from a consumers’ standpoint (Yoo, & Donthu, 2001, p.1). Brand equity is rooted in “the differential effect of brand knowledge on consumer response to the marketing of the brand” (Keller, 1993, p.8). In other words, knowledge is the foundation of brand equity, which allows for the formation of positive behavioural attitudes.

Aaker (1996, p.103) postulated that brand equity is created through its four dimensions - brand awareness, brand associations, brand loyalty and perceived quality, where higher levels in each dimension elevate one's preference for a brand, regardless of available alternatives. *Brand awareness* signifies one's capacity to recognise and recall a brand (Keller, 1993, p.3). *Brand associations* provide meaning to a given brand, as it concerns one's associations regarding its identity and promises (Gill & Dawra, 2010, p.193). *Brand loyalty* revolves around consumers' commitment to a given brand either on a behavioural (repeated purchasing patterns) or attitudinal basis (Gill & Dawra, 2010, p.192). *Perceived quality*, reflects the extent to which a given product/service meets the expectations set in consumers' minds, rather than simply encompassing the mere performance of the brand's offerings (Aaker, 1996, p.109; Gill & Dawra, 2010, p.193).

Brands operating under the category retail are defined as the strongest and most valuable brands globally (Anselmsson et al., 2017, p.194). With such a distinct position in the market comes significant rivalry. In such a competitive landscape, having a strong brand equity is crucial for a firm's success and differentiation among competitors (Moliner-Velázquez et al., 2019, p.658). This is because a strong brand equity ultimately enhances the company's performance, as the increased recognition allows for setting premium prices, contributing to its sustained success (Kumar et al., 2018, p.112). Furthermore, a well-recognised brand is better positioned to respond to competition and set higher barriers of entry (Moliner-Velázquez et al., 2019, p.658)

2.4. Shopping orientation

To capture shoppers' attention and meet their needs effectively, retailers have long relied on market segmentation. This practice involves dividing a market into distinct groups of customers who exhibit similar behaviours or characteristics, making it a valuable tool for addressing unique preferences (Park & Sullivan, 2009, p.183). In the fashion industry, customers are categorised, not only based on sociodemographic factors, but also on behavioural and psychographic characteristics (Foedermayr & Diamantopoulos, 2008, p.249; Scarpi, 2020, p.150). Therefore, shopping orientation is often considered an informative criterion for market segmentation. Shopping orientation concerns the preferred activities and approaches an individual exhibits while shopping. More often than not, these habits and motivations are widely aligned with one's personal, economic and social views (Visser & Du, 2001, p.72).

The literature makes a clear distinction between two shopping orientations - utilitarian and hedonic. Utilitarianism signifies a pragmatic and practical approach to shopping. In other words, utilitarian shoppers are task-oriented and view shopping as a chore, rather than as a pleasurable activity. They prioritise convenience and efficiency, while achieving their goals with minimum friction (Scarpi, 2020, p. 3). On the contrary, hedonism denotes an 'experiential' shopping where playfulness, pleasure, curiosity and escapism are at the forefront. As such, 'recreational shoppers' exhibit positive attitudes towards shopping and approach the purchasing context from a ludic-hedonic type in an effort to satisfy their emotional needs (Park & Sullivan, 2009, p.184; Scarpi, 2020, p. 150).

2.5. Personal innovativeness

Consumers vary not only in their shopping behaviours and preferences but also in their individual levels of personal innovativeness. Agarwal & Prasad (1998, p.206) define personal innovativeness as the predisposition to adopt new ideas, practices, and products, reflecting individuals' readiness to embrace innovation ahead of others and their openness to change and experiment with new things (Lu, 2014, p.140). It is essential to recognise that there are two dimensions of personal innovativeness - *global* innovativeness and *domain specific* innovativeness. Global innovativeness pertains to an individual's overall readiness for change, distinguishing between innovators and those who merely adapt to any change. Conversely, domain-specific innovativeness, as its name suggests, posits one's behaviours within a specific, narrowly defined context (Agarwal & Prasad, 1998, p.206).

Given the particular focus of this study on technological innovation, the adoption of the domain-specific approach was considered appropriate. Thus, in this thesis, personal innovativeness in the domain of information technology is defined as the innate individual's tendency to embrace various types of AR technology during their apparel shopping experiences.

2.6. Signalling theory

In an effort to address how the extensiveness of AR inclusion would impact fashion retailers' brand equity, insights from signalling theory would be employed for contextualising the study's findings. Signalling theory, which revolves around mitigating information asymmetry between sender and receiver, becomes pivotal when consumers struggle to assess a company's qualities (Connelly et al., 2011, p.40). This accentuates the reliance on marketing mix elements (e.g. advertisements, packaging) which serve as signals, bridging the

information gap and enhancing attitude formation. Clear and credible signals not only reduce information asymmetry, but also lower information-gathering and processing costs, elevating consumer expected utility. This increase is intricately tied to the added value associated with a brand, constituting brand equity (Erdem & Swait, 2001, p.152-154).

This study delves into the impact of AR inclusion on brand equity, employing signalling theory to explore how brand-provided information shapes equity. A company signalling its adoption of AR serves as an indicator, reflecting both its competitiveness and commitment to enhancing the customer experience (Plotkina et al., 2021, p.786). Therefore, the use of AR is expected to signal customers about a certain quality of the company.

2.7. Hypothesis development and conceptual model

Innovation is imperative for the creation and sustenance of a strong brand. Indeed, a considerable body of literature points to the existence of a positive connection between a company's innovativeness and its brand equity (Marín-García et al., 2020, p.603; Nedergaard & Gyrð-Jones, 2013, p.763). Particularly, in the retail context Dropulic et al. (2022, p.287), established that the most significant impact on store brand equity can be observed, by the adoption of technical innovation and more specifically, service innovations like AR. The linkage between those two constructs was further highlighted by Urdea and Constantin (2021, p.7-10) and Haumer et al. (2020, p.380) who emphasised that integrating novel technologies including AR enhances brand equity in experiential marketing. They detailed that the reason for that stands in the increased customer value the technology contributes to, which widely resonates with one's emotional state.

Further evidence on the relationship between AR and brand equity was found in other scholarly works, which approached the topic in a rather broader, retail-based context. For example, in their study, Wu & Dong (2021, p.221, 223) regarded retail brand equity as a unidimensional concept and investigated its relationship with a set of AR's interactive properties. They found a positive effect of these AR's attributes on retailer brand equity through brand associations. In contrast, Prasad et al. (2022, p.8, 15) conceptualised brand equity as a multidimensional construct and discussed how each of its dimensions are positively impacted by AR's immersive and interactive properties.

As the relationship of how AR's various forms of applications affect brand equity is insufficiently researched within the fashion retail sector, insights from other industries were also employed. Several scholars have found evidence for the positive relationship between these two constructs across different industries, such as tourism (Bae et al., 2020, p.13),

hospitality (Šeric et al., 2016, p.17; Ruan et al., 2020, p.924) and banking (Butt et al., 2024, p.173). Hence, based on the current knowledge and the fact that brand equity is an outcome of the company's service quality, both online and offline (White et al., 2013, p.269), as well as a consequence of the company's digital service innovation (Kim et al., 2021, p.461), it can therefore be inferred that fashion retail brands that strive to improve their service quality through technological advancements, in both physical and online settings are likely to achieve higher levels of brand equity. Drawing on signalling theory, a greater variety of AR applications a firm employ, would suggest its higher commitment to enhance customer experience. Therefore, AR adoption would signal the company's technological sophistication while also showcasing the added value associated with a brand ultimately leading to brand equity. Hence, it is hypothesised that:

H1: The extensiveness of a fashion retailer's AR use has a positive impact on brand equity.

The scholarly literature has found not only that there is a direct positive effect of a retailer's AR adoption on its brand equity, but also indicated the existence of an indirect such effect. Kim et al. (2021, p.460-462) have demonstrated that integrating AR in service innovation, positively impacts brand equity, through enhanced customer engagement. According to McLean & Wilson (2019, p.219) and Diaa (2022, p.372), this effect is attributed to the interconnectedness of AR's attributes - vividness, interactivity and novelty - and their influence on one's predisposition to engage with a brand. While these studies consider such attributes as crucial, the literature is unanimous that retailers' service innovativeness and more specifically the mere presence of AR, directly contributes to customer-brand engagement (Abrar, 2018, p.74; Omar et al., 2021, p.371; Song et al., 2020, p.1216). Singh & Joshi (2024, p.508) further supported the relationship between AR and customer-brand engagement, by emphasising that AR's ability to transcend physical boundaries significantly influences consumers' willingness to engage with brands offering such services. When it comes to the location and non-location-based AR application, Wang et al. (2023, p.8) further suggested that both forms of AR contribute to novel forms of customer-brand engagement.

Contrastingly, the relationship between customer-brand engagement and brand equity is well-established, with empirical evidence indicating a positive interaction between the two constructs. The literature consistently attributes that customer-brand engagement is an antecedent of brand equity (Hepola, 2017, p. 288; Kim et al., 2021, p.461). Therefore,

considering that customer-brand engagement is a mechanism to brand equity, a firm's greater effort in innovating its operations through diverse AR applications, would contribute to heightened brand equity, due to positive customer-brand engagement with the focal brand. This resulted in the following hypothesis:

H2: The relationship between extensiveness of AR use and brand equity is mediated by customer-brand engagement.

With fashion retailers increasingly incorporating AR in an effort to both innovate their operations and further enhance the customer journey experience (Romano et al., 2022, p.1221), it is crucial to understand how a person's inherent propensity for technology can influence their engagement with a focal brand.

While the moderating role of personal innovativeness on the relationship between extensiveness of AR use and customer-brand engagement has not been previously investigated in the fashion retail segment, insights from other industries exist.

A study in the omnichannel banking setting utilised personal innovativeness as a moderator on the relationship between omnichannel quality and customer-brand engagement. The study found that one's personal innovativeness contributes to a significant difference in people's degree of engagement (Tran Xuan et al., 2023, p. 686-687). As such, people classified as highly innovative would be more willing to accept new technology but would exhibit lower engagement levels compared to those with low innovativeness. The reason for that is strictly based on their higher expectations of a seamless experience across omnichannel integrations and their overall expected quality (Tran Xuan et al., 2023, p.684-685). These findings may be specific to the banking industry, as when looking at the fashion retail industry, previous literature stipulates that consumers' willingness to engage with a brand with an attractive personality to which they can relate to, increases. As such, the technological aspect here plays an important role, as one's positive attitude towards shopping technology impacts both their perceptions and engagement intentions with the focal brand (Plotkina et al., 2021, p.785-786). Romano et al. (2022, p.1231) and Dogra et al. (2023, p.2076-2077) further attested to that, by highlighting that personal innovativeness emerges as a crucial aspect in discarding or accepting novel technologies such as AR, thereby contributing to one's brand's intentions.

Hence, this paper hypothesises that consumers' inclination to engage with a brand incorporating AR applications is expected to depend on their personal innovativeness. A

company enhancing its services with a greater variety of AR applications will attract more customer-brand engagement, particularly among individuals exhibiting higher personal innovativeness. This is because technologically versed customers perceive innovative companies as more appealing leading to increased interaction with them (Plotkina et al., 2021, p.791; Rejeb et al., 2023, p.735). Conversely, individuals with lower innovativeness levels would be more reluctant to both technology acceptance and engagement with the company (Bonetti et al., 2018, p.127). Hence the following is hypothesised:

H3: The relationship between extensiveness of AR use and customer-brand engagement is positively moderated by personal innovativeness.

Shopping orientation may play a role in the relationship between intensity of AR use and brand equity. The indication of a company's AR adoption showcases its effort in improving customer experiences through reinforcing more pleasurable brand interactions (Kim et al., 2021, p.460). In fact, Ivanov et al. (2022, p.1928) confirmed that the reason behind this, stands in the immersiveness the technology contributes to, during the digital try on experience, which stands as a powerhouse in enhancing one's decision comfort. Indeed, scholars have found that the properties of AR can provide consumers with both hedonic, as well as utilitarian value (Rauschnabel et al., 2019, p.45; Kumar et al., 2023, p.118; Scarpi, 2020, p.158;).

In the literature, AR has often been described as providing predominantly hedonic value. Indeed, Javornik (2016, p.260) proposed that interactions with AR, and more specifically those among first time users, are more hedonic in their nature than utilitarian. They pointed out that this occurs based on the creation of a sense of enjoyment in users, by bringing a degree of entertainment value, based on its incorporation of different shapes, colours, and styles (Poushneh & Vasquez-Parraga, 2017, p.233). This is echoed by Scarpi (2020, p.163) and Lee et al. (2020, p.57) who underscore that AR generates a higher hedonic stimulation, by providing shoppers with realistic and immersive digital experiences.

In terms of utilitarian value, the personalised nature of AR, which provides customers with extensive information about a given product and allows them to experiment with it in various contexts (i.e try it on, observe it from different angles), has been shown to be a valuable addition in their practically driven approach to shopping (Pantano et al., 2017, p.91-92). This was also confirmed by the findings of Lee et al. (2020, p.58), who indicated that in the online shopping context, the realistic atmospherics that AR creates, through blending

users' physical surroundings with virtual elements, provide utilitarian value, as of the creation of a para-authentic and informative product experience. Hence, the incorporation of AR within the fashion e-commerce allows for alleviating information asymmetry associated with the inability to physically access the merchandise.

While the utilisation of AR has been shown to provide both affective and cognitive benefits, Plotkina et al. (2021, p.791) suggest that the mere indication of AR adoption, creates certain expectations in users about what value they can derive from AR. Therefore, customers may form expectations about what hedonic and utilitarian value they will be provided with, based on their individual shopping orientation. As such, customers with higher levels of hedonic orientation, are expected to gain higher perceived value from the signalling of AR adoption. The same should be true for those that have a utilitarian shopping orientation. Furthermore, Moliner-Velázquez et al., (2019, p.669-670) suggests that one should examine the moderating role of shopping orientation in the relationship between innovation and brand equity, as by creating hedonic and utilitarian value through AR, retailers can improve the customer experience, hence the way they are perceived. As such, the following is hypothesised:

H4a: The relation between the extensiveness of a company's AR use and brand equity is moderated by customers' hedonic shopping orientation, such that the positive effect will be stronger for consumers with high hedonic shopping orientation than for consumers with low hedonic shopping orientation.

H4b: The relation between the extensiveness of a company's AR use and brand equity is moderated by customers' utilitarian shopping orientation, such that the positive effect will be stronger for consumers with high utilitarian shopping orientation than for consumers with low utilitarian shopping orientation.

An overview of the hypothesised relationship between all variables can be found in the conceptual model below (Figure 2.1)

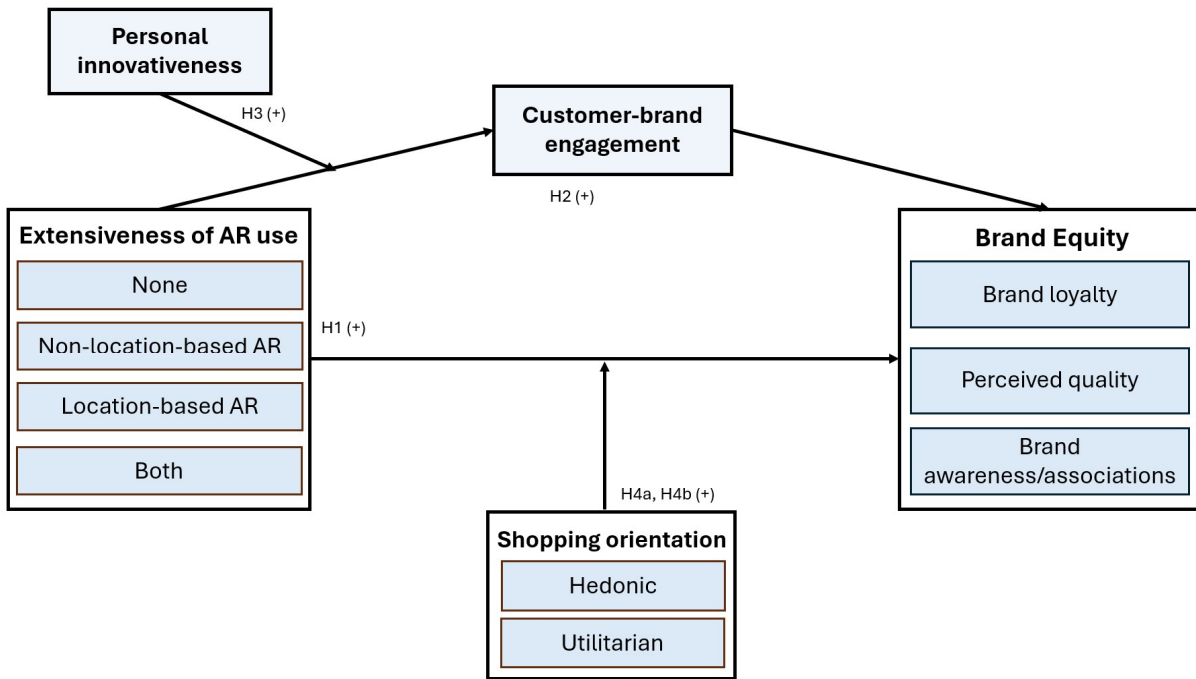


Figure 2.7. *Visual representation of the conceptual model*

3. Method

3.1. Research design

In addressing the research question, a quantitative method was chosen, because of its ability to quantify individuals' opinions and attitudes towards a social issue (Watson, 2015, p.44). This exploratory study focused on the collection of original data and systematically analysed it through the utilisation of statistical tools (Watson, 2015, p.44). Given the aim of this thesis to contribute to extending the academic knowledge by testing the causal relationship between retailers' signalling of AR adoption intensity and brand equity, an experimental design was deemed most suitable (Neuman, 2014, p.282). It is imperative to recognise that while generalisability might not be the foremost consideration during experimentation, the resultant findings are valuable in the sense that they evaluate a theory and provide empirical evidence in its support (Neuman, 2014, p. 287)

The study deployed a unifactorial design in which each respondent was randomly exposed to one out of four levels of AR use. The first and lowest level of AR use allowed for the utilisation of a control group that served as a baseline for comparison (See Table 3.1). Consequently, that allowed the effect of AR use extensiveness to be studied across two levels – *middle level* of AR adoption, which included either location or non-location AR adoption, and *high level* of AR adoption, which signified the combined adoption of both location and non-location AR.

Table 3.1

Overview of experimental conditions (N = 218)

Location based AR	Non-location-based AR	
	Excluded	Included
Excluded	<i>Scenario 1 (n = 65)</i> Control group	<i>Scenario 2 (n = 52)</i> Online AR
Included	<i>Scenario 3 (n = 55)</i> In-store AR	<i>Scenario 4 (n = 46)</i> Online AR and In-store AR

3.2. Sampling and data collection

3.2.1. Respondents profile and requirements

This study was interested in gathering individuals' opinions and attitudes towards a given company's efforts in improving their shopping journeys through signalling of various forms of AR. To retrieve rich and diverse data, the population of interest consisted of

participants of varying backgrounds, towards the topic of interest. Therefore, the only inclusion criterion was that respondents needed to be above eighteen years of age. Respondents were not expected to possess any prior knowledge of AR, nor recognise the tool's applicability in the fashion sector. Rather the survey was set in such a manner to isolate any effect that AR may have towards their overall perceptions.

3.2.2. Sampling design

To form a sample, respondents were gathered through a combination of convenience and snowball non-probability sampling techniques. Those sampling methods are amongst the most accessible in the academia setting, as of their prompt and high response acquiring rate (Babbie, 2018, p.186). Regardless of its popularity, non-probability sampling methods are associated with lack of control over the sample representativeness, which further implicates the results' generalisability to the wide population. While quantitative research commonly relies on probability sampling for their ability to generate broadly applicable findings, the current study lacked a comprehensive sample frame (Babbie, 2018, p.190, 201). Hence, the researcher's main recruitment tactics were based on utilisation of online channels and extended personal networks in spreading awareness regarding the survey. Initially, multiple posts detailing the study's purpose and requirements were created on fashion shopping and survey exchange groups and forums across social media platforms like LinkedIn, Facebook, and Reddit. Additionally, the researcher utilised external crowdsourcing platforms such as Survey Circle, Survey Swap, and Poll Pool to enhance the promotion of the experimental survey. This facilitated the outreach to diverse groups with different backgrounds and locations. Finally, snowball sampling was also actively used as respondents were asked to invite acquaintances, they consider interested in participating.

3.3. Materials

3.3.1. Measures and operationalisation

To measure all theoretical concepts and test the four hypotheses that this thesis set, an online survey with existing and verified scales was utilised. The independent variable being extensiveness of AR use was measured across the two experimental conditions, which are further discussed below. All other main and control variables were measured on a seven-point Likert scale (1=strongly disagree to 7=strongly agree), unless indicated otherwise. All measurement scales and their items can be found in Appendix A.

The dependent variable brand equity was measured using Yoo & Donthu (2001, p.14) multidimensional brand equity scale, consisting of ten items regarding the dimensions of brand equity - brand loyalty, brand awareness/association and perceived quality. The final scale was adapted for precision by adding the brand name of the retailer American Vintage. As such the final scale included items like: 'I will not buy other brands if American Vintage is available in the store', where a higher score indicates a higher degree of brand equity.

The mediator customer-brand engagement was measured using Rather et al. (2018, p.330) modified four-item scale from the original Hollebeek et al. (2014, p.156) scale. In line with Hollebeek et al. (2014, p.155) suggestion, the name of the focal company, American Vintage, was incorporated into each item to enhance precision. An example item from the final scale is: 'I would feel good when I use American Vintage' with a higher score indicating heightened customer-brand engagement.

The first moderator - personal innovativeness was measured using Agarwal & Prasad (1998, p.210) four-item scale which encompasses items measuring individuals' predispositions to try out new information technologies. The scale was selected based on its prominence in the scholarly field and its highly satisfactory reliability score of $\alpha = .84$ (Agarwal & Prasad, 1998, p.210). The scale needed no adjustments, except for reverse coding a single item, as of the originally reported lowest item-to-total correlation score. Hence the item was adjusted as follows: 'In general, I am eager to try out new information technologies.' A higher score across this scale indicates a greater personal innovativeness and willingness to engage with new technologies.

The second moderator - shopping orientation was measured using Voss et al. (2003, p.312) ten-item bipolar hedonic/utilitarian scale. The scale was chosen for its general applicability and reliable nature (Chronhac's $\alpha = .95$). For the measurements of the hedonic orientation, an example of item used in this study was: 'Not fun/Fun', 'Dull/Exciting', while for utilitarian one was: 'Effective/Ineffective', 'Practical/Impractical'.

3.3.2. *Control variables*

To comprehend the impact of retailers' AR adoption intensity on brand equity, this thesis incorporates age and consumer predispositions towards AR as control variables, addressing their potential confounding effects.

Age reflects the prevailing adoption of digital advancements among younger generations, such as Generation Z and Millennials (Xue et al., 2022, p.60). These demographic groups exhibit affinity towards intelligent, immersive, and prompt digital

experiences, shaping their preferences in online shopping. Controlling age helps ensure that observed changes in brand equity are not solely ascribed to variations in age.

Consumer predispositions towards AR encompasses attitudes, feelings, and beliefs regarding the technology's value and usability. Its inclusion allows for controlling individual variations in predispositions and capturing the genuine impact of how brands utilising AR technology are perceived. Therefore, five-item 'Attitude towards using' subscale was adapted to measure respondents' attitudes towards AR. Since the control group was not exposed to the independent variable concerning the extensiveness of American Vintage's AR use, a second version of the scale was deemed necessary. Thus, for measuring the experimental groups' predispositions toward AR, an example item used in this study was: 'I am positive about American Vintage's implementation of innovative try-on technologies', while for the control group the same item was adjusted to: 'I am positive about American Vintage's sales through both offline and online channels, to capture respondents' attitudes toward the brand's presence across various channels. This scale was chosen based on its high reliability and validity (Chronhac's $\alpha = .94$) (Rese et al., 2014, p.873).

The use of these two distinct scales necessitated the computation of a new variable which combined both scales based on their standardised values (z scores). According to Andrade (2021, p.557), z scores enable meaningful comparisons between variables measured on different scales by transforming their values to have a M(SD) of 0(1). Therefore, the newly created standardised control variable was used in all analyses.

3.3.3. *Stimulus materials*

The study operationalized the independent variable, extensiveness of AR use, across two experimental conditions – middle and high level – each varying in the degree of a company's AR use, along with a control condition with no AR utilisation. The investigation of the relationship between this independent variable and its various levels with the dependent variable, brand equity, required the selection of a popular brand widely recognized by many. This choice was informed by Keller's (2003, p.596) findings, highlighting brand knowledge as a crucial component and source of brand equity. Therefore, opting for a real company over a fictitious one was imperative in an effort to minimise the limitations associated with the absence of prior exposure to a given brand. Furthermore, a hypothetical brand lacks the emotional and associative connections that real brands have, limiting its ability to elicit genuine responses from consumers (Joshi & Yadav, 2018, p.131).

Recognising knowledge as one of the key attributes of brand equity (Keller, 2003, p.596), the globally recognized fashion retailer, American Vintage, was selected for the creation of the experimental stimuli. Its international presence and extensive network of stores facilitated wider recognition among respondents. Moreover, the retailer met another pre-set criterion - omnichannel shopping experience. The company is driven by creating a seamless 'phygital' experience and widely investing in their multi-channel presence (Fish, 2020, para 23). Finally, to minimise respondents' bias, it was crucial that the selected company has not yet implemented any form of AR within their customer-centred channels.

Despite the company's popularity, it was unrealistic to expect that all respondents would be familiar with American Vintage. Hence, the experimental stimulus was designed to expose all respondents, across the four conditions, to an 'About us' message on the American Vintage website, detailing its popularity and omnichannel presence. Utilising the company's website as the medium ensured neutrality and avoided inducing specific reactions or associations. Websites serve as the primary point of interaction with a brand due to their informative nature (Sharp, 2002, p.43), allowing all respondents, including those unfamiliar with American Vintage, to be initially acquainted with the brand. The 'About Us' page remained consistent across all groups, while the treatment groups received screenshots containing information about American Vintage's inclusion of location-based AR, non-location-based AR, or a combination of both. To avoid confounding effects the layout and text were kept as consistent as possible across different scenarios. An overview of the stimuli material can be found in Appendix B.

3.3.4. Manipulation check

This study made use of a manipulation check to ensure that the experimental stimuli were operationalised successfully and produced the intended effect on participants (Neuman, 2014, p.304). The manipulation check, in the form of multiple-choice question was implemented to test whether participants across scenarios recognised the type of AR American Vintage was employing. The question was located in the middle of the survey and read the following: 'Which of the following type(s) (if any) of augmented reality adoption did you notice?'

3.4. Experimental procedure

3.4.1. Experimental scenarios pre-test

The materials developed by the researcher featured screenshots of American Vintage's website detailing their degree of AR adoption. To assess their effectiveness, a pre-test was conducted on Qualtrics. A total of 10 participants were reached through convenience sampling, enabling easy follow-up for detailed feedback on the materials quality and clarity. The results and the feedback indicated the need for improvements in image selection and accompanying text clarity.

3.4.2. Pilot test

The pilot test of the survey was conducted online, with five respondents. Upon completion, participants were asked to provide detailed feedback on the experiment's flow, questions clarity, and their overall impression with the survey interface. Their insights primarily revolved around enhancing the survey's coherence and its sequence. Notably, respondents suggested the inclusion of preliminary inquiries regarding awareness and attitudes toward American Vintage to allow for further insights. Feedback also highlighted the imperative to rearrange the survey sequence. Specifically, placing American Vintage-related questions alongside the manipulation stimulus, followed by queries soliciting more personal information. Concerns were also raised regarding the survey layout, which was perceived as inefficient due to excessive scrolling, an issue addressed by integration of matrix tables. Finally, some minor spelling and grammatical errors were noted and promptly rectified prior to publishing the survey.

3.4.3. Experimental survey procedure

The experiment, which was active for the period of 12th to 24th of April, took place on the online platform Qualtrics to harness cost-effective and swift data collection. The experiment commenced with a brief introduction to the general topic, which was followed by a clear explanation of its voluntary nature and data handling techniques. Explicit consent was required for participants to proceed with the experiment, ensuring ethical conduct.

The survey first gathered respondents' initial attitude towards American Vintage, hence a screening question was utilised to allow only those aware of the brand to answer the subsequent attitude-related question. Afterwards, each participant was exclusively exposed to one of the four conditions randomly. Randomisation is pertinent in an experimental design, as it ensures an unbiased distribution of research units across conditions, hence allowing for an unbiased between-group comparisons (Neuman, 2014, p.288). The survey then progresses to a questionnaire gauging respondents' attitudes by first measuring brand equity, and customer-

brand engagement. Subsequently, the control variable and the manipulation check question were presented, followed by shopping orientation and personal innovativeness. The survey concluded with inquiries into respondents' demographic profiles, including age, gender, country of origin, and educational attainment. The completion of the survey was followed by a debrief clarifying the true study objectives. A complete version of the survey can be found in Appendix C.

3.5. Validity and reliability

Non-probability techniques can limit external validity by producing homogeneous samples (Babbie, 2018, p.186). In mitigating this threat, various data gathering techniques and platforms were employed and a diverse participant group was recruited for a richer understanding of the topic. When it comes to internal validity, which signifies the singular effect of the treatment on the dependent variable by accounting for all confounding effects and alternative explanations (Neuman, 2014, p.298), this study employed several strategies to maintain it. Firstly, conducting materials pre-tests ensured that potential flaws were addressed, leading to further refinement of the materials and increased confidence in the causal inferences drawn. Secondly, employing a manipulation check further confirmed the successful treatment implementation (Neuman, 2014, p.304). Finally, random assignment of participants across the four conditions also contributed to enhancing internal validity (Neuman, 2014, p.300).

3.6. Ethics

Ethical practices were followed, including obtaining informed consent and maintaining confidentiality and anonymity in line with Erasmus University guidelines.

The topic was not deemed sensitive, nor the experimental stimuli were provocative, thereby by participating respondents did not oversee any psychological or mental risk. Participation was voluntary, and respondents had the right to withdraw at any time of the experiment. Finally, to prevent any privacy concern, all sensitive data was safely stored, and anonymity of participants was preserved.

4. Results

4.1. Data cleaning and preparation

The total of 236 responses that the experimental survey yielded were subject to careful examination prior to the subsequent analysis. Two responses completed in less than a minute were excluded, as this was deemed as an unrealistically prompt execution, given the length of the survey. Further, the data cleaning and preparation consisted of identifying and deleting 16 other responses which were incomplete. As the survey utilised a force response requirement, missing values were minimal. Therefore, a total of 18 responses were filtered out from the analysis, leaving the final sample of $N = 218$ respondents.

The sample characteristics can be found in Table 4.1 below.

Table 4.1.

Demographic characteristics

Characteristic	Frequency in sample	Percentage of sample
<i>Gender</i>		
Male	81	37.2
Female	135	61.9
Non-binary/third gender	1	0.5
Prefer not to say	1	0.5
<i>Age</i>		
18-24	145	66.5
25-34	48	22.0
35-44	15	6.9
45-54	9	4.1
55+	1	0.5
<i>Education</i>		
Less than high school	3	1.4
High school	32	14.7
Trade/Technical/Vocational training	5	2.3
Bachelor's degree or equivalent	129	59.2
Master's degree or equivalent	45	20.6
Doctorate or professional degree (PhD)	4	1.8
Total	218	100

Some notable sample demographics is that close to two thirds of the sample consisted of 135 females (61.9%) and 81 males (37.2%). Respondents' age varied from 18 to 60 years, where the average age was $M = 25.78$ ($SD = 7.13$). Furthermore, a total of 40 nationalities were represented in the sample, with the majority being from the Netherlands (46.8%), Belgium (11%), Bulgaria (4.6%) and India (3.2%). The most common educational attainment among the participants was a bachelor's degree (59.2%), followed by a master's degree or

equivalent (20.6%). Finally, out of all respondents, 116 (53.2%) were familiar with the brand American Vintage and their overall attitude leaned towards either slightly positive (39.7%) or neutral (31%).

4.2. Preliminary analysis

4.2.1. Randomised assignment to conditions

The statistical software SPSS version 28 was used for all analyses. Initially, it was necessary to establish whether the randomisation was successful. For that a Chi-square test of independence was run to test the randomisation across genders, which indicated insignificant results $\chi^2(2, N = 216) = 4.57, p = .102$. Further, to test the random assignment for age, a one-way ANOVA was conducted, $F(30, 187) = .708, p = .868$, partial $\eta^2 = .10$, which also yielded insignificant values. Finally, it was also important to determine whether the variable ‘Predispositions towards AR’ was randomly assigned across conditions, one-way ANOVA was used, which produced significant results - $F(51, 166) = 10.28, p < .001$, partial $\eta^2 = .76$.

These results clearly demonstrate that age and gender were sufficiently randomised within the sample, and their inclusion as control variables was deemed unnecessary. However, this was not true for the variable ‘Predispositions towards AR’ as its significant p -value indicated insufficient randomisation highlighting the vitality of including it as a control variable in the subsequent analysis and accounting for its potential effect.

4.2.2. Manipulation check

The survey incorporated a manipulation check question to test whether the experimental stimuli were operationalised successfully across all conditions. Hence, for easier navigation, the manipulation check question was dummy coded, which enabled for easier distinction between the correct and incorrect responses.

To verify that the stimuli produced the intended effect on participants across the four conditions, a Chi-Square test of independence was conducted. The resultant analysis revealed a significant association between the experimental conditions and the responses to the manipulation check question within a 95% confidence interval, $\chi^2(9, N = 218) = 138.65, p < .001$. To be more specific the significant result of the test indicated that the distribution of responses between each group is not equal. As such a pattern was apparent in the data, where observations were clearly distributed across the expected groups. For a closer look of the distribution of responses across the four groups refer to Table 4.2.2. Upon closer look, it became apparent that 58.7% of the participants provided an answer that was in line with the

condition that they were in. This further suggests that the manipulation produced the desired effect on participants across the conditions.

Nevertheless, due to over 40% of participants failing to sufficiently indicate their assigned condition, hypothesis testing was conducted twice: once using the full dataset ($N = 218$) and once more with a modified dataset, excluding the incorrect responses. The modified data set had a sample size of $N_{modified} = 128$ and did not yield any substantially different results within any of the tests (Refer to Appendix D for detailed results). Consequently, this paper reports results based on the full dataset, as it is deemed more representative.

Table 4.2.2.

Distribution of observations of the manipulation check question - Which of the following type(s) (if any) of augmented reality adoption did you notice?

		Perceived type of AR adoption				Total
		AR in website and mobile application	AR in physical stores	AR in physical stores and website and mobile application	None	
Experimental groups	Control group	7	9	13	36	65
	Store AR	7	30	12	6	55
	Online AR	32	7	6	7	52
	Both AR	9	5	30	2	46
Total		55	51	61	51	218

4.3. Factor and reliability analyses

The scales adopted for this experiment were assessed and validated through Principal Component Analysis with Varimax rotation. The data was deemed suitable for such analysis, as the assumptions regarding both sample size and relationships among scale items were met (Pallant, 2020, p.189). After determining that all items loaded on their expected factors, a reliability analysis was performed, which indicated that all scales obtained satisfactory internal consistency and no items were deemed necessary for deletion. For a full overview of all items' measures, factor loading and Cronbach's Alphas for all constructs, refer to Appendix A.

The ten-item scale for the dependent variable brand equity was subject to an exploratory factor analysis based on Eigenvalues (> 1.00), $KMO = .86$, $\chi^2(N = 218, 45) =$

1147.88, $p < .001$. In line with Yoo & Donthu (2001, p.6), the items loaded onto three factors, which explained 75.1% of the variance in brand equity – brand loyalty ($\alpha = .86$), brand awareness/association ($\alpha = .86$) and perceived quality ($\alpha = .84$). No items were deemed necessary for deletion. Hence, new variables were created based on their mean score, which were subsequently used for the computation of a single all-encompassing variable for brand equity used for the analysis.

Next, the four-item scale used to measure the mediator customer engagement, was subject to an exploratory factor based on Eigenvalues (> 1.00), $KMO = .73$, $\chi^2(N = 218, 6) = 518.81$, $p < .001$. As expected, all items loaded onto a single factor, explaining 72.8% of the variance in customer-brand engagement. The internal consistency reliability of the scale was found to be strong ($\alpha = .87$).

The four-item scale, measuring the first moderator - personal innovativeness, underwent an exploratory factor analysis based on Eigenvalues (> 1.00), $KMO = .83$, $\chi^2(N = 218, 6) = 516.88$, $p < .001$. As expected, all items loaded onto a single factor, explaining 75.9% of the variance in personal innovativeness and displayed a strong reliability ($\alpha = .89$).

Further, the ten-item bipolar scale, measuring the second moderator - shopping orientation, has undergone factor analysis based on Eigenvalues (> 1.00), $KMO = .90$, $\chi^2(N = 218, 45) = 1702.65$, $p < .001$. All items loaded correctly into two factors – hedonic ($\alpha = .95$) and utilitarian ($\alpha = .85$) – aligning with Voss et al. (2003, p.312) and the resultant model explained 74.0% of the variance in shopping orientation.

Finally, exploratory factor analysis was conducted separately for the two distinct five-item scales intended to measure the control variable – predispositions towards AR. For the treatment groups, all items loaded on a single factor explaining 74.8% of the variance in consumer predispositions towards AR. Similarly, the items designated for the control group loaded into a single factor explaining 69.2% of the variance. The scales exhibited strong reliability – $\alpha = .92$ for the former and $\alpha = .89$ for the latter.

4.4. Descriptive statistics and correlations

Descriptive statistics for variables under study were calculated. A zero-order correlation matrix was generated to examine the relationships between pairs of all variables comprising the conceptual model, as shown in Table 4.4.

There are three notable findings from this analysis. First, customer-brand engagement is strongly and positively correlated to brand equity. Second, the control variable -

predispositions towards AR is positively correlated to brand equity, customer-brand engagement and personal innovativeness. Finally, age is seen to have several positive correlation effects with brand equity, customer-brand engagement and hedonic shopping orientation. These relationships will be further probed in the additional analysis section.

Table 4.4.*Descriptive statistics and correlations (N = 218)*

	1	2	3	4	5	6	7	8	9	10	11	Mean	SD
1. No AR	-											.30	.46
2. Location-based AR	-.38**	-										.25	.44
3. Non-location-based AR	-.37**	-.33**	-									.24	.43
4. Both AR	-.34**	-.30**	-.29**	-								.21	.41
5. Brand equity	.06	.07	-.05	-.09	-							3.75	1.05
6. Customer brand engagement	.04	-.02	.05	-.08	.66**	-						4.46	1.20
7. Personal innovativeness	-.01	-.04	.00	.05	.07	.16*	-					4.75	1.20
8. Shopping orientation - Utilitarian	.14*	-.03	-.05	-.08	-.03	.04	.09	-				5.23	1.13
9. Shopping orientation - Hedonic	.07	-.05	-.03	.00	.13	.14*	-.01	.47**	-			5.25	1.55
10. Predispositions towards AR	.00	.07	.05	-.12	.44**	.52**	.31**	.05	.01	-		0.00	1.00
11. Age	-.02	-.01	-.01	.04	.19**	.18**	-.10	-.13	-.17*	.04	-	25.78	7.13

Note. Significance levels **p < .01 level (2-tailed), *p ≤ .05 (2-tailed)

The variable Predispositions towards AR is standardised and have M(SD) of 0(1)

4.5. Hypothesis testing

4.5.1. Direct effect

In order to test the effect of the distinct levels of AR adoption on brand equity, a one-way between-groups analysis of covariance (ANCOVA) was conducted, as it allowed to hold the control variable constant. It was hypothesised that extensiveness of AR use will positively affect brand equity. The test indicated that there was no significant effect of AR types on brand equity across conditions, $F(2, 214) = 0.53, p = .588$, partial $\eta^2 = .01$. Therefore, it can be concluded that there is no significant direct effect of extensiveness of AR use on brand equity, thus **H1 is rejected**. However, the covariate 'Predispositions towards AR', $F(1, 214) = 49.88, p < .001$, partial $\eta^2 = .19$ had a significant positive effect on brand equity.

4.5.2. The mediating effect of customer-brand engagement

To test the hypothesised mediation effect of customer-brand engagement, a bootstrapping procedure was utilised using the PROCESS macro-Model 4 for SPSS (Hayes, 2022, p.79). Before running the test, the multi-categorical independent variable was configured so that its first level represented the control group, as PROCESS's automatic employment of the first level as a reference group. The overall model, which controlled for the effect of 'Predispositions towards AR' achieved significance, $F(3, 214) = 26.43, R^2 = 0.27, p < .001$. However, this was caused by the significant effect of the control variable 'Predispositions towards AR' ($b = .63, p < .001$). When observing path *a*, the different levels of the independent variable, on the other hand, were not significant (all p 's $\geq .545$). Next, the effects on brand equity were explored. Again, the overall model met the significance threshold $F(4, 213) = 43.79, R^2 = .45, p < .001$. Path *b* showed a significant effect of the mediator customer-brand engagement on brand equity ($b = .52, p < .001$) and the effect of the control variable 'Predispositions towards AR' ($b = .14, p = .031$). Path *c* revealed that the relationships between the levels of extensiveness of AR use and brand equity were not significant (all p 's $\geq .465$). Finally, the presence of indirect effects was investigated. Neither of the three categories achieved significance as the results were as follows: location-based AR or non-location-based AR, $\beta = -.05, CI95\% = [-.20, .10]$, both AR, $\beta = -.06, CI95\% = [-.28, .15]$. Thus, it cannot be said that a significant indirect effect of extensiveness of AR use occurred through customer-brand engagement, hence **H2 is rejected**. Table 4.5.2. represents the regression analysis results.

Table 4.5.2.*Results of mediation analysis (N=218)*

Variable	Model a-path			Model b/c'-path		
	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>
Middle level of AR adoption (X1)	-.10	.16	.545	-.08	.12	.520
High level of AR adoption (X2)	-.11	.20	.591	-.11	.15	.465
Customer-brand engagement (MED)	-	-	-	.52	.05	.000
Predispositions towards AR (control variable)	.63	.07	.000	.14	.06	.031
Notes: Models	$R^2 = .27, F(3, 214) = 26.43, p = .000$			$R^2 = .45, F(4, 213) = 43.79, p = .000$		

Note: a-path: Extensiveness of AR use to Customer-Brand Engagement; b-path: Customer-Brand Engagement to Brand Equity; c'-path: Extensiveness of AR use to Brand Equity

4.5.3. *The moderating effect of personal innovativeness*

To test the third hypothesis, a moderation analysis was conducted using PROCESS macro-Model 1. No significant main effects were found for the middle level of AR adoption (location-based or non-location-based AR) ($p = .541$). The analysis also did not yield a significant main effect of the high level of AR adoption (both location and non-location-based AR) on customer-brand engagement, $p = .561$. The main effect of personal innovativeness also did not meet the significance level, $p = .687$. Yet, a significant result was obtained for the control variable predispositions towards AR, $b = 0.62, p < .001$. Finally, no significant interactions between the different levels of extensiveness of AR use and personal innovativeness emerged (all p 's $\geq .552$). Therefore, **H3 was rejected**.

4.5.4. *The moderating effect of shopping orientation*

The fourth and final hypothesis centred towards the moderating effect of shopping orientation was tested with PROCESS macro-Model 1, where the analysis was run twice, due to the two distinct categories of said construct. For both tests, the control variable - predispositions towards AR was accounted for.

First, for the utilitarian dimension, the main effect of AR's middle level of adoption was investigated, where the results were not significant, $p = .279$. This was also the case for the combination of both AR types – the high level of AR adoption ($p = .392$). Moreover, no effect of utilitarian shopping orientation on brand equity was found, $p = .419$. However, the

effect of the control variable was observed to meet the significance level, $b = 0.46, p < .001$. None of the examined interaction effects were significant as all p values were higher or equal to .109. As such the hypothesised moderating effect of utilitarian shopping orientation on the relationship between extensiveness of AR use and brand equity was not observed.

Second, for the hedonic dimension, the results also showed no significant main effect of middle level of AR adoption ($p = .447$), and for high level of AR adoption ($p = .389$). Hedonic shopping orientation also had no significant effect on brand equity ($p = .469$). The control variable remained significant for this dimension as well ($b = 0.46, p < .001$), but no significant interactions were observed (all p 's $\geq .455$). Therefore, since no significant interactions with either utilitarian or hedonic shopping orientations on the relationship between extensiveness of AR use and brand equity were observed, **H4a and H4b were rejected**. Table 4.5.4. represents the results of the moderated regression analysis.

Table 4.5.4.

Results of the moderated regression analysis (N = 218)

Variable	Customer-brand engagement			Brand equity			Brand equity		
	MOD: Personal innovativeness			MOD: Utilitarian shopping orientation			MOD: Hedonic shopping orientation		
	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>
Location or Non-location AR (X1)	-.10	.16	.541	-.16	.15	.279	-.11	.15	.447
Both Location and non-location AR (X2)	-.12	.20	.561	-.16	.19	.392	-.16	.18	.389
MOD	.05	.13	.687	-.10	.12	.420	.06	.08	.469
X1 x MOD	-.09	.15	.552	-.04	.14	.791	.01	.10	.918
X2 x MOD	.01	.18	.949	.28	.17	.109	.09	.12	.455
Predispositions towards AR (control variable)	.62	.08	.000	.46	.06	.000	.46	.07	.000
Notes: Models	$R^2 = .27, F(6, 211) = 13.17, p = .000$			$R^2 = .22, F(6, 211) = 9.79, p = .000$			$R^2 = .21, F(6, 211) = 9.47, p = .000$		

4.6. Additional analyses

Following the hypotheses testing which revealed an absence of significant effects, it was deemed insightful to perform a series of additional analyses to gain a deeper understanding and uncover potential explanations that the initial analysis failed to provide.

Firstly, PROCESS macro-Model 4 was run in an effort to explore the mediation effect of customer-brand engagement on AR use and each of the dimensions of brand equity. So far in this thesis, brand equity has been analysed as an all-encompassing, multidimensional construct, whereas its individual constituent dimensions, as well as their effects were not studied.

When examining the effect of AR signalling on brand loyalty, where customer-brand engagement mediates the relationship, no significant effect of middle level of AR use on the mediator was observed, $b = -0.04$, $p = .846$. High level of AR uses also did not have a significant effect on customer-brand engagement, $b = -0.25$, $p = .279$. No significant effect of AR's middle level of adoption on loyalty, $b = -0.23$, $p = .200$. Additionally, the effect of both types of AR combined also did not yield significant results, $b = -0.11$, $p = .646$. Customer-brand engagement was found to have a significant effect on brand loyalty $b = 0.49$, $p < .001$. No indirect mediation effect was observed, $\beta = -0.02$, $CI95\% = [-0.20, 0.16]$.

When examining the effects on brand awareness/association, no significant effect of either type of AR was found, $b = 0.01$, $p = .947$. Similarly, the combination of both location and non-location-based AR also did not meet the significance threshold, $b = 0.01$, $p = .976$. The effect of customer-brand engagement on brand awareness/association was significant, $b = 0.71$, $p < .001$. No indirect mediation effect was observed, $\beta = -0.03$, $CI95\% = [-0.27, 0.23]$.

When examining the effects on perceived quality, no significant effect of AR's middle level of use was found, $b = 0.04$, $p = .808$. Similarly, the high level of AR adoption also did not meet the significance level, $b = -0.28$, $p = .146$. The effect of customer-brand engagement on brand awareness/association was found to be significant, $b = 0.52$, $p < .001$, while no indirect mediation effect was detected, $\beta = -0.02$, $CI95\% = [-0.21, 0.17]$.

Secondly, given the nature of the independent variable that represents the extensiveness of AR use, its computation was designed to capture this rank order. Consequently, the two individual levels of location-based and non-location-based were combined into a single level, which hindered the possibility to observe if there is any significant difference between these two types of AR adoption. In order to test whether there was a different effect between the two, a two-way ANOVA was performed with brand equity as the dependent variable.

The test revealed that no significant main effect for location-based AR existed, $F(1, 214) = 0.04$, $p = .849$, partial $\eta^2 = .00$. Therefore, there was no significant difference in scenarios where location-based AR was included ($M = 3.74$, $SD = 1.07$) versus scenarios

where it was excluded ($M = 3.76, SD = 1.04$). When examining the effect of non-location-based AR, the effect was significant at the 10% level, $F(1, 214) = 2.94, p = .088$, partial $\eta^2 = .01$. Participants in conditions where non-location-based AR was included ($M = 3.62, SD = 1.07$) reported lower brand equity perception respondents in scenarios where it was excluded ($M = 3.86, SD = 1.02$).

Lastly, in light of this thesis's specific emphasis on innovative technology, age was initially defined as a control variable. Given the propensity of younger individuals to adopt technology more readily (Xue et al., 2022, p.60), a retailer's adoption of AR could influence their perception of a said brand. Although the randomisation tests conducted in the beginning of this chapter revealed that age's inclusion in the analysis was not necessary, an additional analysis with age as a moderator was considered beneficial in elucidating the role age plays in this broader narrative, especially considering its significant correlation with brand equity, customer engagement and hedonic orientation. As such PROCESS model 3 was utilised, where AR use was the independent variable, brand equity the dependent and hedonic shopping orientation - moderator.

The main effect of the middle level of AR adoption was investigated, where the results were not significant, $p = .575$. This was also the case for the high level of AR adoption ($p = .173$). Moreover, no effect of hedonic shopping orientation on brand equity was found, $p = .100$. The effect of the age also did not meet the significance level, $p = .097$. None of the examined interaction effects were significant as all p values were higher or equal to .312.

Moreover, to test how age moderates the relationship between customer-brand engagement and brand equity, PROCESS model 1 was used. It showed that the effect of customer-brand engagement on brand equity is significant, $b = 0.56, p < .001$, while the effect of age on brand equity was not found to be significant, $p = .217$. The interaction effect between customer-brand engagement and age was also not significant, $p = .709$.

5. Discussion and conclusions

This study's main purpose was to contribute to the research gap on whether the adoption of AR would lead to fashion retailers attaining brand equity, by taking a signalling perspective. Moreover, this study sought to further uncover if there are any significant moderating or mediating effects on the main direct effect between brand equity and extensiveness of AR use.

No significant effects of the independent variable - extensiveness of AR use on the dependent variable - brand equity was found, neither directly nor indirectly through the mediator customer-brand engagement. However, the mediation analysis revealed that there is a significant positive effect of the mediator customer-brand engagement on brand equity. Additionally, shopping orientation with its two dimensions - utilitarian and hedonic, were not found to moderate the direct relationship between extensiveness of AR use and brand equity. Further, the hypothesised moderating effect of personal innovativeness on the relationship between extensiveness of AR use and customer brand-engagement was found to not be significant. Regardless, it is important to note that all mediation and moderation analysis incorporated the control variable - predispositions towards AR, whose effect was consistently significant. This might indicate a possible role of the control variable in explaining the variance of the dependent variable – brand equity. As such, based on this study it cannot be concluded that fashion retailers signalling their extensiveness of AR use would have any effect on brand equity - a result opposite of what was detailed in the theoretical framework.

5.1. Theoretical implications

5.1.1. The role of AR signalling on brand equity

This paper was the first to examine whether there is a relationship between a fashion retailer signalling its extensiveness of AR adoption and its brand equity. No significant effect between these two constructs was observed. While Dropulic et al. (2022, p.287), as well as Urdea and Constantin (2021, p.7-10) brought evidence that service innovation through novel technologies, particularly AR, significantly impacts retailer brand equity, this does not appear to be the case for the current study. A potential explanation for this could be based on the methodological differences from previous studies. Past research provided respondents with direct interaction with the technology itself (Haumer et al., 2020, p.375; Kim et al., 2021, p.459), however this thesis was instead interested in observing one's reaction to a company's AR adoption, by simply reading a message on their official website. This distinction might explain why past literature, which used a more hands-on approach to examining AR, elicited

more positive responses among participants. This notion can somewhat be reflected by prior empirical findings detailing the substantial effect of AR's novelty and vividness on one's predispositions to engage with a brand, thus playing a role in their perceived brand equity (Diaa, 2022, p.372, Kim et al., 2021, p.460-462; McLean & Wilson, 2019, p.219).

Nevertheless, the innovative approach of applying signalling theory in this study has extended the academic knowledge by revealing a previously undocumented result. As such when comparing existing findings to this paper, it becomes evident that a retailer's mere signalling of AR adoptions would unlikely resonate with one's emotional state, as the message alone might fail to accurately convey how the technology would contribute to customer value (Dropulic et al., 2022, p.287; Urdea & Constantin 2021, p.7-10).

5.1.2. The role of customer-brand engagement

With respect to the relationship between customer-brand engagement and brand equity, firstly this study found a significant strong positive correlation between the two. This suggests that the increased interaction with the brand American Vintage and its offerings, would positively influence one's attitudes and feelings towards the brand, resulting in higher levels of brand equity. Secondly, the mediation analysis revealed a significant positive interaction effect between customer-brand engagement and brand equity. This pattern of results corroborates Kim et al's. (2021, p.462) earlier findings that brand equity is an outcome of customer-brand engagement. Yet, no significant effects of customer brand engagement as a mediator for AR and brand equity, as well as for each of its constituent dimensions were found. These results were inconsistent with Haumer et al's., (2020, p. 380) work, which provided evidence for the significant effect of AR use on all brand equity's dimensions, excluding perceived quality.

5.1.3. The role of personal innovativeness

This study's findings do not support the hypothesised moderating effect of personal innovativeness on the relationship between AR signalling and customer-brand engagement. Therefore, it cannot be said that a fashion retailer's signalling of AR adoption enhances customer-brand engagement, even among individuals exhibiting higher personal innovativeness. These findings extend earlier scholar's work within the fashion retail, as they failed to examine this particular moderation effect. Despite the well-established positive relationship between AR and customer engagement, (Abrar, 2018, p.74; Song et al., 2020, p.1216), the current study was unable to mirror such claims from the signalling perspective.

Regardless, the single most striking observation to emerge was the weak but significant correlation between customer-brand engagement and personal innovativeness. While this correlation is somewhat irrelevant to the primary focus of this thesis, future research may consider exploring this matter further, while isolating the signalling perspective.

These findings have two important theoretical implications for the field of fashion retail. Firstly, by integrating the signalling theory, this study offers a more comprehensive understanding of personal innovativeness by showcasing its insignificant effects on AR use and customer-brand engagement. Secondly, it points to the existing interaction between customer-brand engagement and personal innovativeness and provides a potential avenue for future research.

5.1.4. The role of shopping orientation

Following the recommendations of Moliner-Velázquez et al., (2019, p.669-670), this thesis investigated the moderating role of shopping orientation in the relationship between retailer's innovation and brand equity. Contrary to the initial expectations, the experimental data observed no empirical proof supporting the hypothesis, that shopping orientation moderates the effect of AR signalling and brand equity. Consequently, this thesis cannot ascertain that AR signalling contributes to brand equity, regardless of an individual's degree of hedonic or utilitarian shopping orientations. This can potentially be explained by the signalling's limitation in transporting the user to an envisioning state where they can clearly identify the hedonic and utilitarian value of AR. This notion appears to be in contrast with Plotkina et al's. (2021, p.791) as they found that customers can easily recognise the value of AR, by simply reviewing information on brands' efforts in improving their shopping experience through this tool.

Given the similar signalling approach taken by Plotkina and colleagues, identifying the root cause of the opposite results proves challenging. Regardless, it can be speculated that the methodological differences between the two studies have played a significant role in influencing the outcomes. More specifically, their experimental procedure emphasised a more detailed explanation of the AR tool, unlike this thesis, which steered away from such an approach. Indeed, Plotkina et al. (2021, p.787) utilised existing AR applications for respondents to experiment with, along with administering interactive videos as manipulation stimuli, which better explained the tool's purpose. Moreover, their supervised classroom experiment allowed for exhibiting greater control over the units of analysis.

While no significant results were indicated, the present study has gone some way towards assisting in our understanding that one's shopping orientation might not alter the impact of AR signalling on brand equity. Hence, these findings extend the work of Moliner-Velázquez et al., (2019, p.669-670), by providing new and original insights into a relationship which was not previously explored in the context of fashion retail. However, it is important to bear in mind the possible bias in these findings, as they are particularly concerning the fashion brand American Vintage and one should be cautious when making wider inferences.

5.2. Practical implications

The aim of this thesis was to provide valuable insights to professionals in the field of marketing and fashion retail. In particular, it targeted those keen on promoting a specific fashion brand by highlighting the application of AR in their branding approach, with the ultimate goal of bolstering brand equity. Despite the rejection of all the hypotheses proposed in this thesis, the findings offer some insightful managerial implications.

Firstly, the notion of a fashion retailer signalling its adoption of AR on their website was likely unable to contribute to their brand equity. This creates better awareness that the mere signal may not be sufficient to alter one's perception of the retailer significantly. This could mean that contemporary shoppers may not be as familiar or as interested in this technology, as for it to strongly influence their attitude formations (Rejeb et al., 2023, p.735) Practitioners can potentially re-examine the framings of such campaigns and prioritise greater explanation behind the essence of the technology, followed by its benefit in one's shopping journey.

Another implication that this thesis contributes to is the notion that a single exposure to a particular message may not significantly influence the formation of brand equity. This can be explained by a plethora of marketing research emphasising that advertising frequency and repetition is key for shaping attitudes and enhancing brand recall (Schmidt & Eisend, 2015, p.416). Bornstein and Craver-Lemley (2022, p.241) further corroborate this by explaining that repeated exposure to a specific stimulus can bias an individual's attitude towards that stimulus. Nevertheless, Campbell & Keller (2003, p.298) observed that brand familiarity plays a significant role in this matter. Linking this to the current thesis, nearly half of the respondents were unfamiliar with the brand, which suggests that even if these participants were exposed to the AR signals more than once, it would not have had a noticeable impact on brand equity (Campbell & Keller, 2003, p.301).

5.3. Limitations and directions for future research

It is important to acknowledge that the employed research design faces certain limitations. First and foremost, conducting an online survey, while beneficial in garnering numerous responses, has contributed to lack of control over respondents' attention to the stimulus materials assigned (Babbie, 2018, p.243). In fact, the manipulation check, utilised as a controlling point, attained a considerable portion of incorrect responses across conditions. This can potentially be explained by the multiple-choice design of the question which prompted the selection of a single correct response. Alternatively, participants were potentially making assumptions about the AR application or failing to recognise the type of AR adoption until provided with the manipulation check question. Therefore, replicating this study in a controlled environment could be useful, as it might yield different results.

Secondly, experiments strive to make causal inferences by considering how various manipulations influence one's attitudes (Neuman, 2014, p. 283). The apparent drawback in this is the researcher's inability to trace back individuals' rational and meaning-making process behind their opinions. Hence, when it comes to a topic to which insufficient academic contributions have been made, alternative methods can be a viable solution. As such future research may attempt to investigate the extent to which extensiveness of AR can contribute to the creation of brand equity, by employing either qualitative or mixed methods, as they hold better exploratory power behind respondents' meaning-making processes (Babbie, 2018, p.90).

Thirdly, this study's particular focus towards the fashion retailer American Vintage has implicated the study's effectiveness of generalising the experimental findings to the wide fashion retail industry, as these findings may hold true only for this specific context (Neuman, 2014, p.306). Furthermore, the fact that 46.8% of respondents were not aware of the company may have played a role on the quality of the responses obtained. Therefore, this can be addressed by selecting an alternative and better-known fashion retailer. Furthermore, a comparative experimental design might also be a viable direction for future research, where the differences in the results can be observed between studying a fictitious and a real brand.

The fourth and final limitation is the measurement instrument and operationalisation chosen for the construct of brand equity. As previously highlighted, brand equity consists of several dimensions, which are key for its complete understanding - brand awareness/association, brand loyalty and perceived quality (Aaker, 1996, p.103). This study investigated brand equity as an all-encompassing construct, attributing to the fact that only a handful of academic papers have taken this approach (Kim et al., 2021, p.457; Marín-García

et al., 2020, p.605; Nedergaard & Gyrd-Jones, 2013, p.763). As such, that direction limited the observation of the independent variable's effect of each individual brand equity's dimension. Furthermore, similarly to Yoo and Donthu (2001, p.12) and Pappu & Quester (2006, p.319), this study regards brand equity and retailer equity as similar constructs. Nevertheless, Anselmsson et al. (2017, p.194) argued that retailer specific dimensions could be better captured through a retailer brand equity scale. This, therefore, points to another limitation of the study, in possibly overseeing important dimensions that are unique to the retailing industry, by using a universally applicable scale. Hence, further research could address this matter by utilising an industry-specific scale.

Referring back to the correlation analysis in the results chapter, age was found to significantly correlate with customer-brand engagement, brand equity, and hedonic shopping orientation. Even though, this study did not find any significant effect between these variables during the additional tests, it is suggested that future research explore these relationships further and address the current knowledge gap, by applying the signalling perspective, which has been largely neglected in this context up to now.

Finally, as the current research examined the signalling perspective in a rather narrow manner, it might be wise that future research revises the signalling perspective once again by comparing the effects of signalling of AR with the actual implementation of AR on brand equity. This may provide a more comprehensive approach in understanding whether the signalling theory effect is indeed diminished when used in the fashion retail context.

5.4. Conclusion

Returning to the research question posed at the beginning of this study, it is now possible to state that a branding strategy featuring a retailer's signal of their AR adoption, may not lay any significant internal value. This study has demonstrated, for the first time, that a company's AR signal is unlikely to contribute to the creation of brand equity, nor to customer brand-engagement. Although, customer-brand engagement and brand equity were found to significantly interact, when considering their collective effect with the AR signal, it was revealed that none of the AR levels of adoption were strong enough to exhibit statistically significant effect on these two constructs. Nevertheless, whilst it was not confirmed that the extensiveness of AR played a role on brand equity, the additional analyses conducted revealed a rather substantial outcome. The non-location-based AR signalling was found to approach significance with brand equity, attributing to the potential extrapolation that a signal of an online AR adoption may be perceived more strongly, compared to a signal

featuring a location-based adoption. It is therefore strongly recommended that future research further investigate this matter, using alternative methodological approaches and larger samples.

The second major finding was that customer characteristics, such as personal innovativeness and shopping orientation, did not emerge to have a significant interaction effect on the extensiveness of AR use and brand equity. While it was expected that a company's AR signal and its effect of brand equity would be influenced by one's shopping orientation, no empirical evidence for that was found. The study suggested that a possible explanation for this is the signal's inability in itself to convey the expected hedonic and utilitarian value one can acquire based on their shopping orientation.

Contrastingly, whilst this study did not confirm the expected personal innovativeness' role on AR signalling and customer-brand engagement, it did partially substantiate that there is a direct effect between one's level of innovativeness and their customer-brand engagement. Although this notion was not fully aligned with the scope of this thesis, it was deemed a fruitful finding in contributing to a potential new avenue for the future academic discussion in the field.

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Appendices

Appendix A: Measurement scales

Table A1

Measures, factor loadings, and Cronbach alphas

Construct	Items	Factor Loadings
<i>Brand equity</i>		
Adapted from: Yoo & Donthu (2001, p.14)		
Brand awareness/association	($\alpha = .86$) (1=strongly disagree, 7= strongly agree)	
	1. I can recognise American Vintage across other competing brands	0.64
	2. I am aware of American Vintage	0.68
	3. Some characteristics of American Vintage come to my mind quickly	0.71
	4. I can quickly recall the symbol or logo of American Vintage	0.72
	5. I have difficulty in imagining American Vintage in my mind	0.84
Brand loyalty	($\alpha = .86$)	
	6. I consider myself to be loyal to American Vintage	0.85
	7. American Vintage would be my first choice	0.86
	8. I will not buy other brands if American Vintage is available at the store	0.86
Brand Loyalty	($\alpha = .84$)	
	9. The likely quality of American Vintage is extremely high	0.86
	10. The likelihood that American Vintage would be functional is very high	0.91
<i>Customer-brand engagement</i>		
(1=strongly disagree, 7= strongly agree)		
Adapted from: Rather et al. (2018, p.330)		
	1. I would feel good when I use American Vintage	0.86
	2. Using American Vintage would make me happy	
	3. Using American Vintage would get me to think about the brand	0.89
	4. Using American Vintage would stimulate my interest to learn more about the brand	0.84
		0.81
<i>Personal innovativeness</i>		
(1=strongly disagree, 7= strongly agree)		
Adapted from: Agarwal & Prasad (1998, p.210)		
	1. If I heard about a new information technology, I would look for ways to experiment with it	0.86
	2. Among my peers, I am usually the first to try out new information technologies	0.83
	3. In general, I am eager to try out new information technologies	0.89
	4. I like to experiment with new information technologies	0.91

Shopping orientation

Adapted from:
Voss et al. (2003, p.312)

Hedonic	($\alpha = .95$) (1=strongly disagree, 7= strongly agree)	
	1. Not fun/Fun	0.91
	2. Dull/Exciting	0.86
	3. Not delightful/Delightful	0.91
	4. Not thrilling/Thrilling	0.84
	5. Unenjoyable/Enjoyable	0.91
Utilitarian	($\alpha = .85$)	
	1. Ineffective/Effective	0.79
	2. Unhelpful/Helpful	0.82
	3. Not functional/Functional	0.86
	4. Unnecessary/Necessary	0.68
	5. Impractical/Practical	0.70

Predispositions towards AR (Control variable)	($\alpha = .92$) $N = 153$ (1=strongly disagree, 7= strongly agree)	
Adapted from: Rese et al. (2014, p.873).	1. I am positive about American Vintage's implementation of innovative try-on technologies	0.86
	2. The American Vintage's implementation of innovative try-on technologies is so interesting that you just want to learn more about it	0.85
	3. It just makes sense to use the American Vintage's innovative try-on technologies	0.89
	4. The use of the American Vintage try-on technologies is a good idea	0.89
	5. Other people should also use the American Vintage's try-on technologies	0.84

Predispositions towards online and offline shopping channels (Control variable)	($\alpha = .89$) $N = 65$ (1=strongly disagree, 7= strongly agree)	
Adapted from: Rese et al. (2014, p.873).	1. I am positive about American Vintage's sales through both offline and online channels	0.79
	2. The American Vintage's combination of online and offline channels is so interesting that you just want to learn more about it	0.82
	3. It just makes sense to shop at American Vintage's online and offline channels	0.87
	4. Making use of American Vintage's combination of online and offline channels is a good idea.	0.83
	5. Other people should also use the American Vintage's combination of online and offline channels	0.85

Appendix B: Experimental stimuli

Scenario exposure

All scenarios consist of a company description from the American Vintage 'About us' webpage. All experimental groups receive an additional screenshot detailing the company's adoption of AR.

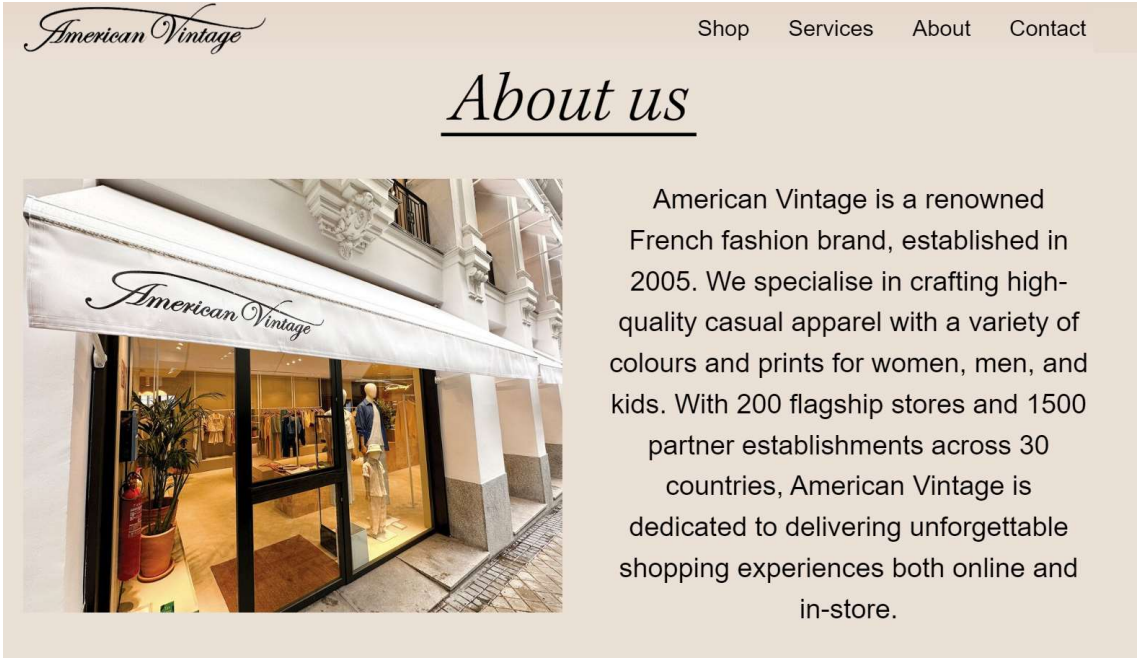
Scenario 1: 'About us' screenshot

Scenario 2: 'About us; screenshot; Online AR (Non-location-based AR adoption)

Scenario 3: 'About us; screenshot; In-store AR (Location based AR adoption)

Scenario 4: 'About us; screenshot; Online & In-store AR (Non-location & location-based AR adoption)

Appendix B1. Company description - About us page



American Vintage Shop Services About Contact


About us

American Vintage is a renowned French fashion brand, established in 2005. We specialise in crafting high-quality casual apparel with a variety of colours and prints for women, men, and kids. With 200 flagship stores and 1500 partner establishments across 30 countries, American Vintage is dedicated to delivering unforgettable shopping experiences both online and in-store.

Appendix B2. Company's adoption of AR - Online AR

American Vintage Shop Services About

Your shopping experience is our main priority, which is why we integrated augmented reality try-on technology into our website and mobile app. With just a few taps you can virtually try on our latest clothing collections using your device's camera. Gain confidence in your selections as you effortlessly explore size and fit, all from the comfort of your own home.

A woman in a colorful floral dress stands in a studio setting. She is holding a smartphone in front of her, which displays a virtual try-on interface. The interface shows a blue long-sleeved dress on a virtual model, with a navigation bar at the bottom featuring several small icons for different clothing items. The background is a plain, light-colored wall.

Appendix B3. Company's adoption of AR - In-store AR

American Vintage

Shop Services About

Step into our flagship stores and immerse yourself in the future of fashion with our innovative try-on technology.

Simply stand in front of our smart augmented reality mirrors, and watch as your favourite styles overlay onto your reflection. Instantly preview how our pieces look on you without the hassle of traditional dressing rooms or waiting lines.



Appendix B4. Company's adoption of AR - Online AR & In-store AR

American Vintage

Shop Services About

Your shopping experience is our main priority, which is why we integrated augmented reality try-on technology into our website and mobile app. With just a few taps you can virtually try on our latest clothing collections using your device's camera. Gain confidence in your selections as you effortlessly explore size and fit, all from the comfort of your own home.



Step into our flagship stores and immerse yourself in the future of fashion with our innovative try-on technology.

Simply stand in front of our smart augmented reality mirrors, and watch as your favourite styles overlay onto your reflection. Instantly preview how our pieces look on you without the hassle of traditional dressing rooms or waiting lines.



Appendix C: Experimental survey flow

Appendix C1. Introduction and consent

Dear respondent,

Thank you for your interest in this research. I am inviting you to fill in a questionnaire, in which you will be shown screenshots of the multinational fashion retailer American Vintage's website, which I would like you to evaluate. This study is focused on consumers' shopping experiences across different channels – online and in-store. Its purpose is to find out what factors impact shoppers' perceptions about given fashion retailers.

The questionnaire will take approximately 5-10 minutes to fill in. All research data will remain **completely confidential** and is collected **anonymously**. No sensitive and identifiable data would be shared to third parties. Your participation in this study is voluntary and you can withdraw at any stage without giving any reasons.

If you have questions about this research, you can contact me via 668181ha@eur.nl. This study is in accordance with the guidelines set out by the Ethics Committee of Erasmus University Rotterdam.

PS: Users of the research platforms SurveyCircle.com and SurveySwap.io will receive points for their participation.

Do you consent to participate in this research project?

I consent

I do not consent

Appendix C2. American Vintage awareness and attitude questions

Have you previously heard about the fashion retailer American Vintage? What is your attitude towards the brand American Vintage?

- Yes (sent to attitude question)
- No

What is your attitude towards the brand American Vintage?

- Extremely negative
- Moderately negative
- Slightly negative

- Neither positive nor negative
- Slightly positive
- Moderately positive
- Extremely positive

Appendix C3. Introduction to American Vintage

Please take a moment to closely examine the information, gathered from the website of the fashion retailer American Vintage before proceeding.

Appendix C4. Experimental stimuli for manipulated groups only

American Vintage has dedicated their efforts on introducing augmented reality try-on technology into their shopping experience. You can find detailed information about this feature on their website, showcased on the image below.

Appendix C5. Measurement of dependent variable - brand equity

Please carefully and honestly indicate, to what extent do you agree with the following ten statements regarding American Vintage.

There are no right or wrong answers.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I consider myself loyal to American Vintage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
American Vintage would be my first choice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I will not buy other brands if American Vintage is available at the store	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The likely quality of American Vintage is extremely high	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The likelihood that American Vintage products would be functional is very high	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I can recognize American Vintage among other competing brands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am aware of American Vintage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Some characteristics of American Vintage come to my mind quickly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can quickly recall the symbol or logo of American Vintage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have difficulty in imagining American Vintage in my mind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix C6. Measurement of the mediator - Customer engagement

Please indicate to what extent you agree with the following four statements.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I would feel good when I use American Vintage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using American Vintage would make me happy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using American Vintage would get me to think about the brand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using American Vintage would stimulate my interest to learn more about the brand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix C7. Measurement of control variable

- Provided to all manipulated groups

Please indicate to what extent you agree with the following statements.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I am positive about American Vintage's implementation of innovative try-on technologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The American Vintage's implementation of innovative try-on technologies is so interesting that you just want to learn more about it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It just makes sense to use the American Vintage's innovative try-on technologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The use of the American Vintage try-on technologies is a good idea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other people should also use the American Vintage's try-on technologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- Provided to control group only

Please indicate to what extent you agree with the following statements.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I am positive about American Vintage's sales through both offline and online channels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The American Vintage's combination of online and offline channels is so interesting that you just want to learn more about it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It just makes sense to shop at American Vintage's online and offline channels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Making use of the American Vintage's combination of online and offline channels is a good idea.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other people should also make use the American Vintage's combination of online and offline channels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix C8. Manipulation check

Earlier in this survey, you read an informative section about American Vintage. Which of the following type(s) (if any) of augmented reality adoption did you notice?

- Augmented reality adoption in website and mobile application
- Augmented reality adoption in physical stores
- Augmented reality adoption both across physical stores and website and mobile application
- None

Appendix C9. Measurement of the moderator - shopping orientation

Please indicate the options that best reflect your opinion, regarding your general attitude towards shopping.

For me, shopping is...

Ineffective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Effective
Unhelpful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Helpful
Not functional	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Functional
Unnecessary	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Necessary
Impractical	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Practical

Please indicate the options that best reflect your opinion, regarding your general attitude towards shopping.

For me, shopping is...

Not fun	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Fun
Dull	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Exciting
Not delightful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Delightful
Not thrilling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Thrilling
Unenjoyable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Enjoyable

Appendix C10. Measurement of the moderator - personal innovativeness

Please indicate to what extent you agree with the following statements regarding your **attitude towards technology**.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
If I heard about a new information technology, I would look for ways to experiment with it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Among my peers, I am usually the first to try out new information technologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In general, I am eager to try out new information technologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I like to experiment with new information technologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix C11. Demographic questions

Please answer these final questions about yourself and finish the survey.

How old are you (please state in numbers)?

What is your gender?

- Male
- Female
- Non-binary/third gender
- Prefer not to say

Where are you from?

What is the highest level of education that you have completed?

- Less than high school
- High school
- Trade/Technical/Vocational training
- Bachelor's degree or equivalent
- Master's degree or equivalent
- Doctorate or professional degree (PhD)

Appendix C12. Debrief

Debriefing

Thank you for participating in this survey. Your answers will be treated confidentially.

Please click the arrow below to submit your answers.

Disclaimer: You have intentionally been provided with limited information about the study to ensure unbiased responses. This study aims to determine to what extent the adoption of augmented reality within different channels of fashion retailers shopping experience can impact consumers perceptions of a brand and how that plays a role on its brand equity.

All information about American Vintage that has been presented in this questionnaire was created for the purposes of this study. While parts of it were based on factual information, any mention of augmented reality adoption is entirely fictional.

Any questions or concerns you may have about the study, can be addressed by contacting me via:
668181ha@eur.nl

Appendix D: Regression analysis results ($N_{modified} = 128$)

Table D1

Results of the moderated regression analysis ($N = 128$)

Variable	Customer-brand engagement MOD: Personal innovativeness			Brand equity MOD: Utilitarian shopping orientation			Brand equity MOD: Hedonic shopping orientation		
	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p-value</i>	<i>b</i>	<i>SE</i>	<i>p</i>
Location or Non-location AR (X1)	-.05	.25	.836	-.09	.22	.693	-.09	.21	.674
Both Location and non-location AR (X2)	-.12	.30	.680	-.16	.26	.544	-.19	.25	.443
MOD	.00	.17	.992	-.01	.16	.962	.01	.11	.903
X1 x MOD	.00	.20	.995	-.11	.20	.573	.17	.14	.231
X2 x MOD	-.05	.26	.847	.21	.23	.938	.08	.16	.603
Predispositions towards AR (control variable)	.50	.11	.000	.44	.09	.000	.44	.09	.000
Notes: Models	$R^2 = .15, F(6, 121) = 3.69, p = .002$			$R^2 = .19, F(6, 121) = 4.65, p = .000$			$R^2 = .20, F(6, 121) = 5.15, p = .000$		

Table D2

Results of mediation analysis ($N=128$)

Variable	Model a-path			Model b/c'-path			
	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	
Location or Non-location AR (X1)	-.05	.25	.838	-.05	.16	.741	
Both Location and non-location AR (X2)	-.14	.29	.626	-.16	.19	.410	
Customer-brand engagement (MED)	-	-	-	.54	.06	.000	
Predispositions towards AR (control variable)	.49	.11	.000	.17	.08	.027	
Notes: Models	$R^2 = .15, F(3, 124) = 7.54, p = .000$						$R^2 = .51, F(4, 123) = 32.19, p = .000$

Note: a-path: Extensiveness of AR use to Customer-Brand Engagement; b-path: Customer-Brand Engagement to Brand Equity; c'-path: Extensiveness of AR use to Brand Equity