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Augmented reality adoption in luxury stores: an experimental study to investigate the impact of "Magic Mirrors" on people with low self-esteem.

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INTRODUCTION

This paper stems from the intention to achieve a more accurate understanding of the effect of Augmented Reality on consumers during the shopping experience in physical luxury shops. More specifically, we wanted to analyse whether the use of Magic Mirrors (mirrors that allow customers to see their own image reflected on a monitor that digitally superimposes the image of the garments they want to try on onto the image of their body) was preferred during the shopping experience for people with low self-esteem. Considering that through the virtual try-on of the Magic Mirror, the contours of our body are modified, or otherwise improved, the choice of this last variable is due to the fact that we wanted to test whether a person with low self-esteem might prefer this purchase method to a traditional one.

The structure of this thesis consists of three chapters. The first chapter concerns a general description of the phenomenon starting with a description of Industry 4.0 (a field to which augmented reality belongs) both in a general way as well as from the point of view of the luxury sector. In addition, the history of augmented reality and the most important features of the technology such as tracking techniques are presented. Next, a comparison between augmented reality, virtual reality and mixed reality is proposed in order to gain a good understanding of the differences between the three.

The second chapter proceeds with the description of augmented reality from the perspective of the luxury sector. More specifically, topics such as the characteristics of augmented reality in the luxury sector and its omnichannel approach will be discussed. Next, the use of augmented reality both online and in physical shops will be illustrated. In the first case, we will discuss the uses of the technology in websites and through mobile phone apps, while in the second case we will go more specifically into all the uses of augmented reality in physical shops (mainly virtual fitting rooms and magic mirrors). This chapter closes with the formulation of the research hypothesis:

H1: For people with low self-esteem the usage of AR Magic Mirrors in luxury stores positively influence their feeling of consumer decision confidence and consequently the willingness to buy.

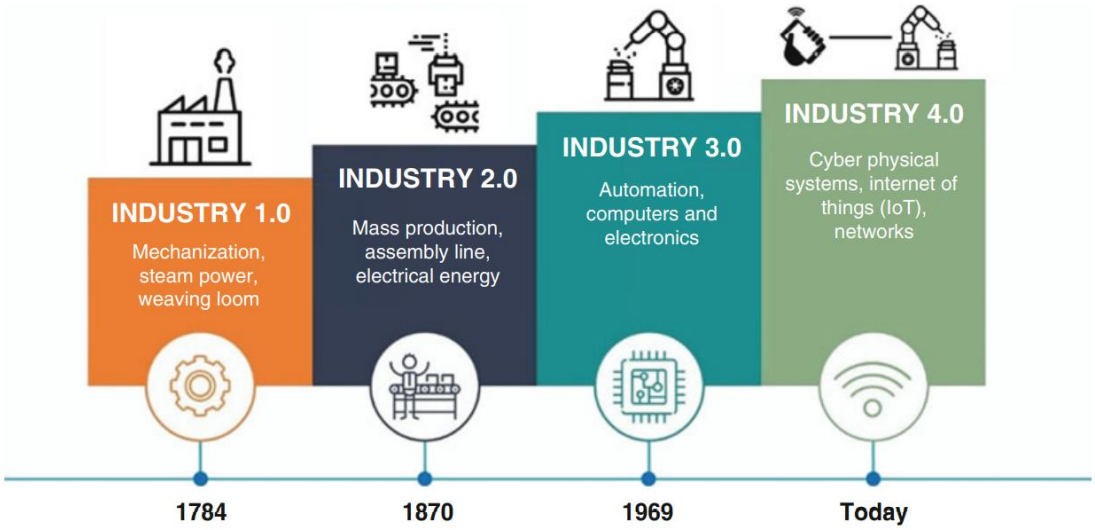
The third, and final chapter, is dedicated to the study of the research model and the interaction mode of the variables taken into consideration. After describing the questionnaire and how it was administered, we move on to present the sample obtained and its characteristics. Subsequently, the chapter consists of the analysis of the data obtained from the survey to test whether the initial hypothesis had statistical significance. The concluding part of this paper consists of managerial implications, research limitations and conclusions.

CHAPTER I

1.1 Industry 4.0

The assembling economy in Ontario has recently accepted what many are referring to "Industry 4.0" as the start of the fourth mechanical revolution after the 1960s' basic robotization (De Pace et al., 2018). In order to introduce this new industrial phase, it is fair to trace all the steps that led to the cutting-edge technology we are experiencing in the 21st century.

Figure 1: Industry 4.0



Source: Nayyar et al., 2020

Mechanization, steam power, and weaving looms were the focus of Industry 1.0. The focus of Industry 2.0 was on mass production, assembly lines, and electricity while automation, computers, and electronics were the focus of Industry 3.0. With the expanding boom of Internet of Things, Networks, Big Data, and Cyber-Physical Systems in today's day, the phrase Industry 4.0 was coined. Industry 4.0, a new automated mechanical innovation, is a modification that allows data to be aggregated and researched across multiple machines, utilizing a faster, more adaptable, and increasingly successful approach to produce a higher-quality product at lower costs (Bordeleau et al., 2018). This widespread revolution will increase productivity, drive money-related issues to the forefront, enhance mechanical advancement, and alter the labour.

Industry 4.0 is a term used to describe the current state of computerization and data collection and this new era of industry is defined by the use of highly advanced computerized system and information to boost efficiency and production, including efforts to connect machines and products via networks. More in detail,

the nine pillars of this innovative period are: big data analytics, simulation, autonomous robots, horizontal and vertical integration, cloud, cybersecurity, addictive manufacturing, the IoT and augmented reality.

Big data analytics arises since our reality is witnessing the creation and diffusion of an infinite amount of digital data. All the information comes from the increase of digital devices that automate most of the procedures through the daily creation of articles, content, photos, posts, and videos spread by users within the main social platforms (Rezzani, 2013). To be able to collect, filter and process the so-called "Big Data" requires technologies with high computing power and resources that conventional data management and storage systems do not have. Companies must therefore invest in analytical software capable of analysing all available data in a competitive timeframe, in order to increase the operational efficiency of their marketing strategies and, consequently, the satisfaction of their customers.

The simulations are all the processes that are put in action in physical or digital way, inside a controlled space, in order to succeed to understand and to verify the possible development of a phenomenon previously planned through theoretical models. The 3D simulations are used inside the operations of the systems in order to take advantage of the data in real time and to be able, in advance, to bring corrective manoeuvres.

Autonomous robots are the fundamental pillars for the technological development and the increase of automation of production processes of companies operating in different sectors. The key features that make these new systems fundamental to the augmentation of the industrial sector are integration, adaptability and mobility, which are far superior to more traditional systems. Taken together, these improvements mean that advanced robotics technologies will be able to perform many tasks more economically than the previous generation of automated systems (Rezzani, 2013).

Vertically and horizontally integrated system of communication networks are implemented in an increasingly number of companies. This process makes businesses, firms and departments processes and systems more integrated, and, in this way, highly automated value chains will come to life (Rezzani, 2013).

In order to operate effectively within Industry 4.0, large amounts of data and information are increasingly required, consequently, companies must necessarily expand their storage capacity and data sharing speed (Cloud). Only in this way will the performance of information management technologies improve, reaching reaction times of a few thousandths of a second and, consequently, through Cloud and Cloud computing services, companies will be able to achieve better results (Puri, 2019). As a result of the fourth industrial revolution, high operational risks have been created that compromise the normal course of production processes: we are talking about Cybersecurity risks. Precisely because of the nature of Industry 4.0, possible cyberattacks can have serious consequences as they can affect a wider network of information and damage multiple organizations even over a long period of time. To be able to deal with these risks, Cybersecurity strategies must be resilient, they must be fully integrated from the first developments to the strategic and technological vision of the company to be able to ensure the proper conduct of business (Waslo, 2017).

Additive Manufacturing, better known as 3D printing, is on the verge of being widely used within industrial manufacturing processes. Some of the world's best companies have realized enormous business opportunities and have begun to implement strategies to maximize the potential of this new technology (Boston Consulting Group, 2017). Among the primary uses of 3D printing is the production of prototypes or small batches of customized products that can greatly reduce transportation and handling costs (Puri et al., 2019).

The definition of Internet of Things, abbreviated as IoT, describes the situation in which the Internet extends into the real world and manages to incorporate everyday objects. Objects are therefore no longer disconnected from the virtual world, but can be controlled remotely and connected to each other, thus becoming physical access points that make it possible to use network services (Mattern, 2010). The IoT can also be defined as a combination of virtual networks that allow dual communication between machinery, structures, finished and unfinished products through the use of local intelligence.

For what concerns augmented reality, it is one of the most important pillars in the development of Industry 4.0 and it will be investigated in more detail in the following subchapters.

1.1.1 Industry 4.0 in the luxury sector

Nowadays, multinational luxury companies are defined by several characteristics like market competition (Brondoni & Arrigo, 2015), unstable and rapidly changing demand and high profitability (Mosca, 2008). Customers are no longer satisfied with merely purchasing luxury things when they become more widely available; they often want it before the general public does, or they want it entirely customized to set themselves apart from others. This entails a reduction in production times as well as several reorganizations of the entire manufacturing process. The increasing engagement of electronic methods throughout industrial processes gave rise to the notion of Industry 4.0. The concept refers to a future smart factory model in which computer-driven systems monitor physical processes, generate a virtual duplicate of the actual environment, and make decentralized decisions through self-organization mechanisms (Smith, 2016). In fact, the purpose of Industry 4.0 is to achieve a deeper interconnection and cooperation between available resources and the final client; it is a multi-layer arrangement made up of complicated machinery, people, goods, and data within the manufacturing area and throughout the value chain.

The use of these systems enables a firm to improve its productivity and gain a competitive advantage. In fact, it is a revolution that affects a firm at all stages, from production to human resources (Paschetto, 2015). The method is technologically associated with the introduction of Cyber-Physical Systems (CPS), which are collaborative computational entities with strong linkages to the physical world that provide and use Internet-

based data-accessing and data-processing services (Fornari et al., 2018). Despite the fact that luxury fashion is a unique industry, all of its procedures are cyclical, and it might benefit from these implementations.

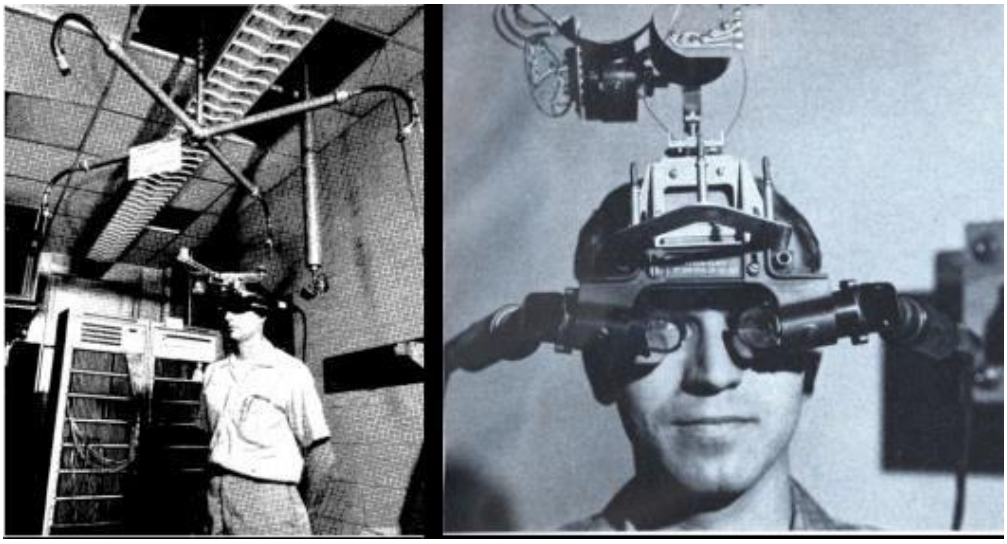
One of the qualities attributed to luxury products is the strong link with the past demonstrated by the tradition handed down over time (Dubois, 2001), a definition that can be properly understood as the brand's heritage being established upon the traditions passed down by the various artisans who crafted the goods. Nevertheless, as previously indicated, if we divide and analyse the production process in depth, we discover that it is cyclical, and thus parts of its phases might benefit from innovations which would make it leaner without harming the ultimate product's quality. The laser-cutting equipment used for leather items are one example of this. A robot can cut all of the pieces needed to make a handbag in a matter of minutes but cutting them by hand could take up to half an hour.

1.2 Augmented reality history

Contrary to popular belief, the history of augmented reality began long before the 2000s, precisely in 1968. In order to illustrate the history of this new technology in a more organized and detailed way, each decade will be individually described starting from 1960s until today.

AR in the 1960s: In 1968, Ivan Sutherland and Bob Sproull created the first head-mounted feature, which they called The Sword of Damocles. Obviously, it was a dreadful contraption indicating shabby PC structures (Nayyar et al., 2020).

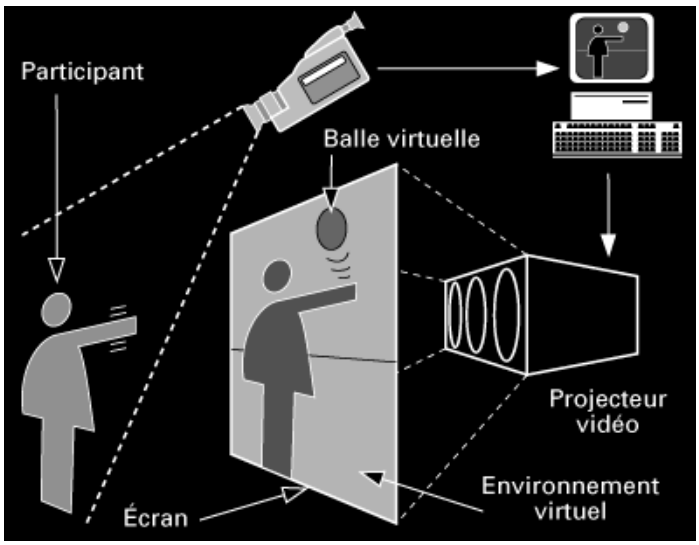
Figure 2: The Sword of Damocles



Source: Liu et al., 2018

AR in the 1970s: In 1975, Myron Krueger created Videoplace, a fake reality lab. The analyst postulated a link between cutting-edge technology and human advancements. In the future, this concept would be used to specific projectors, camcorders, and onscreen diagrams.

Figure 3: Videoplace

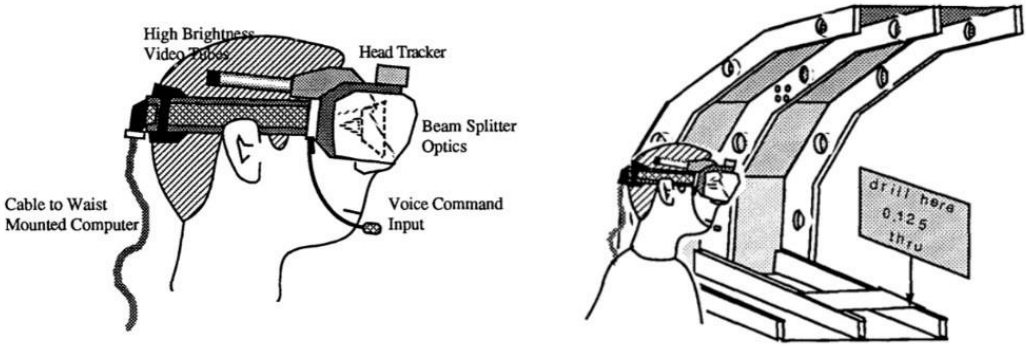


Source: www.aboutmyronkrueger.weebly.com

AR in the 1980s: In 1980, Steve Mann invented EyeTap, a conservative computer that was designed to be worn in front of our eyes. It used to capture the scenery so that it could be overlay with ramifications later, and then present everything to a client who could also engage with it using technologies for head enhancements. In 1987, Douglas George and Robert Morris created the heads-up introduction model (HUD) that, when pointing the machine to the sky, it displayed astronomical data.

AR in the 1990s: The concept of "augmented reality" was first used in 1990 but it was not until 1992 that Tom Caudell and David Mizell actually coined the term Augmented Reality to indicate the superimposition of virtual images on real images. In fact, two years earlier, the two researchers were commissioned by Boeing to devise a system that would simplify the wiring of aircraft electronics and they created a viewer capable of visualizing the exact sequence of operations to be performed to solve problems related to the assembly of the aircraft. Later, in 1994, Jun Rekimotoand Takashi Nagao realized a digital system through which it was possible to obtain information from some images, equipped with barcode, through the use of a camera connected to a PDA (Pucci M.,2015). Subsequently, in 1999, a social gathering of scientists led by Frank Delgado and Mike Abernathy explored an innovative course program which used data from a helicopter camera to create streets and runways.

Figure 4: Viewer created by Caudell and Mizell



Source: www.medium.com

AR in the 2000s: a Japanese analyst named Hirokazu Kato created and distributed AR ToolKit, an open-source SDK (software development kit). In the same year more innovations were presented like Trimble Navigation, that demonstrated an outer defensive top-mounted AR system in 2004, and Wikitude, that created an augmented reality travel guide for Android phones in 2008.

Today's AR: In the year 2013, Google released a beta version of Google Glass, which had a web connection via Bluetooth. In 2015, Microsoft unveiled two fresh out of the box new advancements: Windows Holographic and HoloLens (an AR goggles with a slew of sensors that show HD 3D images). In 2016, Niantic released the Pokemon Go mobile game.

1.3 Augmented reality

The popularity of augmented reality interactive technology is quickly growing, and so is its use. This rise has been driven by the widespread of smartphone usage, cost improvements, increased mobility, and AR's potential to give experiential value and impact to the consumer journey (Watson et al., 2018). As a result, augmented reality gives consumers the ability to confidently evaluate products and make judgments (Kim and Forsythe, 2008). Moreover, AR has grown rapidly in the new century, thanks to various applications embedded in mobile devices such as sensors in smartphones, tablets, or glasses. In fact, the number of application areas is continually expanding, and the quality of AR applications has improved as developers pay more attention to consumers' wants and wishes (Poushneh and Vasquez-Parraga, 2017).

AR refers to a set of technologies that combine real-world and virtual data to enhance up a particular experience (Lamantia, 2009). Some clients avoid making online purchases due to possible flaws that could make the online process dangerous (Kim and Forsythe, 2008). AR can provide memorable experiences for

online shoppers (MacIntyre et al., 2001) because, by offering adequate product information (Lu and Smith, 2007), it will be easier for them to examine the targeted products (Kim and Forsythe, 2008) and make more confident judgments (Oh et al., 2008). AR is a technology where the user is located between the real-life world and the overlay virtual elements, which can include films, photos, or other virtual items (Javornik, 2016).

Augmented reality has primarily been researched in the field of computer technology (Javornik, 2016; Rese et al., 2016), and the most widely accepted definition of AR, proposed by Azuma et al. (2001), comes from the same field: "An AR system supplements the real world with virtual (computer-generated) objects that appear to coexist in the same space as the real world. […] we define an AR system to have the following properties:

- combines real and virtual objects in a real environment
- runs interactively, and in real time
- registers (aligns) real and virtual objects with each other"

The concept given by Azuma et al. (2001) emphasizes the interaction of virtual and physical elements in real time. To put it another way, AR allows for such integration of virtual aspects to reality (Javornik, 2016). People, things, and the environment are examples of actual elements (Javornik, 2016). In the retail world, this means that AR may add virtual components to retail products, people, or retail surroundings in real time, potentially creating seamless consumer experiences (Bulearca and Tamarjan, 2010; Huang and Liao, 2015). As a result, as AR technology has become more inexpensive, more businesses have begun to include it into their experiential retail offerings (Deloitte, 2016; Mintel Trends, 2016). The transition to digitalization has allowed AR to expand beyond specific sectors and have an impact on the consumer journey, particularly in the online and mobile environments of retail (Javornik, 2016; Poushneh and Vasquez-Parraga, 2017; Scholz and Smith, 2016). Indeed, as smartphones become more common, there has been a boom in interest in mobile AR apps (Dacko, 2017).

Like Azuma, other researchers have come up with other definitions of augmented reality and, overall, these definitions express that the augmented reality technology creates what is called an augmented real environment (ARE). An ARE is a new interactive and smart location where individuals may use augmented reality to improve their relationships, interactions, and lives (Caboni et al., 2019).

1.3.1 Augmented reality features

Recent studies have looked at the key attributes of AR technologies (interactivity, hypertextuality, modality, connectivity, location-specificity, mobility, virtuality) with a particular focus on interactivity (Javornik, 2016;

Poushneh and Vasquez-Parraga, 2017), modality (Huang and Liu, 2014; Jin, 2009), and augmentation (Javornik, 2016; Poushneh and Vasquez-Parraga, 2017).

Interactivity is defined as "the extent to which users can participate in influencing the shape and content of a mediated environment in real time" and has been widely researched (Steuer, 1992). Interactivity is thought to entertain and immerse users, resulting in a pleasant affective reaction (Fiore et al., 2005). Several authors have looked at how interactivity provides experience value by allowing customers to enter a state of flow, which is when they are immersed in a highly absorbing state while using interactive elements (Javornik, 2016; van Noort et al., 2012).

Modality consists of different types of content that a platform can supply, such as audio or visual formats (Javornik, 2016). Huang and Liao (2017) looked at the development of a sense of touch and self-location well within virtual image in creating a multimodal flow experience. They discovered that these AR elements generate a first-person viewpoint and sensation of self-location, as well as an authentic experience, via "the vivid and genuine integration of spatial vision" (Huang and Liao, 2017). Huang and Liu (2014) investigated whether storytelling, context simulations, and item simulations have different persuasive impacts. According to their findings, AR that is designed to tell a story is essential for producing experiential value.

AR's potential to produce immersive experiences, according to Javornik (2016), is due to its distinctive characteristics of augmentation. According to Javornik (2016), augmentation is peculiar to AR in the sense that it enhances physical reality by overlaying virtual features on top of real-world environments. AR is far more than just another interactive technology, as Javornik (2016) points out, because its capacity to augment or modify the visual picture of reality in real time produces a more immersive flow than other equally engaging experiences. Indeed, Poushneh and Vasquez-Parraga (2017) and Javornik (2016) both show the value of augmentation in boosting immersion, fun, and enthusiasm, resulting in increased experience value creation.

Furthermore, AR can help to enrich the retail environment, both online and in physical places, by providing multiple types of value to consumers and businesses (Pantano et al., 2017; Scholz and Duffy, 2018). For what concerns consumer value, augmented reality allows consumers and potential users to connect with and touch products in a new way (Brengman et al., 2018) enhancing product tangibility (Vonkeman et al., 2017). AR adds various level of information to help buyers perceive how products fit them individually (Rese et al., 2014; Lu and Smith, 2007; Olsson et al., 2013). Customers' intent to buy an object improves when they touch it, as does their inclination to purchase a greater price and their overall propensity to buy. More information makes it easier for customers to interact and fully immerse themselves in the shop environment (Yaoyuneyong et al., 2014). Information on product composition, design, and functionality, as well as more general aspects, are all examples. In this way, customers become part of the designing process of the item they desire to buy using augmented reality. It is feasible to increase customer happiness and engagement (Javornik, 2016) and influence customer decision-making with AR. According to Scholz and Duffy (2018), AR creates a "zone of fantasy"

where customers can connect with one another. When client happiness rises, the buying process becomes more spontaneous and adaptable (Dacko, 2017).

Meanwhile, from the retailers' perspective, AR allows businesses to achieve a variety of objectives in their advertising and marketing strategy, such as encouraging customers to visit their store (online or offline), increasing brand knowledge and customer loyalty, and creating an immersive sensory environment. In particular, AR allows retailers to reconfigure or rebuild retail space by encouraging a distinct mode of customer perception and sense making, as well as the use of numerous aspects related to the five senses. Retailers may employ augmented reality to provide customers virtual try-ons to help them choose the best products for their needs (Brengman et al., 2018). AR has shown to be an effective tool for promoting retail shops and generating customer traffic.

Its benefits for retailers include enhanced speed in collecting data on consumer behavior and, as a result, improved service at the point of sale, which has a beneficial impact on the consumer buying experience (Dacko, 2017; Flavián et al., 2019; Pantano and Naccarato, 2010). Retailers can use AR to enhance sales volumes by providing a personalized pre-purchase review through mobile, web-based, and in-store applications (Dacko, 2017). Scholz and Smith (2016) emphasize the importance of AR for retailers in terms of creating a memorable customer experience and increasing consumer engagement (Bonetti et al., 2018). The primary advantages that merchants can get from using AR into their retail strategy are shown in the following table.

Figure 5: AR value for retailers

Value for retailers	
Advertising	Creative and interactive advertising
Experience	Experiential environment
Attracting	Customers online and offline
Sales	Increase sale volume
Environment (online and offline)	Smart and easy to use
Brand awareness and customer loyalty	Increase BA and CL
Information	Get more information regarding customers behaviour

Source: Caboni et al., 2017

Moreover, Dacko (2017) proposed other possible AR benefits for merchants. He believes that AR can enhance conversion and return on sales by allowing customers to virtually try on apparel and make-up. He further claimed that AR can reinvigorate otherwise passive shelf displays and ultimately accelerate store traffic by

giving a more dynamic and exciting experience. Finally, he proposed that augmented reality apps provide for a more personalized buying experience.

1.3.2 Technology

Compared to virtual environments or Virtual Reality, Augmented Reality requires more advanced technologies, which is why it has required more time to fully mature in this particular field. The three main principles of this technology are:

- Combination of real and virtual objects in a real environment
- Registration and alignment of real and virtual objects with each other
- Interactive, three-dimensional, real-time operation

In order to ensure that the technology works properly, some key components must be present, such as: display, tracker, computer graphics and software.

The displays most commonly used by this technology are: head-mounted display (HDM), hand-mounted display and spatial display. The HMD systems consist of a mounted screen on the head of the subject through the use of a helmet, and they can be monocular or binocular. In addition, the display can be transparent, called optical see-through, or generated entirely through the use of a video, called video see-through. In the case of optical see-through, not only does it leave the resolution of the real world intact, but is also less expensive and, even when changing observation point, avoids the situation where an object appears to move away from the background. However, the use of mirrors and transparent lenses can reduce the brightness and contrast of both the images and the perception of the real world. Regarding see-through videos, the brightness and contrast of virtual objects easily match with the real world, and, since reality is digitized, it is easier to remove objects from the real environment. In this case, the disadvantages can be a low resolution of the real environment and a limited range of vision.

Hand-mounted displays are a good alternative to the head-mounted displays just mentioned, as they are less invasive, ready to use and portable. Currently there are different types of devices such as tablets, ultra-mobile PCs, PDAs and finally smartphones. If before the use of tablets and notebooks was preferred, nowadays the unstoppable development of the performance of smartphones make them certainly the most attractive devices with respect to the use of Augmented Reality, as they combine powerful processors, camera, accelerometer and GPS. Regarding this technology the disadvantages could concern the screen surface that could be too small for 3D interfaces.

By Spatial Displays it is meant a category of display that maintains a static position in the environment in which it is located, such as video projections, holograms, radiofrequency sensors and tracking systems to

report graphic information on the screen, without the need to wear or carry any display. A classic example of Spatial Display is found in Virtual Mirrors inside stores, where the subject can comfortably wear clothing without the need to change.

1.3.3 Tracking techniques

Tracking is the problem of detecting the position of the user and its orientation with respect to the surrounding environment. In the literature, three different tracking techniques are identified: sensor-based tracking techniques, vision-based tracking techniques, hybrid tracking techniques.

Sensor-based tracking techniques use magnetic, acoustic, inertial, optical and/or mechanical sensors. Each type of sensor has a respective advantage and disadvantage. For example, magnetic sensors have a high update rate, and they are lightweight, but they can be disturbed by any metallic material that is nearby disrupting the magnetic field.

Vision-based tracking techniques use computer vision techniques to determine the position and perspective of the user relative to the real world. In order to activate this technique, the sensor must have a camera. The latter generates information useful for the determination of its position and orientation with respect to the real situation. To simplify the process, landmarks from the environment itself can be used, or they can be created specifically for the use of Augmented Reality. These are called markers or fiducial symbols, which are easily recognized by the camera software.

Figure 6: Prada SnapChat filter

Source: www.voguebusiness.com

Usually they are physical objects, mainly pieces of paper, but also natural elements can be used with the technique called natural feature tracking. An example that uses this technique is the well-known application SnapChat, which tracing a natural element such as the face can "augment" reality with virtual data.

In some Augmented Reality applications, computer vision alone is not able to provide a robust tracking solution, and for this reason hybrid tracking techniques have been developed. There is a growing consensus to combine inertial technologies, such as accelerometers (one of the first sensors introduced in smartphones that allows to determine how our device is moved) with computer vision technologies. In fact, many games and applications exploit these sensors to make us drive cars, planes or puppets, or when we turn our smartphone, the image adapts to the movement that the device undergoes.

1.4 Augmented reality and virtual reality

The use of AR is principally based on the reproduction of 3D images of virtual objects. It is similar to virtual reality (VR), but it is important to underline their main differences (Caboni et al., 2019). The differences that distinguish these two tools are obvious and quite relevant. Augmented Reality corresponds to an augmented version of the actual reality that provides precise information as faithful as possible to the actual surrounding environment, made possible by the use of technology that superimposes digital images and information on the real environment. To make this possible, AR employs sophisticated digital systems, such as Google Glasses, or simpler and more common tools, such as smartphones and tablets. In other words, AR allows, through the concept of "overlay", to make the digital reality interact with the real one, enriching the visual field of users with the use of digital tools necessary for the superimposition itself of the two realities.

Virtual Reality, on the other hand, fully replaces the real world with one created virtually. In line with what has just been said, VR includes that set of technologies that allow to transport the user elsewhere, in a different reality from the one the user finds in front of him/her. All this is made possible by the use of specific visors that, if worn, allow the user to isolate himself from the surrounding world and transport him/her into a parallel reality, generally realized through the use of 3D graphics. The viewers usually used for the use of VR are: Oculus Rift, Oculus Go, Samsung Gear VR, Google Cardboard. The latter allow you to use your smartphone as a tool to activate VR. To do this, you must select the video of your interest in and, at the moment when the image begins to split, you must insert your smartphone inside the glasses to start the entertainment experience and enter in a parallel reality. What at first glance might look like a static image, once the glasses with the embedded smartphone are put on, will become an interactive image, providing a 360° view of the represented environment.

Figure 6: AR vs VR

Elements of AR	Differences and similarities		AR	VR
Technology	Reproduction in 3D	D	Objects	Environment
	Superposition	D	Virtual elements in real environment	Virtual element in virtual environment
	Need for electronic tool	D	No need to see	Yes need to see
	Computer based	S	Yes	Yes
Context	Kind of reality	D	Natural reality	Synthetic reality
User experience	Goal	S	To enhance consumer experience	To enhance consumer experience

Source: Caboni (2019)

Considering the differences between the two technologies shown in the table above, the positive effects generated by AR are more appropriate for physical retail stores because through augmented reality, consumers have the opportunity, for example, to test several products/clothes without physically trying them (Verhagen et al., 2014; Yim et al., 2017). In this context, AR is more realistic than VR for different reasons. AR permits the overlap of virtual elements in the real and physical worlds in which a user is immersed (Hwangbo et al., 2017), whereas with VR, the user is completely immersed in a virtual world with virtual objects. In this way, VR presents a stark difference to AR because a synthetic reality is generated by a computer (Pantano et al., 2017; Burdea and Coiffet, 2003) and is composed only of virtual objects (Milgram et al., 1994). However, it is interesting to note that techniques used to develop AR applications come from techniques used in developing VR (Rese et al., 2017; Azuma, 1997). Moreover, the two technologies are considered similar whent it comes to support the goal of enriching users' experience (Yim et al., 2017).

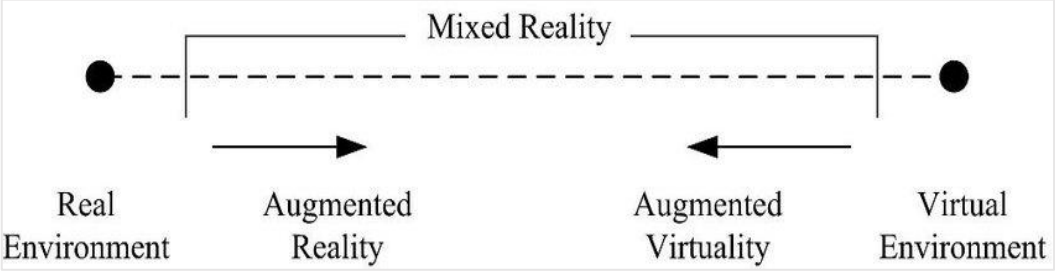
1.4.1 Mixed reality

A second type of reality, virtually realized, comes from the meeting of Augmented Reality and Virtual Reality: this is called Mixed Reality (MR). For what concerns this new technology, it is a middle ground between Augmented Reality and Virtual Reality. It represents any technology that combines virtual elements with real elements. Mixed Reality is a technology with elements that are more virtual than the ones in Augmented Reality and a bit more real than the ones in Virtual Reality. It is a type of technology that allows to modify virtual reality through the interaction between the real and virtual environment.

Hoenig et al. (2015) came up with a definition of this technology following the definition of Augmented Reality by Azuma et al., thus a Mixed Reality system as one that:

- combines physical objects in at least one physical environment and virtual objects in at least one virtual environment
- runs interactively (often called real-time)
- spatially maps physical and virtual objects to each other

Figure 7: Mixed Reality



Source: Hoenig et al., 2015

More in detail, objects such as humans, robots, sensors, and obstructions make up the physical world in an MR space. These objects can communicate with one another and with virtual environment aspects. Secured, closed environments can incorporate physical elements that represent a safety danger or allow for the installation of specific equipment (such as a motion capture system) required to complete the physical-to-virtual data transmission. In fact, no alterations or modifications to physical-world components (such as the robot's camera and sensors) are required due to direct data exchange between the physical and virtual environments.

A MR system's virtual world can help overcome physical limits, and it can be constructed using a variety of current technologies, such as robotic simulators or 3D gaming engines. Robots and sensors, as well as models of more complicated items, can be found in the virtual environment, just as they can in the physical one. Because MR allows for direct communication between the virtual and physical worlds, there is a great deal of freedom in terms of which aspects exist in the physical world and which can appear in the virtual. Physical or virtual components might be chosen based on the demands and convenience of the user.

MR has various advantages over AR or AV due to its interactive nature between diverse contexts, for example (Hoenig et al., 2015):

- Spatial flexibility: Experiments with robots can be carried out remotely thanks to the interaction between physical and virtual surroundings in MR. This can help organizations collaborate more effectively because they are no longer constrained by geography and can convene in a centralized virtual environment.

- Elimination of safety risks: Safety concerns of human-robot interaction can be addressed using MR by dividing them into separate real or virtual settings. Physical robots can connect with virtual people or physical humans in a distinct physical environment in MR, removing concerns about human safety in the event of failures.
- Simplification of debugging: The barrier between simulation and realization is narrowed thanks to the combined physical and virtual MR space. The virtual component of MR enables for display of multiple robot states so that problems can be detected early. MR generates a rich environment in which all physical and virtual data interact in real time, with no additional computation or calculation required. This speeds up and simplifies the debugging process.
- Unconstrained additions to robots: In a virtual reality environment, integrating or modifying virtual characteristics of robots that would be too expensive, time-consuming, or unattainable in reality is conceivable. For example, a virtual camera can be added to a robot that is too small to carry one.
- Scaling up swarms: Experiments on robots are made easier by MR. Because of the continuous connection between the physical and virtual environments, the majority of the group can be mimicked, and trials on only a few real robots may be sufficient.

1.5 AR marketing

Previous researchers have tried to define "AR Marketing" proposing several definitions that could express its real meaning. In 2022, after attending to the 5th AR and VR conference, Rauschnabel et al. identified a definition that combined interdisciplinary ideas from both technologies:

"AR Marketing is defined as the strategic integration of AR experiences, alone or in combination with other media or brand-related cues, to achieve overarching marketing goals by creating value for the brand, its stakeholders, and societies at large, while considering ethical implications".

From this definition it is clear that AR Marketing is defined as a sub-discipline that works in tandem with the marketing strategy department of an organization instead of as a stand-alone project. As a result, it is identified as a goal-oriented, multidisciplinary and wide technology in need of further investigation.

For what reasons AR marketing represents a strategic aspect?

Strategic refers to a comprehensive, smart, resource-based and complex process. Although the definition of an AR Marketing strategy may change over time, broad goals, technological assets, skills, and long-term synergy with several strategies will almost certainly be crucial to success. First, the suggested definition places a greater emphasis on concept than performance. Marketing is commonly connected with the department in charge of advertising activities. On the other hand, many marketing functions are handled by departments with

different designations, such as public relations, communications, human resources, customer service, and sales. The word "function" usually brings to mind images of a "silo" or a dedicated "marketing department." AR Marketing strategy, like the marketing notion itself, involves numerous corporate areas.

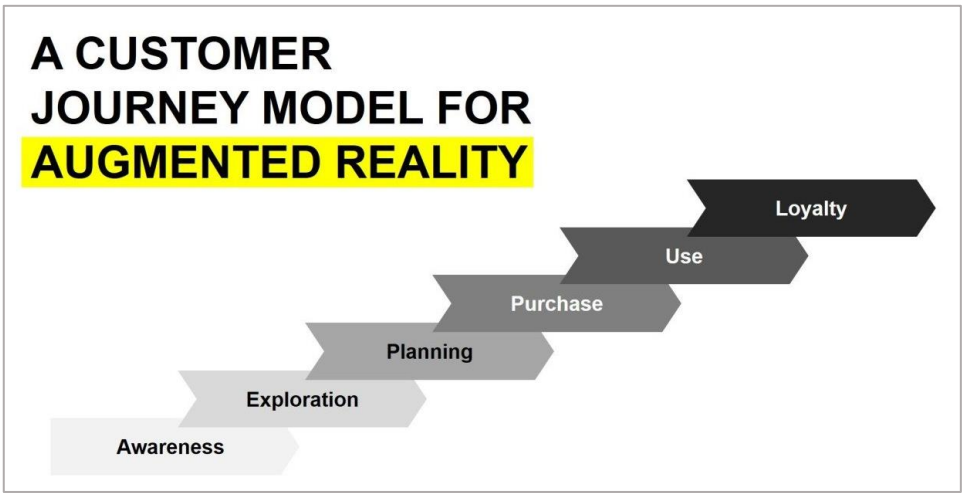
Second, rather than being driven by technology, AR should have a purpose to deliver value. AR marketing could furnish different kind of values: utilitarian (enhancing people's efficiency), hedonic/experiential (getting involve in brand stories), social (making connections with different brand fans), eudaimonic (improving happiness and self-development), inspirational (encouraging creativity or imagination), or edutainic value (game - based learning activities or the perception of becoming more skilled consumers).

Moreover, creating and implementing new touchpoints, or expanding old touchpoints, successfully into the consumer journeys is a difficult process for AR Marketing. For this reason, AR is frequently used in conjunction with other media and touchpoints. As a result, it must be well linked with other forms of media and marketing and, as a result, current platforms have begun to incorporate AR capabilities. For example, Facebook allows advertisers to use augmented reality (AR) features in their adverts (for example, a user's phone can utilize the camera to digitally "try on" sunglasses), and Amazon has an AR-view function based on 3D models (eMarketer, 2020; Gatter et al., 2022). Other businesses, meanwhile, use offline ads to allow customers to engage with virtual AR material via their smartphones (Yaoyuneyong et al., 2016; Sung et al., 2022). Customer journey maps are a technique to talk about and manage multiple touchpoint sequences in marketing.

AR combines online and offline touchpoints to create a hybrid experience, thus, there are more phases in the customer journey purchase experience in comparison to the general order pre-purchase - purchase - post purchase. Moreover, AR play an important role in the entire Marketing Mix (4 P's). In fact, Rauschnabel et al. (2022) identified a customer journey model for Augmented Reality (AR) Marketing composed by 6 phases:

- Awareness: Consumer gets to know and gets aware of a brand and its offers
- Exploration: Consumer explores a brand, its products, and offers without a specific purchase need, but to identify new needs or opportunities
- Planning: Consumer is aware of the need to purchase a specific type of product and plans the purchase in detail
- Purchase: Consumer purchases a product via AR
- Use: Consumer uses the product
- Loyalty: Consumer becomes and/or stays loyal to a brand

Figure 8: AR customer journey model



Source: Rauschnabel et al., 2022

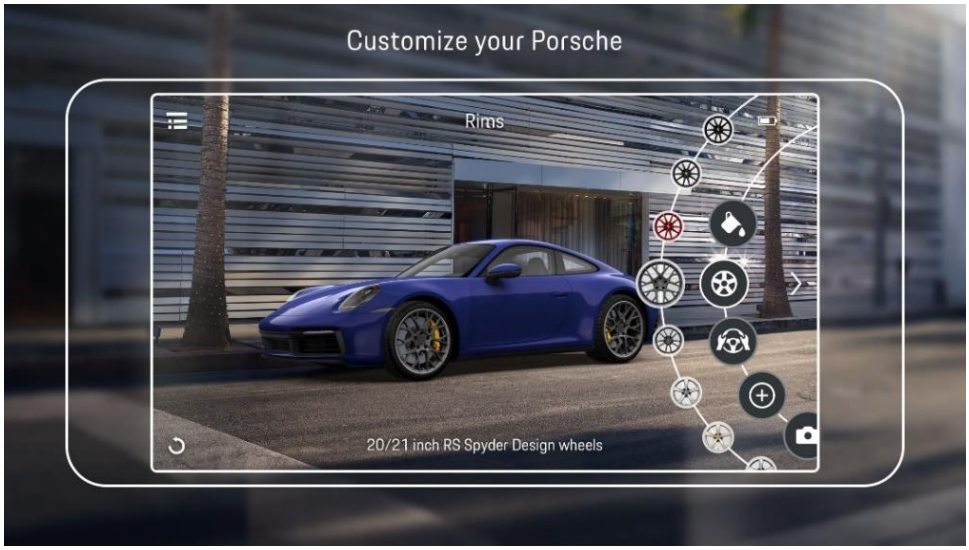
In its most upgraded version, augmented reality can be the actual product. Niantic, for example, created the Pok'mon Go game, which is an AR version of their Pok'mon characters. Another tendency is for media businesses to create "AR replacements" for existing offerings (Rauschnabel, 2021). Consider the possibility of a Netflix AR TV app on AR glasses replacing TV screens. While such replacements may appear futuristic, prominent companies are working to make them a reality. For example, when CEO Mark Zuckerberg presented Meta's (previously Facebook) metaverse plan at the F8 conference, he hypothesized that "a lot of things that we consider of as physical items today, like a TV for displaying an image, will actually simply be $1 apps in the app/play store."

Similarly, Post-it Notes may become obsolete if consumers discover a more effective way to attach virtual notes to real surfaces. AR could open up new distribution channels in terms of location. In the future, businesses may use augmented reality to install complete shelves in their customers' living rooms. Finally, when marketers strive to figure out how to sell AR, there's the issue of pricing. According to research (Huang, 2021; Heller et al., 2019a, 2019b), AR boosts consumers' willingness to pay, which could assist justify AR investment.

Consumers may obtain AR benefits in exchange for personal data in addition to monetary transaction. AR has the ability to provide large amounts of rich data about a person and their environment, making it an attractive environment for targeted advertising. With this in mind, Porsche has believed in and invested in technologies and tools that can reach consumers and give them added value. First among these technologies is Augmented Reality. In late 2018 and early 2019, Porsche launched Porsche Augmented Reality Visualizer App (PARVA),

an app for iOS and Android mobile devices that allows customers to project their dream car directly in front of their home garage.

Figure 9: PARVA



Source: www.newsroom.porsche.com

By configuring the interior features of their car in Porsche's online configuration platform, they will be able to switch to their smartphone and view in different dimensions the car they created just seconds earlier. Once projected, in case we want to change colour, it will be possible to do so through an interactive menu that allows you to make changes to the bodywork in real time. "From now on, thanks to our new app, configuring a Porsche will be an even more digitized experience. Before making purchase decisions, every person can virtually park their dream Porsche in the driveway, on top of their living room table thanks to a scale reproduction or show a photo-realistic version to their friends," says Oliver Hoffmann, Head of Marketing Communications at Porsche (Davey, 2014). Such technology can break down millions of information barriers that previously stood between the customer and the company. Today, this is easier and has helped to increase the consumer experience as well.

CHAPTER II

2.1 Augmented reality in luxury retail

The rapid development of digital technology has profoundly altered all sectors of the marketplace including the luxury fashion sector (Mastropetrou, Bithas, 2019). Previously, this sector was exclusive, but technology has made it accessible to everyone.

Luxury is not only about the expensive price tag, it is about the one-of-a-kind experience. When customers invest in these high-end goods, they want an emotional connection and trust (Jaggi, Singh, 2022). In fact, it has been shown that the luxury sector relies on distinct characteristics such as authenticity, aesthetic expression, exclusivity, high quality, hedonism, prestigious image, premium price, and a strong emotional connection with customers (Ko, Costello, Taylor, 2019). Luxury fashion firms have transformed the way they communicate with their customers resulting in new digital marketing and social media techniques. Over the last decade, designing a user-friendly website, mobile app, and social media platform have all become important marketing communication channels for brand promotion and customer involvement (Chadha, Ahuja, 2020).

The majority of luxury businesses that are pioneering digital strategies are slowly starting to use augmented reality into their marketing plan, which offers new opportunities due to its unique qualities. For these reasons, fashion luxury firms are utilizing augmented reality to not only raise brand awareness, but also because it enables them to communicate with their target audience in a more timely and interactive manner.

Thanks to Augmented Reality and Artificial Intelligence technologies, luxury fashion brands are able to create an excellent consumer experience, reach more consumers, and build closer relationships with their audience (Chadha, Ahuja, 2020). This new technology can be implemented to show customers how the product will look before they buy it and hence conversions or just to make the purchase experience more interactive and exclusive. Because of augmented reality's unique ability to merge the virtual and the physical world, luxury consumers can immerse themselves in virtually enhanced experiences while trying on luxury accessories or going around a virtual luxury shop (Javornik et al., 2021).

2.1.1 Characteristics of AR in luxury retail

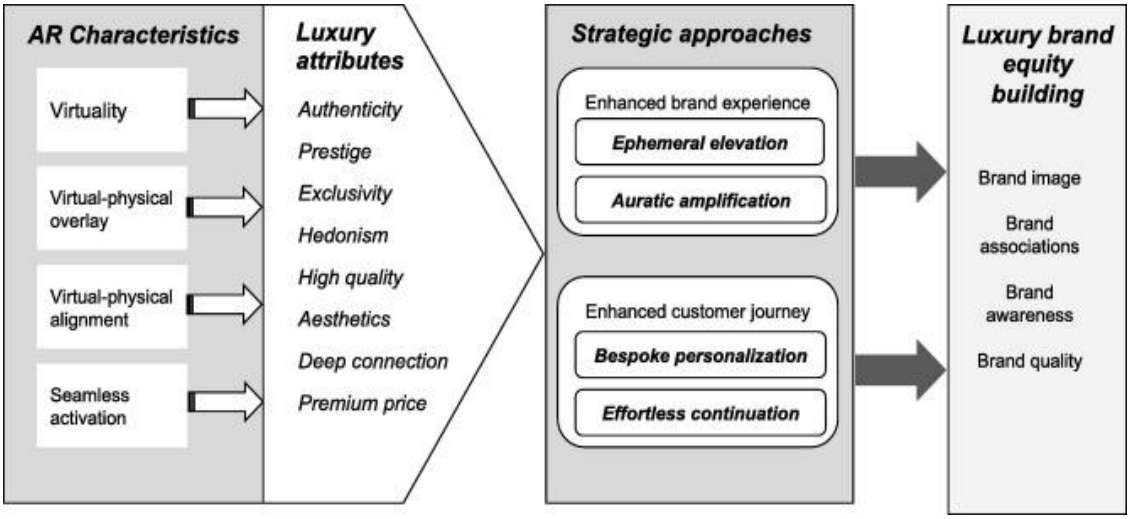
Whereas many studies on augmented reality have focused their attention on the effectiveness of this visualization technique from a general point of view (Merle et al., 2012; Bahti et al., 2010; Rosa et al., 2006),

Javornik et al., in 2021, focussed their study on the luxury sector. From this research they were able to highlight the 4 characteristics of augmented reality that shape consumer experience:

- Virtuality (visual stimulation): refers to the visual stimuli that augmented reality projects to the consumer. Certainly, the degree of virtuality is less than that of virtual reality as the consumer experiences a mixture of the real world with elements of augmented reality (Javornik, 2016).
- Virtual-physical overlay (virtual representations combined with the physical environment): refers to virtual representations placed on real-world environments, the amount of which can vary. Similarly, Heller et al. (2019) recognized picture production as an AR affordance that allows users to visualize 3D product representations in real-world settings.
- Virtual-physical alignment (real-time interactivity of physical elements with virtual ones): when virtual and physical elements look visibly aligned, allowing for real-time interaction with virtual elements. The degree of alignment, however, can vary depending on the tracking quality.
- Seamless activation (AR visualizations autonomously activated): it allows AR visualizations to be enabled autonomously using geolocation, marker identification, or marker less tracking (Javornik et al., 2019). The degreeof "seamlessness" is determined by the tracking system's reliability and responsiveness.

A recent study conducted by Petit et al. (2021) found out that virtual representations, like AR, increases sensory qualities, the perception of luxury craftmanship and strengthens brand relationships, conveying a new form of exclusivity; the possibility of adding virtual elements on physical surroundings can create brand proximity and hence a deeper resonance with consumers than online browsing. Moreover, this study demonstrates that luxury brands can implement augmented reality to achieve four strategic approaches. These strategies are aimed at both improving the customer experience and enhancing the customer journey.

Figure 1: Characteristics of augmented reality



Source: Javornik et al. (2021)

Regarding brand experience:

- Ephemeral elevation: enables luxury brands to elicit powerful emotions in customers. Through the use of a virtual layer customers are transported into the brand's world, creating a hedonic and almost fantastic experience. It can also be used to show exclusive content for specific locations or for particular collections.
- Auratic amplification: allows this new augmented reality technique to create a brand's distinct and specific aura. This can be achieved by immersing users in the brand's original craftsmanship, majesty and easing the access to the brand world.

Regarding the customer journey:

- Bespoke personalization: the consideration process is centred on the exclusivity of the luxury purchasing ritual thanks to AR visualization of the high-quality materials and craftsmanship of the product when each luxury good can be adapted to consumer wants (Rosenbaum et al., 2019). Nonetheless, the value of AR resides in the personalization of customer interactions with the brand and products during the contemplation phase.
- Effortless continuation of the journey through the brand world: allows for less conspicuous variations between virtual and real touchpoints. This saves the customer time and effort, which is a primary goal of the luxury service (Roper et al., 2013). AR facilitates absorption and involvement in the unique brand environment, which heightens exclusivity, a key component of premium services (Wirtz et al., 2020). Kuehnl et al. (2019) show that while utilitarian considerations are important, they are not what attract and maintain luxury clients. For them, the trip should go beyond optimization and efficacy.

The use of augmented reality in luxury fashion has a strategic importance since it can improve the success and profitability of a brand by focusing on enriching customers' luxury shopping experiences, resulting in higher customer happiness (Pantano, Timmermans, 2014). Furthermore, consumer happiness is an essential result, as existing research suggests that customer discontent with the usage of these new technologies is rather common (Nawres et al., 2021).

2.1.2 The omnichannel approach

Omnichannel retailing is viewed as a new paradigm in the literature. It is defined as the set of actions engaged in the sale of products or services through different channels that are active all at the same time, with comprehensive consumer interaction and full retail integration (Beck, Rygl, 2015). Fashion and luxury retailers are attempting to escape what has been identified by the name "Internet Dilemma" by Kapferer (2017): on the one hand, the Internet struggles to transmit sophistication, quality, and emotional involvement, risking

oversimplifying the perceived value of fashion products; on the other hand, the online channel is also a powerful communication vehicle, allowing information to circulate more easily and rapidly, reaching a large number of people. By combining the physical and online worlds, retailers can improve brand exposure and reputation (Aiello, Donvito, 2006).

According to a recent study by Forrester Research (2017), both physical and online retailers play an important part in the fashion sector. Even in the case of luxury products, individuals who choose to buy online do so for the convenience, the availability of a larger selection, or the ability to customize the purchase. Those who choose to buy in a regular store, on the other hand, do so because they want to touch the object before purchasing it, they are concerned about counterfeit goods, or are purchasing luxury items for the first time. However, data on online sales shows that adopting an omnichannel strategy is critical for fashion and luxury companies.

The objective to be achieved is the creation of a one-of-a-kind and customized purchasing experience. The new omnichannel tactics are aimed at making technology more intelligent, integrated, and innovative. Desai, Potia and Salsberg (2012) have coined the term "Retail 4.0" to describe this new frontier. The physical and digital virtual worlds are connected and driven toward hybrid solutions in an omnichannel context: consumers buying online can choose to pick up the product or, if not satisfied, return it physically to the shop; they can also choose a product in the shop and order it online if it is not available at that time. Physical stores in Retail 4.0 are becoming increasingly connected, and customers can use a variety of methods to look for information online, including mobile apps, tablets, interactive mirrors, walls, virtual dressing rooms, and live chats. Retailers can also utilize RFID (Radio-Frequency IDentification) and QR code to convey personalized messages to customers and manage their relationships in order to fully understand their behaviour. Fashion and luxury brand retailers are required to adopt an omnichannel approach and handle the physical and digital dimensions of retail phygital (combination of physical and digital retailing techniques) since creating a unique shopping experience is one of their top priorities (Armstrong & Rutter, 2017).

The first luxury brand to adopt an omnichannel approach was Burberry and this choice was driven by the need to boost brand visibility, client loyalty, and consumer interaction. In fact, Burberry decided to create a social channel and an e-commerce site with extremely high image and digital content quality, giving the ability to customize garments, to buy online and pick up in store, and the ability to receive service assistance thanks to customer service and live chats. Moreover, Burberry intended to provide clients at its physical boutiques with an experience similar to the one available online by providing their flagship stores, particularly the one on Regent Street in London, with large digital displays projecting exclusive brand videos, live streaming of events, and runway shows. Burberry has also launched in 2010 the "Burberry Retail Theatre", which broadcasts live shows in twenty-five different locations all around the world (Burberry.com).

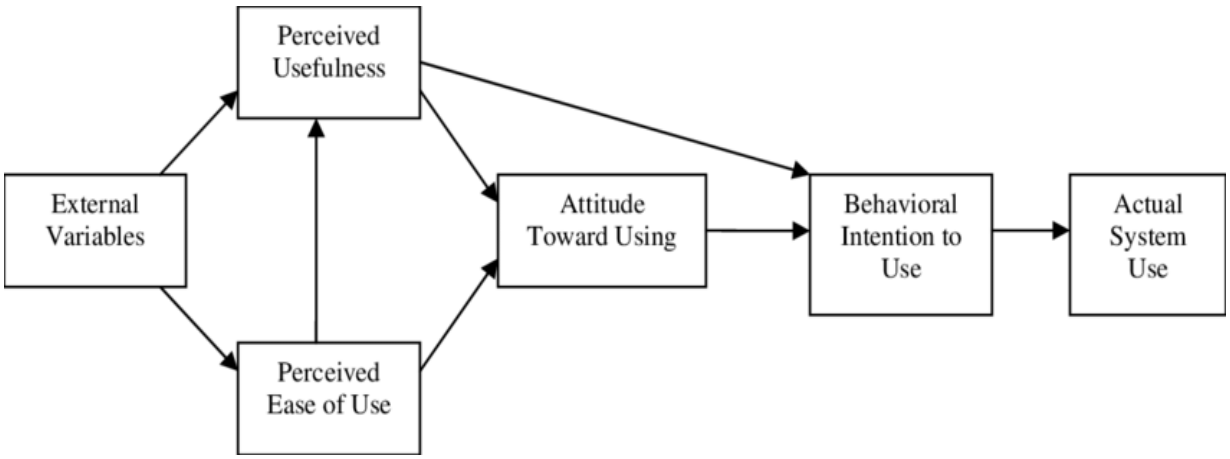
Figure 2: Burberry Retail Theatre

Source: https://www.designscene.net/

2.1.3 From TAM to the Augmented Reality Acceptance Model

The Technology Accepted Model (TAM) is used to anticipate how well new technology will be accepted by users. Since it produces good validity, the Davis model (1986) is the most extensively utilized in information systems research. TAM is an adaption of the Fishbein's Theory of Reasoned Action (TRA), which is an action theory based on the notion that a person's reactions and perceptions of something will impact his or her attitude and behaviour (Fishbein, 1977). To the TRA paradigm, TAM adds two main variables: perceived usefulness and perceived ease of use.

Figure 3: The Technology Accepted Model (TAM)



Source: Davis, 1986

“Perceived usefulness” is described by Jogiyanto (2007) as the degree to which someone believes that employing a particular technology will boost their performance. Perceived usefulness is a concept that considers how information technology might be used to improve performance and benefit people. Individuals who believe that using a particular technology would improve their performance are said to have perceived usefulness (Andriyano, Rahmawati, 2016).

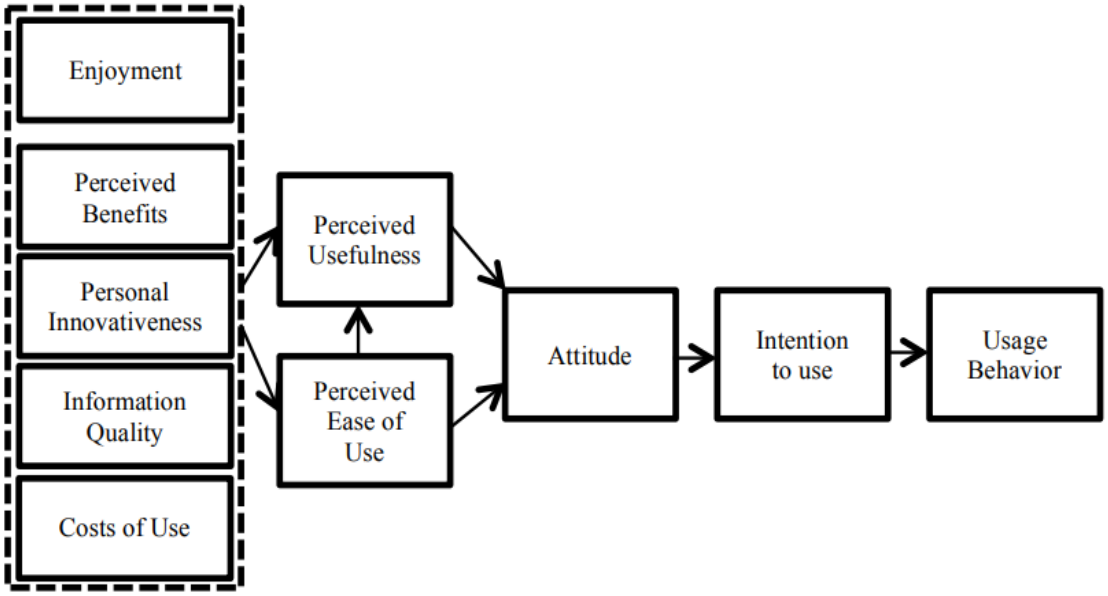
The extent to which someone believes technology is simple to understand is referred to as “Perceived ease of use” (Davis, 1989). This concept is also backed by Wibowo in 2008, who states that a person's perception of a technology's ease of use is defined as a metric by which a person believes the technology can be easily comprehended and used. The sense of ease, according to Jogiyanto (2007), is a person's assumption that utilizing technology is effortless. If a person believes that technology is simple to use, he or she will use it.

However, if the situation is the opposite, the individual would never use it. The amount of engagement and use between the user and the system can also reflect how easy it is to use. The more often used systems indicate that people are more familiar with them, and that they are easier to run and utilize.

Regarding the relationship between the usage of augmented reality and the TAM model, the majority of researchers always implemented the prospect adding external factors without taking into account what other researchers had previously discovered and, in 2014, Leue and Jung finally identified the updated version of the augmented reality acceptance model. In fact, this model adds five distinct external factors to the original one that were previously identified by other researchers as fundamental external variables when it comes to the acceptance of the augmented reality technology.

Since Leue and Jung realised that there was a lot of dispersed literature on this topic, they made a concerted effort to put together everything that was available on the acceptance of augmented reality technology in order to develop a comprehensive model. These new variables that the authors added replace what Davis identified as simply “external variables”, more in details we find: enjoyment, perceived benefits, personal innovativeness, information quality and cost of use.

Figure 4: The augmented reality acceptance model



Source: Leue et al., 2014

The following is a detailed literature review of each variable providing information regarding previous researchers' findings:

- Enjoyment: the significance of enjoyment for the intention to use new technologies was firstly identified by Ha and Stoel (2009). Subsequently, in 2012, Haugstvedt and Krogstie included in their AR acceptance model the concept of enjoyment, emphasizing the importance of enjoyment in AR acceptance research. Followed by Wojciechowsk and Cellary (2013) that came to the conclusion that enjoyment had a significant impact on attitudes toward utilizing AR apps.
- Perceived benefits: The importance of benefits for technology acceptance behaviour has been comprehensively examined by Amoako-Gyampah and Salam (2004) and by Olsson et al. (2012) that found that perceived benefits are a key reason for AR users to accept this new technology. Moreover, according to Nicolas et al. (2008), perceived usefulness and attitude toward the usage of AR are influenced by perceived prestige and perceived flexibility benefits.
- Personal innovativeness: According to Lin et al. (2007), including personal innovativeness is especially useful when investigating in a volunteer research setting, because users' willingness to be technology pioneers is especially pertinent to voluntary users. Personal innovativeness can be characterized as users' readiness to try out new services and goods, as stated by Rogers' Diffusion of Innovation Theory (Rogers, 1962). Furthermore, in the context of AR, the favourable influence of personal inventiveness on the intention to use has also been demonstrated (Yussof et al., 2011).
- Information quality: In 2009, Ha and Stoel carried out a research which confirmed the importance of the quality dimension in the TAM model. In addition, early adopters' perceptions of AR services were

explored by Olsson et al. (2012), who discovered that the most valuable mobile AR services were those displaying pragmatic usefulness for the user. Thus, they concluded that AR adopters want comprehensive, high-quality information that is contextually relevant.

- Costs of use: When analysing users' adoption of e-commerce applications, Parra-López et al. (2011) noted the necessity of integrating expenses of use. They concluded that researchers should account both the monetary and non-monetary sacrifice of using the application by including effort costs, loss of privacy costs, and difficulty of usage costs (Parra-López et al., 2011).

2.1.4 Need for touch

The term "need for touch" refers to people's inclination to touch products. Haptic information is often more accessible to people who have a high desire for touch (Peck, Childers, 2003). There are two types of touch needs: the autotelic and the instrumental.

Autotelic need for touch is a hedonically motivated condition in which people get pleasure from being able to touch items. In this manner, touching products is an "end in and of itself". The functional value of touch is referred to as the instrumental necessity for touch. People with a strong instrumental need for touch are more likely to touch products in a goal-directed and utility-oriented manner, with the goal of evaluating the product's features, usefulness, and quality. People with a high need for touch suffer disappointment (Peck, Wiggins, 2006) and quality concern (Kühn et al., 2020) when they can't touch things, making need for touch a relevant construct.

Despite the fact that both dimensions are related, they have been discovered to have distinct levels of influence in different situations. Peck and Childers (2003) discover that autotelic need for touch is more strongly associated with higher continuous accessibility and, as a result, spontaneous haptic processing than instrumental need for touch. They contend that autotelic touch is more implicit and linked to automated processing. Instrumental demand for touch, on the other hand, is more cognitively driven and serves utilitarian goals. Although AR creates an instant sensory experience, buyers acquire no genuine knowledge about the product's haptic qualities. Autotelic need for touch is considered to be more influential than instrumental need for touch in terms of a reaction to AR features.

Moreover, it has been shown that, contrary to popular belief, consumers with a high demand for touch rank AR material even higher than those with a low need for touch. De Canio et al., (2021) demonstrated that augmented reality content has the potential to replace actual in-store encounters. More specifically, the findings consistently reveal that when consumers with a higher autotelic demand for touch interact with AR content, they receive greater hedonic advantages than those with a lower autotelic need for touch. These

hedonic benefits also lead to more favourable marketing results, such as increased brand awareness, product and app attitudes, and purchase intent.

The only effect that could not be recreated is the consumers' brand attitude. This is likely due to the fact that brand attitude is more consistent and depends less on the context than other outcomes, such as product attitude. When an AR feature is employed, utilitarian gains are received even though they are less consistent. When usage is assumed, consumers with a higher autotelic need for touch consistently expect larger utilitarian advantages than those with a lower autotelic need for touch, and this situation could have a beneficial impact on attitudinal outcomes. Hedonic benefits, on the other hand, are not expected. In fact, when the instrumental need for touch is taken into account, the results are somewhat comparable but less consistent.

2.2 Augmented reality in online luxury retail

Nowadays, people do not always bother going physically to the stores to buy a product, instead they prefer using online websites to choose and order the specific item from the comfort of their home. For this reason, the online retail sector is evolving rapidly (Statista, 2021). Customers use digital technology throughout the entire shopping process, from the product research to the finalization of the purchase, because in this way they have access to a wider variety of products compared to a regular physical store. Now customers are looking for an enhanced experience and, for this reason, implementing AR technology is identified as a successful move to boost online sales and increase people's desire to buy (Lixăndroiu et al., 2021). Moreover, they discovered how the implementation of online AR can lead to an emotional response from the customer, in detail we find emotions such trust, pleasure, flow and emotional involvement.

Trust: Trust is a fundamental variable during online shopping because the customer has to rely on the website not being able to see the product in real life and, therefore, it can be considered as a fundamental element from the consumer's perspective. The possibility that augmented reality gives to the consumers to actually see the product in 3D generates a feeling of trust and makes the purchasing process more enjoyable and reliable (Yousaf et al., 2021).

Pleasure: According to Yim et al. (2012), consumers who utilize 3D representations have a better online experience compared to those who typically shops in a static 2D environment. In fact, it has been shown that a unique visualization experience delivered by augmented reality can generate pleasure (Pantano et el., 2017). Furthermore, according to Kim et al. (2008), 3D virtual systems enable for immersive and interactive product trials, which can increase pleasure throughout the online shopping journey. As a result, AR technology could be able to expand the client's imagination creation process by merging the real world with the virtual one to deliver a memorable experience.

Flow: Flow is defined by Csikszentmihalyi (1990) as a state in which people are so absorbed in a task that nothing else seems to matter. Flow occurs when a person perceives a task to be difficult, but their expertise is sufficient to complete it (Roy, Balaji, Nguyen, 2020). Previous research has established the relevance of flow in explaining immersive online technologies and how they influence consumer perceptions (Su et al., 2016). In fact, flow has been presented as an emotional response when the consumer has the possibility to use those types of technologies such as augmented reality.

Emotional involvement: Emotional involvement is the degree to which an individual is emotionally involved in a behaviour (Holsapple et al., 2007) and, according to a study on consumption behaviour in a 3D environment, it is considered as a significant aspect in comprehending user virtual entertainment (Javornik et al., 2021). Customer journey and brand experience are essential elements in the luxury sector because not only is important the active involvement of the consumer during the buying process, but also the response after the purchase (Kuehnl et al., 2019).

The concept of brand experience, which is so important to luxury businesses, is shaped by different customer touchpoints, including the augmented reality interface, which must elicit hedonic consumer emotions (Brakus, Schmitt, Zarantonello, 2009). Such reaction strengthens the consumer's emotional connection towards the technology and the brand.

2.2.1 Augmented reality in e-commerce

Due to the great technological development of the last decades, e-commerce has become a fundamental tool for the development of marketing strategies and for enhancing the relationship between customers and the brand.

According to a study by the Point-of-Purchase Advertising Institute (2020), 70% of purchasing choices are made in stores but, as most customers are now showrooming (consumers that search for information in the store and simultaneously search online to get more information (Verhoef et al., 2015)), the role of a modern e-commerce becomes crucial in driving customers to purchase the desired product.

Augmented reality, which is built on interactivity, virtuality, mobility, and synchronization, incorporates both virtual and physical components, which may lead to purchases. Those are the most relevant online e-commerce characteristics of augmented reality identified by Wang et al. (2015).

More in detail:

- Interactivity: it complements current web technology by providing consumers with more information.
- Virtuality: in AR applications, virtuality is less prevalent, resulting in a lack of responses associated with interactive social engagement (Scholz et al., 2016).

- Geolocation: it is a common feature of AR, and it allows for personalized and efficient client service. As with mobile technology, research suggests that this leads into a greater desire for future use and a favourable outlook (Javornik, 2016). In retail, AR technologies are frequently implemented on smart devices and huge interactive screens. In this way customers can see products in a virtual setting, for example customers can see the virtual representation of furniture in a physical room (Javornik, 2016).
- Mobility: the word "mobility" means that the customer does not have to physically move but, thanks to portability and wearability features, they are immersed in a virtual environment in which they can navigate while remaining in one place in the real world.
- Synchronisation of virtual and physical/real elements (augmentation): this technology is also linked to the synchronization of the virtual and physical world. If on one hand it results in comprehensive experiences that focus on traditional creative activities in the real world, on the other it simultaneously provides engaging and exciting improvement in the digital universe.

According to recent research, online retail platform saw an unprecedented rise in traffic during the corona virus pandemic: retail websites generated almost 22 billion visits in June 2020, up from 16.07 billion global visits in January 2020 (Statista, 2020). At the same time customers still love shopping in stores, mainly for the chance of touching and feeling products and for the security of seeing what they are buying (Nielsen, 2020). The solution is the usage of the augmented reality technology in online platforms because it helps consumers having a more realistic idea on how the product will look and fit.

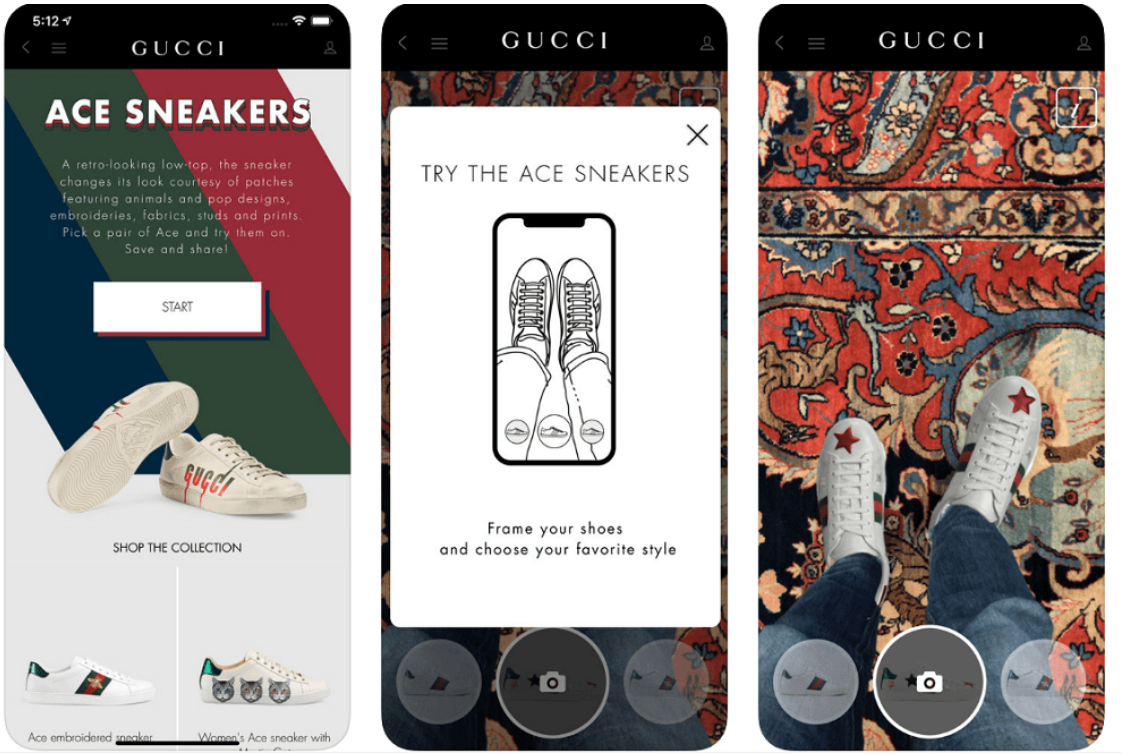
Based on the study carried out by Brengman, Willems and Van Kerrebroeck (2019), customers who buy online may experience a stronger level of perceived ownership as a result of augmented reality. In fact, the research shows how augmented reality can actually lead to a better sense of ownership and, as a result, a larger likelihood of customer purchases.

2.2.2 Mobile augmented reality (MAR)

As the use of mobile devices has radically transformed the traditional retail sector, the combination of augmented reality with mobile applications is attractive to both customers and retailers (Rauschnabel et al., 2019; Qin et al., 2021). Despite the availability of a variety of mobile devices, cell phones remain the most popular mobile AR device due to their widespread use and accessibility (Wang et al., 2016). Furthermore, developments in technology such as embedded cameras, touch screens, and smartphone sensors might improve mobile augmented reality (MAR) experiences and open up new possibilities (Billinghurst, Duenser, 2012). Furthermore, people nowadays like to have their mobile devices within reach at all times. Certainly, people utilize it to surf the Internet more than any other networking device, implying that cell phones are the most trusted and essential gadget for an individual. The growing use of smartphones and the increasing tendency of

consumers to shop directly on such devices also includes luxury items. In comparison to traditional e-commerce channels like websites, MAR apps have been selected as the preferable platform for product information and interactive demonstration because to their low costs and high accessibility (Cranmer et al., 2020).

Figure 5: The Gucci MAR app



Source: https://vrscout.com

Researchers are also focusing on the role of augmented reality in how customers feel about their purchase decisions. Due to the obvious smaller screen size for the same amount of information, both visual and textual, mobile phones place a larger cognitive load on the user than computers (Adipat, Zhang, Zhou, 2011). When a high-value online purchase is made on a mobile device, the cognitive effort, as well as the associated uncertainty and risk, can be decreased if the product is shown in a three-dimensional representation (Hong, Pavlou, 2014; Li, Daugherty, Biocca, 2002).

In fact, online luxury shopping demands trust in the vendor since consumers cannot touch or feel the product. Due to lack of physical presence, consumers have to dedicate a lot of resources to verify the product efficacy and to develop confidence with their purchase, for example looking at reviews or consumer reports (Pentina, Bailey, Zhang, 2015). The fact that high-quality AR-based applications simulate the physical presence of the product reassures the customer for what concerns its suitability and also supports the reliability of the vendor (Javornik et al., 2021; Mavlanova, Benbunan-Fich, and Lang, 2016). Consumers are more likely to have

hedonic buying experiences when they have access to three-dimensional information (Pe-Than, Goh, Lee, 2014). Consumers who have more immersive experiences are more likely to buy the luxury product that is suited for them, which boosts their confidence and influences future purchase intentions (Kim, Biocca, 1997).

Furthermore, researchers have presented evidence of the positive impact of MAR experiences in the customer decision-making process in the context of retail (Pantano et al., 2017; Qin et al., 2021). Prior MAR research in retailing have stressed the usefulness of MAR in the buying process at all stages of the client purchasing journey, not just the pleasurable and enjoyable moments.

In comparison to a traditional website, Jessen et al. (2020) found that using AR in the early stages of the consumer buying experience positively influences customers' responses to creativity. Customer creativity raises the likelihood of the customer feeling satisfied with the outcome of a purchase decision and, when AR is implemented to increase customers' creativity, this aspect becomes an actual characteristic of that technology. Existing augmented reality applications often aim to increase engagement (Scholz, Smith, 2016), for example, by providing customers with fun, engaging, and pleasurable experiences in which they may try out various purchase options in a variety of settings (Scholz, Duffy, 2018). Moreover, research has shown that mobile augmented reality has a favourable impact on customer engagement (Hilken et al., 2020).

2.3 Augmented reality inside luxury stores

Fashion and apparel retailers are progressively adopting digital technologies in-store to improve the shopping experience, increase customer service quality, and gain a competitive advantage in an evolving technology-driven and increasingly competitive environment (Bell et al., 2017). All this offers possibilities for retailers to learn, as they may use technology-generated data on consumer behaviour, to adapt more effectively their company strategy and objectives and contributing to the ongoing shaping of retail business models and consumer behaviour (Ailawadi, Farris, 2017).

While VR uses a wearable device (typically a headset) to block out real-world experiences and fully immerse the user in digital and fascinating 3D worlds (Bonetti et al., 2017), AR allows users to have enhanced and more realistic experiences within their physical world (Rauschnabel, 2018), resulting in an enhanced/augmented physical world (Pantano et al., 2017).

Retailers have recently become more interested in adopting augmented reality applications in the purchasing process to personalize the in-store experience and bring life to their physical shops (Berman, 2019). In a highly digitalized retail business, a monitor with videos may be enough to engage visitors and enhance the shopping experience. AR in-store applications use projection-based AR interfaces to provide customers with a richer, more immersive, and engaging experience (Huang, 2019; Yim, Park, 2019).

Incorporating augmented reality into a physical business opens up plenty of possibilities for assisting customers with their purchasing decisions. The most obvious benefit is that AR can allow customers to examine the qualities of a product in real time without having to switch their attention between the item and other sources of information, such as pamphlets or product websites. Customers can also use this type of in-store application to double-check the size and colour of the garments they are wearing before making a purchase (Hwangbo et al., 2017). Customers can learn more about their body type and how it relates to the garments they want to purchase throughout this method. This augmented reality in-store application has the potential to give many of the same benefits that traditional shopping previously provided (Lee, Leonas, 2018). Because with augmented reality technology retailers have the possibility to digitally provide product features and display them either in proximity to the client or as an overlay on the product the user is looking at, another interesting yet untapped purpose, is comparing the properties of two or more physically existing objects at the same time. Such functions can alleviate the pressure on a user's memory, which can be significant when comparing a huge number of very similar items in a store (Álvarez Márquez, 2020). The possibility to see a product's feature in direct comparison to another one can allow the user to identify problems or differences and change their mind. In this way, they have the possibility to request another product that have different features in comparison to the previous item.

Consumers may not always have precise and specific preferences, and they frequently develop them on the go when a decision must be made. The lack of preferences is particularly problematic in digital catalogues, where there are many options to consider, potentially leading to the so called "choice overload" (Dirk Bollen, 2010). Recommender systems play an important role in minimizing the amount of data that customers must review, as well as influencing the client's preference-construction process.

As a result, augmented reality has the ability to improve consumers' visualisation of products, increase engagement, and improve perceptions of the shopping experience, resulting in a favourable impact on store and brand perception. Furthermore, with technology-mediated commerce, consumers' perceived control and autonomy contribute to improving the shopping experience (Poncin et al., 2017). In reality, allowing consumers to maintain some control while maintaining a level of difficulty meant to develop user competence leads to increased consumer satisfaction as well as increased shopping effectiveness, control, and convenience. Therefore, this has a beneficial impact on the customer's opinion of the retailer as well as their purchasing decisions (Roy et al., 2017). Retailers, on the other hand, can make a positive impression on customers and attract new types of customers by improving the in-store shopping experience.

The most popular implementation of augmented reality in stores is through the virtual try-on technology that created the opportunity for customers to try on several outfits without having to put them on.

Sekhavat (2017) identified three types of virtual try-on systems:

- Image-based: Image-based virtual try-on overlays a clothing image on the model as static overlays, which had the drawback of generating arbitrary viewing angles.
- Model-based: A reconstructed 3D model of a user or personalized avatar is used in model-based virtual try-on.
- Live AR: Live AR try-on uses many video cameras in a virtual fitting room to record body photos and overlay garment images on top of them in real-time. This was made possible by the introduction of motion capture software like Microsoft Kinect.

2.3.1 Virtual fitting rooms

Several technologies for establishing virtual dressing rooms using webcams, camera arrays, and depth sensors have been proposed in recent research. Ehara and Saito (2006) used a web camera to visually overlay texture selected by users on T-shirt surfaces. The proposed method was tested using image-based systems with a pre-learned algorithms to collect images of a client standing in front of a blue screen. Protopsaltou et al. (2002) have demonstrated an Internet-based virtual fitting room that uses common body measurements to produce virtual 3D bodies and motion-capture markers. Garcia Martin and Oruklu (2012) presented a virtual fitting room using Android mobile devices. The principal sensor was the mobile phone camera, and no other equipment was required. Because a mobile device has limited storage and processing capacity, it was currently not possible to run real-time 3D simulations to a sufficient level. In addition, Hauswiesner et al. (2013) used numerous cameras to create a virtual dressing room where the user does not have to be in a specific viewpoint or position to engage with the system. As shown, all of the preceding instances demonstrate issues with technology availability and the inability to conduct real-time simulations.

The increased use of depth sensors at the consumer level has pushed research work on virtual dressing rooms. Giovanni et al. presented a virtual try-on system in 2012 that used Microsoft Kinect V1 and an HD camera. The HD camera was required due to the Kinect V1's RGB camera's low resolution. For the suggested system, they created one hundred and fifteen 3D apparel items. Moreover, a Kinect sensor was also employed in the KinectShop and Fitnect programs, which let users to try on a 3D cloth model in real time. In the Bodymetrics application, eight PrimeSense depth sensors were utilized to simulate 3D cloth based on the user's movement. Umut Gultepe (2014) presented a real-time 3D simulation on a virtual avatar, using a depth map and skeleton joints acquired from depth sensors to obtain the appropriate heights and widths for scaling the avatar and the fabric.

Stores, homes, and smart mobile devices can all benefit from VFR-enabled purchasing. Successful VFR apps generate precise physical scan related data to assure fit quality. These "Body Shape" IDs can be used for a variety of things. One option is to construct accurate 3D avatar-type representations of the customer's body to

fit garments instead of fitting clothes on the shopper's image. Another option is to combine 3D scan data with gender and age information to access potentially endless apparel databases across numerous merchants, to place orders for family and friends, and so on (Adikari et al., 2020). Furthermore, allowing designers access to accurate 3D models of clothing and apparel allows VFR technology to incorporate physics and thus to improve and contribute to make the shopping experience more realistic. Additionally, the possibility to incorporate social media's communication and feedback to receive suggestions and input (Twitter, Facebook) enhances the purchasing experience. Finally, smart-phone apps may alert users when items on their wish lists become available in nearby businesses, connecting local shopping with bargain hunting (Adikari et al., 2020). VFRs provide shops with new options in several areas by properly overcoming the suit/fit issue. The promise of a "perfect fit" for online customers removes a significant barrier for them, which should lead to more sales and lower return rates leading to an increased brand visibility on the internet by using multiple marketing platforms. The successful apps in the virtual fitting room market were KinectShop (Pachoulakis, 2012), Bodymetrics(2019), "Imagine,at" (2019), and Fitnect (Rathnayake et al., 2018).

2.3.2 Magic Mirrors

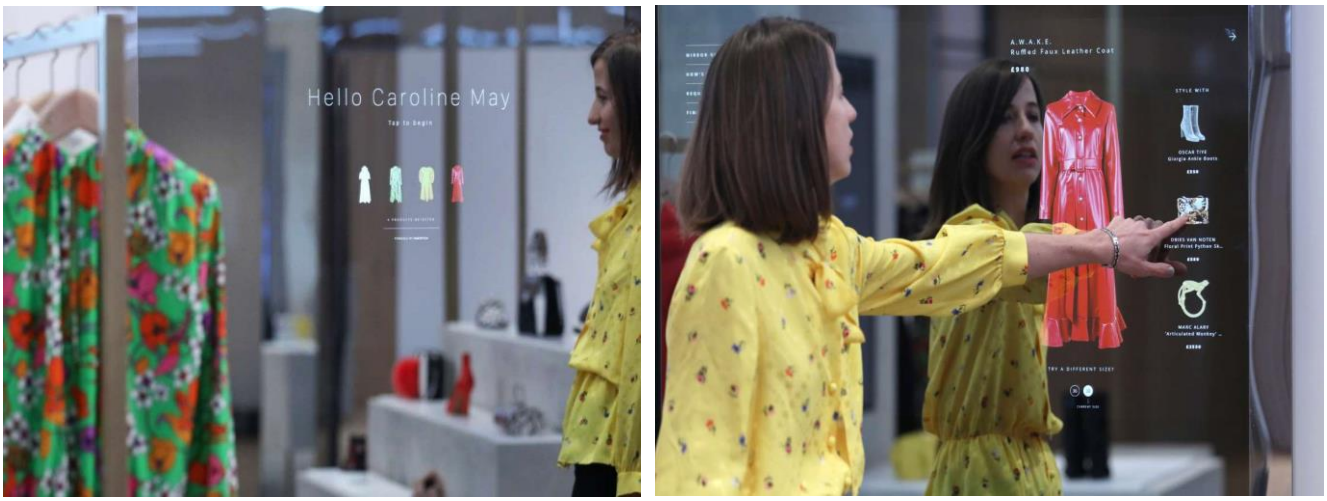
The most common augmented reality technology that virtual fitting rooms in department stores adopt is the so called “Magic Mirrors”. This devise works on the “flawless tracking principle” (Singh et al., 2016) that makes the interactive monitor look like a simple mirror. Magic mirrors combine the functionality of a simple mirror, which reflects whatever is in front of it, with that of a monitor, which shows digital images without taking into account the surrounding area. Indeed, the image of the client that is captured by a digital camera is reproduced on the mirror screen and, with the help of algorithms, the spatial measurements and movements of the client are identified to deliver a virtual experience. This allows the user to experience multiple scenarios in a virtual environment. In fact, having the possibility to add digital elements to your specific physical conformation makes you detach from the 2D avatar view that the customer experiences when shopping in a traditional offline context.

If you want to experience this new way of shopping you have to simply position yourself in front of a Magic Mirror in a virtual fitting room and then you can start trying on different clothes picking from a range of models, colours, and sizes. Once you have decided which item to try on, the mirror screen will show your reflection by adding the garment previously chosen in its particular colour, model and size. Moreover, in case the wanted item is not currently available in-store, the Magic Mirror can show that particular product in all the colours and sizes non physically present in that store offering services of virtual fitting and recommendation system (Hwangbo et al., 2017). Garments will be placed over your digital image, and you will see how they fit.

There are different examples of Magic Mirrors like the one called “FashionistaTM”, a method that allows consumers to interact with the website through hand movement to "try on" clothes before saving them in a virtual basket. Moreover, you can send a photo of your outfit to your friends and family for immediate reaction. Thanks to its motion-capture technology and the Wi-Fi connection, the mirror can record your movements making the process truly interactive. Miri Kim and Kim Cheeyong have presented a "Magic Mirror" system that uses a depth sensor to acquire real-time user body measurements and construct 3D costumes based on those factors.

Another example is the Magic Mirror used in the new department stores created by Farfetch called “the Store of the Future” where the technology used is very elaborated because it linked the classical “Magic Mirror” to the Farfetch app and to all the clothing rails that are physically present in the store. In this way, when a consumer touches or move any of the clothing hanged in one of the rails, the sensors detect and recognise the garment and shows on the mirror screen the garment in question adding it directly to the mobile app's wish list (Mortimer, 2017). Moreover, the mirror has incorporated a product recommendation system like those found on online websites. As the customer tries on different clothes, other garments appear on the screen that the software has identified as compatible and personalised in relation to their style, purchases, and previous research (Mortimer, 2017). When the customer finds one of the proposed clothing styles interesting, he or she simply clicks on the monitor and asks to try it on, also identifying the desired colour and size. The main features upon which the functioning of this "Store of the Future" is based are consistency and communication. More specifically, Store of the Future's great organization refers to the successful communication between the digital mirror, the app, the website and the checkout which promotes the development of a seamless customer profile fundamental to create a coherent, tailored customer targeting throughout all platforms (Kansara, 2017).

Figure 6 & 7: The Magic Mirror in the “Store of the future” by Farfetch



Source: https://www.scmp.com/

Additionally, customers can virtually try on not only garments but also make-up with this innovative technology. In fact, in 2018, Guerlain made available in the Selfridges flagship shop in London a Magic Mirror that allowed customers to modify the packaging and colour of their iconic "My Rouge" lipstick making it a personalised one. Then, with the camera of the mirror display, customers could virtually test how the chosen colour would look on their face and if it was the best choice for their complexion. By doing so, they not only were able to create their own personalised lipstick but also share it with their friends via Facebook, Instagram, or email.

2.4 Consumer decision confidence

Consumer decision confidence is defined as the extent to which an individual perceives himself or herself capable and assured with respect to his or her marketplace decisions and behaviours. As a result, consumer decision confidence reflects subjective assessments of one's ability to create positive experiences as a customer in the marketplace (Adelman, 1987). Self-confidence among consumers is considered as a multidimensional secondary disposition that is more closely tied to consumer phenomena than basic tendencies such as self-esteem (Lastovicka 1982). Because of the omnipresence of consumer behaviour in everyday life, consumer confidence is thought to be a generally steady self-appraisal that is readily accessible to the individual (Blascovich, Tomaka 1991).

This concept is defined as a multidimensional construct and it consists of two higher-order components, each of which has several dimensions (Gerbing, Hamilton, Freeman 1994). These several components, which describe unique content domains, are then interpreted using a single-dimensional set of items. The two higher-order components represent the two primary roles that increased customer confidence (Mossman, Ziller, 1968). To put it another way, consumer confidence represents an individual's perception of his or her ability to make more effective consumer decisions, including the ability to collect and use information (DM); and to defend himself or herself from being misled, tricked, or treated unfairly (PROT). When faced with difficult decisions including huge volumes of information and stress from marketplace pressures, consumer confidence serves to enable the consumer to work efficiently.

Furthermore, evidence was presented for the use of consumer decision confidence metrics to moderate theoretically and practically significant correlations. Consumer confidence was found to regulate the relationship between price-quality schema (Lichtenstein et al., 1993) and the choice of higher-priced options through influencing decision-making and personal outcomes. The study also provided further evidence about the current measures' relative predictive ability compared to various competing measures.

For these reasons the consumer decision confidence variable is taken into consideration in this research as the use of augmented reality could make the purchase process easier and make customers less doubtful of their

choices. This is because, as mentioned previously, with the use of AR technology the customers have at their disposal a myriad of products in their various options that could make the customer feel more comfortable and feel more confident about the purchase.

2.5 Consumer self-esteem

Self-esteem is defined as the degree to which people value and accept themselves, as well as think well of themselves (Blascovich, Tomaka, 1991). In particular, it refers to a person's confidence and positive self. Since people with low self-esteem expect that they will not perform very well, they will try to avoid embarrassment, failure, or rejection by the society (Solomon, 2018). In fact, the most commonly accepted proposition about it is that people tend to be worried about how others view them and tend to avoid public places like swimming pools and gyms or, more in general, places where their bodies are exposed to other people (Thompson, Chad, 2002).

In retail people have to relation themselves with wearable items like dresses, t-shirts, trousers etc. that are known as “highly-involving products”, defined as a product category for which consumers highly rely on body-related information in their purchase process (Rosa et al., 2006). Thus, when trying on clothes in real life, it can happen that an item’s fit is not perfect for the client’s body types and so emphasize all the “imperfections” that the consumer may be self-confidence about. In this situation, AR would be a more effective tool for customers who have a negative body image because it explicitly portrays a better representation of themselves. In fact, AR projects in the mirror screen the image of the consumer’s figure simply adding the virtual and digital representation of the garment chosen.

In order to investigate self-perception for marketing, a variety of studies using the technology of AR mirrors objectives have been conducted. For example, Javornik and Pizzetti (2017) used an AR mirror to investigate self-perception by having participants look at themselves on a tablet while wearing virtual makeup. They discovered that using augmented reality makeup can boost users' self-esteem and buying intent. Another study looked at the impact of virtual representations of sunglasses and discovered a link between participants' body image perception and their AR consumer experience (a negative body image led to a better AR consumer experience) (Yim et al., 2019).

2.6 Research Model

From all the research and analysis presented so far, we can clearly notice that the field of augmented reality is increasingly attracting the attention of academics, driven mainly by the relevance and novelty of the

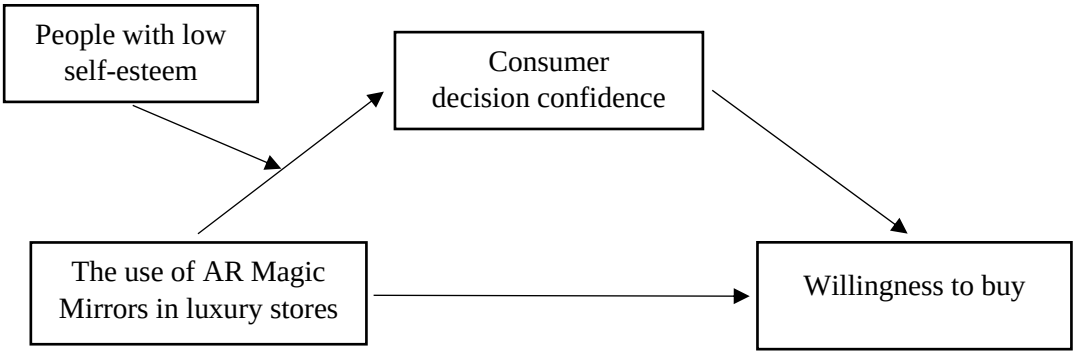
phenomenon. Until now, researchers have relied primarily on investigating technology from a digital perspective, through the creation of apps, as it is defined as the most proliferated and fast-expanding part of the field (Wang et al., 2016).

Thus, there is the need to have more literature that reaches out to all the dimensions of the phenomenon with a stronger attention to the physical reality since the Covid emergency is slowly diminishing and the people are coming back to their usual in-store shopping experience. Therefore, given the little possibility to make experiments for physical equipment of augmented reality in recent years, this research wants to expand the knowledge taking as a study variable specifically the use of magic mirrors in physical stores.

To explore in more detail augmented reality in physical stores, the research model is made up of other two concepts: consumer decision confidence and people self-esteem. The choice of including these parameters is because previous research has not shown if the usage of AR technology could make the customer feel more empowered and more confident about the purchase at the same time and this relationship could bring the consumer to make an easier purchase decision.

Moreover, this research does not limit itself to studying certain parts of the consumer's body, as Gucci has already done for the footwear sector and Yim et al. (2019) for the eyewear sector, but rather takes into consideration the entire body in order to have a 360-degree view of the customer's experience.

To capture what has been said, it was mainly discussed how the use of augmented reality is fundamental in the luxury retail sector and more specifically how the concepts of the usage of Magic Mirrors technology, consumer decision confidence and people self-esteem are key concepts that studied together can discover a new relevant relationship and thus contribute to the present literature. Therefore, the scope of this research is to study whether the use of augmented reality Magic Mirrors in the luxury sector can generate an increased consumer decision confidence in people with low self-esteem which will then be reflected in the consumer's willingness to buy.



INDEPENDENT VARIABLE (X): The use AR Magic Mirrors in luxury stores - Dichotomous Variable

DEPENDENT VARIABLE (Y): Willingness to buy - Continuous Variable

MEDIATOR (M): Consumer decision confidence - Continuous Variable

MODERATOR (Z): People with low vs high self-esteem – Continuous Variable

H1: For people with low self-esteem the usage of AR Magic Mirrors in luxury stores positively influence their feeling of consumer decision confidence and consequently the willingness to buy.

CHAPTER III

3.1 Research methodology

In order to prove the research question expressed in the previous chapter, a scientific experiment was created to collect data on the four variables of the moderated mediation model. Thus, the intent of this analysis is to investigate whether the shopping experience using Magic Mirrors in a luxury store positively affects consumer confidence and thus their willingness to buy for subjects with low self-esteem. Therefore, it is reported the research hypothesis that will be tested:

H1: *For people with low self-esteem the usage of AR Magic Mirrors in luxury stores positively influence their feeling of consumer decision confidence and consequently the willingness to buy.*

To prove the existence of these relationships, a survey was created through the qualtrics platform, and it was administered to 255 people. The survey consists of 19 questions divided into multiple choice (yes/no) and Likert scales in which the respondents will have to express their level of agreement or disagreement with the proposed statements. The latter will consist of 7-point Likert scales with values ranging from 1= strongly agree to 7= strongly disagree. The language chosen for the questionnaire was Italian because, being on Italian territory, the intention was to make it possible for all people to participate.

The survey opens with an introduction block in which the purpose of the survey and the fact that it is completely anonymous are described. After reading this information the participant, accepting the conditions, proceeds to the first question. We can divide the survey into three parts.

The first part of the questionnaire includes the first question regarding whether the participant was a luxury customer or not:

- *Sei solito/a comprare lusso presso negozi fisici? (Si/No)*

and then the first pre-validated scale regarding self-esteem is proposed. This scale was taken from Webster et al's (2022) pre-validated scale (six items, 7-point Likert scale) and it was used to study the moderator of this model.

The items have been adapted and translated into Italian:

- *Mi sento soddisfatto/a dell'aspetto del mio corpo in questo momento*
- *Mi sento frustrato/a o innervosito/a dalla mia performance attuale*
- *Mi preoccupo di quello che gli altri pensano di me*
- *Mi sento poco attraente*
- *Sento che non sto facendo bene*

- *Sono preoccupato/a di sembrare stupido/a*

The choice to administer the self-esteem scale before showing the stimuli is because, in this way, the participants would not be biased by any circumstances and their responses about their self-acceptance would be totally truthful.

The second part of the questionnaire was designed to investigate the level of consumer confidence and willingness to buy after being exposed to one of the two possible scenarios shown randomly. More in detail, the two possible scenarios where: a shopping experience with the Magic Mirror technology and a "traditional" shopping experience with the shopping assistant. These scenarios were chosen in order to have two different points of view on the phenomenon: the participants' point of view in case they were using the Magic Mirror during their shopping session and in the case they were facing a traditional shopping experience with the saleswoman.

Figure 1: First Scenario Magic Mirror

Figure 2: Second scenario salesperson

Source: Qualtrics

After showing the scenario, the participants were asked to indicate how much they agreed with the statements regarding the two scales that, even in this case, are pre-validated scales. More specifically, Lassoued et al's scale (2015) was used for the consumer confidence scale (five items, 7-point Likert scale), whereas Dodds et al's scale (1991) was used for the willingness to buy scale (three items, 7-point Likert scale). All the items have been adapted and translated into Italian.

Following the statements for the consumer confidence scale:

- *Mi sento sicuro/a della qualità e sicurezza di questo metodo di acquisto*
- *Mi sento ottimista sulla qualità complessiva dell'esperienza di acquisto*
- *Mi considero soddisfatto/a dell'esperienza di acquisto*
- *Posso contare su questo tipo di esperienza di shopping per ottenere un servizio di alta qualità*
- *Penso che questo tipo di esperienza di shopping possa essere considerata affidabile per assicurare che il servizio sia di alta qualità*

Then, the ones for the willingness to buy scale:

- *Ho intenzione di comprare i miei vestiti attraverso questo tipo di esperienza di shopping*
- *Sarei disposto/a a comprare i miei vestiti attraverso questo tipo di esperienza di shopping.*
- *La probabilità che io compri il capo d'abbigliamento è alta*

After answering the previous questions, participants were subjected to an attention check question where they were asked to select which of the two options proposed best represented the scenario previously presented. In this way it was possible to check if the survey was carried out correctly or if the participants did not give the appropriate attention to the stimuli to which they were exposed.

Finally, in the last part of the survey, demographic questions were administered, more specifically:

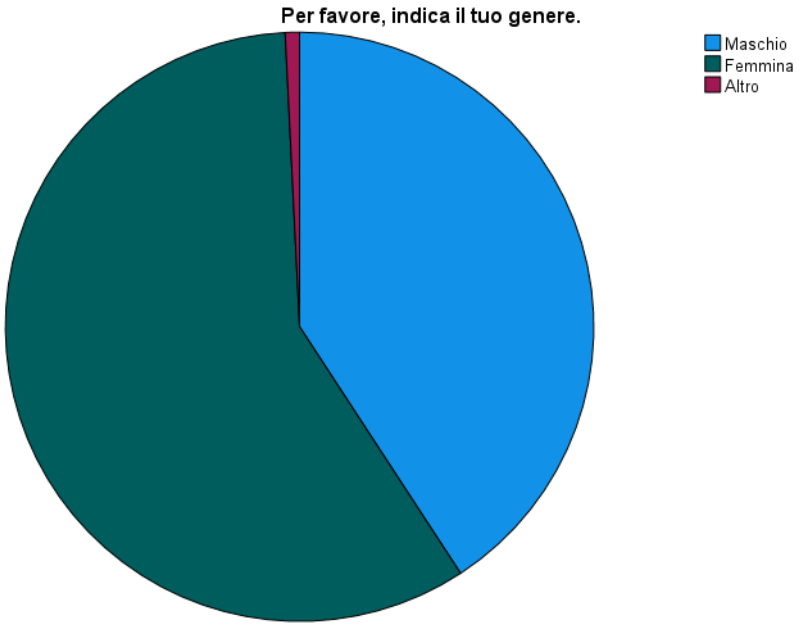
- *Per favore, indica la tua età nel box sottostante.*
- *Per favore, indica il tuo genere*.

3.2 Participants

The survey was distributed through a snowball sampling where it was initially shared to friends, family, and colleagues who then forwarded it to other people, and it was distributed from the 28th of April 2022 to the 1st of May 2022. Recorded responses were initially 297, but after removing all uncompleted sessions, the final sample was composed by 255 responses.

Starting with the participant analysis, we can highlight the demographic traits that best describe the sample. As we can see from the table and the graph, the sample consists of 59% women (frequency: 151), 41% men (frequency: 104) and 1% other (frequency: 2).

Graph 1: Gender description



Source: SPSS

Table 1: Gender output SPSS

Per favore, indica il tuo genere.

		Frequenza	Percentuale	Percentuale valida	Percentuale cumulativa
Valido	Maschio	104	40,8	40,8	40,8
	Femmina	149	58,4	58,4	99,2
	Altro	2	,8	,8	100,0
	Totale	255	100,0	100,0	

Source: SPSS

Next, we can analyse the average age of the sample, which is 26.31 (Table 2) with a higher frequency for ages 21 and 23.

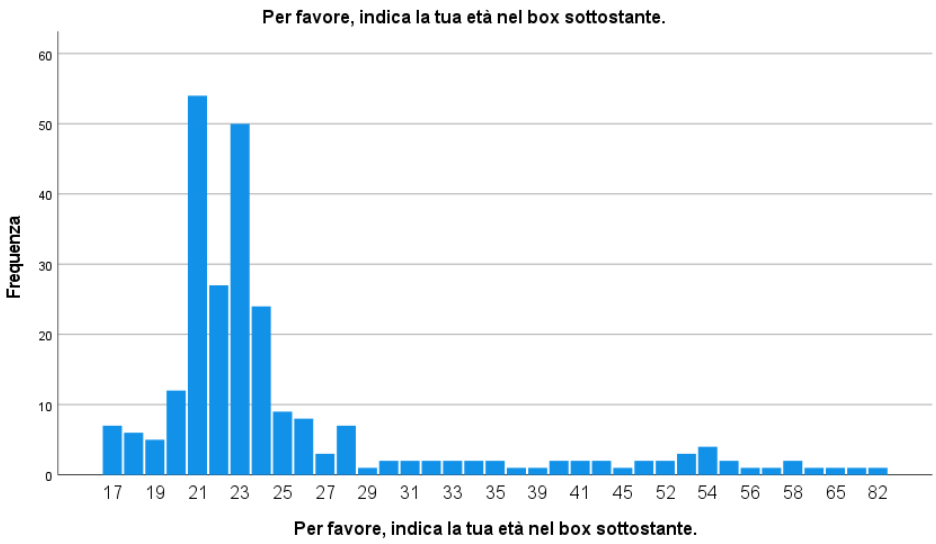
Table 2: Gender output SPSS

Per favore, indica la tua età nel box sottostante.

Media	N	Deviazione std.
26,31	255	10,465

Source: SPSS

Graph 2: age frequency



Source: SPSS

Regarding the distinction between people who buy luxury and people who do not buy luxury we can see from Table 3 that there is a majority for those who are used to buy in luxury shops (luxury yes= 141; luxury no= 114). This variable will be considered and analysed in more detail afterwards.

Table 3: Luxury variable

Sei solito/a comprare lusso presso negozi fisici?

		Etichetta valore	N
luxury	0	No	114
	1	Si	141

Source: SPSS

3.3 Hypothesis testing

To start testing the hypothesis of the study, five new variables were created of which three corresponded to the averages of the items of the three pre-validated scales (*meanself, meanconf and meanwtb*) and two dummy variables.

The dummy variables were created for:

- the two different scenarios: "*Scenario*" (0 = "scenariocommessa"; 1="scenarioMagicMirror")
- luxury client/no luxury client: "*Luxury*" (0 = "no"; 1= "si")

Afterwards, each scale was tested for reliability through the Cronbach alpha study and these were the results:

- The self-esteem scale, moderator, consists of 6 items and was found to be reliable with alpha=0.80 and no item if removed was found to make the scale more reliable.

Table 4: Self-esteem scale reliability check

Statistiche di affidabilità

Alpha di Cronbach	Alpha di Cronbach basata su elementi standardizzati	N. di elementi
,803	,808	6

Source: SPSS

- The "Consumer confidence" scale, mediator, consists of 5 elements and was found to be reliable with alpha = 0.95 and no item if removed was found to make the scale more reliable

Table 5: Consumer confidence reliability check

Statistiche di affidabilità

Alpha di Cronbach	Alpha di Cronbach basata su elementi standardizzati	N. di elementi
,954	,955	5

Source: SPSS

- The "Willingness to buy" scale, dependent variable, consists of 3 elements and was found to be reliable with alpha = 0.94 and no item if removed was found to make the scale more reliable

Table 6: Willingness to buy reliability check

Statistiche di affidabilità

Alpha di Cronbach	Alpha di Cronbach basata su elementi standardizzati	N. di elementi
,946	,946	3

Source: SPSS

To test the relationship between the dependent variable and mediator in the two different scenarios, univariate analyses of variance were run.

Table 7: Distribution two scenarios

Fattori tra soggetti

		Etichetta valore	N
scenario	0	scenariocommessa	128
	1	scenarioMagicMirror	127

Source: SPSS

Table 8: Descriptive statistics two scenarios

Statistiche descrittive

Variabile dipendente: meanWTB

scenario	Medio	Deviazione std.	N
scenariocommessa	4,3281	1,34898	128
scenarioMagicMirror	2,6929	1,55533	127
Totale	3,5137	1,66763	255

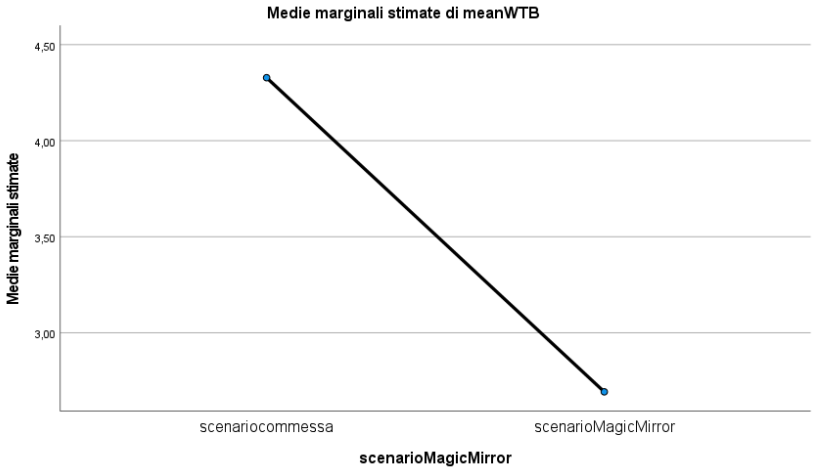
Source: SPSS

As you can see from the first table, the two scenarios were shown randomly to a total of 255 people distributed in:

- 128 to whom the scenario representing the traditional shopping experience (with the salesperson) was shown
- 127 to whom the scenario representing the shopping experience with the Magic Mirror was shown.

Looking at the model (Table 8), we can see that by examining the two scenarios and the dependent variable "WTB", we can immediately see a clear distinction regarding their means.
In fact, the mean for the scenario with the salesperson was 4.3281 while the average for the scenario with the Magic Mirror was only 2.6929. From these data we can state that, in the absence of other variables, the participants who were shown the first stimulus (salesperson) expressed a higher propensity to buy than the participants who were shown the stimulus with the Magic Mirror. Below we can see the graph representing these results:

Graph 3: mean WTB for the scenarios



Source: SPSS

Table 9: Levene Test WTB

Test di Levene di eguaglianza delle varianze dell'errore[a,b]

		Statistica di Levene	gl1	gl2	Sig.
meanWTB	Basato sulla media	,722	1	253	,396
	Basato sulla mediana	,059	1	253	,809
	Basato sulla mediana e con il grado di libertà adattato	,059	1	213,023	,809
	Basato sulla media ritagliata	,180	1	253	,672

Source: SPSS

With the Levene's test we investigate whether the variances are equal across the whole sample and, since the sign is p > 0,5, the null hypothesis is confirmed. Thus, our datasets fulfil the homogeneity of variance assumption.

Table 10: Test of between-subject effect WTB

Test di effetti tra soggetti

Variabile dipendente: meanWTB

Origine	Somma dei quadrati di tipo III	df	Media quadratica	F	Sig.	Eta quadrato parziale	Parametro noncent.	Potenza osservata[b]
Modello corretto	170,460[a]	1	170,460	80,473	,000	,241	80,473	1,000
Intercetta	3142,507	1	3142,507	1483,562	,000	,854	1483,562	1,000
scenario	170,460	1	170,460	80,473	,000	,241	80,473	1,000
Errore	535,909	253	2,118					
Totale	3854,667	255						
Totale corretto	706,369	254						

a. R-quadrato = ,241 (R-quadrato adattato = ,238)

b. Calcolato utilizzando alfa = ,05

Source: SPSS

Continuing to study the relationship between the two scenarios and the dependent variable, from the table above we can see that for both “Corrected Model” and “Scenario” we have significance. In fact, Model F (1,170) = 80,473, Sig. = 0,000 alpha < 0,05, thus we reject H0. There is significant mean difference on the willingness to buy due to one of the two scenarios.
Following, Model F (1,170) = 80,473, Sig. = 0,000 alpha < 0,05, thus we reject H0. “Scenario” is a significant variable, influencing mean differences in the willingness to buy.

Subsequently, looking at the two scenarios and the dependent variable "Consumer confidence" we can see, even in this case, a clear distinction as regards the means (Table 11).

Table 11: Descriptive statistics Consumer confidence

Statistiche descrittive

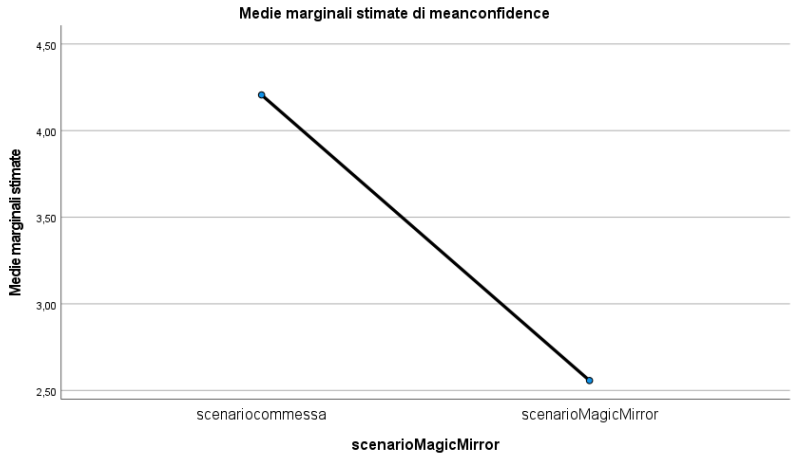
Variabile dipendente: meanconfidence

scenario	Medio	Deviazione std.	N
scenariocommessa	4,2062	1,29589	128
scenarioMagicMirror	2,5575	1,30752	127
Totale	3,3851	1,53948	255

Source: SPSS

In fact, for the scenario with the salesperson there is an average of 4.2062 while for the scenario with the Magic Mirror an average of only 2.5575. Again, we can state that, in the absence of other variables, the participants who were shown the first stimulus (salesperson) expressed a higher consumer confidence than the participants who were shown the stimulus with the Magic Mirror. Below we can see the graph representing these results:

Graph 4: mean Consumer confidence for the scenarios



Source: SPSS

Table 12: Levene Test Consumer confidence

Test di Levene di eguaglianza delle varianze dell'errore[a,b]

		Statistica di Levene	gl1	gl2	Sig.
meanconfidence	Basato sulla media	,085	1	253	,771
	Basato sulla mediana	,405	1	253	,525
	Basato sulla mediana e con il grado di libertà adattato	,405	1	234,410	,525
	Basato sulla media ritagliata	,000	1	253	,989

Verifica l'ipotesi nulla che la varianza dell'errore della variabile dipendente sia uguale tra i gruppi.

a. Variabile dipendente: meanconfidence

b. Disegno: Intercetta + scenarioMagicMirror

Source: SPSS

Also in this case, since the sign of the Levene Test is higher than 0,5, the null hypothesis is confirmed. Thus, our datasets fulfil the homogeneity of variance assumption

Table 13: Test of between-subject effect Consumer confidence

Test di effetti tra soggetti

Variabile dipendente: meanconfidence

Origine	Somma dei quadrati di tipo III	df	Media quadratica	F	Sig.	Eta quadrato parziale	Parametro noncent.	Potenza osservata[b]
Modello corretto	173,298[a]	1	173,298	102,276	,000	,288	102,276	1,000
Intercetta	2916,393	1	2916,393	1721,186	,000	,872	1721,186	1,000
scenario	173,298	1	173,298	102,276	,000	,288	102,276	1,000
Errore	428,685	253	1,694					
Totale	3524,000	255						
Totale corretto	601,983	254						

a. R-quadrato = ,288 (R-quadrato adattato = ,285)

b. Calcolato utilizzando alfa = ,05

Source: SPSS

From the table above we can see that for both “Corrected Model” and “Scenario” we have a significance. In fact, Model F (1,173) = 102,276, Sig. = 0,000 < alpha= 0,05, thus we reject H0. There is significant mean difference on the consumer confidence due to one of the two scenarios.
Following, Model F (1,170) = 102,276, Sig. = 0,000 alpha < 0,05, thus we reject H0. “Scenario” is a significant variable, influencing mean differences in the consumer confidence.

After establishing that both the dependent variable and the independent variable had a significant effect on the dummy variable “scenario”, we must also consider the other model variable “self-esteem”.

In this way, we want to investigate whether or not the variable "self-esteem", which moderates the model, is significant and, in order to do this, we do the moderated mediation on SPSS using the PROCESS function (model 7) developed by Andrew F. Hayes (2012).

This research proposes that the effect of the scenario (salesperson/Magic Mirror) on the willingness to buy is mediated through consumer confidence while self-esteem moderates the path between “scenario” and the mediator “consumer confidence”.

While we are studying this moderated mediation the software will give us also separate information on the single relations including the single moderating effect of self-esteem on scenario and willingness to buy.

Table 14: Moderated mediation output PROCESS

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 3.4 *****************

         Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2018). www.guilford.com/p/hayes3

**************************************************************************
Model  : 7
    Y  : meanWTB
    X  : scenario
    M  : meanconf
    W  : meanself

Sample
Size:  255

**************************************************************************
OUTCOME VARIABLE: a path
 meanconf

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      ,6449      ,4159     1,4010    59,5616     3,0000   251,0000      ,0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     4,1853      ,1047    39,9805      ,0000     3,9791     4,3915
scenario    -1,6450      ,1483   -11,0899      ,0000    -1,9372    -1,3529
meanself     -,5389      ,0941    -5,7245      ,0000     -,7242     -,3535
Int_1         ,9777      ,1324     7,3847      ,0000      ,7169     1,2384

Product terms key:
 Int_1    :        scenario x        meanself

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      ,1269    54,5335     1,0000   251,0000      ,0000
----------
    Focal predict: scenario (X)
          Mod var: meanself (W)

Conditional effects of the focal predictor at values of the moderator(s):

   meanself     Effect         se          t          p       LLCI       ULCI
    -1,1209    -2,7409      ,2098   -13,0645      ,0000    -3,1541    -2,3277
     -,1209    -1,7632      ,1492   -11,8185      ,0000    -2,0571    -1,4694
     1,3791     -,2967      ,2353    -1,2610      ,2085     -,7601      ,1667

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   scenario   meanself   meanconf   .
BEGIN DATA.
      ,0000    -1,1209     4,7893
     1,0000    -1,1209     2,0484
      ,0000     -,1209     4,2505
     1,0000     -,1209     2,4872
```

```
      ,0000     1,3791     3,4422
     1,0000     1,3791     3,1455
END DATA.
GRAPH/SCATTERPLOT=
 meanself WITH     meanconf BY       scenario .

************************************************************************
OUTCOME VARIABLE: b and c' path
 meanWTB

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      ,8872      ,7871      ,5967   465,9320     2,0000   252,0000      ,0000

Model
              coeff         se          t          p       LLCI       ULCI
constant      ,3391      ,1711     1,9815      ,0486      ,0021      ,6761
scenario     -,0716      ,1146     -,6245      ,5329     -,2974      ,1542
meanconf      ,9484      ,0373    25,4200      ,0000      ,8749     1,0218

****************** DIRECT AND INDIRECT EFFECTS OF X ON Y *****************

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI
     -,0716      ,1146     -,6245      ,5329     -,2974      ,1542

Conditional indirect effects of X on Y:

INDIRECT EFFECT:
 scenario    ->    meanconf    ->    meanWTB

   meanself     Effect     BootSE   BootLLCI   BootULCI
    -1,1209    -2,5994      ,2164    -3,0384    -2,1838
     -,1209    -1,6722      ,1546    -1,9755    -1,3711
     1,3791     -,2814      ,2679     -,7877      ,2639

      Index of moderated mediation:
             Index     BootSE   BootLLCI   BootULCI
meanself      ,9272      ,1481      ,6474     1,2304

 Pairwise contrasts between conditional indirect effects (Effect1 minus Effect2)
    Effect1    Effect2   Contrast     BootSE   BootLLCI   BootULCI
    -1,6722    -2,5994      ,9272      ,1481      ,6474     1,2304
     -,2814    -2,5994     2,3180      ,3703     1,6185     3,0759
     -,2814    -1,6722     1,3908      ,2222      ,9711     1,8455
---

********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95,0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

W values in conditional tables are the 16th, 50th, and 84th percentiles.

NOTE: The following variables were mean centered prior to analysis:
          meanself

NOTE: Variables names longer than eight characters can produce incorrect output.
      Shorter variable names are recommended.

------ END MATRIX -----
```

Source: SPSS

In order to begin analysing the moderated mediation, we can notice that the output is divided into sections analysing each part of the relationship:

- A path (moderated effect of "self-esteem")
- B path (relation between the mediator and the dependent variable) and C' path (direct effect of the independent on the dependent variable)
- Moderated mediation

A PATH

From the section "*OUTCOME VARIABLE: meanconf"* we can see that the coefficient of "Scenario" is -1,6450 and it represents the slope for the effect of "Scenario" on "Consumer confidence". The slope is negative, and we have statistical significance ($p < 0,05$). While the coefficient of "Self-esteem" is -0,5389 and it represents the slope for the effect of "Self-esteem" on "Consumer confidence". Even in this case the slope is negative, and we have statistical significance ($p < 0,05$).

Since the coefficients are both negative, it means that the lower the self-esteem, the more people prefer to buy with the Magic Mirror and vice versa. Moreover, in the section regarding the "Conditional effects" we can notice that the effect of the scenario on the mediator is not consistent for all three levels (low, medium, and high self-esteem). In fact, level 3 is not significant ($p= 0,2085$) and this implies that the higher the self-esteem, the more the scenario with the Magic Mirror is not preferred. This result further validates the research.

If we look at Int_1 (Interaction1 = scenario x self-esteem) we have a positive slope (0,977) and we also have statistical significance ($p < 0,05$). Thus, we can state that the effect of scenario on consumer confidence is moderated by self-esteem. The moderation is confirmed.

Furthermore, if we look at the R2-chng we can state that only 12,6% of the variance of the variable "self-esteem" is explained by the interaction between the IV and the moderator.

B PATH AND C' PATH

We have a significant B PATH (meanconf 0,9484 and p 0,0000) but, for what concerns the C' PATH, the direct effect, it is not significant (p 0,5329).

Thus, we don't have a significant direct effect and only "Consumer confidence" is a good predictor of "willingness to buy".

MODERATED MEDIATION

To test the moderated mediation, we have to look at the section called "*INDEX OF MODERATED MEDIATION*" (highlighted in yellow). This index tests whether we have an indirect effect that is moderated by our moderator. Since we don't know the distribution of this index, we have to look at the bootstrapping numbers. If it is significant, zero is not part of this interval and both limits have the same form (both positive or both negative), then we have a significant index of moderated mediation and we have a moderated mediation.

From our output we can see that in both bootstrap levels zero is not included (*BOOTLLCI* =0,6474 and *BOOTULCI* =1,2304), thus we can consider this relationship statistically significant.

Since it is significant then we have to look at the "*INDIRECT EFFECT*" that it is positioned right above the previous results. In the table there are three values of the moderator: -1 SD, mean and +1SD and we can check if all three values are statistically significant. In our case only level 3 is not significant (*BOOTLLCI* =-0,7877 ; *BOOTULCI* = 0,2639) and this implies that when the variable self-esteem is high, the type of purchase scenario does not influence the increase in consumer confidence.

Lastly, we look at the "*DIRECT EFFECT*" that in our case, as we have noted earlier, we don't have a significance in the direct effect (path C').

Since C' is not significant and AB is significant, then self-esteem turned out to be a pure mediator because it fully explained the relationship between x and y. For this reason, we can state that there is a total mediation.

After this analysis we can state that the hypothesis of this study (H1) is confirmed.

3.4 Managerial implications

This study contributes to the literature in several ways. Previous studies on augmented reality have focused on numerous positive effects from its use but it has never been studied in relation to the "self-esteem" variable during the in-store shopping experience.

The existing literature on augmented reality has predominantly focused on the later stages of the customer journey. As a result, it has transcended the unique role that AR technologies can play for the customer experience. Numerous studies, for example, have investigated customer acceptance of AR as a new technology (Huang & Liao, 2015), or the impact of AR on purchase intentions (Smink et al., 2019). In contrast, this research explored the impact of this technology on the physical shopping experience.

The results showed that AR is able to make people like the physical shopping experience more especially for those subjects with low self-esteem. However, the analyses seem to suggest that, in the absence of the self-esteem variable, the relationship between the independent and dependent variables is not statistically significant, probably due to the fact that respondents, not being in an actual shopping situation, may not have been able to actually perceive their need in the situation shown.

This study provides many insights for companies operating in the luxury sector to make a difference in terms of the physical shopping experiences. Using AR technology to make the shopping experience more pleasant, attractive, stimulating and efficient can indeed positively influence customers and increase their attractiveness. In particular, the results of this study can help marketing managers to incorporate AR marketing into existing

strategies to maximize the shopping experience enjoyment in luxury stores since developing better customer experiences through the use of new technologies should be their priority (Parise et al., 2016).

Achieving customer engagement through technology in the early stages of a purchasing process is likely to result in snowball effects that can translate into positive outcomes such as purchase and the establishment of a referral mechanism (Kumar et al., 2010). In this way, people who have already tried the AR experience can share it with family, friends, and even on social media. In addition, the present study is of interest to all brands operating in the fashion industry that sell clothing and accessories because the positive results in terms of experience were obtained precisely by showing participants a hypothetical process of buying this type of product.

3.5 Research limitations

The limitations encountered in this study are several. First, it must be considered that all the respondents in the sample examined were Italian and a convenience sample was used for the research. In addition, almost half of the respondents (114 out of 225 total) were not used to buy luxury, therefore, they may not have been aware of the basic idea of the analysis.

Moreover, when compiling the survey, respondents may have been influenced both by the latter two conditions and also by the fact that consumers have not actually been confronted with a purchase situation with AR (since these solutions are currently only available in the foreign countries) and, therefore, may not have actually immersed themselves in the experience reproduced through photos. This may have affected the enjoyment of the experience, but more importantly the role of the Magic Mirror that may not have been actually perceived.

The study could be repeated on a larger and more representative sample, and future research could test the enjoyment of the experience through AR with the use of other different products such as in the make-up industry. To overcome these problems, videos could be submitted as stimuli or technologies such as Virtual Reality could be used where the actual shopping experience with augmented reality is understood and perceived.

3.6 Conclusions

Augmented reality is a new technology that is increasingly becoming part of our daily lives, entering more and more sectors, and reaching even more people. In this study, this new technology was first introduced by explaining its technical and scientific basis, how it can be used, and in which areas it is increasingly becoming an established feature. Subsequently, all the scientific literature concerning reality augmentation in the specific

sector of luxury, a fundamental variable for our research, was presented, highlighting the role that this technology is playing and the benefits that both companies and consumers can derive from it. This research then concluded with the last chapter in which the survey data were analysed to see whether or not the initial hypothesis had a statistical validity. Thanks to this survey, and the data obtained, it could be seen that the relationship between the self-esteem variable and the use of the Magic Mirror was statistically significant and therefore the initial hypothesis was accepted. In fact, the use of Magic Mirrors was perceived as a tool that could make the shopping experience more pleasant, stimulating, and attractive for people with low self-esteem. This result has a very high value because it analyses the use of this technology from the point of view of physical shops as, in recent years, there has been an increasing focus on studying the phenomenon from a digital/e-commerce perspective. Augmented reality offers a new shopping experience by combining the physical and digital shopping experience by eliminating barriers consumers might face. As we noted in our study, augmented reality is still seen by consumers as something new and extremely innovative, which on the one hand could be an exciting asset, but on the other hand could be intimidating due to the lack of information about the specific technology.

The positive results obtained from the study are very encouraging and can be used as a starting point for further studies or in-depth investigations, especially since we are in a world where technological expansion and development is growing faster and faster. For this reason, all brands, from the smallest to the largest, should start using and incorporating augmented reality technology into their business plan to exploit its potential and attract new customers.

As expressed in the previous chapters, more and more brands are adding this feature to their websites and even, in the case of larger brands, installing monitors in their physical shops. All this is happening because the use of this new technology is becoming increasingly fundamental and important for the growth of brands.

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SUMMARY

Nowadays, multinational luxury companies are defined by several characteristics like market competition (Brondoni & Arrigo, 2015), unstable and rapidly changing demand and high profitability (Mosca, 2008). Customers are no longer satisfied with merely purchasing luxury things when they become more widely available; they often want it before the general public does, or they want it entirely customized to set themselves apart from others. This entails a reduction in production times as well as several reorganizations of the entire manufacturing process. The increasing engagement of electronic methods throughout industrial processes gave rise to the notion of Industry 4.0. The concept refers to a future smart factory model in which computer-driven systems monitor physical processes, generate a virtual duplicate of the actual environment, and make decentralized decisions through self-organization mechanisms (Smith, 2016). The concept of Industry 4.0 comprehends the use of Augmented reality.

The popularity of augmented reality interactive technology is quickly growing, and so is its use. This rise has been driven by the widespread of smartphone usage, cost improvements, increased mobility, and AR's potential to give experiential value and impact to the consumer journey (Watson et al., 2018). AR refers to a set of technologies that combine real-world and virtual data to enhance up a particular experience (Lamantia, 2009). Some clients avoid making online purchases due to possible flaws that could make the online process dangerous (Kim and Forsythe, 2008). AR can provide memorable experiences for online shoppers (MacIntyre et al., 2001) because, by offering adequate product information (Lu and Smith, 2007), it will be easier for them to examine the targeted products (Kim and Forsythe, 2008) and make more confident judgments (Oh et al., 2008). AR is a technology where the user is located between the real-life world and the overlay virtual elements, which can include films, photos, or other virtual items (Javornik, 2016).

Contrary to popular belief, the history of augmented reality began long before the 2000s, precisely in 1968 when Ivan Sutherland and Bob Sproull created the first head-mounted feature, which they called The Sword of Damocles. However, it wasn't until 2001 that the most widely accepted definition of AR was proposed by Azuma et al.: “An AR system supplements the real world with virtual (computer-generated) objects that appear to coexist in the same space as the real world. […] we define an AR system to have the following properties:

- combines real and virtual objects in a real environment
- runs interactively, and in real time
- registers (aligns) real and virtual objects with each other”

Furthermore, AR can help to enrich the retail environment, both online and in physical places, by providing multiple types of value to consumers and businesses (Pantano et al., 2017; Scholz and Duffy, 2018). For what concerns consumer value, augmented reality allows consumers and potential users to connect with and touch products in a new way (Brengman et al., 2018) enhancing product tangibility (Vonkeman et al., 2017). AR adds various level of information to help buyers perceive how products fit them individually (Rese et al., 2014; Lu and Smith, 2007; Olsson et al., 2013). More information makes it easier for customers to interact and fully

immerse themselves in the shop environment (Yaoyuneyong et al., 2014). Information on product composition, design, and functionality, as well as more general aspects, are all examples. In this way, customers become part of the designing process of the item they desire to buy using augmented reality. It is feasible to increase customer happiness and engagement (Javornik, 2016) and influence customer decision-making with AR. According to Scholz and Duffy (2018), AR creates a "zone of fantasy" where customers can connect with one another. When client happiness rises, the buying process becomes more spontaneous and adaptable (Dacko, 2017).

Meanwhile, from the retailers' perspective, AR allows businesses to achieve a variety of objectives in their advertising and marketing strategy, such as encouraging customers to visit their store (online or offline), increasing brand knowledge and customer loyalty, and creating an immersive sensory environment. In particular, AR allows retailers to reconfigure or rebuild retail space by encouraging a distinct mode of customer perception and sense making, as well as the use of numerous aspects related to the five senses. Retailers may employ augmented reality to provide customers virtual try-ons to help them choose the best products for their needs (Brengman et al., 2018). AR has shown to be an effective tool for promoting retail shops and generating customer traffic.

Its benefits for retailers include enhanced speed in collecting data on consumer behavior and, as a result, improved service at the point of sale, which has a beneficial impact on the consumer buying experience (Flavián et al., 2019; Dacko, 2017; Pantano and Naccarato, 2010). Retailers can use AR to enhance sales volumes by providing a personalized pre-purchase review through mobile, web-based, and in-store applications (Dacko, 2017). Scholz and Smith (2016) emphasize the importance of AR for retailers in terms of creating a memorable customer experience and increasing consumer engagement (Bonetti et al., 2018).

The displays most commonly used by AR are: head-mounted display (HDM), a mounted screen on the head of the subject through the use of a helmet, hand-mounted display, such as tablets and smartphones, and spatial display. By Spatial Displays it is meant a category of display that maintains a static position in the environment in which it is located, such as video projections, holograms, radiofrequency sensors and tracking systems to report graphic information on the screen, without the need to wear or carry any display. A classic example of Spatial Display is found in Virtual Mirrors inside stores.

Augmented reality in luxury retail

The rapid development of digital technology has profoundly altered all sectors of the marketplace including the luxury fashion sector (Mastropetrou, Bithas, 2019). Previously, this sector was exclusive, but technology has made it accessible to everyone.

The majority of luxury businesses that are pioneering digital strategies are slowly starting to use augmented reality into their marketing plan, which offers new opportunities due to its unique qualities. For these reasons, fashion luxury firms are utilizing augmented reality to not only raise brand awareness, but also because it enables them to communicate with their target audience in a more timely and interactive manner.

Thanks to Augmented Reality and Artificial Intelligence technologies, luxury fashion brands are able to create an excellent consumer experience, reach more consumers, and build closer relationships with their audience (Chadha, Ahuja, 2020). This new technology can be implemented to show customers how the product will look before they buy it and hence conversions or just to make the purchase experience more interactive and exclusive. Because of augmented reality's unique ability to merge the virtual and the physical world, luxury consumers can immerse themselves in virtually enhanced experiences while trying on luxury accessories or going around a virtual luxury shop (Javornik et al., 2021).

Javornik et al., in 2021, focussed their studies on the luxury sector and from this research they were able to highlight the 4 characteristics of augmented reality that shape consumer experience:

- Virtuality (visual stimulation)
- Virtual-physical overlay (virtual representations combined with the physical environment)
- Virtual-physical alignment (real-time interactivity of physical elements with virtual ones)
- Seamless activation (AR visualizations autonomously activated)

Augmented reality in online luxury retail

The two main areas of online augmented reality are E-commerce and Mobile augmented reality (MAR).

Due to the great technological development of the last decades, e-commerce has become a fundamental tool for the development of marketing strategies and for enhancing the relationship between customers and the brand. The most relevant characteristics identified by Wang et al. (2015) are:

- Interactivity: it complements current web technology by providing consumers with more information.
- Virtuality: in AR applications, virtuality is less prevalent, resulting in a lack of responses associated with interactive social engagement (Scholz et al., 2016).
- Geolocation: it is a common feature of AR, and it allows for personalized and efficient client service. In retail, AR technologies are frequently implemented on smart devices and huge interactive screens. In this way customers can see products in a virtual setting, for example customers can see the virtual representation of furniture in a physical room (Javornik, 2016).
- Mobility: the word “mobility” means that the customer does not have to physically move but, thanks to portability and wearability features, they are immersed in a virtual environment in which they can navigate while remaining in one place in the real world.
- Synchronisation of virtual and physical/real elements (augmentation): this technology is also linked to the synchronization of the virtual and physical world.

As the use of mobile devices has radically transformed the traditional retail sector, the combination of augmented reality with mobile applications (MAR) is attractive to both customers and retailers (Rauschnabel et al., 2019; Qin et al., 2021). Certainly, people utilize it to surf the Internet more than any other networking device, implying that cell phones are the most trusted and essential gadget for an individual. The growing use

of smartphones and the increasing tendency of consumers to shop directly on such devices also includes luxury items.

In fact, online luxury shopping demands trust in the vendor since consumers cannot touch or feel the product. Due to lack of physical presence, consumers have to dedicate a lot of resources to verify the product efficacy and to develop confidence with their purchase, for example looking at reviews or consumer reports (Pentina, Bailey, Zhang, 2015). The fact that high-quality AR-based applications simulate the physical presence of the product reassures the customer for what concerns its suitability and also supports the reliability of the vendor (Javornik et al., 2021; Mavlanova, Benbunan-Fich, and Lang, 2016). Consumers are more likely to have hedonic buying experiences when they have access to three-dimensional information (Pe-Than, Goh, Lee, 2014). Consumers who have more immersive experiences are more likely to buy the luxury product that is suited for them, which boosts their confidence and influences future purchase intentions (Kim, Biocca, 1997).

Augmented reality inside luxury stores

Fashion and apparel retailers are progressively adopting digital technologies in-store to improve the shopping experience, increase customer service quality, and gain a competitive advantage in an evolving technology-driven and increasingly competitive environment (Bell et al., 2017). Retailers have recently become more interested in adopting augmented reality applications in the purchasing process to personalize the in-store experience and bring life to their physical shops (Berman, 2019).

Incorporating augmented reality into a physical business opens plenty of possibilities for assisting customers with their purchasing decisions. The most obvious benefit is that AR can allow customers to examine the qualities of a product in real time without having to switch their attention between the item and other sources of information, such as pamphlets or product websites. Customers can also use this type of in-store application to double-check the size and colour of the garments they are wearing before making a purchase (Hwangbo et al., 2017). Customers can learn more about their body type and how it relates to the garments they want to purchase throughout this method. Such functions can alleviate the pressure on a user's memory, which can be significant when comparing a huge number of very similar items in a store (Álvarez Márquez, 2020). The possibility to see a product’s feature in direct comparison to another one can allow the user to identify problems or differences and change their mind. In this way, they have the possibility to request another product that have different features in comparison to the previous item.

Consumers may not always have precise and specific preferences, and they frequently develop them on the go when a decision must be made. The lack of preferences is particularly problematic in digital catalogues, where there are many options to consider, potentially leading to the so called “choice overload” (Dirk Bollen, 2010). As a result, augmented reality has the ability to improve consumers' visualisation of products, increase engagement, and improve perceptions of the shopping experience, resulting in a favourable impact on store and brand perception. The most popular implementation of augmented reality in stores is through the virtual

try-on technology that created the opportunity for customers to try on several outfits without having to put them on.

Magic Mirrors

The most common augmented reality technology that virtual fitting rooms in department stores adopt is the so called “Magic Mirrors”. This devise works on the “flawless tracking principle” (Singh et al., 2016) that makes the interactive monitor look like a simple mirror. Magic mirrors combine the functionality of a simple mirror, which reflects whatever is in front of it, with that of a monitor, which shows digital images without taking into account the surrounding area. Indeed, the image of the client that is captured by a digital camera is reproduced on the mirror screen and, with the help of algorithms, the spatial measurements and movements of the client are identified to deliver a virtual experience. This allows the user to experience multiple scenarios in a virtual environment. In fact, having the possibility to add digital elements to your specific physical conformation makes you detach from the 2D avatar view that the customer experiences when shopping in a traditional offline context.

If you want to experience this new way of shopping you have to simply position yourself in front of a Magic Mirror in a virtual fitting room and then you can start trying on different clothes picking from a range of models, colours, and sizes. Once you have decided which item to try on, the mirror screen will show your reflection by adding the garment previously chosen in its particular colour, model and size. Moreover, in case the wanted item is not currently available in-store, the Magic Mirror can show that particular product in all the colours and sizes non physically present in that store offering services of virtual fitting and recommendation system (Hwangbo et al., 2017). Garments will be placed over your digital image, and you will see how they fit.

There are different examples of Magic Mirrors like the one called “FashionistaTM”, a method that allows consumers to interact with the website through hand movement to "try on" clothes before saving them in a virtual basket. Another example is the Magic Mirror used in the new department stores created by Farfetch called “the Store of the Future” where the technology used is very elaborated because it linked the classical “Magic Mirror” to the Farfetch app and to all the clothing rails that are physically present in the store. In this way, when a consumer touches or move any of the clothing hanged in one of the rails, the sensors detect and recognise the garment and shows on the mirror screen the garment in question adding it directly to the mobile app's wish list (Mortimer, 2017). Moreover, the mirror has incorporated a product recommendation system like those found on online websites. As the customer tries on different clothes, other garments appear on the screen that the software has identified as compatible and personalised in relation to their style, purchases, and previous research (Mortimer, 2017). When the customer finds one of the proposed clothing styles interesting, he or she simply clicks on the monitor and asks to try it on, also identifying the desired colour and size. The main features upon which the functioning of this "Store of the Future" is based are consistency and communication. More specifically, Store of the Future's great organization refers to the successful communication between the digital mirror, the app, the website and the checkout which promotes the

development of a seamless customer profile fundamental to create a coherent, tailored customer targeting throughout all platforms (Kansara, 2017).

Consumer decision confidence

Consumer decision confidence is defined as the extent to which an individual perceives himself or herself capable and assured with respect to his or her marketplace decisions and behaviours. As a result, consumer decision confidence reflects subjective assessments of one's ability to create positive experiences as a customer in the marketplace (Adelman, 1987). This concept is defined as a multidimensional construct and it consists of two higher-order components, each of which has several dimensions (Gerbing, Hamilton, Freeman 1994). These several components, which describe unique content domains, are then interpreted using a single-dimensional set of items. The two higher-order components represent the two primary roles that increased customer confidence (Mossman, Ziller, 1968). To put it another way, consumer confidence represents an individual's perception of his or her ability to make more effective consumer decisions, including the ability to collect and use information (DM); and to defend himself or herself from being misled, tricked, or treated unfairly (PROT). When faced with difficult decisions including huge volumes of information and stress from marketplace pressures, consumer confidence serves to enable the consumer to work efficiently.

Furthermore, evidence was presented for the use of consumer decision confidence metrics to moderate theoretically and practically significant correlations. Consumer confidence was found to regulate the relationship between price-quality schema (Lichtenstein et al., 1993) and the choice of higher-priced options through influencing decision-making and personal outcomes. The study also provided further evidence about the current measures' relative predictive ability compared to various competing measures. For these reasons the consumer decision confidence variable is taken into consideration in this research as the use of augmented reality could make the purchase process easier and make customers less doubtful of their choices. This is because, as mentioned previously, with the use of AR technology the customers have at their disposal a myriad of products in their various options that could make the customer feel more comfortable and feel more confident about the purchase.

Consumer self-esteem

Self-esteem is defined as the degree to which people value and accept themselves, as well as think well of themselves (Blascovich, Tomaka, 1991). In particular, it refers to a person's confidence and positive self. Since people with low self-esteem expect that they will not perform very well, they will try to avoid embarrassment, failure, or rejection by the society (Solomon, 2018). In fact, the most commonly accepted proposition about it is that people tend to be worried about how others view them and tend to avoid public places like swimming pools and gyms or, more in general, places where their bodies are exposed to other people (Thompson, Chad, 2002).

In retail people have to relation themselves with wearable items like dresses, t-shirts, trousers etc. that are known as “highly-involving products”, defined as a product category for which consumers highly rely on

body-related information in their purchase process (Rosa et al., 2006). Thus, when trying on clothes in real life, it can happen that an item's fit is not perfect for the client's body types and so emphasize all the "imperfections" that the consumer may be self-confidence about. In this situation, AR would be a more effective tool for customers who have a negative body image because it explicitly portrays a better representation of themselves. In fact, AR projects in the mirror screen the image of the consumer's figure simply adding the virtual and digital representation of the garment chosen.

Research Model

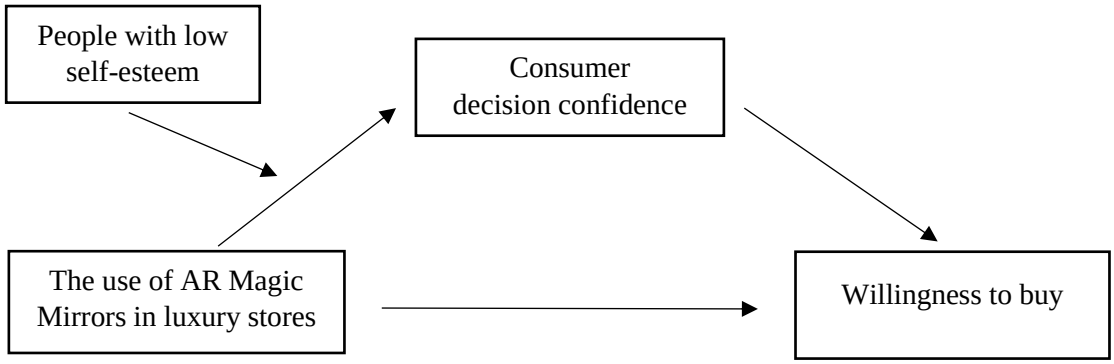
From all the research and analysis presented so far, we can clearly notice that the field of augmented reality is increasingly attracting the attention of academics, driven mainly by the relevance and novelty of the phenomenon. Until now, researchers have relied primarily on investigating technology from a digital perspective, through the creation of apps, as it is defined as the most proliferated and fast-expanding part of the field (Wang et al., 2016).

Thus, there is the need to have more literature that reaches out to all the dimensions of the phenomenon with a stronger attention to the physical reality since the Covid emergency is slowly diminishing and the people are coming back to their usual in-store shopping experience. Therefore, given the little possibility to make experiments for physical equipment of augmented reality in recent years, this research wants to expand the knowledge taking as a study variable specifically the use of magic mirrors in physical stores.

To explore in more detail augmented reality in physical stores, the research model is made up of other two concepts: consumer decision confidence and people self-esteem. The choice of including these parameters is because previous research has not shown if the usage of AR technology could make the customer feel more empowered and more confident about the purchase at the same time and this relationship could bring the consumer to make an easier purchase decision.

Moreover, this research does not limit itself to studying certain parts of the consumer's body, as Gucci has already done for the footwear sector and Yim et al. (2019) for the eyewear sector, but rather takes into consideration the entire body in order to have a 360-degree view of the customer's experience.

To capture what has been said, it was mainly discussed how the use of augmented reality is fundamental in the luxury retail sector and more specifically how the concepts of the usage of Magic Mirrors technology, consumer decision confidence and people self-esteem are key concepts that studied together can discover a new relevant relationship and thus contribute to the present literature. Therefore, the scope of this research is to study whether the use of augmented reality Magic Mirrors in the luxury sector can generate an increased consumer decision confidence in people with low self-esteem which will then be reflected in the consumer's willingness to buy.



H1: For people with low self-esteem the usage of AR Magic Mirrors in luxury stores positively influence their feeling of consumer decision confidence and consequently the willingness to buy.

Research methodology

In order to prove the research question expressed in the previous chapter, a scientific experiment was created to collect data on the four variables of the moderated mediation model. Thus, the intent of this analysis is to investigate whether the shopping experience using Magic Mirrors in a luxury store positively affects consumer confidence and thus their willingness to buy for subjects with low self-esteem.

To prove the existence of these relationships, a survey was created through the Qualtrics platform, and it was administered to 255 people. The survey consists of 19 questions divided into multiple choice (yes/no) and Likert scales in which the respondents will have to express their level of agreement or disagreement with the proposed statements. The survey opens with an introduction block in which the purpose of the survey and the fact that it is completely anonymous are described. After reading this information the participant, accepting the conditions, proceeds to the first question. We can divide the survey into three parts.

The first part of the questionnaire includes the first question regarding whether the participant was a luxury customer or not and then the first pre-validated scale regarding self-esteem is proposed. This scale was taken from Webster et al's (2022) pre-validated scale (six items, 7-point Likert scale) and it was used to study the moderator of this model. The choice of administering the self-esteem scale before showing the stimuli is because, in this way, the participants would not be biased by any circumstances and their responses about their self-acceptance would be totally truthful.

The second part of the questionnaire was designed to investigate the level of consumer confidence and willingness to buy after being exposed to one of the two possible scenarios shown randomly. More in detail, the two possible scenarios where: a "traditional" shopping experience with the shopping assistant and a shopping experience with the Magic Mirror technology. These scenarios were chosen in order to have two different points of view on the phenomenon: the participants' point of view in case they were using the Magic

Mirror during their shopping session and in the case they were facing a traditional shopping experience with the saleswoman.

After showing the scenario, the participants were asked to indicate how much they agreed with the statements regarding the two scales that, even in this case, are pre-validated scales. More specifically, Lassoued et al's scale (2015) was used for the consumer confidence scale (five items, 7-point Likert scale), whereas Dodds et al's scale (1991) was used for the willingness to buy scale (three items, 7-point Likert scale).

After answering the previous questions, participants were subjected to an attention check question where they were asked to select which of the two options proposed best represented the scenario previously presented. In this way it was possible to check if the survey was carried out correctly or if the participants did not give the appropriate attention to the stimuli to which they were exposed. Finally, in the last part of the survey, demographic questions were administered.

The survey was distributed through a snowball sampling where it was initially shared to friends, family, and colleagues who then forwarded it to other people, and it was distributed from the 28th of April 2022 to the 1st of May 2022. Recorded responses were initially 297, but after removing all uncompleted sessions, the final sample was composed by 255 responses that consists of 59% women (frequency: 151), 41% men (frequency: 104) and 1% other (frequency: 2).

Hypothesis testing

To start testing the hypothesis of the study, five new variables were created of which three corresponded to the averages of the items of the three pre-validated scales (*meanself, meanconf and meanwtb*) and two dummy variables.

The dummy variables were created for:

- the two different scenarios: "*Scenario*" (0 = "scenariocommessa"; 1="scenarioMagicMirror")
- luxury client/no luxury client: "*Luxury*" (0 = "no"; 1= "si")

Afterwards, through the Cronbach alpha study, each scale revealed a reliability higher that 0,8 (Self-esteem: alpha=0,81; Consumer confidence: alpha=0,96; Willingness to buy: alpha=0,95). Thus, each scale is identified as reliable for the study.

The two scenarios were shown randomly to a total of 255 people distributed in 128 to whom the scenario representing the traditional shopping experience (with the salesperson) was shown and 127 to whom the scenario representing the shopping experience with the Magic Mirror was shown.

We start the testing with the analysis of the two scenarios with both the dependent variable "willingness to buy" and the mediator "consumer confidence". In both scenarios there is a clear distinction regarding their means. In fact, for what concerns the relationship with the dependent variable the mean for the scenario with the salesperson was 4,3281 while the average for the scenario with the Magic Mirror was only 2,6929. From

these data we can state that, in the absence of other variables, the participants who were shown the first stimulus (salesperson) expressed a higher propensity to buy than the participants who were shown the stimulus with the Magic Mirror. Moreover, for what concerns the relationship with the mediator for the scenario with the salesperson there is an average of 4,2062 while for the scenario with the Magic Mirror an average of only 2,5575. Again, we can state that, in the absence of other variables, the participants who were shown the first stimulus (salesperson) expressed a higher consumer confidence than the participants who were shown the stimulus with the Magic Mirror.

After establishing that both the dependent variable and the independent variable had a significant effect on the dummy variable “scenario”, we must also consider the other model variable “self-esteem”. In this way, we want to investigate whether or not the variable "self-esteem", which moderates the model, is significant and, in order to do this, we do the moderated mediation on SPSS using the PROCESS function (model 7) developed by Andrew F. Hayes (2012). This research proposes that the effect of the scenario (salesperson/Magic Mirror) on the willingness to buy is mediated through consumer confidence while self-esteem moderates the path between “scenario” and the mediator “consumer confidence”.

In order to test the moderated effect of “self-esteem” (A PATH) we have to look first the section of the PROCESS output where the coefficient of “Scenario” is -1,6450 and it represents the slope for the effect of “Scenario” on “Consumer confidence”. The slope is negative, and we have statistical significance ($p < 0,05$).

While the coefficient of “Self-esteem” is -0,5389 and it represents the slope for the effect of “Self-esteem” on “Consumer confidence”. Even in this case the slope is negative, and we have statistical significance ($p < 0,05$). Since the coefficients are both negative, it means that the lower the self-esteem, the more people prefer to buy with the Magic Mirror and vice versa. Moreover, in the section regarding the “Conditional effects” we can notice that the effect of the scenario on the mediator is not consistent for all three levels (low, medium, and high self-esteem). In fact, level 3 is not significant ($p= 0,2085$) and this implies that the higher the self-esteem, the more the scenario with the Magic Mirror is not preferred. This result further validates the research.

If we look at Int_1 (Interaction1 = scenario x self-esteem) we have a positive slope (0,977) and we also have statistical significance ($p < 0,05$). Thus, we can state that the effect of scenario on consumer confidence is moderated by self-esteem. The moderation is confirmed. Furthermore, if we look at the R2-chng we can state that only 12,6% of the variance of the variable “self-esteem” is explained by the interaction between the IV and the moderator.

For what concerns the relation between the mediator and the dependent variable (B PATH) and the direct effect of the independent on the dependent variable (C PATH) we identified that we have a significant B PATH (meanconf 0,9484 and p 0,0000) but, for what concerns the C’ PATH, the direct effect, it is not significant (p 0,5329). Thus, we don’t have a significant direct effect and only “Consumer confidence” is a good predictor of “willingness to buy”.

To test the moderated mediation, we have to look at the section called "*INDEX OF MODERATED MEDIATION*" (highlighted in yellow). From our output we can see that in both bootstrap levels zero is not included (*BOOTLLCI* =0,6474 and *BOOTULCI* =1,2304), thus we can consider this relationship statistically significant.

Since it is significant then we have to look at the "*INDIRECT EFFECT*" that it is positioned right above the previous results. In the table there are three values of the moderator: -1 SD, mean and +1SD and we can check if all three values are statistically significant. In our case only level 3 is not significant (*BOOTLLCI* =-0,7877 ; *BOOTULCI* = 0,2639) and this implies that when the variable self-esteem is high, the type of purchase scenario does not influence the increase in consumer confidence.

Lastly, we look at the "*DIRECT EFFECT*" that in our case, as we have noted earlier, we don't have a significance in the direct effect (path C'). Since C' is not significant and AB is significant, then self-esteem turned out to be a pure mediator because it fully explained the relationship between x and y. For this reason, we can state that there is a total mediation.

After this analysis we can state that the hypothesis of this study (H1) is confirmed.

Managerial implications

This study contributes to the literature in several ways. Previous studies on augmented reality have focused on numerous positive effects from its use but it has never been studied in relation to the "self-esteem" variable during the in-store shopping experience. The existing literature on augmented reality has predominantly focused on the later stages of the customer journey. As a result, it has transcended the unique role that AR technologies can play for the in-store customer experience. Numerous studies, for example, have investigated customer acceptance of AR as a new technology (Huang & Liao, 2015), or the impact of AR on purchase intentions (Smink et al., 2019). In contrast, this research explored the impact of this technology on the physical shopping experience.

The results showed that AR is able to make people like the physical shopping experience more especially for those subjects with low self-esteem. However, the analysis seems to suggest that, in the absence of the self-esteem variable, the relationship between the independent and dependent variables is not statistically significant, probably due to the fact that respondents, not being in an actual shopping situation, may not have been able to actually perceive their need in the situation shown.

This study provides many insights for companies operating in the luxury sector to make a difference in terms of the physical shopping experiences. Using AR technology to make the shopping experience more pleasant, attractive, stimulating and efficient can indeed positively influence customers and increase their attractiveness. In particular, the results of this study can help marketing managers to incorporate AR marketing into existing strategies to maximize the shopping experience enjoyment in luxury stores since developing better customer experiences through the use of new technologies should be their priority (Parise et al., 2016).

Achieving customer engagement through technology in the early stages of a purchasing process is likely to result in snowball effects that can translate into positive outcomes such as purchase and the establishment of a referral mechanism (Kumar et al., 2010). In this way, people who have already tried the AR experience can share it with family, friends, and even on social media. In addition, the present study is of interest to all brands operating in the fashion industry that sell clothing and accessories because the positive results in terms of experience were obtained precisely by showing participants a hypothetical process of buying this type of product.

Research limitations

The limitations encountered in this study are several. First, it must be considered that all the respondents in the sample examined were Italian and a convenience sample was used for the research. In addition, almost half of the respondents (114 out of 225 total) were not used to buy luxury, therefore, they may not have been aware of the basic idea of the analysis.

Moreover, when compiling the survey, respondents may have been influenced both by the latter two conditions and also by the fact that consumers have not actually been confronted with a purchase situation with AR (since these solutions are currently only available in foreign countries) and, therefore, may not have actually immersed themselves in the experience reproduced through photos. This may have affected the enjoyment of the experience, but more importantly the role of the Magic Mirror that may not have been actually perceived.

The study could be repeated on a larger and more representative sample, and future research could test the enjoyment of the experience through AR with the use of other different products such as in the make-up industry. To overcome these problems, videos could be submitted as stimuli or technologies such as Virtual Reality could be used where the actual shopping experience with augmented reality is understood and perceived.