



# Radboud Universiteit

## **Exploring the Impact of Virtual Reality Advertising on Sustainable Purchase Intention:**

An VR-experimental Study

*Master Thesis*

*Master Business Administration; Innovation & Entrepreneurship*

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## **Abstract**

Green marketing is getting more important every day to create a sustainable future. For sustainable businesses to grow and make a positive, sustainable impact, it is necessary to stand out. New possibilities arise for sustainable enterprises to promote their products and escape the clutter created by the vast number of advertisements on social media platforms. With the introduction of virtual reality (VR) innovations, an option to improve online customer experience and escape the clutter is provided by displaying 360-degree VR social advertisements. It engages the user's senses in a virtual customer experience (CX) to create purchase intention. This research creates a deeper understanding of the VR customer experience and the effect of the level of immersion (HMD vs Mobile) on the purchase intention in a green marketing context. An experimental lab study with a custom-made 360-degree advertisement tested the conceptual framework. Results showed that the level of immersion does not significantly influence the purchase intention. However, it creates a significantly higher feeling of presence, leading to a higher emotional engagement, significantly affecting purchase intention. By empirically assessing this phenomenon, this research contributes to understanding the VR CX and the effect of the level of immersion on purchase intention in a green marketing context. Furthermore, it provides managers of sustainable companies with insights into implementing an effective 360-degree advertisement in their green marketing strategy and escaping the advertisement clutter.

**Key areas:** 360-degree social advertising, Virtual reality customer experience, purchase intention of sustainable products, green marketing

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## 1. Introduction

In 2023, businesses are at the front end of two revolutions: a sustainable revolution (Else, 2021) and a digital revolution (Suhairi et al., 2023). By releasing the Sustainable Development Goals (United Nations, 2022), the United Nations showed the world that not all previous goals on sustainability were being achieved. They set new goals on sustainable investments in physical and human infrastructure and voice the need for these goals to be promoted to a greater extent by businesses and governments. The interest in sustainability and the demand for more sustainable products has expanded to the consumer. New and existing companies act on these needs by creating and promoting environmentally appropriate products. Green marketing aims to reduce product and production systems' social and environmental impact. It is the concept used to describe marketing activities to promote products that are less harmful to the environment (Murin et al., 2015; Öztürk, 2020). The main challenge of marketers is to creatively think about how marketing can fulfil the needs of consumers for a better standard of living amid sustainable development (Choudhary & Gokarn, 2013).

It is essential to tailor the marketing approach to this target audience and communicate the sustainability features of the product clearly and effectively because prices are the main reason consumers refrain from buying a more sustainable option (Pieters et al., 2022). Green consumers already consider more dimensions than only price, for example, the environmental impact and social- and economic impact (Hanss & Böhm, 2012). By supplying consumers with these green products, businesses contribute to the sustainable goals set by the United Nations and the future of our planet (United Nations, 2022). Therefore, sustainable businesses must effectively market their green product and convey their sustainable mission. Organisations have endless possibilities to advertise their products to their target audience due to the enormous development of technology in the past decades.

### 1.1 Practical Need

Lately, environmental sustainability has risen to the top of the international political agenda and has been recognised as a key driver of innovation (Dangelico & Vocalelli, 2017). There are over 1,000 start-ups launched annually in the Netherlands Veld (Henz et al., 2022), with most of these start-ups focused on technology to positively impact a sustainable future (Henz et al., 2022). The number of companies developing green products followed this trend and

started rapidly growing, with consumers showing an increasing interest in these products. This makes the current start-up environment competitive, and all new businesses seek the consumer's attention most effectively. There are various digital marketing channels to convey advertisements and motivate consumers to purchase their green products (Woo et al., 2015). The biggest channel is social media advertisement, where businesses promote products to millions of users of applications. The most popular are Facebook, YouTube and Instagram (Dixon, 2023; C. Wang & Hung, 2019). The global market for social media advertising will be worth 471.9 Billion dollars by 2030, growing at a rate of 8.7% annually until 2030 (*Global Strategic Business Report*, 2023). Businesses see the opportunity and focus their resources on these growing platforms, creating an enormous amount of advertisements that exceed a consumer's acceptance level (Ha & Mccann, 2008). This is called advertisement clutter (Ha & Mccann, 2008). Advertisement clutter is undesirable for consumers and businesses (Ha & Mccann, 2008) because it negatively interferes with consumers' visual attention and ad effectiveness (Jung & Heo, 2021). The sustainable consumer gets lost in the enormous amount of information, resulting in avoidance and lower recognition (Jung & Heo, 2021; Nelson-Field et al., 2013). Larger brands are more immune to this clutter than small ones, so low-clutter environments are more important for new and smaller brands (Nelson-Field et al., 2013). Therefore, these businesses' managers search for new ways to escape the clutter by promoting their products in new ways.

One way to escape this advertisement clutter is by innovating and creating unique content, for example, to engage a consumer's senses through touch, smell, sound and sight (Subramanian, 2015). An advertisement in VR is an example of a type of unique content that triggers consumer senses. VR can be defined as a vivid first-person experience in a three-dimensional environment while (partially) blocking out the physical world (Bailey & Bailenson, 2017). VR offers a new digital world in which the user is immersed, and the virtual world engages their senses. For example, users can experience flying over a city without taking their feet off the ground (Jung et al., 2016). New and improved realistic 360-degree video advertisements in VR are an opportunity to promote products for sustainable businesses. This technology gives consumers a virtual experience with the product (Baltezarevic, 2023). By doing so, VR can disrupt established marketing strategies, like the introduction of smartphones and the Internet (Rosedale, 2017). The biggest social media platforms support VR in the form of a 360-degree video, which allows movement of the viewing field in a virtual world when moving the device (Corbillon et al., 2017). To do so, a consumer can use a head-mounted

display (HMD) or a mobile phone with a VR mode. Data shows that there are 171 million users of VR worldwide (Alsop, 2022) and the market in the US will increase from 12 Billion to 22 Billion dollars over the coming three years. The newly announced Apple Vision Pro will further boost the name of VR and increase innovation in this market due to their battle with the current market leader Meta (Duffy, 2023). Next to that, millions of consumers in the Western world own a mobile phone, including a display and motion sensor, with the ability to run VR files through Facebook or YouTube applications. Facebook has had over 400 million downloads annually over the past few years (IQBAL, 2023), and YouTube has over 10 billion downloads (Abdullah, 2021). This means there are many potential buyers to be reached, and their sustainable consumption can greatly impact reaching the set goals.

These reports show the increasing popularity of VR, sustainable consumption, and social advertising. To profit from this trend and make a sustainable impact, managers of companies need a crucial understanding of how VR advertisement, in the form of a 360-degree advertisement, can be implemented effectively into a social media advertising strategy in a green marketing context. Next, empirical research is needed to show which device should be focused on when making 360-degree advertisements. This is by comparing head-mounted displays (HMDs) and mobile phones. This unmet need can slow down the process of making a positive, sustainable impact and harm our planet's future. Next to the harmful sustainable impact, a significant number of revenue streams would remain untapped, given a large number of HMDs, mobile phones, and social statistics. Knowledge of the drivers and outcomes of 360-degree advertisement in VR is crucial to create an overview of how to successfully integrate VR into a green marketing strategy on the different devices and increase the purchase intention of these sustainable products that positively impact the planet. Existing research on the commercial implementation of VR lacks guidance to do so.

## 1.2 Theoretical Need

In the existing literature, green marketing has been studied in different forms like eco-labelling (Murin et al., 2015), green brand positioning (Dangelico & Vocalelli, 2017) and consumer attitudes towards green products and sustainable behaviour (Groening et al., 2018). However, there is limited knowledge of green marketing in a social advertisement environment. The article by Ktisti et al. (2022) mentions the need for further investigations into green marketing on a social platform. Mandliya et al. (2020) suggest further research on the purchase intention of these sustainable products. In social-advertisement, reports and

studies have been published on all types of (social) advertisement and examine how different digital devices affect consumers' responses to advertising (Fiore et al., 2005; Stewart et al., 2019). Stewart et al. (2019) state that the choice of social advertising channel significantly influences purchase intention. Baxendale et al. (2015) state that positive queues in the customer experience can positively affect brand consideration and buying behaviour. However, there are limited studies found that focus solely on VR in this social advertisement context.

Next to this gap, studies found on VR are mostly descriptive. VR in current studies is focused on the abstract concepts of immersion, presence and engagement (Gibson & O'Rawe, 2018; Makransky & Petersen, 2021) connected to VR, but these studies lack empirical evidence in a green marketing context and the role it represents in the customer experience (CX). It is important to know what makes these abstract concepts work in the VR CX to implement later. Zaki et al. (2023) call for future research investigating VR in offline marketing, online marketing, and mobile channels. Previous research on VR has shown that it is a proven tool to convey a message to a consumer, where the consumer's senses play a crucial role (Tussyadiah et al., 2018). Next to that, VR can penetrate multiple industries and bring convenience to people (Jin, 2022; Tussyadiah et al., 2018), but these studies do not study VR in a commercial setting. Saren et al. (2013) argue that VR can be used to explore future technologies and is unsure how consumers may react and adopt this new technology. Research has been done on VR 360-degree video in marketing (Cowan & Ketron, 2019; Tussyadiah et al., 2018) and the possibility for gamification (Xu et al., 2013), but this is mainly studied in tourism and education. Cowan & Ketron (2019) call for further marketing research on using VR applications in a market-related environment, and even in the field of tourism, there is a call for further research by Leung et al. (2020).

To conclude, a theoretical and managerial need exists for research on the drivers and outcomes of 360-degree advertisements in VR. The existing literature reveals several gaps that call for further exploration and investigation. The primary gap is a lack of knowledge of the virtual reality customer experience in green marketing. A better understanding of the variables connected to the VR CX is needed first because this creates a solid foundation of knowledge. Examining all elements that make up the online VR customer experience is relevant since they remain relevant over all devices. Second, there is a lack of empirical studies on VR in a green marketing context. In line with this gap, there is a lack of knowledge

on comparing the effect of 360-degree video advertisements viewed through head-mounted displays or mobile devices on the purchase intention of sustainable products. For managers searching for new ways to improve their green marketing strategy by integrating VR technology into their green marketing approach, it is important to learn about the implementation, focusing on the type of content and device and the effectiveness of a 360-degree advertisement. Further empirical research is necessary to enhance the comprehension of the subject, as the prior studies lacked sufficient insights.

### 1.3 Research Objective

To address these needs, which are mentioned above, the present study sets out to investigate the effect of the level of immersion on the purchase intention of sustainable products in a green marketing context by answering the following research question: *“How does the level of immersion affect the virtual reality consumer experience and their purchase intention in a green marketing context?”*

This study aims to find the effect of the level of immersion used for 360-degree video advertisements in green marketing on purchase intention (Desai, 2019; Stewart et al., 2019). The effect of the level of immersion on presence will be assessed by the data collected in this study. This data will also be used to measure the feeling of presence leading to emotional engagement and their influence on purchase intention. The degree of a sustainable lifestyle is a moderator in this study because research has shown that personal interests, determining the attention level, influence presence (Barfield & Hendrix, 1995; Darken et al., 1999; Witmer & Singer, 1998). In order to test the effect of each construct connected to the subject and gain more knowledge in the field of VR, a lab experiment was conducted over the last weeks on the campus of Radboud University. The experiment required a custom 360-degree video advertisement of a sustainable product that could be used in green marketing. This advertisement was then displayed on two devices with different levels of immersion (HMD vs Mobile). HMD has a higher level of immersion than the mobile phone (Makransky & Petersen, 2021). Both let the user interact with the 360-degree advertisement from a fixed viewpoint (Loomis et al., 1999; Makransky & Petersen, 2021). This manipulation allows us to investigate the effect of the level of immersion in this research model.

## 1.4 Relevance

The contributions of this study are both theoretical and managerial. First, this study contributes to the practical knowledge of VR social advertisements on social platforms, which is part of green marketing. Managers of sustainable businesses can use this knowledge to implement VR advertisement into their green marketing strategy. Second, it creates more insight into the effect that the level of immersion has on presence, based on the theory of Steuer (1992). Third, it expanded the knowledge on the effect of presence on emotional engagement in the VR customer experience in a green marketing context. Fourth, the relationship between emotional engagement and purchase intention is assessed, contributing to the existing theories and prior knowledge.

## 1.5 Outline

The remainder of this thesis is structured as follows. First, the theoretical background of this study is described in the next chapter, which will include a deeper dive into the matter connected to this research and supply a conceptual model. Second, the research design addresses the methodology of this study and ethical considerations are presented. Third, the analysis of the experiment, conclusion, and discussion will be presented. To complete this thesis, theoretical- and managerial implications will be stated, as well as the limitations and directions for future research.

## 2. Theoretical Background

This chapter provides the thesis's theoretical background on all crucial concepts and their definitions. Further, it elaborates on current studies and literature within this field. Hypotheses on the relationships between each construct are created and developed into a conceptual model. It is crucial to create a solid foundation, consisting of existing insights into concepts ranging from green marketing in general to VR CX and purchase intention of sustainable products.

### 2.1.1 Green Marketing

Green marketing is a broad concept introduced in the late 1980s and can be applied to consumer goods, industrial goods and services (Polonsky, 1994). In this study, we define green marketing as all activities designed to generate and facilitate exchanges intended to satisfy human wants and needs while complying with minimal detrimental impact on the natural environment (Polonsky, 1994). A general marketing strategy entails four steps: segmentation, targeting, positioning, and differentiation (Kotler & Armstrong, 2018). These connect to the 4Ps (Product, price, place, and promotion) of the traditional marketing mix (Kotler & Armstrong, 2018). The 4Ps are tools to execute the strategy. Promoting environmentally appropriate products is part of green marketing (Murin et al., 2015).

The development of green marketing consists of three stages: ecological-, environmental- and sustainable green marketing (Peattie, 2001). To start, ecological green marketing is related to marketing activities for environmental problems. Second, environmental green marketing is learning about clean technology, eco-performance, sustainability, and the environment's vulnerability. The last stage is sustainable green marketing, where green markets and products, which have become effective with the development of the environmental marketing approach, offer opportunities to green consumers, and activities have been carried out for the continuity of efforts to change the behaviour of communities (Peattie, 2001). In order to be as sustainable as possible and positively impact the planet's future, businesses should aim for this last stage (Öztürk, 2020; Peattie, 2001). Other terms related to green marketing are recycling, sustainability and environmentally friendly. The main challenge of marketers nowadays is to creatively think about how marketing can fulfil the needs of consumers for a better standard of living amid sustainable development (Choudhary & Gokarn, 2013). More sustainable consumption would stop unsustainable consumption and production patterns, which cause the triple planetary crises of climate change, biodiversity loss and pollution (Clark, 2007).

### 2.1.2 Social Advertisement Effectiveness

Social advertising is part of the fast-growing market of digital marketing. This includes all marketing efforts that use an electronic device or the internet to execute a digital tactic or strategy to connect with customers or businesses and persuade a purchase (Desai, 2019). The employment of social media platforms to endorse green products has emerged as a prevalent practice among marketers and is increasingly considered a critical component in maintaining

relevance and competitiveness (Constantinides, 2014; Desai, 2019). The exponential growth of online advertising has led to concerns among businesses regarding advertising clutter within the online media landscape (Ha & Mccann, 2008). The sheer volume of online advertisements that consumers are presented with leaves them unable to ignore them, resulting in their perception as high clutter and creating a weakened impact on the consumer's impression (Ha & Mccann, 2008). Companies must adopt innovative and creative strategies to survive the challenges in the ever-expanding global market (Terkan, 2014). One way to do so is by creating unique and engaging content (Subramanian, 2015). This (social) interaction is valued highly (Abdullah, 2021; Voorveld et al., 2018). By using a combination of targeted advertising, which reaches audiences interested in a specific product or service (Knoll, 2016), and interactive content, which piques the interest of consumers who are more devoted to learning and willing to pay attention (McIntyre et al., 2021), businesses have an effective tool to overcome and cut through the advertisement clutter. Sustainable businesses should focus on creating advertisements that interest their targeted consumer.

### 2.1.3 Customer Experience

In today's market, businesses and (targeted) consumers meet via different online- and offline channels. These distinct moments of interaction between the consumer and business are called touchpoints (Baxendale et al., 2015). These touchpoints are part of the customer experience (CX) in a green marketing context and are becoming increasingly more complex and important (Lemon & Verhoef, 2016). Verhoef et al. (2009) define customer experience as a multidimensional holistic construct that involves the customer's cognitive, affective, emotional, social, and physical responses to the retailer or product. Schmitt (1999) narrowed it down into the factors: sensory experiences, affective experiences, creative cognitive experiences, physical experiences, behaviours and lifestyles and social identity experiences. The CX is a dynamic process that evolves with every stage, starting at the first touchpoint and ending at post-purchase (Lemon & Verhoef, 2016). In the pre-purchase stage, the purchase consideration is created and is heavily influenced by the CX with the product and brand (Lemon & Verhoef, 2016). Examples of video touchpoints in this stage are in-stream, display, mobile, and social video (Stewart et al., 2019). Research has shown that 'touchpoint positivity' adds explanatory power to the prediction of change in consideration when compared to frequency alone (Baxendale et al., 2015). The post-purchase stage is focused on the consumption behaviour of the product. For sustainable products, it is important that the

sustainable product changes unsustainable behaviour and have a positive impact during the post-purchase stage. Sustainable marketers of businesses can influence the CX and decision-making if they understand the specific needs of consumers and how to translate those needs into positive and effective touchpoints (Belch & Belch, 2009).

## 2.2 VR CX

The touchpoint in the CX studied will be a 360-degree video advertisement in VR used in green marketing. VR is watched mostly on an HMD, also known as VR glasses. This creates a unique way of seeing digital content for the consumer (Jung et al., 2016) and can be used to mediate online video advertisements. This new way of advertising engages customers' senses. It creates cognitive, affective, emotional, social, and physical reactions (Lemon & Verhoef, 2016) more than traditional advertising by allowing interaction with the displayed content. All factors stated by Schmitt (1999) are triggered by allowing this interaction with a virtual world. A user who watches a 360-degree video on an HMD or mobile phone can choose which portion of spherical content is displayed by moving the device in a specific direction. This portion of the spherical surface attended by the user is projected to a segment of their digital viewing field (Corbillon et al., 2017). VR allows the user to be transported into a virtual world and gives them an experience where emotions are created. In this research, we focus on these two concepts of VR CX: presence and emotional engagement.

### 2.2.1 Presence

Presence is the feeling of physically and mentally being in a different place or environment, in your mind, virtual or in reality (Steuer, 1992). It is the sense of being transported to another location or the sense of being in a mediated space other than where the physical body is located (Biocca, 1997). Presence and immersion are often used interchangeably. Slater (2003) states that presence is the human reaction to immersion. Presence goes beyond the limits of sensory organs themselves. Hudson et al. (2019) agree that they are not synonyms but give a contradicting definition to Slater, showing that there is not one universal definition. This study follows the following division: the objective level of sensory fidelity is immersion, and the subjective counterpart is presence (Slater, 2003).

Three factors determine the level of presence (Sheridan, 1992). The first is the extent to which online sensory information is similar to the real world. This corresponds with the definition of

Shih (1998), who believes that presence depends on how closely the computer-mediated experience simulates the consumer's real-world interaction with a product and is also stated by Steuer (1992). The second determinant is the ability to control the consumer's sensors to the stimulus, resulting in an immersive viewing experience. VR in this study allows interaction through the movement of the user's head in three directions: up, down, and side to side. By steering their viewpoint by motion and embracing the new digital surrounding, the user connects more values to what they experience (Sheridan, 1992). These stimuli engage users to pay visual attention to the content. Research shows that the more the users focus on virtual environmental stimuli, the more they are involved in the experience, resulting in higher degrees of presence (Witmer & Singer, 1998). The final determinant is the ability to change or interact with the product. All three determinants combined are similar to the definition of Steuer (1992) and Slater (2003) in that it is all about the subjective feeling of being in this virtual environment as a user. A higher score on all three determinants results in a higher state of presence and overall quality of the CX (Clemente et al., 2014; Slater, 2003; Steuer, 1992). There is another factor that influences presence. The notion of presence is inseparable from attentional factors (Barfield & Hendrix, 1995; Witmer & Singer, 1998). The feeling of presence depends on the meaning given by the user to the stimuli presented and affects the second determinant by Sheridan (1992).

### 2.2.2 Emotional Engagement

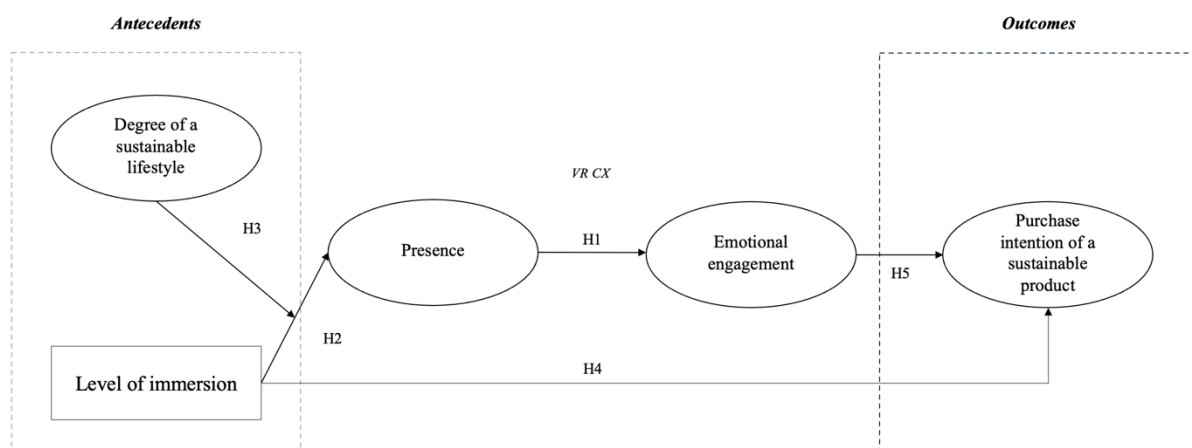
Presence is defined in the previous segment of this thesis as the subjective counterpart of immersion. By steering the viewpoint by motion and embracing the new digital surrounding, the user connects more values to what they experience (Sheridan, 1992). During these experiences, emotions get developed by the user (Krishna, 2012). Emotions significantly attract a consumer's attention and engagement (Poels & Dewitte, 2019). VR has been proven to create positive attitudes during these so-called VR experiences (Suh & Chang, 2006; Van Kerrebroeck et al., 2017). A so-called flow state is created by immersion. This is a state of peak enjoyment, high energetic focus, and creative concentration (Csikszentmihalyi, 2012).

Furthermore, VR experiences can positively impact the strength of the user's beliefs and the intensity of attitudes towards a product (Klein, 2003). In a green marketing context, this would mean that the VR experience would create a positive attitude toward a sustainable product. The definitions of engagement in this context are dissimilar in existing studies. This study will consider engagement as the willingness to have emotions affect and thoughts

directed towards and aroused by the mediated activity (Bouvier et al., 2013). A user's engagement is an essential dimension of the user experience during an interactive mediated activity (O'Brien & Toms, 2008; Schubert et al., 2001). When assessing the VR CX in 360-degree videos advertisement, we can state that an increase in presence leads to a higher sense of emotional engagement (Allcoat & Mühlénen, 2018; Mouatt et al., 2020) and will higher the quality of the VR CX (Clemente et al., 2014; Slater, 2003; Steuer, 1992). This is because being more present in the virtual world and involved with the content makes the user more engaged and develops emotions, especially during the VR CX. This creates the following hypothesis:

*H1: A consumer's higher feeling of presence positively affects emotional engagement as part of the VR CX in green marketing.*

**Figure 1 Conceptual model**



## 2.3 Drivers

### 2.3.1 Level of Immersion

VR differs from traditional video advertisements by developing an interactive digital surrounding with visuals and sound. It falls into the following categories of Schmitt (1999): sensory- and cognitive experience. Hudson et al. (2019) find that CX in non-physical settings is influenced by immersion, interaction with other participants and virtual environments. Immersion is the user's involvement with a VR system, which results in being in a flow state (Berkman & Akan, 2019). As stated earlier, this study defines objective immersion (Slater, 2003). Immersion is created by engaging the user's senses (Biocca et al., 2001). VR

experiences accessed through an HMD are generally regarded as high immersion because of the allowance of interaction by motion, creating depth perception for each eye and the ability to completely shut out the real world for the user (Makransky & Petersen, 2021). VR provides customers with an immersive- and interactive online shopping experience. This VR shopping experience is most viewed on mobile phones (Snelson & Hsu, 2019). As stated earlier, a mobile phone cannot provide a fully immersive experience compared to an HMD. In green marketing, the consumer can only focus on the product advertisement when using an HMD. While HMD completely shuts off the real world, allowing the user to focus all their senses on the virtual world, a mobile phone still allows them to simultaneously experience the virtual and physical world (Makransky & Petersen, 2021). Therefore, we can conclude that HMD has a higher level of immersion than mobile phones (Loomis et al., 1999; Makransky & Petersen, 2021). Since presence is based on the interaction between sensory stimulation, environmental factors, and internal tendencies (Witmer & Singer, 1998), a higher level of immersion encourages the user to feel physically and mentally in a different place than a lower level of immersion. This is because the user is more involved in the whole experience by allowing the senses to focus on the displayed content, resulting in a higher degree of presence (Witmer & Singer, 1998). Out of this statement, the following hypothesis is created:

*H2: A higher level of immersion, connected to the device used in green marketing, leads to a higher feeling of presence.*

### 2.3.2 Sustainable Lifestyle

In this study, one of the outcomes is the purchase intention of a sustainable product, which is most applicable to people with a sustainability interest or lifestyle. A lifestyle is an integrated set of routines and practices incorporated into how people dress, eat, act, and travel (Pieters & Wedel, 2004) and influences an individual's or society's use of natural and personal resources (Reyes et al., 2019). This, therefore, includes buying less impactful products. When purchasing a product, consumers consider environmental-, social- and economic dimensions (Hanss & Böhm, 2012). Having a high degree of sustainable preferences in the abovementioned three dimensions increases the likelihood of purchasing sustainable products (Sun & Wang, 2019). The paper by Gilg et al.(2005) also mentions these three dimensions when classifying the green consumer. The green lifestyle is mostly seen adopted by young, female, well-educated, liberal and wealthy people (Brough et al., 2016; Gilg et al., 2005; Olli et al., 2001; Roberts, 1993).

Research has proven that focus on the product can increase their feeling of presence (Darken et al., 1999) and state of flow (Csikszentmihalyi, 2012). The level of interest and involvement, the psychological state resulting from the focus of energy and attention to a coherent group of significantly related stimuli and activities (Witmer & Singer, 1998), depends on the degree of importance and meaning given to the event by individual users. The study results by Celsi & Olson (1988) also provide strong evidence that felt involvement with the product plays a motivational role in consumers' attention and comprehension processes. We can apply this to sustainable consumers in green marketing, who give sustainable products more acknowledgement than people that do not have a sustainable lifestyle. This influences the second determinant of presence (Sheridan, 1992): the ability to control the consumer's sensors to the stimulus. The user connects more values to what they experience by embracing the new digital surrounding when paying attention (Sheridan, 1992). Consequently, the correlation between immersion and presence is not solely influenced by the sensory information but also by the level of interest generated by the sustainable product. Out of this data, the following hypothesis is created:

*H3: Having a sustainable lifestyle positively affects the relationship between the level of immersion and presence.*

## 2.4 Outcomes

### 2.4.1 Purchase Intention

Advertisements positively influence potential and existing customers in their decision-making process; it stimulates the consumer to make the conscious product- and brand decisions (Gibson & O'Rawe, 2018). In this study, purchase intention is the likelihood that a customer will purchase a product (Jamieson & Bass, 1989). This definition corresponds with the definition given by Monroe & Chapman (1987): "a mixed outcome in that the buyer gains a product or services but loses the money paid for the product." Others say that purchase intention is the individual's awareness to attempt to buy a brand (Shabbir et al., 2009) and what we think we will buy (Park et al., 2005). We can apply this to sustainable products. Brundtland (1987) defined sustainability as meeting today's needs without sacrificing the ability of future generations to meet their own needs. Not only the level of engagement and the variables mentioned above are leading in the purchase intention of sustainable products.

Purchase intention in a green marketing context is created in the first three stages of purchase behaviour: problem recognition, information search and evaluation of alternatives (Comegys et al., 2006). These are followed by purchase decisions and post-purchase evaluation (Comegys et al., 2006). Purchase intention is influenced by demographic factors like age, gender, profession, and education (Daneshvary & Schwer, 2000). Wang et al. (2012) add the variables: features of products, perception of consumers, country of origin and perception of the country, showing that there are multiple product-related variables. For sustainable products, this would be its impact caused during the production, purchasing, process of use, and recycling processes. Stewart et al. (2019) present that choice in the digital marketing channel, which differs in the level of immersion, also directly influences purchase intention. In existing research, comparisons indicate that a higher purchase intention was generated when evaluating the product in moderate or high visual sensory immersion rather than a low sensory immersive environment (Biocca et al., 2001; Daugherty et al., 2008). Participants in a study by Daugherty et al. (2008) reported significantly higher levels of product knowledge and purchase intention after an immersive channel experience rather than a 2D advertisement due to the increased viewing angle. By increasing the viewing angle of the consumers, they tend to focus more on what they see, increasing their purchase intention. In VR, the user has a full viewing field in the virtual world. When applying this theory in a green marketing context, the following hypothesis can be created:

*H4: The level of immersion connected to the channel used in green marketing positively affects a consumer's purchase intention of a sustainable product.*

Further, Poels & Dewitte (2019) mention three emotions related to advertisement effectiveness and consumer perception: Awe, fear, and anger. These emotions are more likely to be experienced and valued by users with intrinsic motivation towards a product. Awe creates a more open-minded position and creates sensitivity to information (Poels & Dewitte, 2019), which is proven to be crucial to create the feeling of presence. Fear induces social fear and triggers customers to be more alert for relevant fear-related information. Anger can enhance purchase intention with its antagonistic character (Frijda, 1986). Emotional engagement and attitude are crucial in gaining consumers' attention to create purchase intention because it creates value for the consumer (Poels & Dewitte, 2019). A positive correlation exists between customer engagement and consumer purchase behaviour, mainly based on an emotional bond that betters a consumer's purchase behaviour (Barhemmati &

Ahmad, 2015). Consumers who create emotions during the advertisement will likely consider buying the sustainable product. Emotional engagement positively affects advertisement effectiveness and consumer perception, correlated with purchase intention because of the value the consumer gives to the product. (Barhemmati & Ahmad, 2015; Poels & Dewitte, 2019). This creates the following hypothesis:

*H5: A higher feeling of emotional engagement positively affects the purchase intention in green marketing.*

### 3. Methodology

This chapter will provide explanations of the methodology, manipulation, and ethical considerations. A quantitative study is conducted as a lab experiment with a survey. The conceptual model (see Figure A) is fundamental to this lab experiment. The approval of MOYU was received for using their notebooks as part of the experiment. The public campus of the Radboud University Nijmegen has served as the location where the experiment was executed, more specifically, the Elinor Ostrom building and the University library. The objective of the research was to investigate the proposed hypotheses empirically.

#### 3.1 Design

This conducted lab experiment used a one-factor, between-subjects experimental design. The manipulated independent variable was the level of immersion. In condition 1, the participant used an HMD and was shown a commercial of a sustainable product with a high immersion level. The other half of the respondents saw the same commercial of a sustainable product on a mobile phone. This second condition represented a lower level of immersion. All respondents were given the scenario (Appendix G) before participating in this experiment.

An advertisement was created and edited to fit the blueprint of this experiment. The product used in the social advertisement is made by the Dutch company MOYU. The advertisement was shot at their headquarters, and the homemade-style approach to content is typical for the green marketing team of MOYU and deemed representable by both founders (See Appendix D for additional information on the product and Appendix E for the advertisement design). The Insta360 One X camera produced 360-degree content in 1080p and was edited in

Insta360 Studio 2023. The advertisement was uploaded to a private YouTube channel where both devices could access the commercial. To maintain consistency among variants, solely altering the level of immersion, the respondent's limited mobility within the digital environment was considered, and a static camera position was adopted. With the addition of movement to use the full virtual viewing field, the user is forced to focus their attention and move the device to engage with the content. Uniformity in video resolution across both devices was also ensured. The audio component of the video was recorded by the Insta360 One X and produced through the built-in speakers of both devices, as it aligns with the typical mode of application.

Depending on the day, participants were assigned to one of the two conditions, and all participants were chosen randomly on campus. The HMD can display 360-degree video with the user's ability to interact with the content by head movement. The HMD used was an Oculus Go provided by the Radboud University Nijmegen. YouTube VR was used to run the custom-made advertisement. The mobile phone operated by the other group of participants was an iPhone 13 Pro by Apple. Condition 2 broadcasted the 360-degree advertisement through the mobile application YouTube in VR mode. The experiment was conducted in a similar closed room over four days to keep the external variables minimum. The rooms only had one window-side and limited external sounds. This controlled environment makes it a lab experiment.

Before administrating the experiment and finding all participants, it was necessary to check if manipulating the level of immersion was done as intended. A pre-test survey (see Appendix B) was conducted to see if the HMD and mobile differ in the level of immersion. In this pre-test, there was one question on the level of immersion to ensure that the manipulation was done as intended and two questions on whether the content was understandable or/and confusing. These results will be touched upon later in this study.

### 3.2 Procedure

Participants were randomly selected on campus and asked if they had 10 minutes to help with the experiment. When agreed to participate, participants in this research were guided to the room where the HMD and mobile phone were located. Before the experiment, the participant was given a consent form (see Appendix F), which they must sign to participate, and the experiment's goal was communicated. After, the participant got told the scenario. The

participant viewed the advertisement through condition one (HMD) or condition two (Mobile). After seeing the commercial, the participant was asked to complete the survey on a MacBook Pro 2021. The participant was never left alone with the devices and always checked if the commercial was fully played with sound. Completing the survey on the device watched was considered, but would not reduce this study's duration or disorientation, the measured presence (Schwind et al., 2019) and would create another variable to consider when analysing the data. After completing the survey, the participant was thanked and guided outside the room.

### 3.3 Participants

This study had 69 participants and 66 usable responses due to missing values. The benchmark was 30 usable responses in each condition, conforming to the 'Central Limit Theorem' (2008). This theory states that if you take sufficiently large samples from a population, the samples' means will be normally distributed, even if the population is not normally distributed ('Central Limit Theorem', 2008). By convention, the 'Central Limit Theorem' considers a usable sample size of 30 "sufficiently large". The sampling distribution will approximately follow a normal distribution with this sample size in both conditions. The selection of participants was executed by convenient sampling, part of the nonprobability technique. This sampling method means that some members of the population, compared to others, have a substantially larger, but unknown, chance of selection (Galloway, 2005). The average age of the participant was 22, with most people having finished their bachelor's degree.

### 3.4 Construct Measurement

The experiment measured the relations between all concepts in the conceptual model. All variables have been considered to prove the hypotheses and establish the significance of their relationships. The study measures were chosen from existing literature on each concept (Appendix C). Questions have been formed by the criteria connected to the used concepts within the literature. The question of the level of immersion, also used in the pre-test, was adopted from the study by Jennett et al. (2008) and used to check if the manipulation was done as intended. Presence was adopted from the studies by Barfield & Hendrix (1995), Lessiter et al. (2001) and Slater et al. (1994). Further, emotional engagement was adopted by Dubovi (2022) and Fredricks et al. (2016). A 7-point Likert scale was adopted from a study

by Kumar (2018) to measure purchase intention. Pieters & Wedel (2004) define a sustainable lifestyle, and the scale of Rakic & Rakic (2015) was used to measure the item on a 5-point Likert scale. The pre-test also used the scale by Kim et al. (2022) for confusion and the scale by Lee et al. (2017) for understanding. An overview of all concepts, the number of items, descriptions and level measurement used in the main survey can be found in the table found in Appendix B. This table corresponds with the pre-test and main surveys (Appendix A & Appendix B).

### 3.5 Control Variables

There are three control variables measured in addition to the concepts mentioned above. A demographic stereotype was researched, that being a high-educated young female, and confirmed as the general character of the buyer of sustainable products (Brough et al., 2016; Gilg et al., 2005). Therefore, education was chosen as a control variable. Age was also added from the VR study by Jennett et al.(2008), which states that age affects the level of immersion. Ease of use is the last control variable, which in Davis & Davis (1989) study is argued a crucial variable for accepting new technologies like VR. Without these control variables, this study could not make accurate claims about the impact of independent variables. Controlling for extraneous variables is particularly important when researching people because humans are complex beings (Webb, 2017).

### 3.6 Intended Data Analysis

Conducting a survey was the designated data collection method for doing this quantitative research since it is a tool to examine relationships between different variables on a bigger scale, and it allows the researcher to analyse the data more extensively (Nardi, 2018). After seeing the commercial, respondents were presented with the survey in Qualtrics (Appendix B). The results and data were exported into SmartPLS, a program designed to run SEM analyses. SmartPLS was the program of choice for its visual interface, easy-to-use operating system, and the fact that it assesses effects in total. SmartPLS is more sophisticated than the alternative tools that assess all effects in isolation. Before doing any tests, data was cleaned and prepared. Different data analyses were executed to test the hypotheses between all variables. Reliability and validity were also tested in SmartPLS. Reversed items were included in the survey to increase validity and reduce acquiescence bias (Schriesheim & Hill, 1981) and were later transformed to fit the positive questioning of the survey.

### 3.7 Ethical Considerations

When conducting this lab experiment, it was essential to consider ethical considerations. Participation was anonymous to respect the privacy of the participant. The only personal details of the participant asked in the survey were their age and education. The participant needs a trusting feeling and the ability to ask questions or quit at any moment during the research. As stated earlier, a consent form must be signed before participating in this experiment. This consent form (Appendix F) provided all information needed. By signing the consent form, all possible consequences connected to participating in the study (for example, motion sickness) were placed on the respondent. The participants were asked if they needed additional help handling the device. The research goal and duration were communicated to the respondent, and overall results were shared if they asked to do so. The respondent was given an ID to ensure that personal data would be anonymous. The name of the participants on the consent forms is only available for the researcher and will be deleted after finalising the report. The data's confidentiality level was also included in the consent form.

This study is created by following the referencing rules of the American Psychological Association (APA), which gives credit and recognition to the authors of the used theories, reports, and studies. No third party was involved in measuring and analysing the data. The study will eventually be uploaded to the database of Radboud University.

## 4. Pre-test

To test whether the manipulation works as intended, a pre-test with 13 participants was conducted. This pre-test also tried to eliminate the alternative explanation by assessing the level of confusion and understanding of the advertisement. Each participant was assigned to one of the conditions (HMD vs Mobile phone). After signing the consent form, all participants were shown the same advertisement of the MOYU product and asked to fill in the pre-test survey (Appendix A) after seeing the whole video. First, the participant was asked for their ID to keep track of the number of respondents in each group. Next, they were asked: "How immersed did you feel?". This item was measured on a scale from 1 (low) to 10 (high). Then three statements were given the following statements: "The information in this video was easy for me to understand"; "I was able to follow this video's content with little effort";

“Viewers like me should find this video easy to understand”. These items were measured using a 7-point Likert scale ranging from “Strongly disagree” (1) to “Strongly agree” (7). The final question was another statement: “I found the advertisement content confusing”. This was also measured using a 7-point Likert scale ranging from “Strongly disagree” (1) to “Strongly agree” (7) and was later reversed to fit the positive questioning.

An independent-sample t-test showed that the manipulation works as intended. Participants exposed to the video through the HMD had a significantly higher immersion level than those who used the mobile phone ( $MHMD = 8.50$ ,  $MVR = 6.29$ ,  $t = 4.226$ ,  $p < 0.03$ ). This difference is also shown in the item understand. The rating of the item understand ( $MHMD = 6.6111$ ,  $MVR = 5.7143$ ,  $t = 3.295$ ,  $p = 0.007$ ) shows a significant difference between the groups (HMD vs Mobile). However, this significant difference has not been deemed a threshold not to use the advertisement because both groups had a high mean when asked if they understood it ( $MHMD = 6.6111$ ,  $MVR = 5.7143$ ). This corresponds to “Agree” and “Strongly agree”, meaning the average participant understands the advertisement. Possible explanations for this phenomenon are different levels of English because most of the participants in condition 2 study in Dutch or lack focus due to their exam period. The data of the reversed item of confusion ( $HMD = 6.1667$ ,  $VR = 6.1429$ ,  $t = 0.063$ ,  $p < .951$ ) shows that there was no significant difference found between the two groups (HMD vs Mobile phone).

Overall, the pre-test showed that (1) the level of immersion significantly differed between the groups, (2) both groups of participants showed that they did not significantly differ in the level of confusion, and (3) showing that both participants did understand the advertisement by scoring high means, the pre-test concludes that the manipulation is done as intended and the advertisement is suitable to be used for the experiment.

## 5 Analysis

To analyse the data, SmartPLS 4 and SPSS 29 were used. SPSS provided insights into the numbers and was used to gain more insights into the correlations between individual constructs. SmartPLS 4 was used to create the overall model of this experiment and provided the option to run a PLS-SEM analysis of the data collected through this VR experiment.

## 5.1 Data Preparation

The experiment had 69 participants, of which 66 were used in the analysis. These 66 participants were divided equally over both conditions. Thirty-three people made up condition 1 (HMD), and 33 people made up condition 2 (Mobile), all aged 18 and 26. The three excluded participants had missing data, which would result in lower quality and less coherent data when included. This number of participants still exceeds the standard set by the ‘Central Limit Theorem’ (2008) and is therefore deemed usable. Five respondents got handed the same ID in the experiment, meaning these had the same answer to the first question. These responses could be identified as individual participants by looking at their time stamps and responses, which differed from their similar ID counterparts. The condition of each participant could also be traced back by analysing their time stamps and dates. Therefore, this data was deemed usable and included in the results.

## 5.2 Manipulation Check

A manipulation check was conducted to ensure that the level of immersion was manipulated as intended. The manipulation check was conducted through an independent samples T-test. The group with the high level of immersion (HMD) reported a higher level of immersion ( $M = 7.61$ ,  $SD = 0.966$ ) than the group with a lower level of immersion ( $M = 5.85$ ,  $SD = 1.460$ ). This significant relationship is in line with the result from the pre-test. These results support the statements made in the existing theory that HMD has a higher level of immersion than mobile (Makransky & Petersen, 2021). Based on these results, the manipulation can be considered as intended for this experiment.

## 5.3 Evaluation of The Measurement Model

To ensure the reliability and validity, the measurement model was evaluated. This was needed for all multi-item constructs and addressed its internal reliability, convergent validity and discriminant validity (Hair et al., 2022). Partial least squares structural equation modelling (PLS-SEM) analyses the proposed model of our experiment. This type of test is useful for smaller sample sizes because parameters are estimated in blocks, and multivariate normality is not required (Hair et al., 2022). Version 4 of SmartPLS used 10,000 resamples in the bootstrapping procedure to evaluate and produce robust standard errors and t-statistics (Hair et al., 2022). This SEM was conducted after determining that almost all measurement values

fell in the threshold statistics of skewness (-3 and +3) and kurtosis (-10 and +10)(Brown, 2006)(see Appendix H). The only item that exceeded this value by a low amount was purchase intention. Purchase intention was close to the threshold of 3, making it neglectable and resulting in inclusion. Further, a dummy variable was created for the dichotomous variable of the two conditions and added to the model as 'Welkegroep' (HMD vs Mobile). The condition 'HMD' was given the value of 1, and the second condition got 0 because this corresponds with the increasing immersion level. The variable education was excluded because all participants were in the same category when making dummies for this item, making this uniform item lack explanatory power.

A confirmatory factor analysis was conducted to check if the items represent the latent constructs found under variables in Table 1. In this analysis, multiple items were omitted (see Appendix K) because they did not exceed the threshold of .7 (Jr et al., 2011). The items that remained in the model are found in Table 1. This internal reliability test will express the values in the composite reliability value of the construct (CR). In support of the acceptable internal reliability, the composite reliability values for all multi-item constructs ranged from .847 to .929, exceeding the threshold of 0.70 (Jr et al., 2011). Next to CR, the convergent validity was measured and established (see Table 1). All average variance extracted (AVE) values exceed 0.5 (Fornell & Larcker, 1981). To support the acceptance of discriminant validity, inter-construct correlation values were lower than the square root of the AVE (see Appendix K) (Fornell & Larcker, 1981)

*Table 1* Factor loadings, composite reliability and average variance extracted of the constructs and their items

<b>Variables and components</b>	<b>Loadings (t-value)</b>
<i>Presence</i>	CR: 0.861 AVE: 0.675
Presence 4- Somehow, I felt that the virtual world surrounded me.	0.851 (14.653)*
RevPresence 5 - I did not feel present in the virtual space**	0.752 (7.099)*
Presence 6 - I was completely captivated by the virtual world	0.866 (22.794)*

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<b><i>Emotional engagement</i></b>	CR: 0.847 AVE: 0.649
EmoEnga 1 - I felt emotionally engaged during the advertisement	0.812 (9.422)*
EmoEnga 3 - I felt emotionally engaged by the virtual surrounding	0.810 (5.274)*
EmoEnga 4 - I felt emotionally engaged by the sound	0.794 (7.670)*

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<b><i>Purchase intention</i></b>	CR: 0.914 AVE: 0.842
PurchaseIn 1 - There is a chance that I would buy this product of MOYU	0.935 (25.142)*
PurchaseIn 2 - Next time I need a notebook, I would consider buying this product of MOYU	0.899 (15.550)*

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<b><i>Sustainable lifestyle</i></b>	CR: 0.929 AVE: 0.766
Sustainable 1 - When making decision about purchasing I always choose products which positively affect sustainability	0.852 (3.575)*
Sustainable 2 - When making decision about using a product I always choose the way (of using a product) which positively affects sustainability.	0.888 (3.647)*
Sustainable 3 - When making decision about product disposal I always choose the way (of product disposal) which positively affects sustainability.	0.863 (3.434)*
Sustainable 4 - When making decision about using water, land, energy, and other resources I always choose the way (water, land, energy and other resources) which positively affects sustainability.	0.863 (3.434)*

---

<b><i>Ease of use</i></b>	CR: 0.920 AVE: 0.697
EaseofUse1 - Learning to operate this VR-device is easy for me.	0.773 (3.181)*
EaseofUse2 - I find it easy to get this VR-device to do what I want it to do.	0.904 (4.390)*
EaseofUse3 - My interaction with this VR-device is clear and understandable.	0.885 (4.388)*

EaseofUse4 - I find this VR-device to be flexible to interact with.	0.795 (3.147)*
EaseofUse5 - It is easy for me to become skillful at using this VR-device.	0.810 (3.397)*

---

**Notes: CR composite reliability; AVE average variance extracted; \*p<0.01; \*\*item is reversed to have the same positive fit as all other items**

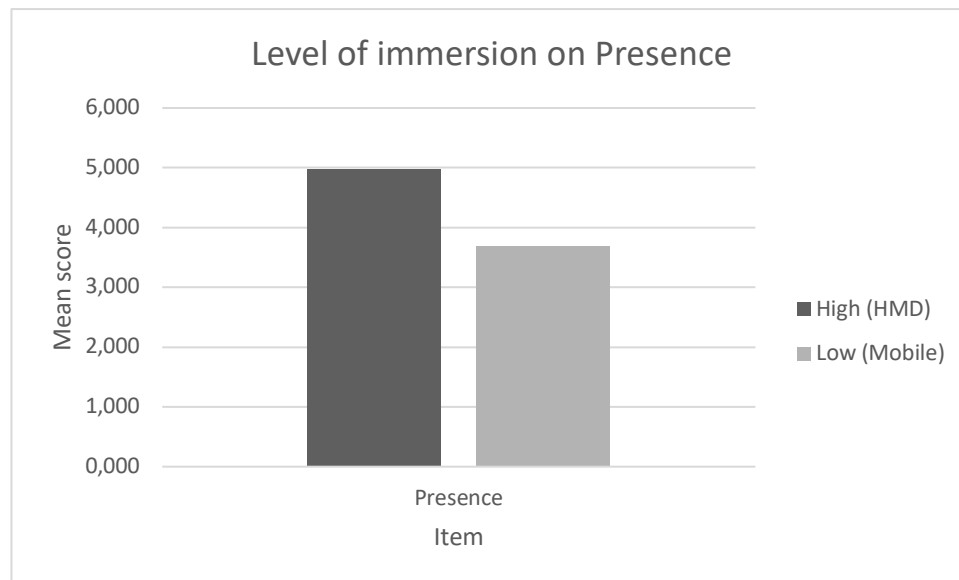
## 5.4 Evaluation of The Structural Model

### 5.4.1 Goodness of Fit

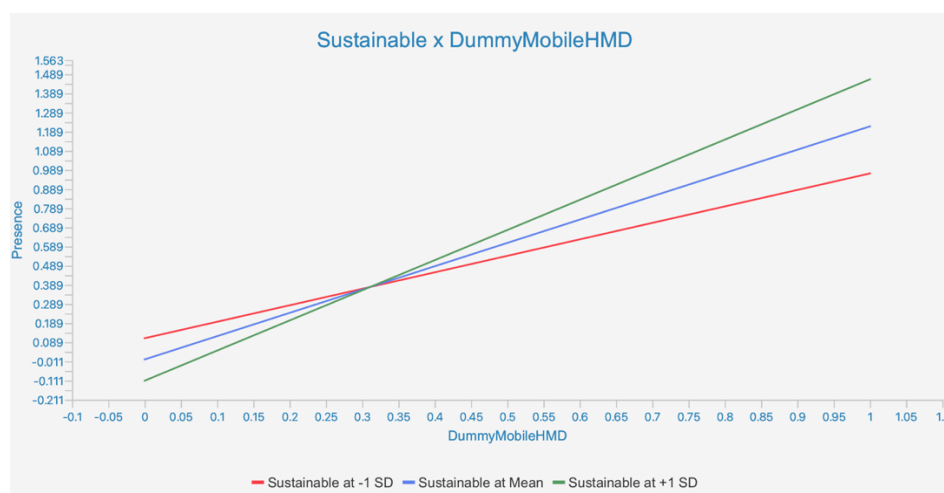
The model's overall fit was assessed first before assessing the structural model. The  $R^2$  values consider each inner latent model's complexity and can be found in Figure 4. Tenenhaus et al. (2008) proposed a goodness-of-fit (GoF) index to examine the model fit. The formula  $GoF = \sqrt{\text{communality} \times \overline{R^2}}$  was used. The GoF indicated an adequate model fit with a value of  $\sqrt{0.192}$  or 0.438 (Wetzels et al., 2009).

### 5.4.2 Statistical Findings

First, the model (see Figure 4) shows that the effect mentioned in the first hypothesis is statistically significant ( $\beta = 0.381, p < 0.05; R^2 = 0.145$ ). This means that a higher score on presence leads to a higher score on emotional engagement by having a positive effect. Therefore, we can accept H1. Second, H2 stated the relationship between the level of immersion and presence. Data from this experiment showed a significant effect of the level of immersion, connected to the devices used, on presence ( $\beta = 1.207, p < 0.05; R^2 = 0.412$ ). Condition 1 (HMD), with a higher level of immersion, scored a higher mean score ( $M = 4.970, SD = 1,118$ ) than condition 2 ( $M = 3.687, SD = 1,198$ ) of this multi-item construct (see Figure 2). This resulted in the acceptance of H2.

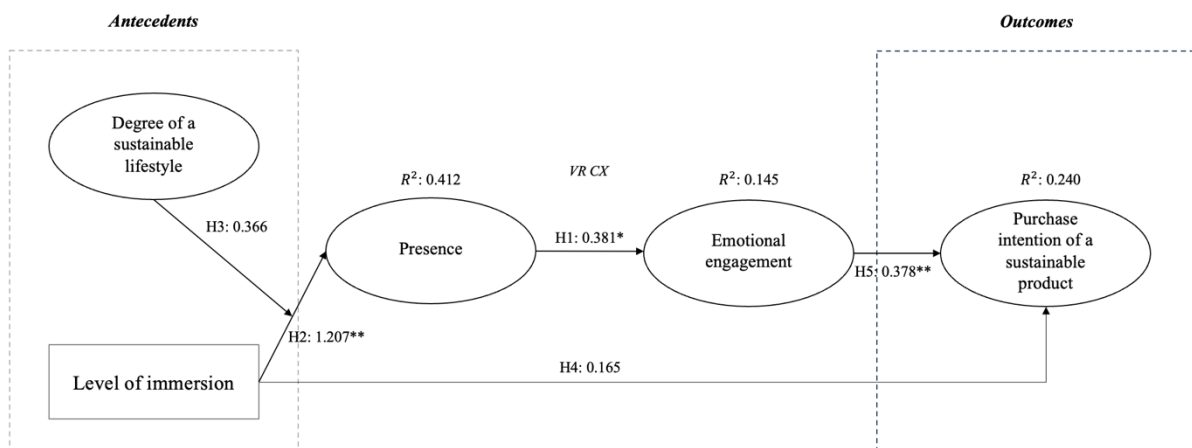
**Figure 2 The mean score of Level of Immersion (HMD vs Mobile) on Presence**

Third, H3 stated that there is a significant influence on this relationship by a moderator in this study: sustainable lifestyle. The significant effect of the level of immersion on presence was examined and accepted. The hypothesis of H3 can also be conditionally accepted because, in the context of this experiment, the moderator has a marginally significant effect on the relationship between the level of immersion and presence ( $\beta = 0.366, p < 0.1$ ). Figure 3 shows the moderation graph and tells us that the effect of the level of immersion on presence is positive, meaning that a high degree of a sustainable lifestyle strengthens the relationship between the level of immersion and presence.

**Figure 3 Moderation graph**

Fourth, the direct effect of the level of immersion on purchase intention was examined in the model and hypothesis 4 stated that it had a positive influence. In the results is found that there was no significant effect of the level of immersion on purchase intention in this model ( $\beta = 0.165, p > 0.05; R^2 = 0.240$ ). Data shows that the mean score on purchase intention of condition 1 (HMD) was higher ( $M = 5.225, SD = 1.194$ ) than that of condition 2 (Mobile) ( $M = 4.835, SD = 0.955$ ). With these values, H4 is rejected. The last tested hypothesis involved the positive effect of emotional engagement on purchase intention. The results, connected to H5, show a significant effect of emotional engagement on purchase intention ( $\beta = 0.378, p < 0.05; R^2 = 0.240$ ). This means we can accept H5.

**FIGURE 4 Structural model results**



**Notes:** \*\*: meets or exceeds  $p < 0.01$  (two-tailed); \*: meets or exceeds  $p < 0.05$  (two-tailed)

The effect of the control variables: Age and Ease of use were tested in this model. Age had a marginally significant effect on purchase intention ( $\beta = -0.175, p < 0.10$ ). Ease of use did not significantly affect purchase intention ( $\beta = -0.253, p > 0.05$ ).

### 5.5 Additional Results & Analysis

The effect of the level of immersion on purchase intention was also examined outside of this model using the data of this experiment. This total effect of the relationship without mediators is not used as a gatekeeper as it does not directly evaluate the indirect effect. The effect proved insignificant ( $\beta = 0.434, p > 0.05; R^2 = 0.047$ ). This does not align with the theory (Biocca et al., 2001; Daugherty et al., 2008). Compared to the structural model, the reduction in effect size shows that the introduction of the mediators negatively influences this

relationship. This creates an indirect-only mediation, where there is no significant direct effect of the level of immersion on purchase intention, and the moderator significantly affects purchase intention (Zhao et al., 2010). The VR CX mediators align with the theoretical framework by proving significant.

The indirect effect of the independent variable on the dependent variable through mediators in the structural model of this experiment was also examined (see Appendix L). The effect of the level of immersion through both mediators was proven to be marginally significant ( $\beta = 0,172, p < 0.10$ ) and show a positive effect. Next to that, condition 1 (HMD) scored higher on emotional engagement ( $M = 4.533, SD = 1.026$ ) than participants in condition 2 (Mobile) of this multi-item construct ( $M = 4.09, SD = 1,299$ ). This resulted in a significant indirect effect ( $\beta = 0.460, p = 0.036$ ). The indirect effect of presence, through emotional engagement, on purchase intention was also significant ( $\beta = 0.142, p = 0.038$ ).

## 6. Discussion

### 6.1 Discussion & Conclusion

The increasing degree of advertisement clutter on social platforms has made it harder for businesses to stand out, keep the consumer's attention, and increase purchase intention. This, in combination with the increased market share of HMDs and mobile phones, calls for businesses to innovate and create new types of advertisements. Therefore, this experimental lab study provided a better understanding of the VR CX with a 360-degree advertisement displayed on an HMD in one condition and on a mobile phone in the other. This experiment revealed how the level of immersion affects the purchase intention in a green marketing context. It answered the following research question: *“How does the level of immersion affect the virtual reality consumer experience and their purchase intention in a green marketing context?”*

Figure 4 shows empirical evidence by showcasing multiple key findings. The study revealed that the level of immersion (HMD vs Mobile) significantly affects presence. Participants exposed to the condition with a high level of immersion had a higher level of presence than the other half of the participants, confirming what was stated in existing research in VR (Loomis et al., 1999; Makransky & Petersen, 2021; Witmer & Singer, 1998). These studies

also found that the level of immersion affects presence positively, and this study is in line with the conclusions drawn in the existing literature. The relationship between the level of immersion was influenced by the degree of a sustainable lifestyle, proven to be marginally significant. This means that having a personal interest in the product, created by it being complementary to a person's lifestyle, does influence the interaction between the level of immersion and presence. In this study, a sustainable product was used, which interests people with a sustainable lifestyle. Interest and involvement in these types of products should increase focus (Barfield & Hendrix, 1995; Darken et al., 1999) and positively affect the relationship between the level of immersion and presence (Celsi & Olson, 1988; Csikszentmihalyi, 2012), which it did marginally in the context of this study. Results also showed that presence significantly affects emotional engagement. Participants with high presence were more likely to have high emotional engagement. This leads to an increase in the overall score of the VR CX in green marketing. This is in line with existing literature (Allcoat & Mühlénen, 2018; Clemente et al., 2014; Mouatt et al., 2020; Slater, 2003; Suh & Chang, 2006; Van Kerrebroeck et al., 2017), which state that by being more present in a virtual world the user connects more emotions to what they experience.

Next to that, when emotional engagement is high, it reported a significantly elevated score in purchase intention compared to participants with low emotional engagement. This is in line with the theory that emotional engagement positively affects advertisement effectiveness and consumer perception, which is positively correlated with purchase intention (Barhemmati & Ahmad, 2015; Poels & Dewitte, 2019) and also in line with a study by Klein (2003), which states that emotional engagement has a positive impact on the strength of the user's beliefs and the intensity of attitudes towards a product. The direct effect of the level of immersion on purchase intention was proven to be non-significant. This does not comply with existing literature (Biocca, Daugherty, et al., 2001; Daugherty et al., 2008; Stewart et al., 2019). This literature states that there is an effect of the level of immersion on purchase intention. In the context of this study, data shows that the mean score on purchase intention of condition 1 (HMD) was higher than condition 2 (Mobile), explaining the positive effect but proven not of enough strength to be significant. There are explanations for these differences. Data shows that the average respondent will lean toward having the intention to purchase the sustainable product of MOYU. Since the notebook is not well-known at this point, and the prices are not included in the commercial could make it much easier for consumers to make these statements. Combined with the fact that some participants did not experience VR on mobile or

HMD, this could influence their purchase intention of the sustainable product. Further, the social advertisement used was only 42 seconds long, which could affect the VR CX of the user.

The control variables in this experiment were proven to be non-significant. Age did not have a significant effect on purchase intention. Jennett et al (2008) stated that age influences the process, which was also the case in this experiment by a small margin. This could be because the demographic was similar when it came to age. Ease of use had a non-significant effect on purchase intention, scoring just above the threshold of being marginally significant. This means that the complexity of the device to the user did not influence purchase intention in this experiment.

## 6.2 Theoretical Implications

The existing literature on green marketing is limited and hard to find (e.g. Dangelico & Vocalelli, 2017; Groening et al., 2018; Murin et al., 2015). This is also the case for studies on VR CX, consisting of presence and emotional engagement (Gibson & O’Rawe, 2018; Makransky & Petersen, 2021) and purchase intention of a sustainable product (Mandliya et al., 2020). There are multiple studies to be found on social platform advertising (Fiore et al., 2005; Ktisti et al., 2022; Stewart et al., 2019) and VR-marketing (Tussyadiah et al., 2018), but almost none are done in the same empirical setting as this study. The call for empirical evidence in the VR field was voiced by existing research (Cowan & Ketron, 2019; Leung et al., 2020). Cowan & Ketron (2019) expressed the need for further marketing research on using VR applications in a market-related environment, and Leung et al. (2020) voiced the need to do so in tourism. Zaki et al. (2023) call for future research to investigate a VR continuum embracing offline, online, and mobile channels. This experimental lab study answers these needs for more empirical data by assessing the antecedents (level of immersion and degree of a sustainable lifestyle) and the outcomes (purchase intention of a sustainable product) in 360-degree VR advertisement, as well as contributing to the knowledge on the concepts of presence on emotional engagement in the VR CX. By doing so, this study contributed to the knowledge of VR and 360-degree advertisement.

First, this study found that presence significantly affects emotional engagement in the VR CX. This empirically found evidence strengthens current statements made in existing literature (Allcoat & Mühlénen, 2018; Clemente et al., 2014; Mouatt et al., 2020; Slater, 2003; Suh &

Chang, 2006; Van Kerrebroeck et al., 2017). It shows that when a higher state of presence is created, it affects emotional engagement. Second, consistent with existing literature (Loomis et al., 1999; Makransky & Petersen, 2021; Witmer & Singer, 1998), these results confirm that presence is significantly increased for people that had a higher level of immersion (HMD) than the people that had a lower level of immersion (Mobile) and create a better understanding of this phenomenon. Third, the degree of a sustainable lifestyle, the moderator of the relationship between the level of immersion and presence, was proven marginally significant in this study. Existing theories support this (Celsi & Olson, 1988; Darken et al., 1999; Witmer & Singer, 1998), and this study strengthens their statements. Next, this study found that a high emotional engagement leads to a significantly higher purchase intention than a lower emotional engagement. This effect was also proven in the existing literature (Poels & Dewitte, 2019), and the result, the significant effect of emotional engagement on purchase intention, strengthens these statements. Therefore, it adds to the existing literature on the effect of emotional engagement in the VR CX on purchase intention.

Next to that, the direct effect of the level of immersion was proven to be non-significant in this study. However, the indirect effect of the level of immersion on purchase intention through both mediators proved to be marginally significant in the context of this experiment. This study answers the need of Cowan & Ketron (2019), that expressed the need for further marketing research on using VR applications in a market-related environment by supplying more insights into the relation of the variables connected to the VR CX in a green marketing context. It also answers the need by Zaki et al. (2023), who called for future research to investigate a VR continuum embracing offline, online, and mobile channels, by supplying them with new insights. The non-significant result does, however, not comply with existing studies (Biocca et al., 2001; Daugherty et al., 2008; Stewart et al., 2019) and this calls for further investigation of the effect of the level of immersion on purchase intention in the same context of this study.

### 6.3 Managerial Implications

With the results showing evidence of a non-significant direct effect of the level of immersion on purchase intention, the analyses can support, inspire, or demotivate managers of sustainable companies' marketing teams to promote their sustainable products in 360-degree VR. When mediated by presence and emotional engagement, purchase intention is positively affected by the level of immersion, meaning that managers at these sustainable companies

should experiment with this interactive type of advertisement to escape the clutter and create new interactive content that increases their VR CX in a green marketing context. These advertisements should then be spread on social platforms that support VR, for example, YouTube and Facebook, because of reports showing an increasing market of VR- (Alsop, 2022) and social-media users (Abdullah, 2021). The managers should not choose to create a 360-degree advertisement specifically for the device with a high level of immersion because this does not directly lead to a higher purchase intention but can focus on devices with different levels of immersion to tap in on the now untapped revenue streams and increase the positive impact of sustainable consumption. The 360-degree advertisement should fit the personal interest or lifestyle of the targeted consumer because this increases presence. Therefore, managers should create advertisements that visualise the interest of their targeted customers. For green marketing, sustainability-inspired content would be the designated type of content. This choice can be made based on the fact that (1) level of immersion does not have a significant effect on purchase intention, (2) A higher presence leads to a higher emotional engagement, resulting in a higher purchase intention, (3) the devices used in this experiment were no problem to handle by this participant-demographic but is affected by age, and (4) that the degree of sustainable lifestyle does have a marginally significant effect on the relationship between the level of immersion and presence.

#### 6.4 Limitations & Future Research

The results of this experimental lab study seem comprehensive; by assessing presence, emotional engagement, purchase intention, degree of a sustainable lifestyle, and control factors. However, there are some limitations. First, in both the conditions, HMD and mobile, there were accidental external influences when experimenting. These involved loud sounds (like a door banging), people screaming and notification sounds. Another limitation is that sitting on an uncomfortable chair in an almost empty closed room on the campus is not representative of how most devices are used or will be used in the future. Future research could focus on studying the effect in a room without external influences or choose to conduct field research in an environment that accurately represents the typical surroundings of users. Second, the original model of this experiment also included the control variable of Education. However, this variable was finally excluded due to a full monotonous demographic of students falling into the same education category. The age of each participant was also very similar, ranging from 18-26. Future research can be done to see if these results hold when

having younger and older participants with different levels of education. Third, the current experiment used the platforms YouTube and YouTube VR. These platforms support 360-degree videos, but the image quality YouTube VR can display on the Oculus Go 2 is low-quality compared to other HMDs. Future research may use an HMD with higher image quality, which simulates the real world as realistically as possible and increases the feeling of presence (Clemente et al., 2014; Slater, 2003; Steuer, 1992). Next, future research can also focus on different platforms available for VR-capable devices besides YouTube VR. To conclude, future research could further investigate which device, video length, sound, and content of a 360-degree advertisement effectively influence purchase intention since all construct effects are proven significant, except the direct effect of level of immersion.

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## Appendices

### Appendix A Pre-test Survey

Question 1: What was your participant ID?

Question 2: How immersed did you feel? (1 = not at all immersed, 10 = very immersed)

Question 3: Answer the following statements: (Strongly disagree to strongly agree on a 7-point Likert scale)

- The information in this video was easy for me to understand
- I was able to follow this video's content with little effort
- Viewers like me should find this video easy to understand

Question 4: Answer the following statement: (Strongly disagree to strongly agree on a 7-point Likert scale)

- I found the advertisement content confusing

### Appendix B Survey

Question 1: What was your participant ID?

Question 2: Please review the following 6 statements and select the response that best applies to you while you were viewing the advertisement: (Strongly disagree to strongly agree on a 7-point Likert scale)

- I was fully aware of the real world surrounding me. (i.e., sounds, room temperature, other people, etc.)
- The virtual world seemed real to me.
- I was not aware of my real environment.
- Somehow, I felt that the virtual world surrounded me.
- I did not feel present in the virtual space
- I was completely captivated by the virtual world

Question 3: Please review the following 6 statements and select the response that best applies to you while you were viewing the advertisement: (Strongly disagree to strongly agree on a 7-point Likert scale)

- I felt emotionally engaged during the advertisement
- I felt joy
- I felt emotionally engaged with the virtual surrounding
- I felt emotionally engaged by the sound
- I felt fear
- I felt anger

Question 4: Please review the following 3 statements and select the response that best applies to you after viewing the whole advertisement: (Strongly disagree to strongly agree on a 7-point Likert scale)

- There is a chance that I would buy this product from MOYU
- Next time I need a notebook, I would consider buying this product from MOYU
- I would not consider buying this product from MOYU

Question 5: Please review the following 5 statements and select the response that best applies to you. (Strongly disagree to strongly agree on a 5-point Likert scale)

- When deciding on purchasing I always choose products which positively affect sustainability
- When deciding on using a product I always choose the way (of using a product) which positively affects sustainability.
- When making decisions about product disposal I always choose the way (of product disposal) which positively affects sustainability.
- When making decisions about using water, land, energy, and other resources I always choose the way (water, land, energy and other resources) which positively affects sustainability.
- I live a sustainable lifestyle.

Question 6: Please review the following 5 statements and select the response that best applies to you. (Strongly disagree to strongly agree on a 7-point Likert scale)

- Learning to operate this VR device is easy for me.
- I find it easy to get this VR device to do what I want it to do.
- My interaction with this VR device is clear and understandable.
- I find this VR device to be flexible to interact with.
- It is easy for me to become skilful at using this VR device.
- I find this VR device hard to use.

Question 7: What is your highest finished education?

Question 8: What is your age? (In numbers)

Question 9: How immersed did you feel? (1 = not at all immersed, 10 = very immersed,)

#### Appendix C Operationalization Table

Variable	Nr. of item	Item description	Level	Measure
<b>Level of immersion</b>	1	Immersive feeling Used for manipulation check	Interval	10 = very immersed; 0 = not at all immersed (Jennett et al., 2008)
<b>Presence</b>	6**	Level of presence (Steuer, 1992),	Interval	7-point Likert-scale Strongly agree / Strongly disagree (Barfield & Hendrix, 1995; Lessiter et al., 2001; Slater et al., 1994)
<b>Emotional engagement</b>	6**	Emotionally engagement (Sheridan, 1992)	Interval	7-point Likert-scale Strongly agree / Strongly disagree (Dubovi, 2022; Fredricks et al., 2016)
<b>Purchase intention</b>	3**	Likelihood of purchasing (Jamieson & Bass, 1989)	Interval	7-point Likert-scale Strongly Agree / Strongly (Kumar, 2018)

<b>Degree of a sustainable lifestyle</b>	5**	Living a sustainable lifestyle (R. Pieters & Wedel, 2004)	Interval	5-point Likert-scale Strongly agree / Disagree (Rakic & Rakic, 2015)
<b>Age</b>	1	Age in numbers	Ratio	Between 18-99  (Jennett et al., 2008)
<b>Ease of use</b>	6**	Ease-of-use (Davis & Davis, 1989)	Interval	7-point Likert-scale Strongly Agree / Strongly Disagree (Davis & Davis, 1989)
<b>Education</b>	1*	Highest finished education	Interval	From no schooling completed to doctorate degree in 10 steps
<b>ID</b>	1	Participant number	Ratio Dummy	HMD 0-100(1), Mobile 200-300(0)

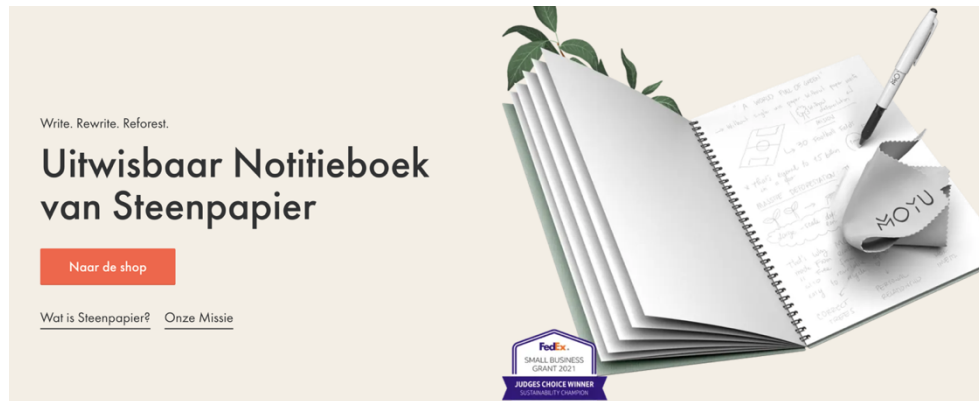
**NOTE: \*Excluded from the analysis; \*\*See Table 1 for the used items on each variable and Appendix K for the excluded items**

#### Appendix D Additional Information Sustainable Product

- Product: Sustainable notebook/booklet A5
- Brand: MOYU
- Based in Amsterdam

MOYU is a young company based in Amsterdam. Out of love for nature, they created a sustainable rewritable notebook made of stone paper which is erasable and rewriteable. Their mission is to curb paper waste to save forests and create new ecosystems by planting one tree with every notebook sold. They also won an international FedEx Award for sustainability. Their product is all about the experience when using the notebook and sustainability. They

raised over 280.000 euros in their crowdsourcing campaign on CrowdAboutNow and have a lifetime turnover of over 1.000.000 euros. They sell their notebooks business-to-business, in retail and on their online shop. Below you will find a screenshot of their website.



Source: (MOYU | *Het Uitwisbare Notitieboek van Steenpapier*, n.d.)

## Appendix E Advertisement Design

The video consists of 1 scene with a length of 42 seconds. Both conditions used the same video. The video is shot at the office of MOYU. The content of the video:

- Introduction
- Introduction founders
- Introduction MOYU
- Demonstration
- Call to action

Visual: In the MOYU office. A person talking to the camera and walking around the room. Coming closer to the person and showing the MOYU notebook on the desk, erasing what they wrote down in the notebook. The person shows how it works and all the other designs.

Tekst: “Hoi, aan deze kant! Mijn naam is Martijn van MOYU en dit zijn Paul en Roel. Zij hebben 3,5 jaar MOYU opgericht, een bedrijf dat hun steentje probeert bij te dragen aan duurzaamheid deze dagen. Dit zijn MOYU’s, het zijn notitieboekjes gemaakt van steenpapier. Zoals deze van het WWF. Ze zijn dus van steenpapier en dit maakt ze super duurzaam en

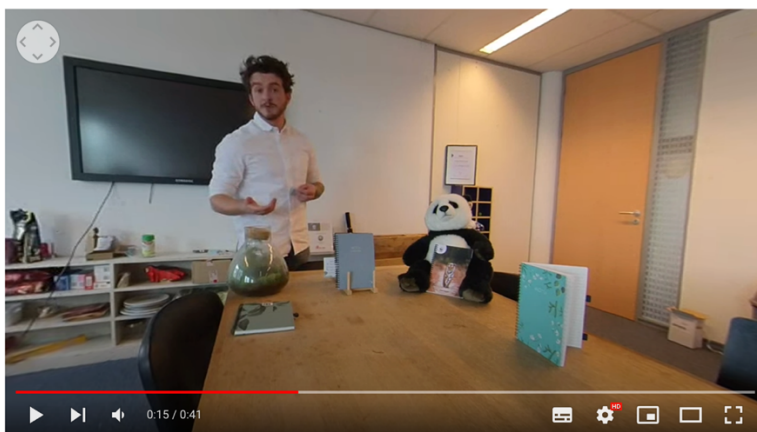
cradle-to-cradle gecertificeerd. Het allermooiste kan je hier zien. Hier is namelijk uitwisbaar en herschrijfbaar. Wil jij nou ook zo'n enorm mooi boekjes waar jij je leven lang mee kan doen, check dan onze designs op de website: [www.moyu-notebooks.com](http://www.moyu-notebooks.com)"

Text "Hi, on this side! My name is Martijn from MOYU and these guys are Paul and Roel. They founded MOYU 3.5 years ago, a company trying to do its bit for sustainability these days. These are MOYUs, which are notebooks made of stone paper. Like this one from the WWF. They are made of stone paper, and this makes them super durable and cradle-to-cradle certified. You can see the very best thing right here. This is because it is erasable and re-writable. If you want one of these beautiful booklets that will last a lifetime, check out our designs at [www.moyu-notebooks.com](http://www.moyu-notebooks.com)".

Screenshots of the video:



Thesis VR Ad



Thesis VR Ad

Video link request: [vanblitterswijk.martijn@outlook.com](mailto:vanblitterswijk.martijn@outlook.com)

## Appendix F Consent Forms

Radboud University

**School of Management**

### Participant Consent Form VR

**Purpose:**

Gaining insights on responses to 360-degree video advertisements.

**Equipment:**

A Virtual Reality (VR) head-mounted display.

**Procedure:**

As part of the study, you will be exposed to a Virtual Reality (VR) experience, after which you are asked to complete an online questionnaire. Please confirm the following. I understand that Virtual Reality (VR) experiences are highly immersive and can sometimes feel extremely realistic. Further, I confirm that I do not have any physical, mental or health-related reasons or problems that should preclude my participation in the Virtual Reality (VR) experience (e.g., dizziness, nausea, epilepsy, seizures), and I also confirm that I assume all of the physical, psychological, and financial risks associated with the use of Virtual Reality (VR) equipment.

**If you agree to participate in this study, you will be asked to do the following:**

1. Be immersed in a Virtual Reality (VR) experience for about a minute using the head-mounted-device.
2. Complete a short online questionnaire after the Virtual Reality (VR) exposure.

The total time required to complete the study should be approximately 5 minutes, including briefing, set-up/calibration, and debriefing.

**Health Notice/Risks:**

The images you will be shown include an ad of a sustainable notebook, captured in the office of MOYU. We do not expect that exposure to these graphics will cause any harm or discomfort, however, if you experience feelings of distress because of participation in this study you can let the research team know and they will provide you with assistance.

In some cases, participants report a so-called 'Virtual Reality (VR) Simulator Sickness' caused by the Virtual Reality (VR) experience, which can cause dizziness, headaches, anxiety, or other effects on the user's sense of balance, or other mental or physical negative effects when experiencing Virtual Reality (VR). I voluntarily assume all associated risks and take full responsibility for these and any other consequences that may arise from my participation. I agree to report any discomfort or disorientation immediately so that the researcher can remove the equipment and take appropriate measures to assist.

**Confidentiality:**

Your participation in this study is entirely voluntary. You may refuse to complete the study at any point during the experiment or answer any questions with which you are uncomfortable. You may also stop at any time and ask the researcher any questions you may have. Your data will be treated as strictly confidential and will be used for a research project, in which data of all participants will be collated. Information collected for this research project may be made available to other research projects in de-identified form only. Additionally, the information and results from this project may be submitted for publication in academic journals, however, this information will not identify you in any way. If you want to see your data or the results please contact the email below. The data may be used by organisations in the field of 360-degree video advertisement or VR or other students.

**Contact and Questions:**

If you have any questions regarding this study, you may contact Martijn van Blitterswijk: at [vanblitterswijk.martijn@outlook.com](mailto:vanblitterswijk.martijn@outlook.com)

**Statement of Consent:**

I have read and understood the above information. I have asked any questions I had regarding the experimental procedure, and they have been answered to my satisfaction. I consent to participate in this study.

Name of Participant \_\_\_\_\_ Date: \_\_\_\_

Signature of Participant \_\_\_\_\_

*Thanks for your participation!*

Radboud University

**School of Management****Participant Consent Form Mobile Phone****Purpose:**

Gaining insights on responses to 360-degree video advertisements.

**Equipment:**

A mobile phone (iPhone 13Pro)

**Procedure:**

As part of the study, you will be exposed to a Virtual Reality (VR) experience, after which you are asked to complete an online questionnaire. Please confirm the following. I understand that Virtual Reality (VR) experiences are highly immersive and can sometimes feel extremely realistic. Further, I confirm that I do not have any physical, mental or health-related reasons or problems that should preclude my participation in the Virtual Reality (VR) experience (e.g. dizziness, nausea, epilepsy, seizures), and I also confirm that I assume all of the physical, psychological, and financial risks associated with the use of Virtual Reality (VR) equipment.

**If you agree to participate in this study, you will be asked to do the following:**

1. Be shown a Virtual Reality (VR) ad using the iPhone 13 Pro for about a minute.
2. Complete a short online questionnaire after the Virtual Reality (VR) exposure.

The total time required to complete the study should be approximately 15 minutes including briefing, set-up/calibration, and debriefing.

**Health Notice/Risks:**

The images you will be shown include an ad of a sustainable notebook, captured in the office of MOYU. We do not expect that exposure to these graphics will cause any harm or discomfort, however, if you experience feelings of distress as a result of participation in this study you can let the research team know and they will provide you with assistance.

In some cases, participants report a so-called 'Virtual Reality (VR) Simulator Sickness' caused by the Virtual Reality (VR) experience, which can cause dizziness, headaches, anxiety or other effects on the user's sense of balance, or other mental or physical negative effects when experiencing Virtual Reality (VR). I voluntarily assume all associated risks and take full responsibility for these and any other consequences arising from my participation. I agree to report any discomfort or disorientation immediately so that the researcher can remove the equipment and take appropriate measures to assist.

**Confidentiality:**

Your participation in this study is entirely voluntary. You may refuse to complete the study at any point during the experiment or answer any questions with which you are uncomfortable. You may also stop at any time and ask the researcher any questions

you may have. Your data will be treated as strictly confidential and will be used for a research project, in which data of all participants will be collated. Information collected for this research project may be made available to other research projects in de-identified form only. Additionally, the information and results from this project may be submitted for publication in academic journals, however, this information will not identify you in any way. If you want to see your data or the results, please contact the email below. Organisations in the field of 360-degree video advertisement or VR or other students may use the data.

**Contact and Questions:**

If you have any questions regarding this study, you may contact Martijn van Blitterswijk at [vanblitterswijk.martijn@outlook.com](mailto:vanblitterswijk.martijn@outlook.com)

**Statement of Consent:**

I have read and understood the above information. I have asked any questions I had regarding the experimental procedure, and they have been answered to my satisfaction. I consent to participate in this study.

Name of Participant: \_\_\_\_\_

Date: \_\_\_\_\_

Signature of Participant \_\_\_\_\_

*Thanks for your participation!*

## Appendix G Scenario

NL Stel je het volgende scenario voor:

Je komt net terug van werk/school en ploft op de bank of op bed. Je pakt je VR bril/telefoon en check de socials en Youtube. Terwijl je aan het kijken bent komt deze advertentie.

ENG Imagine the following situation:

You just came home from work/school and sit on the couch. You take the device handed to you and start using YouTube. You start watching videos and after a while, you encounter the following advertisement.

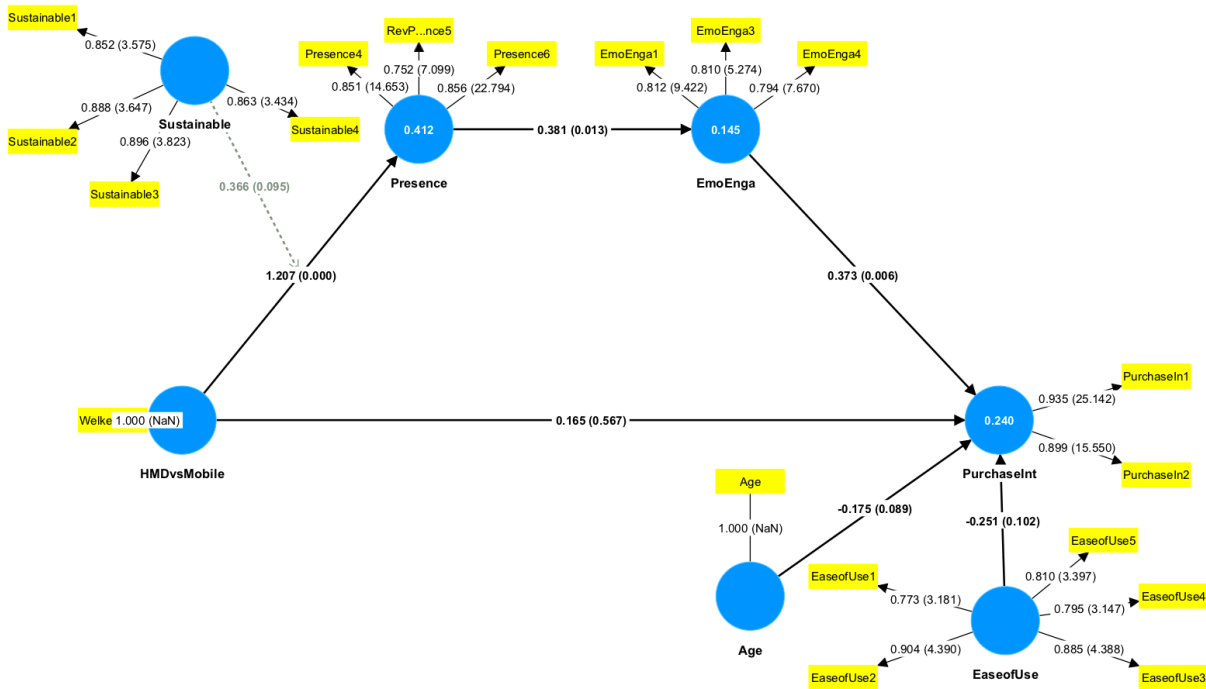
## Appendix H Output SmartPLS: Measurement Model

**Skewness & Kurtosis**

<b>Variable</b>	<b>Skewness</b>	<b>Kurtosis</b>
<b>Age</b>	-0.153	-1.003
<b>Easeofuse</b>	-0.686	2.074
<b>emotional engagement</b>	-0.475	-0.286
<b>HMDvsmobile</b>	-2.063	0.000
<b>presence</b>	0.210	-0.554
<b>purchase intention</b>	3.317	-1.447
<b>sustainable lifetsyle</b>	0.055	-0.649

<b>Variable</b>	<b>Cronbach's alpha</b>	<b>Rho_A</b>	<b>Composite Reliability</b>	<b>AVE</b>
<b>Purchase intention</b>	0.814	0.841	0.914	0.842

Appendix I Output SmartPLS: Structural model



Appendix J Output SmartPLS: Path Coefficients

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ( O /STDEV)	P values
Age → PurchaseInt	-0.175	-0.182	0.103	1.698	0.089
EaseofUse → PurchaseInt	-0.251	-0.254	0.154	1.634	0.102
EmoEnga → PurchaseInt	0.373	0.376	0.135	2.756	0.006
HMDvsMobile → Presence	1.207	1.226	0.183	6.597	0.000
HMDvsMobile → PurchaseInt	0.165	0.214	0.288	0.573	0.567
Presence → EmoEnga	0.381	0.378	0.154	2.478	0.013
Sustainable → Presence	-0.130	-0.097	0.157	0.823	0.410
Sustainable x HMDvsMobile → Presence	0.366	0.340	0.219	1.671	0.095

Appendix K Iterations

Items for possible elimination due to the factor that they have a low loading (<.7):

- Purch3
- EmoEnga 2
- EmoEnga 5
- EmoEnga 6
- Presence 1
- Presence 3
- EaseofUse6
- Presence2

**Iteration 1**

Loading 0.237 REV Purchase intention 3

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
EaseofUse	0.886	0.907	0.908	0.625
EmoEnga	0.496	0.505	0.698	0.291
Presence	0.764	0.788	0.837	0.466
PurchaseInt	0.577	0.826	0.769	0.574
Sustainable	0.898	0.916	0.928	0.764

Delete REV purchase intention 3

**Iteration 2**

Loading 0.351 Emotional Engagement 2

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
EaseofUse	0.886	0.922	0.910	0.632
EmoEnga	0.496	0.497	0.696	0.287
Presence	0.764	0.788	0.837	0.466
PurchaseInt	0.814	0.830	0.914	0.842
Sustainable	0.898	0.916	0.928	0.764

Delete Emotional Engagement 2

**Iteration 3**

Loading 0.471 Emotional Engagement 5

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
EaseofUse	0.886	0.921	0.910	0.632
EmoEnga	0.455	0.466	0.697	0.319
Presence	0.764	0.788	0.837	0.466
PurchaseInt	0.814	0.829	0.914	0.842
Sustainable	0.898	0.917	0.928	0.764

Delete Emotional Engagement 5

**Iteration 4**

Loading 0.153 Emotional Engagement 6

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
EaseofUse	0.886	0.922	0.910	0.632
EmoEnga	0.437	0.497	0.725	0.439
Presence	0.764	0.794	0.836	0.466
PurchaseInt	0.814	0.836	0.914	0.842
Sustainable	0.898	0.913	0.928	0.764

Delete Emotional Engagement 6

**Iteration 5**

Loading 0.527 REV presence 1

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
EaseofUse	0.886	0.923	0.910	0.632
EmoEnga	0.731	0.734	0.848	0.650
Presence	0.764	0.805	0.835	0.464
PurchaseInt	0.814	0.843	0.914	0.841
Sustainable	0.898	0.911	0.929	0.765

Delete REV presence 1

**Iteration 6**

Loading 0.562 presence 3

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
EaseofUse	0.886	0.923	0.910	0.632
EmoEnga	0.731	0.734	0.848	0.650
Presence	0.754	0.795	0.836	0.511
PurchaseInt	0.814	0.843	0.914	0.841
Sustainable	0.898	0.908	0.929	0.766

Delete presence 3

## Iteration 7

Loading 0.616 REV Ease of use 6

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
EaseofUse	0.886	0.923	0.910	0.632
EmoEnga	0.731	0.734	0.848	0.650
Presence	0.757	0.777	0.845	0.579
PurchaseInt	0.814	0.843	0.914	0.841
Sustainable	0.898	0.918	0.929	0.765

Delete REV Ease of use 6

## Iteration 8

Loading 0.671 Presence 2

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
EaseofUse	0.900	0.939	0.920	0.697
EmoEnga	0.731	0.734	0.848	0.650
Presence	0.757	0.777	0.845	0.579
PurchaseInt	0.814	0.853	0.914	0.841
Sustainable	0.898	0.918	0.929	0.765

Delete Presence 2

## Final

Construct reliability and validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
EaseofUse	0.900	0.939	0.920	0.697
EmoEnga	0.731	0.738	0.847	0.649
Presence	0.763	0.801	0.861	0.674
PurchaseInt	0.814	0.851	0.914	0.841
Sustainable	0.898	0.905	0.929	0.766

Discriminant validity Fornell-Larcker criterion

	Age	EaseofUse	EmoEnga	HMDvsMobile	Presence	PurchaseInt	Sustainable
Age	1.000						
EaseofUse	0.058	0.835					
EmoEnga	-0.057	0.178	0.805				
HMDvsMobile	-0.042	-0.116	0.237	1.000			
Presence	-0.127	-0.051	0.379	0.615	0.821		
PurchaseInt	-0.215	-0.204	0.359	0.209	0.101	0.917	
Sustainable	0.146	-0.106	-0.010	0.176	0.177	0.149	0.875

### Discriminant validity HTMT

	Age	EaseofUse	EmoEnga	HMDvsMobile	Presence	PurchaseInt	Sustainable
Age							
EaseofUse	0.080						
EmoEnga	0.074	0.236					
HMDvsMobile	0.042	0.137	0.274				
Presence	0.137	0.272	0.503	0.676			
PurchaseInt	0.236	0.195	0.454	0.223	0.152		
Sustainable	0.152	0.185	0.111	0.191	0.230	0.165	
Sustainable x HMDvsMobile	0.137	0.249	0.056	0.122	0.272	0.149	0.768

### Bootstrapped

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ( O/STDEV )	P values
Age <- Age	1.000	1.000	0.000	n/a	n/a
EaseofUse1 <- EaseofUse	0.773	0.724	0.243	3.181	0.001
EaseofUse2 <- EaseofUse	0.904	0.830	0.206	4.390	0.000
EaseofUse3 <- EaseofUse	0.885	0.817	0.202	4.388	0.000
EaseofUse4 <- EaseofUse	0.795	0.718	0.253	3.147	0.002
EaseofUse5 <- EaseofUse	0.810	0.738	0.239	3.397	0.001
EmoEnga1 <- EmoEnga	0.812	0.812	0.086	9.422	0.000
EmoEnga3 <- EmoEnga	0.810	0.782	0.154	5.274	0.000
EmoEnga4 <- EmoEnga	0.794	0.779	0.104	7.670	0.000
Presence4 <- Presence	0.851	0.841	0.058	14.653	0.000
Presence6 <- Presence	0.856	0.861	0.038	22.794	0.000
PurchaseInt1 <- PurchaseInt	0.935	0.930	0.037	25.142	0.000
PurchaseInt2 <- PurchaseInt	0.899	0.896	0.058	15.550	0.000
RevPresence5 <- Presence	0.752	0.739	0.106	7.099	0.000
Sustainable1 <- Sustainable	0.852	0.797	0.238	3.575	0.000
Sustainable2 <- Sustainable	0.888	0.827	0.244	3.647	0.000
Sustainable3 <- Sustainable	0.896	0.832	0.234	3.823	0.000
Sustainable4 <- Sustainable	0.863	0.796	0.251	3.434	0.001
WelkeGroep <- HMDvsMobile	1.000	1.000	0.000	n/a	n/a
Sustainable x HMDvsMobile -> Sustainable x HMDvsMobile	1.000	1.000	0.000	n/a	n/a

### Appendix L Total Indirect Effects

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ( O/STDEV )	P values
HMDvsMobile -> Presence -> EmoEnga	0.460	0.474	0.220	2.093	0.036
Sustainable -> Presence -> EmoEnga	-0.049	-0.044	0.071	0.697	0.486
Presence -> EmoEnga -> PurchaseInt	0.142	0.132	0.068	2.079	0.038
Sustainable -> Presence -> EmoEnga -> PurchaseInt	-0.018	-0.014	0.026	0.723	0.470
Sustainable x HMDvsMobile -> Presence -> EmoEnga	0.139	0.130	0.105	1.328	0.184
HMDvsMobile -> Presence -> EmoEnga -> PurchaseInt	0.172	0.164	0.093	1.854	0.064
Sustainable x HMDvsMobile -> Presence -> EmoEnga -> PurchaseInt	0.052	0.045	0.039	1.319	0.187