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Do Virtual Influencers Serve as a Powerful Tool in the Eco-Fashion Industry and Shape Consumers' Pro-Environmental Behaviors?

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Master in Marketing

Supervisor:
PhD João Guerreiro, Assistant Professor, ISCTE-IUL Business School, Department of Marketing, Operation and General Management

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BUSINESS
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Abstract

With the growing attention to climate change and sustainability, eco-fashion has come out in recent decades in response to the environmental issues and "throwaway" lifestyle caused by the fast fashion industry. Meanwhile, in today's digital era, where social media influencers as opinion leaders are on the rise, a new type of "AI influencers" also emerged, challenging traditional influencers and enriching many academic studies. AI influencers as a new trend is still yet to be explored. In the context of eco-fashion, this study aims to examine the impact of attitudes toward virtual influencers (VIs) on brand attitude, purchase intentions, and pro-environmental behaviors (PEBs). It also seeks to identify antecedents affecting people's attitudes toward VIs.

The research objectives of this study focus on the answers of 314 participants and utilize partial least squares structural equation modeling to undertake empirical research.

The results show that attitudes toward VIs are positively associated with brand attitude, purchase intentions, and PEBs. This study also demonstrates that perceived credibility, expertise, congruence, humanness, and message involvement positively impact attitudes toward VIs. Hence, this study confirmed the potential of VIs in both commercial and educational aspects, in that they can serve as value practitioners to transform customers' behaviors while gaining profits for the brands; meanwhile, it also suggests marketers select VIs capable of reaching their customers.

Keywords: Eco-Fashion, Sustainability, Virtual Influencers, Brand Attitude, Purchase Intention, Pro-Environmental Behaviors

JEL Classification System: Marketing (M31); Social Responsibility (M14)

Resumo

Com a crescente atenção às alterações climáticas e à sustentabilidade, a moda ecológica surgiu nas últimas décadas, em resposta às questões ambientais e ao estilo de vida "descartável" causado pela indústria da Fast Fashion. Entretanto, na era digital de hoje, onde os influenciadores das redes sociais como líderes de opinião estão em ascensão, também surgiu um novo tipo de "influenciadores de IA", desafiando os influenciadores tradicionais e enriquecendo muitos estudos académicos. Os influenciadores de IA como uma nova tendência ainda precisam ser explorados. No contexto da moda ecológica, este estudo tem como objetivo examinar o impacto das atitudes em relação aos influenciadores virtuais (IVs) na atitude da marca, nas intenções de compra e nos comportamentos pró-ambientais (CPAs). Também visa identificar antecedentes que afetam a atitude das pessoas em relação aos IVs.

Os objetos de pesquisa deste estudo concentram-se nas respostas de 314 participantes e utilizam equações estruturais de mínimos quadrados parciais para realizar um estudo empírico.

Os resultados indicam que as atitudes em relação aos IVs estão positivamente associadas à atitude da marca, às intenções de compra e aos CPAs. Este estudo também demonstra que a credibilidade percebida, a experiência, a congruência, a humanidade e o envolvimento na mensagem impactam positivamente as atitudes em relação aos IVs. Assim, este estudo confirmou o potencial dos IVs tanto nos aspectos comerciais como educacionais, na medida em que podem servir como praticantes de valor para transformar o comportamento dos clientes e, ao mesmo tempo, obter lucros para as marcas; enquanto isso, também sugere que os profissionais de marketing selecionem IVs que sejam capazes de alcançar seus clientes.

Palavras-chave: Ecomoda, Sustentabilidade, Influenciadores Virtuais, Atitude de Marca, Intenção de Compra, Comportamentos Pró-Ambientais

Sistema de Classificação JEL: Marketing (M31); Responsabilidade Social (M14)

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List of Acronyms

VI	Virtual Influencer
CGI	Computer-generated Imagery
PEB	Pro-Environmental Behavior
TPB	Theory of Planned Behavior
SDGs	Sustainable Development Goals

1. Introduction

Although fast fashion satisfies people's instant gratification with fancy designs and low prices, it contributes to environmental and ethical issues such as energy overconsumption, water pollution, clothes waste, and labor exploitation. In order to improve the existing *status quo*, it is essential to prioritize fair working conditions for employees and environmentally friendly purchasing practices. A crucial step towards this shift is to prioritize sustainable fashion, as highlighted by Fletcher (2013) and Thorisdottir & Johannsdottir (2019).

Meanwhile, over the recent decades, with the growing awareness about climate change and sustainability, sustainable clothes have been gaining popularity among the public, which prioritizes both environmental and social responsibilities. According to Coherent Market Insights (2023), the global sustainable fashion market is anticipated to grow 22.9%, reaching US$33.05 Billion by the end of 2030, from US$ 7.80 Billion in 2023. Although eco-fashion can help address unethical manufacturing, it requires greater customer engagement and influencer marketing to be effective.

In today's era, with influencer marketing being on the rise, this study cannot neglect its impact on both advertising and education, e.g., shaping people's minds and behaviors (Marcelo & Marcelo, 2021; Rundin & Colliander, 2021; Wielki, 2020). While we usually assume influencers are real humans, there are also some digital humans emerging on social media platforms with the development of artificial intelligence; for example, virtual assistants, chatting robots, and virtual influencers who boast a large fan base, among which virtual influencers are much closer to human influencers in terms of the roles they can play on social media, such as the commercial advertisers, knowledge disseminators, environmental activists, etc. (Conti et al., 2022; Moustakas et al., 2020; Zelenskaya & Rundle-Thiele, 2022).

CGI (Computer-generated Imagery) influencers are a new type of influencers that are different from traditional influencers online. They are Computer-generated Individuals without a physical body, but they do share similarities with real humans in terms of traits, characteristics, personalities, physical appearance, or behaviors. According to Moustakas et al. (2020) and Mosley (2020), these virtual influencers are designed to be as lifelike as possible, with the aim of engaging and interacting with audiences just like human influencers do. Lewczyk (2021) also demonstrated that virtual influencers are the same as regular influencers as they can maintain their personalities and a certain level of importance over their dedicated followers. Examples of famous virtual influencers are LilMiquela (3M followers), Shudu (240K followers), and noonoouri (427K followers), who have not only cooperated with many well-

known brands for commercial reasons (e.g., Prada, LVHM, Chanel, etc.) but also showed their concerns for both environmental protection and social issues.

Until now, some research has been done on virtual influencers (VIs). As VIs just emerged in influencer marketing, some exploratory analyses have been conducted to figure out how followers perceive the influence of VIs (Choudhry et al., 2022), the different types of relationships (i.e., CGI-human influencer, CGI-endorsed brands, followers-followers, and CGI-followers) (Mrad et al., 2022), people's opinions on virtual influences' value evaluation and ethics (Conti et al., 2022; Robinson, 2020), the opportunities and challenges associated with virtual influencers (Sands et al., 2022) and the behind-the-scenes human interventions with the companies and endorsed brands (Liu & Lee, 2022).

Meanwhile, with regards to the human-virtual influencer interaction, people's reactions to different types of virtual influencers (i.e., human-like virtual influencers and anime-like virtual influencers) are different based on the humanness or anthropomorphized attributes (Arsenyan & Mirowska, 2021; Jang, 2022), providing evidence for the Uncanny Valley phenomenon – a phenomenon where human-like robots or animations evoke feelings of unease as they reach a stage of a being like real humans (Tinwell, 2011). Followers' interactivity and engagement with virtual influencers were also discussed in some papers, which even account for higher rates compared to human influencers due to the VIs' higher responsiveness (Choudhry et al., 2022; Conti et al., 2022; Sands et al., 2022). Therefore, the relationship between virtual influencers can be seen as parasocial.

Also, in terms of follower's attitudes to virtual influencers and their purchase intentions, Thomas and Fowler (2021) demonstrate that AI influencers can produce positive brand benefits similar to those produced by human celebrity endorsers (e.g., impact consumer attitudes and purchase intentions toward the sponsored brands); however, the factors or antecedents influencing attitudes and intentions were rarely explored, which this study would like to address based on the Theory of Planned Behavior (TPB).

In addition, the social value of virtual influencers was also mentioned in some studies, such as Knox Frost's partnership with WHO to disseminate best practices against COVID-19 (Conti et al., 2022) and "Wildlife Watcher Kylie" as an ambassador of the communication program aiming to increase the young people's awareness to protecting Koala and nature (Zelenskaya & Rundle-Thiele, 2022), both of which had achieved good results. At the same time, the growing awareness of climate change and environmental issues, along with the emerging virtual influencers like "Shudu" (@shudu.gram) and noonoouri (@noonoouri), who often convey meaningful messages of environment protection, recycled fashion as well as eco-friendly

lifestyle presents the public with VIs' social responsibility.

However, as virtual influencers are relatively new, their function and possibilities remain to be studied. This study will explore the role of virtual influencers in the eco-fashion industry, a field that is also promising in today's era of sustainability.

Therefore, this study proposes that virtual influencers in the eco-fashion industry can be valuable guides to increase people's awareness and intention to engage in pro-environmental behaviors.

This study suggests treating virtual influencers as a type of human brand. The study will focus on the relationship between the virtual influencers and their followers, and how virtual influencers can promote sustainability. The author proposes that virtual influencers might not only act as brand endorsers to gain profits for the brands but also serve as value practitioners to transform customer behaviors. Taken together, this study aims to (1) identify the factors or antecedents that can influence people's attitudes and purchase intentions toward VIs, and (2) explore virtual influencers' commercial and educational functions in the domain of the eco-fashion industry. The research questions this study will address are as follows:

RQ1: What are the key factors that influence consumers' attitudes toward Virtual Influencers in the Eco-Fashion industry?

RQ2: Will consumers' attitudes toward Virtual Influencers impact their brand attitudes and purchase intentions?

RQ3: Will virtual influencers' value impact people's pro-environmental behavior intentions?

This master's dissertation is organized as follows: Chapter 1 identifies the topic for this thesis, revealing the relevance, research gap, research questions, and structure; Chapter 2 covers the theoretical backgrounds and the previous studies, including the problems of Fast Fashion, the concepts of Sustainability, Eco-Fashion, Human Brands, Influencer Marketing and virtual influencers as well as the theoretical foundation. Chapter 3 describes the conceptual framework of this thesis and the hypotheses. Then, Chapter 4 illustrates the research methodology, including the research approach, data collection process, and questionnaire development. This part also displays the demographic information and the results of the pre-test. Chapter 5 consists of the software used to evaluate the model, data analysis, and the results of this research. Chapter 6 presents the discussion, and Chapter 7 covers the conclusion, including the theoretical and practical implications, limitations, and recommendations for future research.

2. Literature Review

2.1 From Fast Fashion to Sustainability and Eco-Fashion

2.1.1 The History and Issues of Fashion Industry

Originating in the U.S. in the 1990s, fast fashion has increasingly caught consumers' attention in the apparel industry due to its affordability and fanciness (Anguelov, 2015; Khurana & Muthu, 2022) during the past decades. Today, for the vast majority of young people, it is very common to own several pieces of clothes from high street brands such as Zara, H&M, and Forever 21.

However, it takes several centuries for the fashion industry to evolve into what it is today. Looking back at history, there is no concept like "fast fashion", and it was not until the beginning of the 1990s when Zara entered its Market and implemented an accelerated model from the design stage to the clothes on the racks, that the term "Fast Fashion" was coined by the New York Times (McDonald, 2022; SANVT, 2022).

Under the "fast fashion" model, product life cycles are much shorter, and retailers are encouraging potential customers to visit their shops more frequently with the idea of "Here Today, Gone Tomorrow" (Bhardwaj & Fairhurst, 2010). Consequently, in order to increase the assortment of fashion apparel, adding more phases to the existing seasons in a fashion calendar became a necessary method for retailers to gain attraction (Bhardwaj & Fairhurst, 2010). For instance, Liz Claiborne developed six seasons instead of just two (Bailey, 1993). The addition of 3 to 5 mid-seasons has caused immersive pressure on suppliers, who need to deliver the fashion clothes in smaller batches with reduced lead time (Tyler et al., 2006). Meanwhile, the added mid-season purchasing led to a low-price "throwaway market", which has become a trend and norm among customers since then (Tokatli et al., 2008).

Although fast fashion perfectly satisfies people's instant gratification with fancy designs and cheap prices, and benefit some countries with their economic development (like the developing countries such as Bangladesh, Cambodia, Vietnam, etc.), there are still some major environmental and ethical issues associated with it, such as massive amount of water use and water pollution (Anguelov, 2015; Boston Consulting Group, 2017; Niinimäki et al., 2020; Weinzettel & Pfister, 2019), which accounts for 20% of global waste water (UN, 2018); CO_2 emission (Allwood et al., 2006; Kissiger et al., 2013; Mukherjee, 2015; Niinimäki et al., 2020; Quantis, 2018; Rana et al., 2015); Chemical use and damage to the eco-system (Pesticide Action Network UK, 2017 & 2018; Reeves et al., 2002; Roos et al., 2019); textile waste from both the

manufacturing process and consumption (Allwood et al., 2006; Cooklin, 1997; Niinimäki et al., 2020) and forced labor, which was linked to low wages, poor working conditions as well as labor exploitation (Adam, 2002; Bick et al., 2018; Hepburn, 2005; Moulds, 2022; Taplin, 2014; Yunus & Yamagata, 2012)

In a nutshell, promoting economic development, fast fashion and the whole value chain also primarily come at the expense of the environment and human rights, which is unethical (Bhardwaj & Fairhurst, 2010). However, with the growing awareness of climate change, the importance of sustainability, as well as environmental and ethical problems that fast fashion can bring to our planet, some new concepts of lifestyles such as anti-consumerism, minimalism, low carbon, and slow fashion have emerged (Fletcher, 2010; Jung & Jin, 2014), alongside with an increasing demand for sustainable fashion clothes (Goworek et al., 2017).

2.1.2 Introduction to Sustainability

After the past 30 years of sustainable development summits, “sustainability” has gained status rapidly with profound implications within a relatively short period. It has become a popular term, especially in business areas.

Sustainability can be connected and applied in many sectors: ecological, economic, financial, social, international, political, and institutional, depending on what is being sustained (Wright, 2013). As a broad term and after years of improvement, the definitions can vary enormously according to different institutions. A well-accepted one is made by the Brundtland Commission at first, which regards it as “Meeting present needs without compromising the ability of future generations to meet their own needs" (The World Commission on Environment and Development, 1987). More recently, at the 2015 UN Sustainable Development Summit, the 17 interlinked global goals were made and defined as the “2030 Agenda for Sustainable Development”, which further specified the actions and deepened public understanding about sustainability (UN General Assembly, 2015). These Sustainable Development Goals (SDGs) reflect all aspects of contemporary vision, with emphasis on the social dimension of “leaving no one behind”; meanwhile, Peace and Partnership are also added to the former three pillars (People, Planet, Prosperity), aiming to achieve sustainable development for all with a holistic approach (United Nations, 2016).

Today, nearly a decade after the United Nations’ SDGs under the heading of “transforming our world” were raised, a series of actions have already been taken. Focusing on the business area, New Belgium Brewing took the initiative in conserving resources in manufacturing

processes, inputs, outputs, transport, distribution, and suppliers, which also enabled it to receive the top 10% award in 2019 for environmental sustainability (Bahl et al., 2021); Ikea has successfully integrated the sustainability practices in its management starting from supply chain to ensure the product quality, reduce waste and emissions, as well as protect human rights (Laurin & Fantazy, 2017); Unilever also adopted the new and fully integrated corporate strategy – "Unilever Compass" and took the responsibility in tackling the issues such as climate change, plastic pollution, inequality and the social inclusion, with the purpose to make sustainable living commonplace (Unilever, 2020).

In response to sustainable development, the fast fashion industry mentioned above also needs a change, which is more about moving forward to sustainable fashion and slow fashion, providing sustainable items with longer life cycles, as well as reshaping people's over-consumption behaviors and "throwaway" habits to be more eco-friendly to our planet (Jalil & Shaharuddin, 2019; Jung & Jin, 2014).

2.1.3 Sustainable Fashion and Slow Fashion Concept

Although it was in recent decades that eco-friendly clothes started to gain more popularity, sustainable fashion had already emerged in the 1960s, when consumers realized the fashion industry's impact on the environment (Jung & Jin, 2014). Being negatively understood at first, it began to get recognition with anti-fur campaigns in the 1980s and 1990s (Mandarić et al., 2022). More recently, the term has been increasingly associated with fair working conditions and a sustainable business model (Joergens, 2006), organic and environmentally friendly materials, and traceability (Henninger, 2015), as well as slow production and slow consumption (Jung & Jin, 2014). Slow fashion and sustainable fashion focus more on the ethical practices of producers and consumers and prioritize quality over quantity (Ertekin & Atik, 2015; Fletcher, 2010) to decrease the impacts on the environment due to polluted production methods and a large number of short lifespan items.

The environmental issues of the fashion industry have also drawn significant attention from researchers, who are considering a more sustainable way of production and consumption. Some researchers have developed a deeper understanding of the concept of sustainable fashion and slow fashion. Shen, Richards, and Liu (2013) concluded eight broad categories of criteria for sustainable fashion based on previous literature: (1) recycle, (2) organic, (3) vintage, (4) vegan, (5) artisan, (6) locally made, (7) custom and (8) fair trade certificated; meanwhile, Jung and Jin

(2014) also performed a theoretical investigation of slow fashion, among which the following five dimensions are stressed: (1) equity, (2) authenticity, (3) localism, (4) exclusivity and (5) functionality. Some studies have demonstrated the importance of changing the unethical model; for example, Niinimäki et al. (2020) presented the environmental impacts of the conventional business model in the fashion industry and advocated a transformation involving new mindsets adopted at both the business and the consumer levels; Bocken et al. (2018) also illustrated that shifting the system from linear (taking, making, disposing) to a circular way (narrowing, recycling, slowing) can be an excellent approach to be eco-friendly. In addition, there are also studies exploring consumers' purchasing decisions for sustainable fashion clothes, where it is proved and confirmed that there does exist an attitude-behavior gap – consumers' positive attitudes are not always translated into final actual actions (Arbuthnott, 2009; McNeill & Moore, 2015; Wiederhold & Martinez, 2018; Yates, 2008).

Based on the innovation model from Rogers (2003), which demonstrates that consumers must be knowledgeable about one innovation before they finally decide to adopt it, this gap doesn't mean that they don't value sustainability or ethical practices but suggests that consumers may not have enough knowledge or deep understanding about sustainability. In other words, their perceived importance of sustainable clothes is still insufficient to drive their motivations. This knowledge gap can be the main detriment of the attitude-behavior gap, while the higher prices (Chang & Watchravesringkan, 2018; Joung & Park-Poaps, 2013) and less attractive designs (Wai Yee et al., 2016) also play an important role when they are making choices.

Therefore, to enhance consumers' perceived value of sustainable clothes, increase people's awareness about the issues of the fast fashion industry, shift their conventional "throwaway" consuming habits, and shape their pro-environmental behavior intentions, education will play an essential role (Rogers, 2003), which cannot be performed effectively without the help of social media influencers or virtual influencers in today's Internet Age. Hence, this study aims to explore the functions of virtual influencers in the eco-fashion industry, which will first be developed with the introduction of human brands and traditional influencers.

2.1.4 Pro-Environmental Behaviors (PEBs)

Pro-environmental behaviors can be defined as actions that are beneficial to the natural environment or that can reduce the negative impact on it (Lange & Dewitte, 2019; Stern, 2000). Over recent decades, the growing awareness about climate change and sustainability has also

witnessed increasing attention on pro-environmental behaviors in most academics, where many researchers are trying to figure out how to induce people to adopt them (Li et al., 2019). The extant literature has explored different categories of pro-environmental behaviors such as recycling, transport actions, waste management, conservation, energy saving, eco-shopping, and political actions (Berardi, 2017; Briscoe et al., 2019; Liu et al., 2017; Wallace & Buil, 2023; Zhang at el., 2016). These behaviors have some traits in common, which are about reducing, reusing, and recycling (Wallace & Buil, 2023). Meanwhile, according to Stern (1999), green purchases, good citizenship behaviors such as recycling, and environmental activist behavior are three types of behaviors that can encompass all activities concerning PEBs.

Some studies also investigated the antecedents that can influence pro-environmental behaviors, where psychological frameworks such as the TPB theory and VBN theory were widely used ((Li et al., 2019; Lizin et al., 2017; Trautwein et al., 2023; Vu et al., 2022; Wallace & Buil, 2023).

Linking the PEBs with the apparel industry, this study would like to go a step further to examine the determinants that can transform people's pro-environmental behaviors when applied to virtual influencers.

2.2 Human Brands and Influencer Marketing

With the accessibility of mobile phones and the internet, people can now get unlimited information at the click of a screen and connect with 42.3% of the world's population online (Appel et al., 2020). It is vastly different from 30 years ago when Feick and Price pointed out that there would be certain market mavens to possess and disseminate extensive information about all things for consumers. The expansion of the internet and the explosion of social media have raised the importance of market mavens and general social media influencers to a higher-than-ever place in the marketing space (Harrigan, 2021). Today, social media influencers are not only brand endorsers but also serve as human brands who can exert their influence on followers through online interactions (Han et al., 2021; Jun & Yi, 2020).

2.2.1 Human Brands and Social Media Influencers

According to Thomson (2006), human brands refer to famous persons who can build strong relationships with followers by fulfilling their intrinsic needs and performing marketing practices. Research about human brands has explored the attachment theory, the performance,

the attributes that will attract followers, or followers' reactions to them, such as attitudes and intentions, etc. (Han et al., 2021; Kim & Kim, 2022; Malik et al., 2023; Osorio et al., 2022)

Initially, the concept of influencers was associated with celebrities, fashion models, entertainers, musicians, and similar personalities. However, in recent years, scholars such as Gamson (2011) and Jun and Yi (2020) have expanded the scope of this concept. They view influencers as human brands in the era of mass media.

Unlike conventional celebrities, who are the endorsers of specific products or own their brand extensions under their names (Kowalczyk & Royne, 2013; Santos et al., 2019), social media influencers are "regular people" who have become "online celebrities" by posting or creating content on social media sites (Lou & Yuan, 2019). There are also quite a lot of definitions for Social Media Influencer (SMI) in terms of the diverse contexts. Abrams and Hogg (1990) identified SMI as a social leader who can influence others and agree on the same values or desire a membership within a social group; Merwe and Heerden (2009) consider it as an opinion leader that is exceptionally knowledgeable in a specific area; and in business area, according to Freberg et al. (2011), a social media influencer can be a third-party endorser who creates and shapes consumer attitudes through the blogs, tweets or other social network media platforms. In short, social media influencers as content creators can be commercial or marketing propagators who can convey their values and influence followers' behaviors.

To build long-term relationships with followers and increase their engagement, some scholars have stressed the importance of the content of social media influencers (Cheung et al., 2022; Tafesse & Wood, 2021; Zhang et al., 2017). Meanwhile, previous studies also certified that social media influencers, as human brands that possess real-time, direct, rapid, and interactive two-way communication with their followers, can have the same effect with other types of human brands in that they can also form attachment mechanism between the SMIs-follower relationships and will contribute to follower's positive attitudes, purchase intentions as well as loyalty based on the proper attributes of influencers such as personal attractiveness, expertise, homophily, authenticity, etc. (Han et al., 2021; Jun & Yi, 2020; Taillon et al., 2020).

2.2.2 Influencer Marketing

The rise of social media influencers has led to the emergence of Influencer Marketing (IM). IM refers to a form of marketing where the company or brands cooperate with selected influencers to promote their branded content to the influencers' followers and brands' targeted customers (Yodel, 2017). It's an extension of the original concept of word-of-mouth (WOM) marketing

but developed on social media platforms in a more professional way, with the ability to reach a large number of people at once (Sudha & Sheena, 2017). As influencer-generated branded content is considered more organic, authentic, directly connected to followers, and more cost-efficient than traditional advertisements (Crain, 2022; Lou & Yuan, 2019), the popularity of influencer marketing has been growing exponentially. This strategy has also been adopted by many brands, specifically in 2018, when 86% of marketers implemented IM into their overall outreach strategy, and this trend is expected to continue to surge in the next decade (Rahal, 2020). Statista (2022) also showed the influencer marketing size worldwide in 2022, which was valued at $16.4 billion, almost ten times the size in 2016.

2.3 Social Media Influencers in the Fashion Industry

Social media influencers are present in various sectors, including beauty, fashion, health and fitness, travel, food and beverages, toys, and tech. However, the fashion industry is one of the sectors that benefits the most from influencer marketing and is likely to continue experiencing growth in this area. According to Polaris Market Research (2022), the global fashion influencer marketing market was valued at USD 3.01 billion in 2021 and is expected to expand at a compound annual growth rate of 35.9% from 2022 to 2030, reflecting the progressively increasing demands in the fashion industry.

Researchers have already gained some understanding about this area: in terms of appearance or attractiveness, it’s found that in the fashion industry, content from attractive celebrity influencers leads to a higher involvement than fashion experts or trustworthy influencers (Trivedi, 2018), and fashion influencers who fit in the “measured beauty” – the aesthetics of the non-threatening global lifestyle, and the dominant beauty frameworks, are easier to transform their positivity into material wealth (Hund, 2017). According to Sudha and Sheena's study in 2017, bloggers are more effective than brands or celebrities when it comes to marketing products and influencing consumers' decision-making process. It is also important to consider the age of the consumers and present them with various types of information, such as pictures, videos, and textual content. With regards to the fashion influencers–follower relationship, antecedents and factors that affect attitudes toward fashion influencers and consumers’ purchasing intentions are also studied (Chetioui et al., 2020), and variables like involvement also positively influence consumers’ attitudes, which will finally lead to the purchase intentions (Trivedi, 2018). More recently, with the increasing concerns about

sustainability, the impact of influencer marketing on consumers' purchase intention towards sustainable apparel has been studied (Kapoor et al., 2022; Shravya, 2022), which is still in its infant stage and needs more explorations in both the marketing perspective and the level of social pro-environmental actions.

In the realm of marketing, the shift from traditional to influencer marketing brought significant changes. The rise of the internet and social media requires marketers to adapt quickly. Influencers have already become essential players that cannot be ignored, especially in the fashion industry. However, over the past decade, with the development of artificial intelligence and its application in business, other kinds of influencers have also evolved, which are not even real persons but digital humans. The rise of these virtual influencers also led researchers to explore their roles and possibilities in marketing.

2.4 Virtual Influencer: The Promising Social Media Influencer

Today, the development of big data and improvements in computer power have enabled Artificial Intelligence (AI) to enter the business environment and public conversation. Artificial Intelligence can be found in many domains of different industries and departments, such as healthcare industry, automobile industry, fashion industry, or branches like sales, human resources, manufacturing, logistics, marketing, customer services, etc. (e.g., Ajitha & Nagra, 2021; Chien et al., 2020; Huang & Rust, 2018; Luce, 2018; Siau & Yang, 2017; Syam & Sharma, 2018; Tambe et al., 2019; Yu et al., 2018;).

In more recent studies and business insight reports, it is found that AI also spread its utility to the social media area and influencer marketing. Carr (2022) explained that "digital humans" or "virtual influencers" are taking over social media. They are AI-powered virtual beings that can produce a whole range of human body language (Dollitte, 2022). Emergen Research (2022) forecasts that the global market for digital humans will jump to about $530 billion in 2030 from $10 billion in 2020. Virtual influencers, as a type of influencers, are very promising in influencer marketing. Known as "AI influencers" or "CGI influencers", virtual influencers can be defined as computer-generated individuals who have real human traits, characteristics, and personalities, just like their lively colleagues (Mosley, 2020). Lewczyk (2021) states, "Virtual influencers are the same as regular influencers. They have a certain level of importance and influence over a dedicated audience while maintaining relatable, authentic personalities" (para.5). Virtual influencers interact more directly with people as influencers, showing their

“fake” daily life photos or videos on major social media platforms, especially Instagram. Also, virtual influencers are the future of advertising, fashion, and commerce (Robinson, 2020).

According to the article “2022 Digital media trends, 16th edition: Toward the Metaverse,” published on Deloitte Insights (2022) by several co-authors from the United States, it is worth noticing that the appealing influencer is a global trend, with 88% of respondents in Brazil following an influencer and 79% from Japan; in the US, one third says that influencers have influenced their buying decisions. Gartner (2022) predicts that by 2026, 30% of influencer marketing budgets will be allocated to virtual influencers. The appeal is clear once marketers understand the concept of computer-generated images (or, rather, influencers).

In this vein, it’s very likely that Virtual influencers have a bright future in influencer marketing and can replace humans in a way. Gradually, more virtual influencers will emerge, functioning as brand endorsers, influencing customers’ buying decisions and lifestyles, and conveying their opinions or values just like human influencers did. Therefore, this study will dive deeper into the domain of virtual influencers.

3. Conceptual Framework and Hypotheses Development

3.1 Theoretical Foundation: the theory of planned behavior (TPB)

The TPB (Ajzen, 1991) is an extension of the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980). As one of the first influential theories to comprehend and predict human behaviors (Hegner et al., 2017), it has been used in numerous fields, including sociology, psychology, social psychology (Emekci, 2018), environment (Kirton, 2014), commercial setting, or even education (Hegner et al., 2017; Teo & Tan, 2012). According to the TPB, attitude, subjective norms, and behavioral control impact individuals' intention to perform a specific behavior. Intention is a crucial construct in the theory, which acts as a mediating factor between personal dynamics and behavior (Chetioui et al., 2020). Not only practical in explaining consumers' attitudes and intentions, it is also widely used in forecasting people's pro-environmental behavioral intentions (Sarmento & Loureiro, 2021; Yang et al., 2020), which is suitable to be applied in this study to explore the role of virtual influencers.

3.2 Conceptual Model

Illustrated in Figure 1, the conceptual model this study proposed is based mainly on TPB (Ajzen, 1991). The subjective norms, perceived behavioral control, and attitude were put forward in TPB, and other constructs of the virtual influences' credibility, expertise, congruence, attractiveness, as well as followers' involvement, were added according to prior literature (Chetioui et al., 2020; Choi & Rifon, 2012; Goldsmith et al., 2000; Trivedi, 2018). Customers' attitudes toward influencers have been shown to be directly impacted by the influencers' perceived credibility, expertise, and congruence (Bergkvist et al., 2016), and purchase intentions have been proved to be influenced by customer's attitudes, as suggested by the TPB. This study assumes virtual influencers as human brands and a particular type of influencers that can follow the same structure, and all constructs are further discussed in the succeeding sections.

3.3 Hypotheses

Subjective norms are defined as the social pressure individuals can face when behaving in a certain way (Rhodes and Courneya, 2003), which is mainly about people's perception of others'

opinions. Hegner, Fenko, and Teravest (2017) posit that perceived norms refer to the desire to act in a way to please others and can be internally controlled by oneself. Perceived behavioral control was defined the same as self-efficacy, which is "People's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p.391). Since Chetioui, Benlafqih, and Lebdaoui (2020) have already confirmed that subjective norms and perceived behavioral control are both positively associated with the attitude toward human influencers, this study suggests a similar correlation between these two variables and people's attitude toward virtual influencers. Besides, Al-Debei et al. (2013) demonstrate that customers are more likely to perform a specific behavior if they have control over it. Therefore, based on the TPB (Ajzen, 1991), which suggests that the two variables will positively impact attitudes and intentions, the following hypotheses were developed:

H1: Subjective norms have a positive effect on followers' attitudes toward VIs.
H2: Perceived behavioral control has a positive effect on attitudes toward VIs.

According to Hass (2014), perceived credibility outlines whether a person recognizes a claim as true, honest, and unbiased. Perceived credibility is considered one of the most important keys when people choose to follow an influencer (Nam & Dan, 2018) and would have a long-term effect on consumer's behavior toward a brand (Langner & Eisend, 2011). Although in some studies, the authenticity of virtual influencers was questioned as they are not real humans (Conti et al., 2022; Robinson, 2020), this study posits that the perceived credibility can be high in this context as virtual influencers can also be educators, not just profit gainers.

H3: Perceived credibility has a positive effect on followers' attitudes toward VIs.

An expert is perceived as a highly qualified person who can convey accurate information. Yadav et al. (2013) have confirmed that the content and recommendations from expert influencers are more likely to be taken by customers, therefore positively affecting the consumers' attitudes toward the influencers. However, a more recent comparative study from Trivedi (2018) also illustrated a significant relationship between expert influencers and the followers' message involvement, which is to say that higher expertise from the influencers can

lead to more followers' participation. Focusing on virtual influencers, this thesis suggests a positive association between perceived expertise and the message involvement process. Hence:

H4: Perceived expertise has a positive effect on the message involvement process.
H5: Perceived credibility has a positive effect on the message involvement process.

Perceived humanness is generally considered to be the extent to which an individual is seen as typically human (Haslam et al., 2008). It is referred to as anthropomorphism, which has been demonstrated for non-human objects, including geometric shapes, plants (Epley et al., 2007, 2008), slot machines (Riva et al., 2015), and even virtual idols (Huang et al., 2022). The Uncanny Valley hypothesis (Mori et al., 2012) argues that it may reach a point where the avatars or robots elicit negative feelings from users due to their uncanny resemblance to humans (Mathur et al., 2020; Wiese and Weis, 2020). However, recent studies also illustrate that within a certain range, higher anthropomorphism of virtual entities can increase user's social attraction to them, leading to reinforced attitudes toward them (Chen & Park, 2021; Huang et al., 2022). Therefore, this thesis suggests that:

H6: Perceived humanness has a positive effect on attitude toward VIs.

Perceived congruence is defined as the degree to which the motivations or beliefs of two parties can fit together (Garretson & Niedrich, 2004). Similarity, fit, match, and relevance, as alternative terms, have also been used interchangeably to indicate the same meaning (Ju & Lou, 2022). It can affect people's experiences and positively impact satisfaction levels (Hosany & Martin, 2012). Comparative effects can happen in influencer marketing, where the higher relevance between an influencer and its followers will result in a better attitude and increased purchase intention. Chetioui et al. (2020) confirmed a positive link between Influencer/consumer congruence and the attitude toward an influencer, and De Cicco et al. (2021) from a recent study also proved a positive effect between Influencer/product congruence and the attitude toward the influencer. Focusing on virtual influencer marketing, this thesis suggests similar relations. However, the virtual influencers are not real human influencers as they are created by CGI technologies, and according to Uncanny Valley (Mori et al., 2012), affinity to VIs gets higher when humanness increases before reaching the threshold; therefore,

this thesis considers there might be a potential link between congruence and humanness, and congruence will influence attitude toward VIs through perceived humanness. Thus:

H7: VI/Consumer congruence has a positive effect on Perceived humanness.
H8: VI/Product congruence has a positive effect on Perceived humanness.

Message involvement is the involvement of an individual when subjected to a certain communication (Trivedi, 2018), and is known to affect people's motivation to process information and can increase the persuasiveness of marketing messages by influencing consumers' attitudes (Andrews et al. 1990; Kwon & Nayakankuppam, 2015). Muehling and Laczniak (1988) suggest that individuals are more likely to consider the contents if they are involved with the message. Trivedi (2018) summarized that the extent of involvement during advertising exposure determines attitude formation and change; he also found that involvement positively impacts consumers' attitudes in a comparative study between attractive celebrities and fashion experts; thus, this variable will be included in the hypothesis. Accordingly, this study suggests that the message involvement with virtual influencers and the brand they promote will affect the followers' attitudes.

H9: Message involvement has a positive effect on the brand attitude.
H10: Message involvement has a positive effect on the attitude toward VIs.

In addition, it is shown that media exposure and media attention to sustainability communication can reinforce environmental protection behavioral intentions (Lee & Cho, 2020). Specifically, attention to messages helps involve audiences in the communication process and transform the information they have been exposed to into their knowledge (Ho & Yang, 2018; Robert & Dennis, 2005), indicating the importance of involvement to the formation of intention or behaviors. A recent study also found that environmental knowledge and involvement are important components of an individual's environmental behaviors (Saputra et al., 2022). In light of this, this study proposes that the higher level of involvement with the sustainability content shared by the virtual influencers will also lead to more pro-environmental behavioral intentions. Thus:

H11: Message involvement has a positive effect on the Pro-environmental behavioral intention.

Attitude refers to the degree to which an individual would be willing to perform a specific behavior (Al-Debei et al., 2013). Therefore, consumers will be more likely to approve a behavior if their attitude is favorable. Research has revealed a positive link between the attitude toward celebrities and the attitude toward brands and products (Ilicic & Webster, 2016; Kennedy et al., 2021). Meanwhile, there is a dearth of literature on the topic of how one's outlook affects purchase intentions (Chetioui et al., 2020; Shravya, 2022), and the Theory of Planned Behavior (TPB) can also explain people's pro-environmental behavioral intentions (Sarmento & Loureiro, 2021; Yang et al., 2020). Focusing on the studies about PEBs, the attitudes, and the pro-environmental intentions were also proven to be positively related (Shipley, 2022; Wallace & Buil, 2023), which suggested that the favorable attitudes of customers will contribute to pro-environmental intentions or behaviors. Taken together, the following hypotheses are raised:

H12: Attitude toward VIs has a positive effect on the brand attitude.
H13: Attitude toward VIs has a positive effect on the purchase intention.
H14: Attitude toward VIs has a positive effect on pro-environmental behavioral intention.
H15: Brand attitude has a positive effect on purchase intention.

Studies have shown that consumers with more attention or relevant knowledge of the environment are more inclined to buy green products (Choi & Johnson, 2019; Varah et al., 2021). Zhuang et al. (2021) also confirmed that consumers' environmental concerns and knowledge positively affect green purchase intentions. Given that pro-environmental behavioral intention is paired with environmental concerns, this study goes a step further to explore if PEB intention also has a positive effect on the purchase intention of the eco-fashion products promoted by the virtual influencers; therefore, the following hypothesis is suggested:

H16: Pro-environmental behavioral intention has a positive effect on the purchase intention.

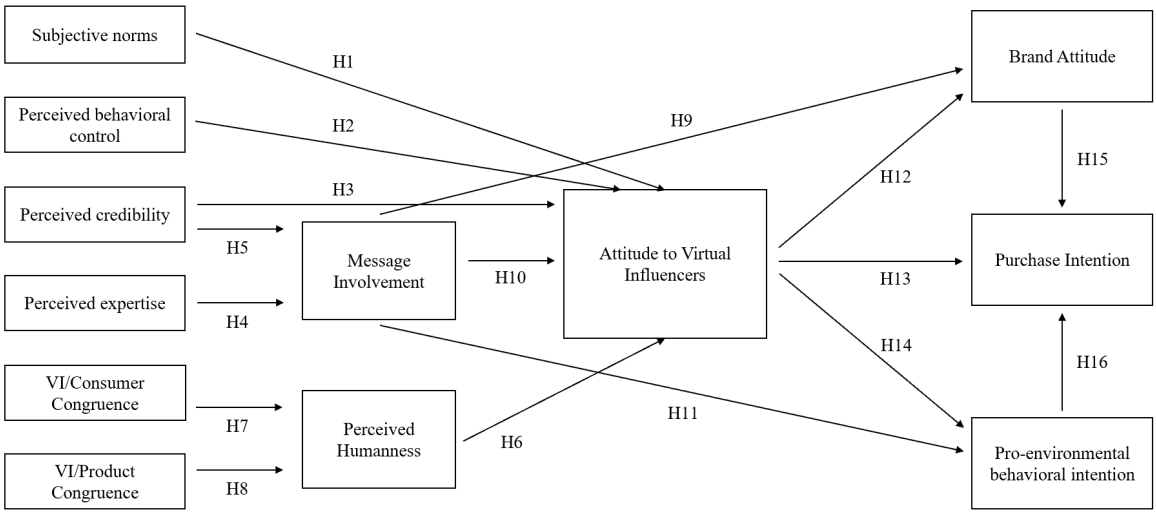


Figure 1. Proposed conceptual model.

4. Methodology

4.1 Research Approach

This study aims to investigate the roles a virtual influencer can play in the eco-fashion industry, uncover the antecedents that can influence consumers' attitudes, purchase intentions, and PEB intentions, and determine to what extent these factors can influence each other. As illustrated by McCusker and Gunaydin (2015), utilizing quantitative research enables many factors to be investigated and allows the researchers to analyze the relationship between varying factors and the research questions; this study will conduct quantitative research in order to test the proposed hypotheses based on literature.

With the objective of collecting data in the most reliable and valid manner (Taherdoost, 2016), questionnaires have been widely used in many studies. Therefore, to comply with quantitative research, the questionnaire is chosen to obtain relevant information from people.

4.2 Sample and Data Collection

4.2.1 Questionnaire Development

This questionnaire items were developed from previous research and published on Qualtrics Survey Software to measure the variables from the conceptual model. The survey shown to the participants contains three parts: 1) the information part to introduce some basic terminologies (e.g., Virtual influencers, fast fashion, eco-fashion, etc.) and four specific cases of virtual influencers promoting sustainable clothes, after which the screening questions are present to ensure that the respondents understand those terms and cases; 2) the main question part developed from 12 variables; 3) the demographic information collection.

The items are adapted in English as the original language and further translated into Chinese to reach people speaking English and Chinese. The following Table 1 presents the variables extracted, the sources, and the number of items included in this survey, all measured according to a five-point Likert scale (1 – Strongly Disagree; 5 – Strongly Agree).

Table 1. Variables' source and number of items.

Variables	Original Source	Number of Items
Subjective norms	Bai, Wang, & Gong (2019)	3
Perceived behavioral control	Jalil & Shaharuddin (2019)	4
Perceived credibility	Martins et al. (2019)	4
Perceived expertise	Chetioui et al. (2020)	3
VI/consumer congruence	Belanche et al. (2021)	3
VI/product congruence	Belanche et al. (2021)	3
Perceived humanness	Huang et al. (2022)	4
Message Involvement	Trivedi (2018)	3
Attitude to virtual influencers	Chetioui et al. (2020)	4
Brand attitude	Jalil & Shaharuddin (2019)	3
Purchase intention	Jalil & Shaharuddin (2019)	4
Pro-environmental behavioral intention	Trautwein et al. (2023)	4

4.2.2 Pre-test

Before publishing this questionnaire, a pilot study was performed, through which the author could detect if there existed some grammar mistakes/misspellings or if the items could lead to any confusion so as to make some modifications or changes before the final distribution.

Meanwhile, internal consistency must be established to ensure validity before a test can be used for research or examination purposes (Tavakol & Dennick, 2011). Therefore, a reliability test was performed to assess Cronbach's alpha coefficient, which provides a measure of the internal consistency for each construct (Jain & Angural, 2017). All values were above 0.70, except for the two that were between 0.60 and 0.70, which was acceptable (Yana et al., 2015).

The pre-test was conducted among 40 respondents, and no question or criticism was raised by them, which confirmed the feasibility of this questionnaire.

4.2.3 Sample and Descriptive Statistical Analysis

This study focused on people who have access to the internet or who have the chance to follow several influencers on social media, such as Instagram, YouTube, TikTok, or some platforms in China like Weibo, Bilibili, etc. A convenience sample was used in this study. The online questionnaire link was published in Facebook groups and WeChat groups or sent to individuals the author knows through personal relationships via social media channels using snowball sampling. The survey used English and Chinese and can access more potential respondents.

In total, 376 responses were recorded, with 314 being valid, yielding an effective response rate of 83.5%. Table 2 presents the demographic characteristics of respondents.

Table 2. Demographic information.

N = 314	Demographic	N	%
Nation			
	Chinese	255	81.2
	European	59	18.8
Gender			
	Female	226	72.0
	Male	76	24.2
	Non-binary/third gender	6	1.9
	Prefer not to say	6	1.9
Age			
	< 18	5	1.6
	18 - 24	171	54.5
	25 - 34	116	36.9
	35 - 44	13	4.1
	45 - 54	7	2.2
	≥ 55	2	0.6
Education			
	High School or below	10	3.2
	Bachelor's Degree	144	45.9
	Master's Degree	141	44.9
	Ph.D. or higher	11	3.5
	Trade School	8	2.5
Employment status			
	Student (not employed)	140	44.6
	Employed full time	115	36.6
	Employed part-time	22	7.0
	Self-employed	10	3.2
	Unemployed	8	2.5
	Retired	5	1.6
	Other	15	4.5
Annual personal income			
	< €20,000	205	65.3
	€20,000 - €40,000	70	22.3
	€40,000 - €60,000	19	6.1
	€60,000 - €80,000	7	2.2
	€80,000 - €100,000	8	2.5
	> €100,000	5	1.6

5. Results and Analysis

The analysis was conducted using the PLS-SEM (Partial least square structural equation modeling) with Smart PLS 4 to test the model, as it is considered to be an appropriate tool to provide information for each construct and the cause-effect relations among all the constructs, especially when a study has a predicative research goal or a relatively complex model. The research model evaluation was divided into two steps: the outer model assessment (measurement model) and the inner model assessment (structural model) (Henseler et al., 2009). The study then applied the bootstrapping re-sampling instruction to 5,000 subsamples to determine whether the proposed hypotheses were supported within the 95% confidence interval.

5.1 Outer model results

5.1.1 Reflective Measurement Model Evaluation

The study considers three aspects to evaluate the reflective measurement models: convergent validity (average variance extracted, (AVE)), internal consistency reliability (Cronbach alpha and composite reliability), and discriminant validity (Fornell-Larcker criterion, cross-loading, HTMT criterion). Table 3 presents the specific results. All of the outer loadings of the rest of the indicators are above 0.70, except for two indicators from perceived behavior control (PBC3 & PBC4). The PBC4 was eliminated from the original model because of its low outer loading (0.571). As for PBC3 (outer loading: 0.687), although the removal can lead to an increase in both composite reliability (rho_c) and average variance extracted (AVE), it affects the Cronbach's alpha and composite reliability (rho_a), making these two values less than 0.700. Therefore, this study still keeps the indicator PBC3 to ensure a higher interval consistency of the construct. This way, the outer loadings vary from 0.687 to 0.931 and are statistically significant ($P < 0.001$).

The average variance extracted (AVE) of all constructs is above 0.50, indicating its adequacy for convergent validity (Ab Hamid et al., 2017). Meanwhile, the Cronbach's alpha value and the composite reliability after the deletion of PBC4 are both higher than the recommended 0.70 (Hair et al., 2019), suggesting that the models are internally reliable.

Table 3. Reliability and validity test for the complete data.

Constructs	Items	Outer loadings	α	CR	VAE
Subjective norms	SN1	0.827	0.741	0.853	0.659
	SN2	0.864			
	SN3	0.741			
Perceived behavioral control	PBC1	0.862	0.704	0.832	0.625
	PBC2	0.815			
	PBC3	0.684			
Perceived credibility	CRED1	0.708	0.768	0.835	0.559
	CRED2	0.767			
	CRED3	0.745			
	CRED4	0.768			
Perceived expertise	EXP1	0.798	0.850	0.908	0.768
	EXP2	0.922			
	EXP3	0.905			
VI/consumer congruence	CCGR1	0.755	0.787	0.876	0.703
	CCGR2	0.897			
	CCGR3	0.856			
VI/product congruence	PCGR1	0.783	0.764	0.864	0.680
	PCGR2	0.847			
	PCGR3	0.841			
Perceived humanness	PH1	0.716	0.816	0.876	0.640
	PH2	0.798			
	PH3	0.829			
	PH4	0.851			
Message Involvement	MI1	0.911	0.896	0.935	0.828
	MI2	0.931			
	MI3	0.886			
Attitude to virtual influencers	ATTVI1	0.752	0.808	0.875	0.636
	ATTVI2	0.840			
	ATTVI3	0.797			
	ATTVI4	0.797			
Brand attitude	BA1	0.860	0.776	0.870	0.691
	BA2	0.807			
	BA3	0.826			
Purchase intention	PIN1	0.843	0.852	0.900	0.693
	PIN2	0.804			
	PIN3	0.843			
	PIN4	0.840			
Pro-environmental behavioral intention	PEB1	0.812	0.883	0.919	0.741
	PEB2	0.898			
	PEB3	0.862			
	PEB4	0.867			

Next, the study proceeds with the test for discriminant validity. According to Hair et al. (2019), discriminant validity shows the extent to which a construct empirically differs from other constructs in the structural model, which is concerned with the uniqueness of one

construct. It can be evaluated by comparing cross-loadings using the Fornel-Larcker criterion or Heterotrait-Monotrait Ratio of Correlation (HTMT). Achieving discriminant validity requires the indicators to have higher loadings on their constructs and lower cross-loadings with other constructs (Alshibly, 2014), which is proved by the results of this research. According to the Fornell and Larcker criterion (1981), the AVE for each construct should be greater than its squared correlation with any other construct. This research shows that the square root of a certain construct is greater than its correlation with other constructs (Table 4), which determines the discriminant validity. In addition, in terms of the Heterotrait-Monotrait Ratio of Correlation (HTMT), Henseler et al. (2015) suggested a more conservative threshold of 0.850 and recommended that the ratios should all be lower than it, which is also satisfied within this research and presented in parentheses. In total, the discriminant validity of the measurement model is obtained.

5.1.2 Composite Measurement Model Evaluation

To check the multicollinearity issues between indicators, this research uses the variance inflation factor (VIF). According to Hair et al. (2011), the variance inflation factor (VIF) value of each indicator should be less than 5. The VIF values in this research are all below 5, ranging from 1.121 to 3.402, which demonstrates a low potential effect of multicollinearity and the acceptability for the regression model.

Table 4. Discriminant validity of constructs with Fornell–Larcker criterion analysis and HTMT ratios.

	ATTVI	BA	CCGR	CRED	EXP	MI	PBC	PCGR	PEB	PH	PIN	SN
ATTVI	**.797**											
BA	.477	**.832**										
	(.599)											
CCGR	.322	.315	**.838**									
	(.403)	(.412)										
CRED	.572	.377	.290	**.747**								
	(.629)	(.412)	(.355)									
EXP	.342	.225	.368	.400	**.877**							
	(.407)	(.275)	(.456)	(.516)								
MI	.634	.493	.370	.475	.300	**.910**						
	(.740)	(.591)	(.436)	(.486)	(.336)							
PBC	.362	.367	.241	.296	.179	.382	**.790**					
	(.463)	(.497)	(.320)	(.343)	(.247)	(.470)						
PCGR	.334	.250	.360	.481	.535	.276	.138	**.824**				
	(.420)	(.315)	(.465)	(.644)	(.660)	(.330)	(.186)					

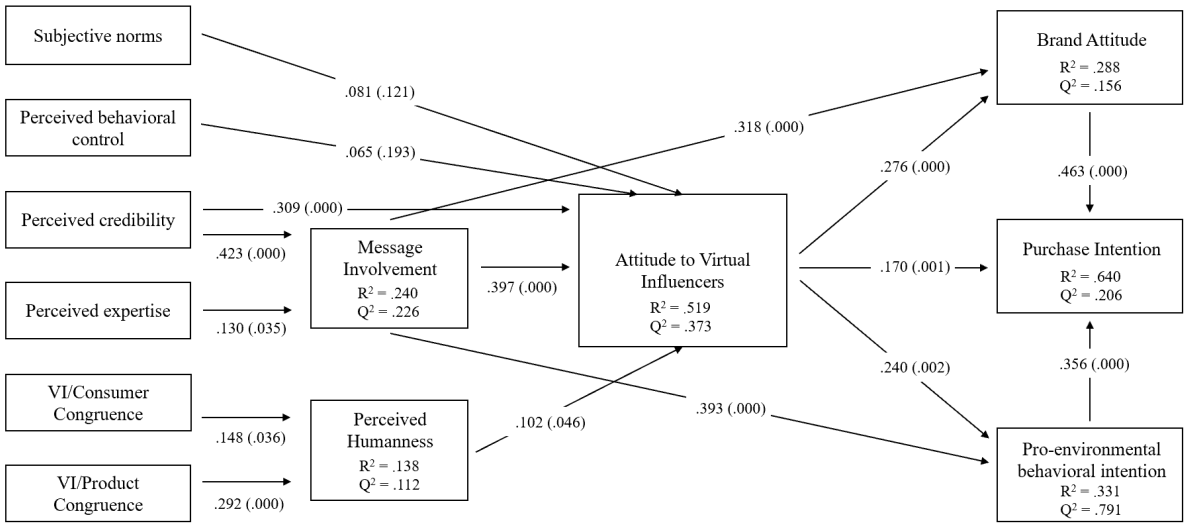
PEB	.488	.409	.291	.393	.366	.544	.274	.294	**.861**			
	(.576)	(.492)	(.349)	(.471)	(.408)	(.611)	(.329)	(.355)				
PH	.310	.266	.253	.288	.295	.229	.175	.345	.269	**.800**		
	(.361)	(.321)	(.310)	(.332)	(.345)	(.255)	(.219)	(.421)	(.298)			
PIN	.565	.690	.368	.407	.364	.575	.409	.252	.629	.269	**.832**	
	(.677)	(.847)	(.457)	(.448)	(.420)	(.657)	(.522)	(.304)	(.723)	(.304)		
SN	.433	.317	.356	.323	.218	.511	.442	.195	.330	.208	.367	**.812**
	(.552)	(.418)	(.474)	(.328)	(.273)	(.629)	(.600)	(.252)	(.408)	(.250)	(.459)	

Note: The abbreviation is used to represent each construct; HTMT ratios are in the parentheses. The diagonal elements (in bold) are the square roots of the variance between the constructs and their measures (AVE)

5.2 Inner model results

The Standardized Root Mean Square Residual (SRMR) of the structural model is 0.99. As the SRMR below 0.1 is acceptable (Hair et al., 2019), this indicates an acceptable fit for the proposed model.

The evaluations of the structural model examine the R^2 estimates, Stone-Geisser's Q^2 value, effect size (f^2), path coefficients (β), and p-values. Figure 2 and Table 5, as follows, show the results of SEM analysis using the training sample.



Notes: The values correspond to the path coefficient. P-values are in the parentheses.

Figure 2. Research Model with PLS algorithm and bootstrapping results.

According to Chin (1998) and Henseler et al. (2009), the R^2 values of 0.67, 0.33, and 0.19 in the inner path model are regarded as substantial, moderate, and weak, respectively. This model predicts a 51.9% of the variance in Attitude to virtual influencers, a 64% of the variance in purchase intention, and a 33.1% of the variance in pro-environmental behavioral intention,

suggesting moderate predictions, while for Message involvement (24%), perceived humanness (13.8%), and brand attitude (28.8%), the values are lower than 33%, indicating weak predictions. In the research model, all the R^2 values are greater than 0.10 (Falk & Miller, 1992), which demonstrates that the variances explained by particular endogenous variables are adequate.

Meanwhile, the Stone–Geisser's Q^2 values for all the endogenous variables are larger than zero; hence, predictive relevance is established (Henseler et al., 2009).

Furthermore, the f^2 value of brand attitude in relation to purchase intentions suggests a strong effect size. The values of perceived credibility to message involvement, the message involvement to attitude towards virtual influencers as well as the f^2 value of pro-environmental behavior intention to purchase intention reveal the moderate effect size. For the rest of the paths, the f^2 values are smaller than 0.15, indicating they are all with weak effect sizes.

All the proposed paths are statistically significant except for the paths from subjective norms to attitude toward virtual influencers ($\beta = 0.081$, $p = 0.121$) and from perceived behavior control to attitude toward virtual influencers ($\beta = 0.065$, $p = 0.193$). Overall, the analysis supports all the hypotheses except H1 and H2.

Table 5. Structural Model Results.

Path	Path coefficient (β)	T	P-value	f^2	Decision
SN -> ATTVI	0.081	1.552	0.121	0.009	H1: Not supported
PBC -> ATTVI	0.065	1.303	0.193	0.007	H2: Not supported
CRED-> ATTVI	0.309	6.738	0.000	0.144 *	H3: Supported
EXP -> MI	0.130	2.109	0.035	0.019 *	H4: Supported
CRED -> MI	0.423	7.704	0.000	0.198 **	H5: Supported
PH -> ATTVI	0.102	1.996	0.046	0.020 *	H6: Supported
CCGR -> PH	0.148	2.100	0.036	0.022 *	H7: Supported
PCGR -> PH	0.292	4.469	0.000	0.086 *	H8: Supported
MI -> BA	0.318	4.786	0.000	0.085 *	H9: Supported
MI -> ATTVI	0.397	7.409	0.000	0.202 **	H10: Supported
MI -> PEB	0.393	5.146	0.000	0.138 *	H11: Supported
ATTVI -> BA	0.276	3.846	0.000	0.064 *	H12: Supported
ATTVI -> PIN	0.170	3.206	0.001	0.054 *	H13: Supported
ATTVI -> PEBI	0.240	3.167	0.002	0.051 *	H14: Supported
BA -> PIN	0.463	8.419	0.000	0.436 ***	H15: Supported
PEBI -> PIN	0.356	4.964	0.000	0.254 **	H16: Supported

Variance explained: ATTVI ($R^2 = 0.519$); BA ($R^2 = 0.288$); MI (($R^2 = 0.240$); PEB (($R^2 = 0.331$);
PH ($R^2 = 0.138$); PIN (($R^2 = 0.640$).
Predictive relevance/validity: ATTVI ($Q^2 = 0.373$); BA ($Q^2 = 0.156$); MI ($Q^2 = 0.226$); PEB ($Q^2 = 0.791$);
PH ($Q^2 = 0.112$); PIN ($Q^2 = 0.206$).
Note: SN = Subjective Norms; PBC = Perceived Behavioral Control; CRED = Perceived Credibility; EXP = Perceived Expertise; PH = Perceived Humanness; CCGR = VI/Consumer Congruence; PCGR = VI/Product Congruence; MI = Message Involvement; ATTVI = Attitude Toward Virtual Influencers; BA = Brand Attitude; PIN = Purchase Intentions; PEBI = Pro-Environmental Behavioral Intentions.

Note: 0.02, 0.15, 0.35 for weak, moderate, strong effects. * $0.02 \leq f^2 < 0.15$; ** $0.15 \leq f^2 < 0.35$; *** $f^2 \geq 0.35$

6. Discussion

Based on the results from Table 5, Hypothesis 1 and Hypothesis 2 are rejected, demonstrating that neither subjective norms nor perceived behavior control are factors that can significantly influence followers' attitudes to virtual influencers. This is not in conformity with the previous studies, which illustrated the positive association between subjective norms and attitude and the association between perceived behavior control and attitude (Bai, Wang, & Gong, 2019; Jalil & Shaharuddin, 2019; Chetioui et al., 2020). For Hypothesis 1, the reason might be that virtual influencers are still relatively new to many people, and sustainable clothes, particularly in China, are still being developed at a very early stage. Therefore, participants don't know much about the VIs and eco-fashion, which can lead to information bias and affect results. Regarding hypothesis 2, the perceived behavior control doesn't impact followers' attitudes toward VIs. Customers can have good control over behaviors in buying sustainable clothes recommended by virtual influencers, but there is no cause-effect to their attitude towards the VIs.

Hypothesis 3, Hypothesis 6, and Hypothesis 10 are supported, and these findings indicate that perceived credibility, perceived humanness, and message involvement will have a positive impact on attitude toward VIs. In previous studies, Nam and Dan (2018) and Trivedi (2018) have already proved the positive impacts of perceived credibility and message involvement on attitudes toward influencers separately. Perceived humanness is also proven to generate a positive effect on attitudes toward VIs (Chen & Park, 2021; Huang et al., 2022). Therefore, the results of this study further confirmed the previous literature in the setting of virtual influencers. The results also showed that H7 and H8 are supported; this means that the VI/consumer congruence and VI/product congruence are well proven to have a positive influence on perceived humanness directly, from which they then indirectly influence attitude toward virtual influencers.

Perceived expertise (H4) and perceived credibility (H5) are proven to have a positive effect on message involvement, which supported previous studies by Yadav et al. (2013) and Trivedi (2018). In the meantime, message involvement is also proven to positively influence brand attitude (H9), which confirms the study from Trivedi (2018). These results indicate that the relations existing among human influencers are equally applicable in the context of virtual influencers. This thesis extended the relevance to the new field of VIs and also validated their functions in the new field of the eco-fashion industry.

In the context of traditional influencers, it is shown that attitudes toward influencers can positively influence brand attitudes and purchase intentions (Chetioui et al., 2020; Ilicic &

Webster, 2016; Kennedy et al., 2021), and Shravya (2022) also illustrated that brand attitude can positively affect the purchase intentions for sustainable clothes. This is further proven in this study while exploring virtual influencers' roles in the eco-fashion industry. The results found that the attitude toward virtual influencers would positively affect brand attitude (H12) and purchase intentions (H13). Furthermore, the attitude toward virtual influencers also has a positive impact on people's pro-environmental behavioral intentions (H14), which was suggested in the studies from Shipley (2022) and Wallace and Buil (2023). Meanwhile, this research also proved that message involvement has a positive influence on pro-environmental behavioral intentions, which echoed the research of Saputra et al. (2022).

The results also showed that pro-environmental behavioral intentions (H16) and brand attitude (H15), in turn, can exert their influence on purchase intentions. This reinforced the findings from the study of Zhuang et al. (2021) and the TPB theory. Meanwhile, the addition of PEB intentions to this conceptual framework enriched this model and also added depth to the understanding of different interactions among variables when they are applied to the virtual influencers.

7. Conclusion

The purpose of this research was to identify the antecedents that can affect consumers' attitudes toward virtual influencers in the eco-fashion area and to assess the impact of attitudes toward VIs on brand attitude, green purchase intentions, and pro-environmental behavioral intentions. To examine this, a model based on the extension of TBP was developed, and other variables were extracted from previous literature to construct this conceptual model. This study reveals that followers' attitude toward virtual influencers is positively influenced by perceived credibility, perceived humanness, and the followers' message involvement, while message involvement is positively impacted by perceived credibility and expertise, and VI/consumer congruence and VI/product congruence can both exhibit a significant influence on perceived humanness; attitude to virtual influencers can also positively affect the brand attitude and purchase intentions. The newly developed framework is finally measured and confirmed suitable for predicting how the factors impacting the attitudes, purchase intentions, and pro-environmental behavioral intentions. By achieving this, this research made some contributions both theoretically and practically; meanwhile, there exist some limitations and suggestions for future research.

7.1 Theoretical Implications

This study has developed a conceptual framework that includes antecedents and consequences of attitudes toward virtual influencers in the eco-fashion industry. Specifically, this study extended the variables used in TBP theory and made several contributions to the existing literature in both the virtual influencers area and the sustainability area.

Firstly, this study extended the existing theory by integrating different variables, such as perceived credibility, humanness, message involvement, congruence, pro-environmental behavioral intentions, etc., to predict followers' attitudes and behaviors more accurately. Through this, the author went one step further to examine the determinants that can transform people's pro-environmental behaviors when applied to virtual influencers. Meanwhile, this study further clarifies that subjective norms and perceived behavioral control, although widely used in TBP theory, are not proven to have an impact on attitudes toward virtual influencers.

Secondly, this study identified the research gap and explored the functions and roles of virtual influencers. Through the survey and collected data, the results demonstrated that a VI

favored by its followers can not only stimulate consumption but also convey educational messages and be an environmental leader. This helps fill the gap in understanding the role positioning of virtual influencers and certifies they can be commercial advertisers and educators as well.

Thirdly, this study provides new insight into employing virtual influencers in the eco-fashion industry, which meets the increasing needs for slow fashion and corresponds to sustainability development goals.

7.2 Practical Implications

The results of the present research also allow us to draw three main practical implications. Firstly, perceived credibility, message involvement, and perceived humanness have been proven to be the most important factors when following a virtual influencer in the eco-fashion industry. VI/follower congruence and VI/product congruence will determine the level of perceived humanness. And in order to achieve a higher involvement rate of followers, the credibility and expertise, as traits of virtual influencers all need to be enhanced. Technology companies or marketers need to consider these factors while adopting virtual influencers in influencer marketing and pay attention to these traits while they are communicating behind the virtual influencers.

Secondly, attitudes toward virtual influencers have been proven to have a significant impact on brand attitude and purchase attention. This leads the author to suggest that virtual influencers would also be a novel but appropriate consideration when they are setting the marketing strategy.

Thirdly, it is also demonstrated that virtual influencers in the eco-fashion area can contribute to people's pro-environmental behavioral intentions, meaning that virtual influencers can be not only profit-gainers but also educators. Adopting virtual influencers to convey environmental knowledge so as to shape people's recognition and actions is also a good way for marketers or non-profit organizations. In a society where we need to pay more attention to sustainability, adopting virtual influencers can be an efficient communication method. Although traditional influencers are still the mainstream selection, this study foresees the vast development potential of virtual influencers in that they are novel, attention-attracting, less costly, less risky, easy to manage, and also more sustainable as they can help save a lot of physical resources in the real world.

7.3 Limitations and Future Research

Despite this study's contributions to theoretical and practical implications, it is also subject to several limitations. Firstly, the data was collected using convenience snowball sampling, not random selection. However, although this non-probability sampling can easily lead to sample bias, it is more easily accessible compared to a probability method and more practical in this case.

Meanwhile, though the questionnaire used in this study is available in both Chinese and English, the vast majority of our participants are from China (81.2%), which may not allow us to expand the conclusions to European countries as people may have different levels of sustainability concepts. Therefore, future research could expand the focus to Europe or other regions for comparisons of outcomes regarding the attitude toward virtual influencers and the impact that virtual influencers can have on their followers.

Furthermore, this study focused on people who might have yet to buy products according to the recommendations from virtual influencers in real life, and it used a setting of 4 cases in the survey. Future studies can include participants who have already followed the virtual influencers or who have purchased products from them. If possible, it’s better to include the qualitative method as well. Thus, there will be a more comprehensive perspective from the interviews with participants.

Lastly, this study is limited to virtual influencers and needs a comparison with human influencers in their effectiveness and economic value. In the era of artificial intelligence, where virtual influencers begin to develop and sprout, it is also very instructive if future studies assess the roles or degree of influence between traditional influencers and virtual influencers in the ecological field.

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Annex (Questionnaire)

ISCTE Instituto Universitário de Lisboa

English

Introduction

Hello, everyone, I'm Qian Que from ISCTE Business School and currently I'm a master's student in Marketing. This survey falls into the scope of my dissertation, which is mainly about exploring the role of virtual influencers in Eco-Fashion industry. The data will be collected anonymously to analyze the link between different factors, only used for academic study.

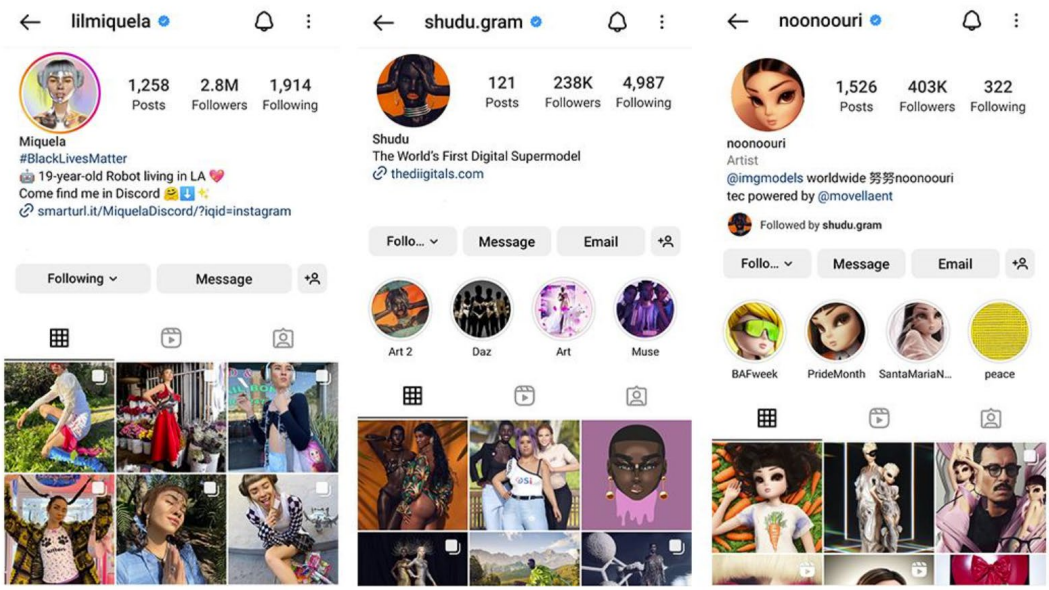
Thank you so much for participating in this survey!

Contact: qqneu@iscte-iul.pt

☐ I Accept

Before moving to the questionnaire below, here are three terms you need to know, so please take some time to go through the follwing introduction:

1. Virtual Influencers (VIs):
According to Mosley (2020), Virtual Influencers (VIs) can be defined as computer-generated "individuals" who have real human traits, characteristics and personalities. Famous VI like Lil Miquela can boast millions of followers on instagram. For now, VIs are the focus that brands cannot neglect in Influencer Marketing.



2. Virtual Influencer Marketing
It refers to a form of marketing where the company or brands cooperate with selected virtual influencers (VIs) in order to promote their brand content to the VIs' followers or brands' targeted customers.

3. Fast-Fashion and Eco-Fashion
Fast fashion satisfies people's instant gratification with fancy designs and low prices, but it contributes to environmental and ethical issues like energy overconsumption, water pollution, clothes waste, labor exploitation, etc.

As a response, eco-fashion has emerged, prioritizing both environmental and social responsibilities. Eco-fashion clothes uses biodegradable components from natural or recycled fibers. These materials grow with no pesticide or fertilizer use, consume less energy and water, and employ no chemical treatment. They are usually priced a bit higher than fast-fashion clothes due to their better quality and durability, with some items costing up to twice as much.

Are you clear about the concepts mentioned above?

○ Yes

Below are 4 examples of virtual influencers promoting eco-fashion and the concept of sustainable development

1. Imma is promoting the Eco-fashion clothes created by Finnish design house Marimekko.
【虚拟影响者 Imma 在推广由芬兰设计公司 Marimekko 创作的生态时尚服装】

2. Shudu is wearing the clothes made from eco-friendly and recycled materials from Hyundai Motor Company's manufacturing process.
【Shudu 穿着由环保和回收材料制成的服装，这些材料取自于现代汽车公司的生产过程】

3. Liam is wearing a top made from organic cotton without the use of synthetic pesticides or other toxic chemicals.
【虚拟影响者 Liam 穿着由有机棉制成的上装，该服装未使用合成杀虫剂或其他有毒化学物质】

4. Noonoouri (Left: VI) is cooperating with real human Sara Cavazza Facchini (Right: creative director of the sustainable fashion Brand "Genny"), encouraging people to protect the environment on the World Earth Day.
【Noonoouri (图左：虚拟影响者) 与真人合作 (图右：生态时尚品牌 "Genny" 的创意总监)，在世界地球日的当天呼吁大家保护环境】

Q1. Consider the following statements, to what extent will you agree or disagree?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Those who influence my behaviors, such as families or close friends think following the virtual influencers (VIs) in Eco-fashion area is a cool thing	○	○	○	○	○
Those who influence my behaviors, such as family, close friends, and partners, think I should follow the VIs in Eco-fashion area.	○	○	○	○	○
Generally speaking, I will follow the VIs in eco-fashion area based on other's opinion.	○	○	○	○	○

Q2. When making your purchasing decision, to what extent will the following statements apply to you?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I have the resources, time, and willingness to purchase Eco-fashion clothes promoted by virtual influencers (VIs) when buying clothes	○	○	○	○	○
I believe that I can purchase eco-fashion clothes promoted by VIs when I want	○	○	○	○	○
To me, purchasing eco-fashion clothes promoted by VIs is easy	○	○	○	○	○
Purchasing eco-fashion clothes promoted by VIs is a decision that is only up to me	○	○	○	○	○

Q3. To what extent do you agree with the statements below?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I feel that the VIs who promote eco-fashion must be convincing.	○	○	○	○	○
I feel that the VIs who promote eco-fashion must be believable.	○	○	○	○	○
I feel that the VIs who promote eco-fashion must be credible.	○	○	○	○	○
I believe that the VIs who promote eco-fashion can be a good reference for purchasing eco-fashion clothes	○	○	○	○	○

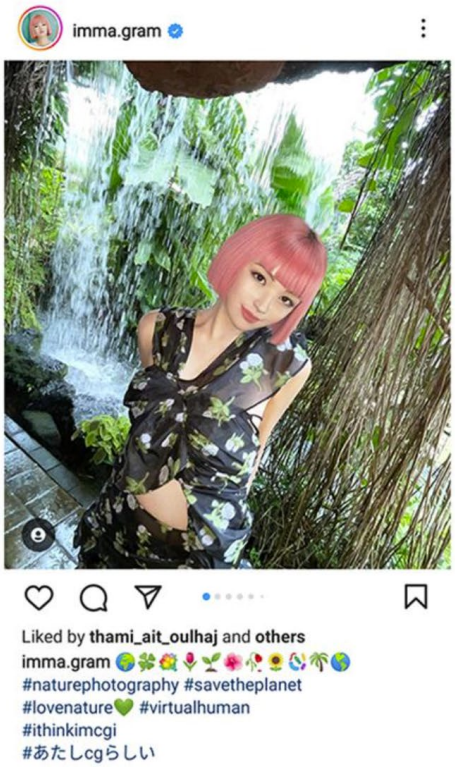
Q4. Look at the following statements and indicate how you feel about them:
The Virtual Influencers (VIs) who promote Eco-fashion ——

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
should be experts in their field	○	○	○	○	○
should have great knowledge	○	○	○	○	○
should provide references based on their expertise	○	○	○	○	○

Q5. To what extent do you agree or disagree with the following statements?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
The value of the virtual influencers (VIs) in eco-fashion area should be in accordance with my value	○	○	○	○	○
The personality of the VIs in eco-fashion area should match my personality	○	○	○	○	○
The images of VIs in eco-fashion area should be identical or close to my ideal self-image	○	○	○	○	○
The images and messages from the VIs in eco-fashion area should have a good match with the products	○	○	○	○	○
The compatibility between the VIs in eco-fashion area and the product should be high	○	○	○	○	○
The alignment between the VIs in the eco-fashion area and the product should be high	○	○	○	○	○

Consider the different types of Virtual Influencers who promote eco-fashion and a sustainable future (Humanlike VIs: Lil Miquela, Imma; Animated VI: Noonoouri)



Q6. To what extent will you agree or disagree with the following statements?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
It's important that the virtual influencers (VIs) who promote eco-fashion have humanlike appearances	○	○	○	○	○
It's important that the VIs who promote eco-fashion act and behave like human beings (e.g., using gestures, popular expressions, etc.)	○	○	○	○	○
It's important that the VIs who promote eco-fashion interact and communicate with their followers like a human being	○	○	○	○	○
It's important that the VIs who promote eco-fashion have a humanlike personality	○	○	○	○	○

Q7. How do you feel about the following statements?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I would like to pay attention to sustainability content from virtual influencers (VIs) on digital media platforms.	○	○	○	○	○
I would like to concentrate on the content of eco-fashion from VIs on digital media platforms.	○	○	○	○	○
I will carefully read the information related to eco-fashion from VIs on digital media platforms.	○	○	○	○	○

Q8. To what extent do the following statements apply to you?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I do believe that Virtual influencers (VIs) who promote eco-fashion can serve as fashion models for me.	○	○	○	○	○
I do believe that VIs who promote eco-fashion can present interesting content.	○	○	○	○	○
I do believe that VIs who promote eco-fashion can provide new deals on eco-fashion clothes.	○	○	○	○	○
I do believe that VIs who promote eco-fashion can serve as a reliable source of information and discovery concerning environment and sustainability.	○	○	○	○	○

Q9. Influenced by the Virtual Influencers (VIs) in the Eco-fashion area, I would like to

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
volunteer my time for pro-environmental activities (e.g., cleaning up the trash for the ocean, planting trees, etc.)	○	○	○	○	○
avoid buying products that have environmentally harmful packaging	○	○	○	○	○
buy products that come in refillable and durable containers.	○	○	○	○	○
recycle more in my daily life (paper products, containers, cans, glasses, batteries, etc.)	○	○	○	○	○

Q10. For the eco-fashion clothes advertised/promoted by the Virtual influencers (VIs), I do believe that

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
the Eco-fashion clothes promoted by VIs have been made of good quality.	○	○	○	○	○
buying Eco-fashion clothes promoted by VIs can help to protect the environment.	○	○	○	○	○
the Eco-fashion clothes promoted by VIs are easy to use, nice and chic.	○	○	○	○	○

Q11. Influenced by Virtual Influencers (VIs) in Eco-fashion area,

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I would like to support and recommend the use of Eco-fashion clothes.	○	○	○	○	○
I would actively look for these eco-fashion clothes in a store/online shop in order to purchase them.	○	○	○	○	○
I would like to buy Eco-fashion clothes if I happen to see them in a store/online shop.	○	○	○	○	○
I would like to consider using Eco-fashion clothes.	○	○	○	○	○

The following are some anonymously asked demographic questions

Q12. Gender

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

Q13. Age

- ○ < 18
- ○ 18 - 24
- ○ 25 - 34
- ○ 35 - 44
- ○ 45 - 54
- ○ ≥ 55

Q14. Education Level

- ○ High School or below
- ○ Bachelor's Degree
- ○ Master's Degree
- ○ Ph.D. or higher
- ○ Trade School

Q15. What is your current employment status?

- ○ Student (not employed)
- ○ Employed full time
- ○ Employed part-time
- ○ Self-employed
- ○ Unemployed
- ○ Retired
- ○ Other

Q16. What is your annual personal income? (If no employment yet, consider the subsidiary or the financial aids from your family or the external sources)

- ○ Less than €20,000
- ○ €20,000 - €40,000
- ○ €40,000 - €60,000
- ○ €60,000 - €80,000
- ○ €80,000 - €100,000
- ○ Above €100,000

Q17. Do you have any comment / suggestion about this survey?