



UNIVERSIDADE CATÓLICA PORTUGUESA

Impact of Virtual Influencers' Attributes on Purchase Intention

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by

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Abstract

The interest in virtual influencer marketing has significantly increased among academics, entrepreneurs, investors, and consumers. This concept is associated with artificial intelligence, aiming to equip machines with the ability to replicate human-like skills (creativity, reasoning, etc.). Virtual influencers (VIs) are one of the technologies supporting this new era of artificial intelligence.

Linked to social media platforms, VIs emerged with the aim of revolutionizing global marketing strategies. For example, Lil Miquela (@lilmiquela on Instagram) has over 2 million followers on Instagram and has collaborated with various brands such as Calvin Klein, BMW, Balmain, Chanel, and Apple. VIs offer unique features, such as brands' control over the content shared on social media, cost reduction, and independence. However, they continue to evoke controversy and uncertainty about their utility.

This study adopts a marketing perspective that explores the impact of VIs attributes on social media users' purchase intention. Based on previous models and studies, and adapting the Human Brand Theory to the virtual world, a conceptual framework was developed to examine inspiration, visual aesthetics, enjoyability, similarity, and expertise of VIs. A quantitative approach was adopted through an online survey targeting social media users.

Keywords: virtual influencers; influencer marketing; attachment; purchase intention.

Resumo

O interesse pelo marketing de influenciadores virtuais tem aumentado significativamente entre acadêmicos, empresários, investidores e consumidores. Este conceito está associado à inteligência artificial, que tem como objetivo dotar as máquinas da capacidade de reproduzir competências semelhantes às humanas (criatividade, raciocínio, etc.). Os influenciadores virtuais são uma das tecnologias que suportam esta nova era da inteligência artificial.

Ligados a plataformas de redes sociais, os influenciadores virtuais surgiram com o objetivo de revolucionar as estratégias de marketing a nível global. Por exemplo, Lil Miquela (@lilmiquela no Instagram) tem mais de 2 milhões de seguidores no Instagram e já colaborou com várias marcas, como Calvin Klein, BMW, Balmain, Chanel e Apple. Os influenciadores virtuais oferecem características únicas, como o controlo das marcas sobre o conteúdo partilhado nas redes sociais, a redução de custos e a independência. No entanto, estes continuam a suscitar controvérsia e incerteza quanto à sua utilidade.

Este estudo adota uma perspetiva de marketing que explora o impacto dos atributos dos influenciadores virtuais na intenção de compra dos utilizadores das redes sociais. Com base em modelos e estudos anteriores e adaptando a Teoria da Marca Humana ao mundo virtual, foi desenvolvido um modelo concetual para examinar a inspiração, estética visual, divertimento, semelhança e experiência dos influenciadores virtuais. Foi adotada uma abordagem quantitativa através de um inquérito dirigido aos utilizadores das redes sociais.

Palavras-chave: influenciadores virtuais; marketing de influenciadores; ligação; intenção de compra.

Contents

Acknowledgements.....	iii
Abstract.....	iv
Resumo.....	v
Table of Figures.....	vii
Table of Tables	viii
1. Introduction.....	9
2. Literature Review and Theoretical Proposed Model	12
2.1. Pros and Cons of VIs	12
2.2. The VIs' ability to fulfill social media users' needs	14
2.3. Impact of Social Media Users' Needs Fulfillment on Attachments to VIs	18
2.4. VIs Attachment's Influence on Purchase Intentions.....	19
3. Method and Data	20
3.1. Data collection instrument and scales	21
3.2. Sample	26
3.3. Data analysis procedures.....	28
4. Results	28
4.1. Measurement model.....	28
4.2. Structural model assessment.....	35
5. Discussion.....	37
6. Conclusion	40
6.1. Theoretical Findings.....	42
6.2. Managerial Contributions	43
6.3. Limitations and Future Research	45
References	47
Appendix	58

Table of Figures

Figure 1 - Proposed Research Model.....	20
Figure 2 - Estimates of SEM. Note. ** $p < 0.05$, solid line: significant path, dotted line: insignificant path.....	35

Table of Tables

Table 1 - Constructs and Items.....	26
Table 2 - Demographic characteristics of the sample (n=226).....	27
Table 3 - Measurement Results.	31
Table 4 - Construct Reliability and Convergent Validity.....	32
Table 5 - Fornell-Larcker criteria.....	33
Table 6 - HTMT ratio.	34
Table 7 - Variation Inflation Factor (VIF).....	34
Table 8 - Results of hypotheses testing.	36

1. Introduction

In the realm of contemporary marketing, the phenomenon of virtual influencer marketing has gained significant traction, captivating the attention of both marketing professionals and consumers (Böhndel et al., 2023; Kim & Baek, 2023). This innovative paradigm involves the creation of computer-generated personas that act as influencers, effectively engaging diverse audiences across social media platforms while endorsing products and services (Franke et al., 2023).

To comprehend the concept of VIs, it is essential to understand the meanings underlying these two interconnected terms. Virtual, in this context, refers to something created by technology that appears to exist but lacks a physical presence (Cambridge Dictionary, 2022). On the other hand, influencers are individuals who advocate for brand advertising and communications (Franke et al., 2023). Importantly, influencers do not need to be traditionally famous; instead, they must be able to connect and interact with their followers on social media platforms (Franke et al., 2023). As explained by Thomas & Fowler (2021, 12), a VI is defined as "a digitally created artificial human, who is associated with Internet fame."

The emergence of VIs has the potential to transform influencer marketing in several ways. VIs, constantly available for communication, create an immersive experience for their followers by promoting social causes. Moreover, the controlled and staged content produced by VIs challenges traditional notions of authenticity in influencer marketing, impacting trust dynamics (Sands et al., 2022). Existing studies have explored how consumer reactions and judgment calls vary based on whether the source behind these VIs is disclosed or remains undisclosed (Franke et al., 2023; Kim & Baek, 2023; Lim & Lee, 2023). However, the escalating prevalence of virtual influencer marketing has heightened social media users' awareness of digital identities, prompting a discernible shift in their

ability to differentiate between real and virtual influencers (Kim & Baek, 2023). On the other hand, past research like the one of Sands et al. (2022) has focused on investigating the transformative impact of VIs on consumer behavior and marketing strategies. Sands et al. (2022) observed diverse consumer responses to VIs, prompting an investigation into how consumers react to VIs. This investigation led to a deeper examination of the unique attributes of VIs and their impact on consumer purchase intent.

Currently, there is a scarcity of empirical studies on VIs with a predominant focus on personal (e.g. inspiration and similarity) and content-driven (e.g. expertise) attributes impact on social media users' needs. Kim & Baek (2023) pointed out that the dimensionality of the attributes of human-like VIs from a conceptual perspective still has a lot of catching up to do, as it is a recent topic. Existing literature primarily addresses personal attributes such as expertise, playfulness and trustworthiness as attributes that impact consumers' behavior (Kim et al., 2024). Additionally, Kim & Baek (2023) scrutinized the structural connections between social media users' word-of-mouth intention, perceived creepiness, perceived authenticity, emotional attachment, and VIs attributes. Despite some analysis on virtual influencer marketing, a comprehensive and in-depth exploration of both personal and content-driven attributes of VIs remains notably scarce in the current research landscape.

Consequently, there is a growing need for empirical studies concentrating on how VIs digital content and personal attributes impact the needs of social media users. In this perspective, this research aims to unravel the impact of VIs attributes on purchase intention, by fulfilling social media users' needs. More specifically, this study intends to answer the following research questions:

RQ 1: How do the attributes of VIs satisfy social media users' needs?

RQ 2: How does this satisfaction affect the attachment to VIs?

RQ 3: How does social media users' attachment to VIs influence their purchase intentions?

Therefore, to answer the research questions, the following research objectives are proposed: investigate how VIs' attributes influence social media users' needs fulfillment and identify attachment mechanism antecedents; examine attachment mechanisms between VIs and social media users; determine the impact of attachment mechanisms on consumers' purchase intentions.

To gain a deeper understanding of the subjects discussed and identify the challenges within the existing body of literature, a comprehensive review of the literature on VIs was conducted in the following chapter. This underscores the significance of further exploration into the issues for a more detailed examination.

The present paper is divided into six chapters, as follows. Chapter one serves as an introduction to the primary subject of VIs. Chapter two presents a comprehensive review of relevant literature, along with the proposed research model. The methodology employed for data collection and model estimation is elucidated in chapter three. Chapter four details the results, encompassing data analysis, particularly focusing on the measurement and structural models. Chapter five is dedicated to discussing the results, where findings are analyzed, interpreted, and contextualized within existing literature. In chapter six, conclusions and final remarks are provided, highlighting the study's contributions to the field while acknowledging limitations and suggesting potential areas for further research. Lastly, we'll present all the references.

2. Literature Review and Theoretical Proposed Model

This chapter will develop the literature review to explore the relevant theoretical contributions to the research object under investigation. Lastly, the hypotheses are presented as well as the correspondent research model.

2.1. Pros and Cons of VIs

In recent years, there has been a growing popularity of virtual (or artificial intelligence) influencers, with many of them closely resembling humans in terms of their physical appearance, personality, and behavior (Moustakas et al., 2020). In accordance with the definition provided by Thomas & Fowler (2021, 12), a VI may be conceptualized as "a digitally generated artificial human associated with internet fame." These entities are computer-generated characters gifted with realistic attributes like those of human beings, effectively imitating both the appearance and behavior of real individuals (Moustakas et al., 2020). Furthermore, VIs gained a substantial following on social media platforms such as Instagram (Gerlich, 2023). Notably, certain VIs are endowed with authentic fictional narratives on social media platforms, wherein they portray human emotions such as heartbreak and affection (Franke et al., 2023). This means that there are many circumstances in which brands may choose VIs over human influencers. As Thomas & Fowler (2021) pointed out, VIs can be just as persuasive as human influencers (e.g. celebrities) in favorably influencing consumer attitudes and purchase intentions. An example of this is a recent survey carried out in the USA, which provides evidence of the positive relationship between consumers' willingness to follow the recommendations of VIs and their purchase

intentions; almost 35% of the people surveyed reported having bought a product recommended by VIs (*Influencer Marketing Factory, 2022*).

Like human influencers, VIs are also able to share different types of content and create relationships with their followers (Ahn et al., 2022). When comparing both, VIs can be seen as very attractive marketing tools due to their high level of control, security, and flexibility (Conti et al., 2022). For instance, brands can leverage the non-human nature of VIs to avoid challenges like fatigue, scandals, and logistical constraints, enabling a more consistent and always-available online presence (Penttinen et al., 2024). However, the use of VIs comes with potential cons. VIs may inadvertently mislead consumers with portrayals of unrealistic lifestyles and visual aesthetics, contributing to confusion regarding authenticity and fostering distrust in their communication with social media users. The unfamiliarity with VIs may elicit strong negative emotions in consumers, such as a sense of "creepiness", which may be linked to the ambiguity and uncertainty surrounding interactions with VIs (Rajaobelina et al., 2021; Langer & König, 2018). Consequently, the improper use of these influencers in social media marketing has the potential to generate adverse effects on consumer perceptions. Despite the contributions of previous studies to understand the pros and cons of VIs, it is still unclear how they use their power of persuasion and can establish partnerships with brands and create content, overcoming certain barriers such as security, control, and flexibility (Conti et al., 2022; Langer & König, 2018). Since social media platforms were originally designed to facilitate personal connections (Lim & Kumar, 2019), this study investigates the mechanisms of connection between VIs and social media users to evaluate if these connections facilitate the influence that VIs can have.

In conclusion, this study is important because it addresses gaps in existing research by focusing on dimensions beyond content-related attributes of VIs such as their expertise, similarity, enjoyability, visual aesthetics and inspiration (Kim

et al., 2024). It aims to understand why and how people engage with VIs (Batista et al., 2021) and by exploring these dimensions, this study has the potential to identify the role of other antecedents or factors (such as social media users' needs) that attract the audience to VIs (Jhavar et al., 2023).

Furthermore, this study aims to fill the gap in understanding how personal and content-related traits of VIs affect the needs of social media users. Prior research has taken divergent approaches, with one line of research focusing solely on VIs' personal attributes, such as playfulness, attractiveness, and trustworthiness, as important attributes for followers to like and follow VIs (Kim et al., 2024; Kim & Park, 2023). Another line of research suggests that followers are attracted to the content of social media influencers, emphasizing features like visual appeal, informativeness, or entertainment value (Ki & Kim, 2019; Stubb & Colliander, 2019; Lou & Yuan, 2019). Recognizing the pivotal role played by both VIs' personal traits and social media content in attracting and retaining followers (Gannon & Prothero, 2016), this study adopts an approach considering VIs' personal (inspiration, enjoyability and similarity) and content-oriented attributes (visual aesthetics and expertise) as equally significant (Ki et al., 2020). This acknowledgment is grounded in the understanding that these attributes collectively contribute to satisfying social media users' needs.

2.2. The VIs' ability to fulfill social media users' needs

Within the scope of this investigation, one of the objectives is to investigate how the personal and content-driven attributes of VIs influence the fulfillment of social media users' needs. Therefore, this study posits ideality, relatedness, and competence as needs that are fulfilled through the attributes of VIs (Ki et al., 2020).

Need for ideality refers to the individuals' desire to seek someone embodying characteristics they perceive as lacking but wish to possess (Karp et al., 1970).

Individuals frequently admire and attempt to imitate role models, especially celebrities, whose attitudes and behaviors work as motivators, compelling people to modify their own attitudes and behaviors to correspond to the celebrity's (Ruvio et al., 2013). The same happens with VIs, once they serve similar purposes to their real-world counterparts. Despite lacking a physical existence, they exhibit all the characteristic traits associated with human influencers (Yu et al., 2023). They engage with followers in online spaces, possess specific objectives and domains of expertise, and attract followers through curated content (Molin et al., 2019). Indeed, a VI whose taste, style, and lifestyle exude inspiration, has the potential to attract likes and follows from social media users, as evidenced by prior research on different types of influencers (Ki & Kim, 2019). According to Ruvio et al. (2013), individuals often admire and emulate role models whose actions and attitudes serve as inspiration compelling them to modify their own behaviors and attitudes. Hence, we posit that a VI projecting an inspirational persona fulfills social media users' need for idealization. This leads to:

H1: A VI with an inspiring persona positively impacts social media users' fulfillment of their ideality needs.

The fulfillment of individuals' need for ideality is also attainable through following a VI who presents aesthetically pleasing content. Existing literature suggest that aesthetic experiences can contribute to psychological well-being and address the need for self-enhancement (Dennis et al., 2014; Leder & Nadal, 2014). For instance, owning a well-designed apparel product not only enhances consumers' perceived desirability to others but also fosters a positive self-perception, thereby contributing to their overall well-being (Ki et al., 2020). Hence, we posit that visually appealing content crafted and curated by VIs possesses the capacity to cater to social media users' idealistic needs. This leads to:

H2: A VI who showcases visually aesthetic content positively impacts social media users' fulfillment of their ideality needs.

The need for relatedness refers to an individual's inherent desire to establish connections in a social environment, thus promoting a feeling of emotional closeness with others (Deci & Ryan, 2000). The content generated by VIs must correspond to the psychological requirements of its followers, arouse greater involvement, satisfaction, and a greater sense of relatedness. That is why these followers actively seek hedonic gratification through their interactions with VIs on social networks (Ibáñez-Sánchez et al., 2022). For example, literature further demonstrates that individuals can fulfill their need for relatedness when they engage with others who provide enjoyable and gratifying interactions (Reis et al., 2000). Similar findings by Ki et al. (2020) were corroborated in digital environments, including online contexts and social media platforms. Consequently, we posit that a VI that identifies with the sense of humor and enjoyment preferences of social media users will effectively satisfy their inherent need for relatedness. This leads to:

H3: A VI whose persona is enjoyable positively impacts social media users' fulfillment of their relatedness needs.

Human-like VIs closely resemble humans in terms of their appearance (Arsenyan & Mirowska, 2021). An example is the study conducted by Lou et al. (2023), asserting that VIs serve as effective marketing tools owing to their attractiveness, human-like functionality, and audiovisual characteristics. Therefore, we propose that a VI whose persona aligns with that of social media users will effectively satisfy their inherent need for relatedness. This leads to:

H4: A VI whose persona is similar to that of social media users positively impacts the fulfillment of their relatedness needs.

Need for competence delineates an individual's propensity to pursue sensations of efficacy, accomplishment, and engagement with challenging tasks

in their pursuits and activities (Deci & Ryan, 2000). It is reasonable to extend the concept of competence to the context of VIs, even though recent literature primarily examines it in the assessment of chatbots and human-robot interactions (Roy & Naidoo, 2021; Yoganathan et al., 2021). Recent work such as that by Li et al. (2023) supports this claim, as they found that digital human avatars would convey competence. In the realm of VIs, customer evaluations are influenced by both likeability and perceived competency (El Hedhli et al., 2023). These evaluations, in turn, impact the followers' inclination to heed VI recommendations and engage in purchase decisions (El Hedhli et al., 2023). Content expertise encompasses the qualifications, competencies, skills, and knowledge demonstrated by VIs, enabling them to deliver well-informed statements on specific topics and issues through their social media channels (Lou et al., 2023; Park et al., 2021). A recent study by El Hedhli et al. (2023) discovered that competence acts as a mediator in the relationship between VIs and consumers' willingness to heed their recommendations, particularly in the case of Miquela, a human-like VI with 2.6 million followers on Instagram. However, this mediating effect was not observed in the case of Shudu, another human-like VI with 241 thousand followers on Instagram. The study suggests that this disparity could be attributed to the fact that both VIs possess different areas of expertise. Also, according to previous research, influencer expertise can be used to predict consumer attitudes towards brands (El Hedhli et al., 2023). Therefore, we suggest that a VI actively involved in the creation and curation of expert content will influence social media users to believe that the VI satisfies their need for competence. This leads to:

H5: A VI who posts content that showcases expertise positively impacts social media users' fulfillment of their competence needs.

2.3. Impact of Social Media Users' Needs Fulfillment on Attachments to VIs

The literature defines attachment as the emotional bond shared between two individuals (Hazan & Shaver, 1994). Moreover, studies by Wang & Chan-Olmsted (2023) suggest that individuals forming stronger attachments to an influencer are likely to develop closer relationships with the influencer.

Consequently, individuals will naturally be drawn to relationships in proportion to the extent that these relationships offer opportunities for the fulfillment of their fundamental needs (Guardia et al., 2000). A means of providing such opportunities is by addressing individuals' need for ideality. For instance, attachment is often rooted in the aspiration of becoming individuals' ideal selves in the future (Japutra et al., 2014). Aligning a brand's image with the consumers' ideal self can cultivate a profound attachment. Attachment formation is also influenced by the fulfillment of individuals' relatedness needs (Ki et al., 2020). Additionally, the satisfaction of competence needs plays a role in attachment development. Ki et al. (2020) highlighted that the desire for competence is a crucial need that followers seek to satisfy through their association with social media influencers. The effective fulfillment of this competence need results in the development of a robust emotional connection.

Therefore, we propose that within the context of social media, social media users are likely to cultivate a profound attachment to a VI, when they successfully address social media users' needs for ideality, relatedness, and competence. This leads us to:

H7: Fulfillment of social media users' needs for ideality (H7a), relatedness (H7b), and competence (H7c) by a VI influences the strength of the attachment they form with the VI.

2.4. VIs Attachment's Influence on Purchase Intentions

In conclusion, our final proposition posits that the positive emotional perceptions that social media users have towards VIs are manifested in their endorsement behavior. Conclusively, when social media users cultivate a deep emotional connection with VIs, there is an increased propensity not only to adopt the brand or product recommendations presented, but also to engage in product purchases.

Purchase intention is defined as “an individual’s conscious plan to make an effort to purchase a brand” (Spears & Singh, 2004, 56). When a VI gathers valuable information online and recommends products, their followers may feel a sense of obligation to reciprocate (Kim et al., 2024). This reciprocity frequently manifests through the purchase of products endorsed by their favorite influencer as a means of showing support (Pop et al., 2022;Yahia et al., 2018). Consequently, in this study, the intention is to rectify the existing gap by exploring both content-related and personal attributes of VIs. This comprehensive approach aims to anticipate the continuity of positive meaning transfer within the relationships forged between VIs and social media users. Therefore, we postulate that the strength of social media users' emotional bonds with VIs directly influences the efficacy of emotional transfer to their endorsed product or brand recommendations. This, in turn, heightens the likelihood of social media users purchasing the recommended product or brand. This leads to:

H8: Social media users' attachment to a VI influences their intentions to purchase products that are featured by the VI on social media.

Based on the literature review and identified research gap, this study introduces a framework, adapted from the Human Brand Theory illustrated in Figure 1 **Figure 1** - Proposed Research Model. This framework offers a fresh perspective that has not been explored in previous research. By visually illustrating the main variables and the proposed connections, the framework provides a structured

foundation which aims to measure, in broad terms, the significance of VIs' attributes that contribute to the intention to purchase.

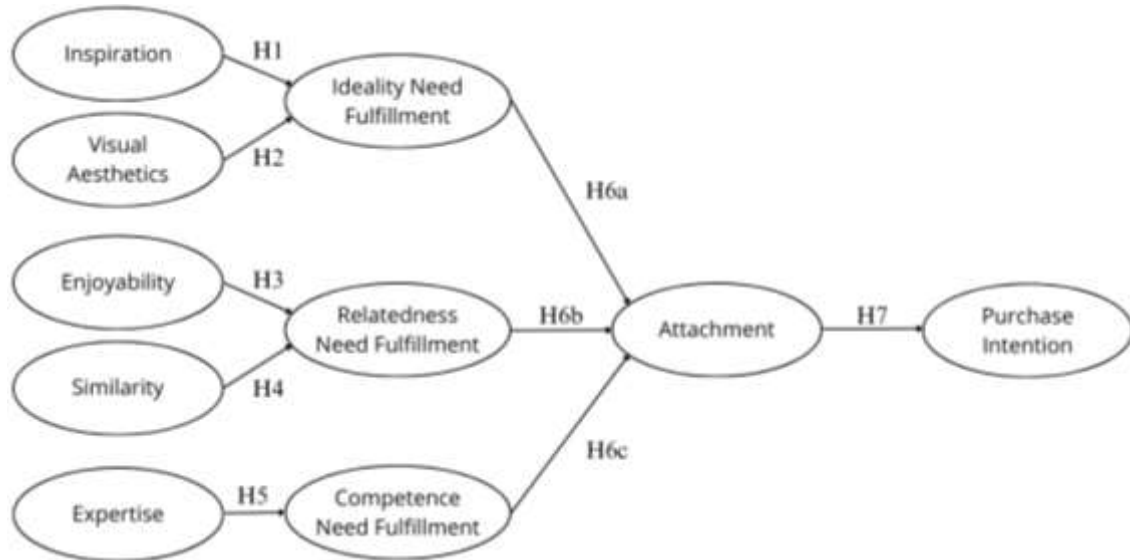


Figure 1 - Proposed Research Model.

3. Method and Data

This chapter outlines the methodological procedures employed in this study to fulfill the stated objectives. These procedures encompass the chosen methodology, data collection process, and model estimation. A comprehensive elucidation of the data processing technique employed in this investigation, namely Structural Equation Modeling (SEM), is provided. For this purpose, the software tool SmartPLS 4 was utilized.

Data was collected during the months of February and March using a questionnaire, in strict adherence to European data protection policy and ethical guidelines.

3.1. Data collection instrument and scales

The most suitable research approach for analyzing the proposed hypothesis is quantitative research, specifically utilizing the survey method. Quantitative research, which involves the quantification of data and typically employs large sample sizes (Martin & Bridgmon, 2012), is considered an objective method employing standardized procedures to gather quantitative data from population samples and draw conclusions (Almeida et al., 2017).

A survey method, as one type of tactic to investigate the knowledge, attitudes, and behaviors of a specific community (Story & Tait, 2019), aims to provide an immediate picture of a particular scenario without attempting to control or manipulate the surrounding circumstances, according to Kelley et al. (2003). In the realm of descriptive research, surveys are highly recommended for providing explanations or testing hypotheses. The convenience, speed of responses, and access to a broader audience make online surveys particularly advantageous (Story & Tait, 2019).

The survey, with a predominant focus on social media users as participants, was distributed through online channels. All participants were provided with comprehensive information regarding the research objectives, data usage, and treatment. Emphasis was placed on the confidentiality and anonymity maintained in the study, and participants were assured of their right to terminate the survey at any point. Detailed information regarding the study's objectives and data handling was provided to participants, who were also guaranteed confidentiality and anonymity throughout the study process. The survey underwent a pilot phase to identify errors and address potential issues and assess the respondents' comprehension of the scale items. The pilot test did not unveil any significant concerns, and minor adjustments were implemented as needed. Participants were instructed to express their level of agreement or disagreement using validated 7-point Likert scales concerning statements related to the

constructs in the model. The items designed to operationalize each construct were formulated based on existing literature. The scale items for inspiration, visual aesthetics, enjoyability, similarity, expertise, ideality need fulfillment, relatedness need fulfillment, competence need fulfillment, and purchase intention were adapted from various sources (see Table 1). Inspiration was measured with 3 items adapted from Bottger et al. (2017); visual aesthetics with 3 items from Bell et al. (1991); enjoyability with 2 items from Chattopadhyay & Basu (1990); similarity with 3 items from Burgoon & Hale (1987) and Feick & Higie (1992); expertise with 3 items from Liljander et al. (2015); ideality need fulfillment with 3 items from Malär et al. (2011) and Swaminathan et al. (2009); relatedness need fulfillment with 2 items from Guardia et al. (2000); competence need fulfillment with 3 items from Guardia et al. (2000) and Pham & Avnet (2004); and purchase intention with 3 items from Pavlou & Gefen (2004).

Constructs	Original Items	Original Author	Adapted Items
Purchase Intention (PI)	<ol style="list-style-type: none"> 1. Given the chance, I predict that I would consider bidding for products from sellers in Amazon's auctions in the future. 2. It is likely that I will actually bid for products from sellers in Amazon's 	(Pavlou & Gefen, 2004)	<p>PI1. Given the chance, I predict that I would consider buying products that are endorsed by virtual influencers, in the future.</p> <p>PI2. It is likely that I will actually buy products that are endorsed by virtual</p>

	<p>auctions in the near future.</p> <p>3. Given the opportunity, I intend to place a bid in the Amazon's auctions.</p>		<p>influencers, in the near future.</p> <p>PI3. Given the opportunity, I intend to buy products that are endorsed by virtual influencers.</p>
Competence Need Fulfillment (CNF)	<p>1. [SMI] makes me feel competent.</p> <p>2. [SMI] makes me feel adequate.</p> <p>3. [SMI] makes me feel capable and effective.</p>	<p>(Guardia et al., 2000);</p> <p>(Pham & Avnet, 2004)</p>	<p>CNF1. Virtual influencers make me feel competent.</p> <p>CNF2. Virtual influencers make me feel adequate.</p> <p>CNF3. Virtual influencers make me feel capable and effective.</p>
Relatedness Need Fulfillment (RNF)	<p>1. [SMI] makes me feel very close to him/her.</p> <p>2. [SMI] gives me a sense of intimacy.</p>	<p>(Guardia et al., 2000)</p>	<p>RNF1. Virtual influencers make me feel very close to them.</p> <p>RNF2. Virtual influencers give me a sense of intimacy.</p>
Ideality Need Fulfillment (INF)	<p>1. [SMI] makes me feel like a mirror image of the person I</p>	<p>(Malär et al., 2011);</p> <p>(Swaminath</p>	<p>INF1. Virtual influencers make me feel like a mirror</p>

	<p>would like to be (my ideal self).</p> <p>2. [SMI] makes me feel close to what is important to me in life with his/her statements.</p> <p>3. [SMI] makes me feel like the kind of person I would like to be with his/her statements.</p>	an et al., 2009)	<p>image of the person I would like to be (my ideal self).</p> <p>INF2. Virtual influencers make me feel close to what is important to me in life with their statements.</p> <p>INF3. Virtual influencers make me feel like the kind of person I would like to be with their statements.</p>
Expertise (EX)	<p>1. When looking at [SMI]'s content, I find he/she is an expert.</p> <p>2. When looking at [SMI]'s content, I find he/she is competent.</p> <p>3. When looking at [SMI]'s content, I find he/she is knowledgeable.</p>	(Liljander et al., 2015b)	<p>EX1. When looking at virtual influencers' content, I find they are experts.</p> <p>EX2. When looking at virtual influencers' content, I find they are competent.</p> <p>EX3. When looking at virtual influencers' content, I find they are knowledgeable.</p>

Similarity (S)	<ol style="list-style-type: none"> 1. I find [SMI] to be quite a bit like me. 2. I find [SMI] to have similar tastes and preferences as me. 3. I find [SMI] to have a lot in common with me. 	(Burgoon & Hale, 1987); (Feick & Higie, 1992)	<p>S1. I find virtual influencers to be quite a bit like me.</p> <p>S2. I find virtual influencers to have similar tastes and preferences as me.</p> <p>S3. I find virtual influencers to have a lot in common with me.</p>
Enjoyability (EN)	<ol style="list-style-type: none"> 1. I find [SMI] funny. 2. I find [SMI] hilarious. 	(Chattopadhyay & Basu, 1990)	<p>EN1. I find virtual influencers funny.</p> <p>EN2. I find virtual influencers hilarious.</p>
Visual Aesthetics (VA)	<ol style="list-style-type: none"> 1. [SMI]'s content is aesthetically pleasing. 2. [SMI]'s content is attractive. 3. [SMI]'s content is visually appealing. 	(Bell et al., 1991)	<p>VA1. Virtual influencers' content is aesthetically pleasing.</p> <p>VA2. Virtual influencers' content is attractive.</p> <p>VA3. Virtual influencers' content is visually appealing.</p>
Inspiration (IS)	<ol style="list-style-type: none"> 1. [SMI] intrigues me with new ideas. 2. [SMI] broadens my horizon. 	(Bottger et al., 2017)	<p>IP1. Virtual influencers intrigue me with new ideas.</p>

	3. [SMI] inspires me to discover something new.		IP2. Virtual influencers broaden my horizon. IP3. Virtual influencers inspire me to discover something new.
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Table 1 - Constructs and Items.

3.2. Sample

Utilizing the snowball method, the survey was circulated with the assistance of individuals who shared it with their contacts and on their social media channels. Through this approach, a final sample of 226 responses was successfully obtained from social media users.

Most of the participants ranged from 24 to 29 years (44,2%) and were women (67,3%). Also, Portuguese participants accounted for 92,5%, followed by England (4,4%). Regarding the occupation, the largest proportion of respondents were workers (58,4%), followed by working students (16,4%). Finally, the educational background of the participants was as follows: master's degrees (44,2%), bachelor's degree (34,1%), high school (14,2%), doctorate (5,3%).

Demographics		Number of responses	Percentage of responses (%)
Age	18-23	56	24,8%
	24-29	100	44,2%
	40-55	50	22,1%
	>55	20	8,8%
Gender	Feminine	152	67,3%
	Masculine	74	32,7%
Education	High school	32	14,2%
	Bachelor	77	34,1%
	Master	100	44,2%
	Doctorate	12	5,3%
	Other	5	2,2%
Country of origin	Portugal	209	92,5%
	Italy	4	1,8%
	England	10	4,4%
	France	1	0,4%
	USA	1	0,4%
	Brazil	1	0,4%
Occupation	Student	41	18,1%
	Working student	37	16,4%
	Employed	132	58,4%
	Unemployed	6	2,7%
	Retired	5	2,2%
	Other	5	2,2%

Table 2 - Demographic characteristics of the sample ($n=226$).

3.3. Data analysis procedures

Using the SmartPLS 4 software, partial least squares (PLS) and SEM were employed to investigate the hypotheses. PLS, as indicated by Hair Jr et al. (2017), is a multivariate analysis method utilized for estimating variance-based SEM. PLS-SEM offers a range of predictive techniques to evaluate and validate exploratory models, making it a preferred approach to anticipate and address research questions, especially in complex models and during initial exploration stages (Hair Jr et al., 2017). Given the novelty of the topic under investigation in this study, the PLS-SEM approach is suitable for yielding optimal findings. Moreover, PLS-SEM serves as a modeling technique particularly useful for handling small sample sizes. Additionally, PLS-SEM proves beneficial for evaluating both structural and measurement models (Hair et al., 2019).

4. Results

4.1. Measurement model

Ensuring the validity and reliability of results, the evaluation of the measurement model holds significant importance. Following the standards outlined by Hair and colleagues, we initially assessed the indicator loadings (Hair et al., 2017; Hair et al., 2019). To be considered reliable, these loadings were required to exceed (0.7), ensuring consistent outcomes. Our analysis indicates that all items demonstrated appropriate factor loadings, ranging from 0.880 to 0.972 (see Table 3).

Constructs/ Items	Loadings	Mean	Standard Deviation
Purchase Intention (PI) - <i>Adapted from Pavlou & Gefen (2004)</i>			
PI1. Given the chance, I predict that I would consider buying products that are endorsed by virtual influencers, in the future.	0.967	3.827	2.102
PI2. It is likely that I will actually products that are endorsed by virtual influencers, in the near future.	0.973	3.671	2.095
PI3. Given the opportunity, I intend to buy products that are endorsed by virtual influencers.	0.971	3.684	2.060
Competence Need Fulfillment (CNF) - <i>Adapted from Guardia et al. (2000); Pham & Avnet (2004)</i>			
CNF1. Virtual influencers make me feel competent.	0.879	2.849	1.807
CNF2. Virtual influencers make me feel adequate.	0.949	3.187	1.784
CNF3. Virtual influencers make me feel capable and effective.	0.947	3.169	1.835
Relatedness Need Fulfillment (RNF) - <i>Adapted from Guardia et al. (2000)</i>			
RNF1. Virtual influencers make me feel very close to them.	0.95	2.658	1.650

RNF2. Virtual influencers give me a sense of intimacy.	0.942	2.476	1.578
Ideality Need Fulfillment (INF) - <i>Adapted from Malär et al. (2011); Swaminathan et al. (2009)</i>			
INF1. Virtual influencers make me feel like a mirror image of the person I would like to be (my ideal self).	0.914	2.631	1.598
INF2. Virtual influencers make me feel close to what is important to me in life with their statements.	0.937	2.520	1.526
INF3. Virtual influencers make me feel like the kind of person I would like to be with their statements.	0.921	2.724	1.682
Expertise (EX) - <i>Adapted from Liljander et al. (2015)</i>			
EX1. When looking at virtual influencers' content, I find they are experts.	0.942	3.747	2.204
EX2. When looking at virtual influencers' content, I find they are competent.	0.966	4.067	2.091
EX3. When looking at virtual influencers' content, I find they are knowledgeable.	0.953	4.031	2.079
Similarity (SI) - <i>Adapted from Burgoon & Hale (1987); Feick & Higie (1992)</i>			
SI1. I find virtual influencers to be quite a bit like me.	0.903	2.787	1.670

SI2. I find virtual influencers to have similar tastes and preferences as me.	0.944	3.231	1.774
SI3. I find virtual influencers to have a lot in common with me.	0.938	2.982	1.743
Enjoyability (EN) - <i>Adapted from Chattopadhyay & Basu (1990)</i>			
EN1. I find virtual influencers funny.	0.944	3.742	1.763
EN2. I find virtual influencers hilarious.	0.956	3.244	1.707
Visual Aesthetics (VA) - <i>Adapted from Bell et al. (1991)</i>			
VA1. Virtual influencers' content is aesthetically pleasing.	0.907	4.444	1.854
VA2. Virtual influencers' content is attractive.	0.943	4.382	1.805
VA3. Virtual influencers' content is visually appealing.	0.929	4.578	1.898
Inspiration (IP) - <i>Adapted from Bottger et al. (2017)</i>			
IP1. Virtual influencers intrigue me with new ideas.	0.880	4.209	1.870
IP2. Virtual influencers broaden my horizon.	0.957	3.871	1.818
IP3. Virtual influencers inspire me to discover something new.	0.902	4.102	1.867

Table 3 - Measurement Results.

Subsequently, three metrics were employed to evaluate the reliability and homogeneity of the constructs: Dijkstra-Henseler's rho (ρ_A), Composite Reliability (CR), and Cronbach's alpha (α). The reliability of the scales was

confirmed by Cronbach's alpha, CR, and rho (ρ_A) values surpassing the threshold of 0.7 (see Table 44) (Hair et al., 2019). Moving forward, the study delved into validity, recognizing its significance in ensuring low correlations between items across different constructs (discriminant validity) and robust correlations between items within the same construct (convergent validity) (Chin, 2010). Consequently, the Average Variance Extracted (AVE), which gauges the extent to which a construct explains the variance of its indicators, was utilized to assess convergent validity in this study. As shown in Table 44, the AVE values for each construct exceeded 0.5, showing that the model meets the convergent validity criteria.

Constructs	Cronbach's alpha (α)	Dijkstra-Henseler's rho (ρ_A)	CR (AVE)
A	0.924	0.925	0.952 (0.868)
CNF	0.917	0.944	0.947 (0.857)
EN	0.892	0.902	0.949 (0.902)
EX	0.950	0.952	0.968 (0.910)
IND	0.915	0.917	0.946 (0.854)
IP	0.901	0.908	0.938 (0.835)
PI	0.969	0.971	0.979 (0.941)
RNF	0.883	0.886	0.944 (0.895)
SI	0.920	0.922	0.949 (0.862)
VA	0.918	0.933	0.948 (0.858)

Table 4 - Construct Reliability and Convergent Validity.

In assessing discriminant validity, this study employed both the Fornell-Larcker criterion (see Table 55) and the Heterotrait-monotrait ratio (HTMT) criterion (see Table 66). The investigation confirmed the Fornell-Larcker criterion, which requires that the square root of a construct's AVE surpasses the correlation between the construct and any other construct (Fornell & Larcker, 1981). Additionally, the HTMT, representing the geometric mean of correlations for

measurement items within the same construct relative to the average item correlations across constructs, was utilized as another criterion for discriminant validity assessment (Dijkstra & Henseler, 2015). As the common variance between constructs was found to be below the cutoff values of 0.90, indicating distinctiveness in the data, the HTMT criterion was also satisfied (see Table 66).

	A	CNF	EN	EX	INF	IP	PI	RNF	SI	VA
A	0.932									
CNF	0.628	0.926								
EN	0.569	0.591	0.950							
EX	0.643	0.619	0.650	0.954						
INF	0.734	0.615	0.649	0.566	0.924					
IP	0.586	0.671	0.648	0.692	0.634	0.914				
PI	0.625	0.654	0.633	0.799	0.557	0.727	0.970			
RNF	0.772	0.694	0.609	0.565	0.808	0.607	0.550	0.946		
SI	0.714	0.540	0.639	0.645	0.685	0.605	0.610	0.711	0.928	
VA	0.531	0.555	0.657	0.747	0.578	0.744	0.693	0.520	0.624	0.926
<p>Notes: Fornell - Larcker criterion Diagonal elements (bold) are the square root of the variance shared between the constructs and their measures (AVE). For discriminant validity, diagonal elements should be larger than off-diagonal elements.</p>										

Table 5 - Fornell-Larcker criteria.

	A	CNF	EN	EX	INF	IP	PI	RNF	SI	VA
A										
CNF	0.673									
EN	0.625	0.653								
EX	0.686	0.648	0.708							
INF	0.796	0.671	0.717	0.604						
IP	0.640	0.732	0.723	0.745	0.696					
PI	0.660	0.683	0.682	0.832	0.590	0.776				
RNF	0.853	0.772	0.684	0.613	0.896	0.682	0.594			
SI	0.774	0.580	0.704	0.689	0.745	0.663	0.646	0.786		
VA	0.574	0.594	0.727	0.800	0.624	0.816	0.734	0.569	0.675	

Table 6 - HTMT ratio.

Lastly, a Variance Inflation Factor (VIF) was utilized to assess the collinearity among all constructs, ensuring that the regression results were not biased (Hair et al., 2011). With VIF values spanning from 1.000 to 3.509, all items exhibited values below or equivalent to 5, signifying the absence of collinearity issues (Hair et al., 2011)(see Table 77).

	VIF
Attachment -> Purchase Intention	1.000
Competence Need Fulfillment -> Attachment	1.959
Enjoyability -> Relatedness Need Fulfillment	1.690
Expertise -> Competence Need Fulfillment	1.000
Ideality Need Fulfillment -> Attachment	2.926
Inspiration -> Ideality Need Fulfillment	2.242
Relatedness Need Fulfillment -> Attachment	3.509
Similarity -> Relatedness Need Fulfillment	1.690
Visual Aesthetics -> Ideality Need Fulfillment	2.242

Table 7 - Variation Inflation Factor (VIF).

4.2. Structural model assessment

After confirming the validity and reliability of the measurement model, a bootstrapping procedure was conducted in SmartPLS with 5000 subsamples to test the study hypotheses using SEM. This process emphasized the coefficients and statistical significance of each path. The primary statistical tools for analyzing the structural model include examining path coefficients and the coefficient of determination R-squared (R^2) (Hair et al., 2019). To evaluate hypotheses H1 (IP \rightarrow INF), H2 (VA \rightarrow INF), H3 (EN \rightarrow RNF), H4 (SI \rightarrow RNF), H5 (EX \rightarrow CNF), H6a (INF \rightarrow A), H6b (RNF \rightarrow A), H6c (CNF \rightarrow A), and H7 (A \rightarrow PI), the model was tested.

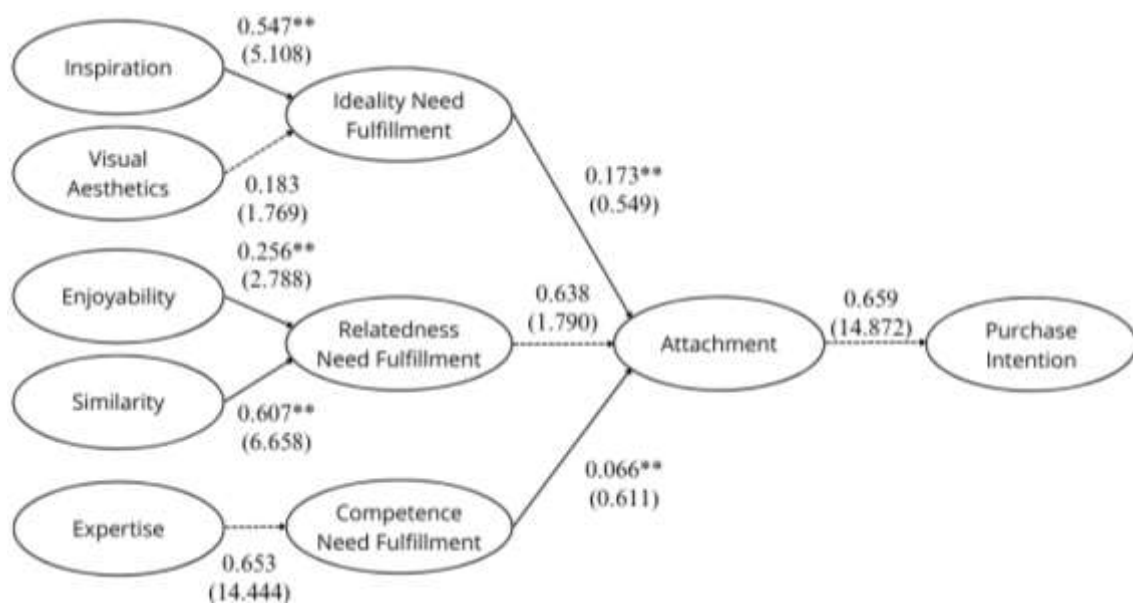


Figure 2 - Estimates of SEM. Note. **p < 0.05, solid line: significant path, dotted line: insignificant path.

The outcomes reveal a positive relationship between inspiration and ideality need fulfillment ($\gamma = 0.547$ and $p < 0.05$), supporting H1; it is important to mention the medium effect size ($f^2 = 0.162$) (Cohen, 1988). Conversely, visual aesthetics is not significantly related to ideal need fulfillment ($\gamma = 0.183$ and $p = 0.541$), thus H2 is not supported. In contrast, both enjoyability ($\gamma = 0.256$ and $p < 0.05$) and

similarity ($\gamma = 0.607$ and $p < 0.05$) are positively related to relatedness need fulfillment, supporting H3 and H4. While the effect size for H3 is small ($f^2 = 0.089$), H4 demonstrates a large effect size ($f^2 = 0.385$). H5 is not supported as expertise was not significantly related to competence need fulfillment ($\gamma = 0.653$ and $p = 0.583$). Regarding H6a and H6c, both ideality and competence needs fulfillment are significantly related to attachment, (respectively $\gamma = 0.173$ and $p < 0.05$; $\gamma = 0.066$ and $p < 0.05$), hence H6a and H6c are supported. The effect size is small on both occasions ($f^2 = 0.083$ and $f^2 = 0.031$, respectively). However, relatedness need fulfillment was found to not be significantly related to attachment ($\gamma = 0.648$ and $p = 0.074$) not supporting H6b. Lastly, H7 is not supported once attachment was not significantly related to purchase intention ($\gamma = 0.659$ and $p = 0.077$).

Hypothesis	Path coefficient	Cis (bias corrected)	t value	p value	f ²	Supported
H1 (IP->INF)	0.547	0.334; 0.753	5.108	0.000	0.162	Yes
H2 (VA->INF)	0.183	-0.023; 0.380	1.769	0.541	0.044	No
H3 (EN->RNF)	0.256	0.091; 0.449	2.788	0.005	0.089	Yes
H4 (SI->RNF)	0.607	0.405; 0.770	6.658	0.000	0.385	Yes
H5 (EX->CNF)	0.653	0.557; 0.735	14.444	0.583	0.622	No
H6a (INF->A)	0.173	-0.298; 0.587	0.549	0.000	0.083	Yes
H6b (RNF->A)	0.648	0.214; 1.213	1.790	0.074	0.149	No
H6c (CNF->A)	0.066	0.133; 0.219	0.611	0.000	0.031	Yes
H7 (A->PI)	0.659	0.566; 0.740	14.872	0.077	0.640	No

Table 8 - Results of hypotheses testing.

The adjusted coefficient of determination value (R^2), measures the variance within the construct, representing a measure of the model's explanatory power

(Shmueli & Koppius, 2011). R^2 ranges between 0 and 1, with a higher value representing a better fit. According to the results of this study, the adjusted R^2 for ideality, relatedness and competence need fulfillment are 0.422, 0.542 and 0.381 respectively, all representing moderate explanatory power. Attachment and purchase intention have an adjusted R^2 value of 0.638 and 0.387 respectively, also showing a moderate explanatory power. So, based on Raithel et al. (2012) guidelines we can conclude that this model is appropriate because all the R^2 values are over 0.10, and these values are substantial since they are above 0.381.

Normally, researchers use the out-of-sample predictive relevance of a model using Stone-Geisser's Q^2 (Geisser, 1974; Stone, 1974; Hair et al., 2017). However, the methodology to derive the Stone-Geisser's Q^2 value involves the use of the blindfolding procedure, which was discontinued in PLS version 4. Consequently, this study opts to utilize Q^2 predict to evaluate the predictive relevance of the model, employing the PLS predict technique (Sarstedt et al., 2022). This choice is made due to the similarity in the interpretation of the results between Q^2 predict and Stone-Geisser's Q^2 (Shmueli et al., 2019). In the PLS predict framework, the Q^2 value compares the prediction errors of the PLS path model with those of simple average predictions. The analysis of Q^2 predict indicated the predictive relevance of this study for all constructs, ideality need fulfillment (0.417), relatedness need fulfillment (0.536), competence need fulfillment (0.376), attachment (0.501) and purchase intention (0.422), since both values are above 0 (Chin, 2010).

5. Discussion

The primary objectives of this study were to: investigate how VIs' attributes influence social media users' needs fulfillment and identify attachment mechanism antecedents; examine attachment mechanisms between VIs and

social media users; determine the impact of attachment mechanisms on consumers' purchase intentions. The results derived from the assessment model furnish valuable insights into the attributes that impact consumers' intent to purchase products endorsed by VIs.

Upon analysis of the results, it was observed that all hypotheses were significantly supported, apart from H2 (VA → INF), H5 (EX → CNF), H6b (RNF → A), and H7 (A → PI). According to this research findings, the fulfillment of ideality needs plays a pivotal role in enabling social media users to perceive VIs as brands endorsers and develop a profound connection with them (H6a). It was observed that visual aesthetics did not exhibit significance in ideality social media users' need fulfillment (H2). This finding aligns with the study conducted by Ki et al. (2020), which demonstrated that visual aesthetics of social media influencers does not affect followers' ideality need fulfillment. One possible explanation could result from the fact that followers, nowadays focus less on VIs' physical traits and put more emphasis on their persona. This research indicates that the inspirational persona of VIs fulfills social media users' need for ideality (H1), rather than their aesthetically pleasing content. Therefore, instead of solely focusing on VIs who possess physical attractiveness or present visually appealing content, brands may consider exercising caution in their selection process. One approach to achieve this is by collaborating with VIs who emphasize inspirational characteristics.

Also, the findings underscore the significance of relatedness fulfillment in fostering social media users' perception of VIs as brand endorsers, but not fostering intimate connections with them (H6b). Specifically, the fulfillment of relatedness needs occurs when a VI is enjoyable and similar to social media users. VIs can cultivate a sense of closeness and address social media users' desires for relatedness by being funny and hilarious or by demonstrating shared interests and preferences with their audience. Thus, our study reaffirms the conclusions

drawn by Khamis et al. (2017), highlighting the substantial role of VIs' similarity as a noteworthy personal trait (H4). Moreover, the quantitative results reveal that when a VI is enjoyable, social media users are more likely to fulfill their relatedness needs (H3), which is consistent with the findings reported by Ki et al. (2020), but not to feel attached to the VI. These outcomes provide nuanced insights into the literature on VIs, accentuating the importance of enjoyability as a pivotal persona-driven attribute that resonates with the fulfillment of social media users' relatedness needs. Consequently, in leveraging VI marketing as an alternative to human influencer and celebrity marketing, marketers may consider collaborating with VIs recognized for their similar and enjoyable persona. In contrast to VIs like Lil Miquela, who mostly endorses luxury brands (Drenten & Brooks, 2020), marketers may favor VIs like Lu do Magalu, who is funnier and portrays everyday situations (de Brito Silva et al., 2022).

Regarding the need for competence, our findings suggest that there is another significant need that social media users seek to fulfill by engaging with VIs, and effectively meeting this need for competence leads to social media users developing strong emotional attachments with the influencers (H6c). More specifically, we observed that expertise is not an attribute of VIs that social media users consider relevant when it comes to fulfilling their competence needs (H5), as evidenced by findings consistent with those of Ki et al. (2020). Particularly, while expertise may not be a primary motivator for followers to satisfy their competence needs, our results indicate that this need positively impacts social media users' attachment to a VI. Thus, when marketing professionals devise strategies for utilizing virtual influencer marketing, for example, for high-tech products that cater to consumers' competence needs, they may opt to focus more on curating informative social media content in collaboration with VIs rather than solely on selecting whom to collaborate with. Consequently, marketing

professionals have an opportunity to leverage brand content from VIs, which provides specific information about product usage and its unique features.

Regarding the first objective of this study, according to the path coefficients, the variables that affect the fulfillment of social media users' needs, in decreasing order of magnitude, are, respectively, inspiration (0.547) regarding ideality need, and similarity (0.607) followed by enjoyability (0.256) regarding relatedness need.

Finally, it is interesting to analyze the unexpected result obtained in hypothesis H7. It was verified that attachment does not have a significant influence on the intention to buy from brands endorsed by VIs. This result was intriguing, and one possible explanation might be the fact that not all social media users interact, daily, with VIs. During the administration of the questionnaire, participants were asked if they ever interacted with a VI. It is important to note that although a participant may know what a VI is, their daily interaction with one can influence their responses. In this way, considering that in recent years, influencers on social media have emerged as a potent marketing asset, capable of significantly enhancing the sales of products and brands they endorse, the participants who are not regular followers of VIs, naturally have a lower intention to buy from brands that have VIs as endorsers (Jiménez-Castillo & Sánchez-Fernández, 2019; Yuan et al., 2021; Ki et al., 2020).

6. Conclusion

By adapting Human Brand Theory to the virtual realm, our study directed attention towards the relationship dynamics between VIs and social media users. This study delved into the mechanisms underlying the development of this connection, as well as its causal factors and subsequent effects. While prior research predominantly focused on social media influencers, our study

illuminated the emerging trend of VIs and elucidated the mechanisms through which social media followers forge strong bonds with them (Ki et al., 2020).

The findings highlighted that, in Portugal—where 92,5% of our study participants were sourced from— VIs have yet to be extensively embraced by brands. Consequently, the profound connection social media users feel towards VIs does not necessarily translate into desirable marketing outcomes, such as purchase intention, exerting an influence on them.

In the exploration of the connection mechanism from the perspective of social media users, an effort was made to identify the specific attributes of VIs that social media users perceived in them and/or in their content, as well as the specific needs they sought to fulfill by following them.

Addressing research question one based on the results, we could verify that similarity was the variable that most contributed to explaining the fulfillment of social media users' needs, namely, need for relatedness. It was also found that inspiration and enjoyability significantly influence the fulfillment of social media users' needs, ideality, and relatedness, respectively. Therefore, those are the main factors that determine the fulfillment of social media users' needs.

Concerning the second research question, the results showed that ideality and relatedness need fulfillment significantly influence social media' attachment to VIs. When applied to competence need fulfillment, this variable has no significant effect on social media users' attachment to VIs.

Regarding research question three, the results of this study doesn't support a significant impact of social media users' attachment to VIs on purchase intention. This result aligns with a study conducted by Lou et al. (2023), which found that in terms of marketing effectiveness, nearly all participants reported never purchasing anything recommended by VIs. Some respondents' comments included: "Like makeup products and stuff like that, right? Um, I would say no, not much influence [on my purchase]." and "Absolutely not.... Like if they are

attempting to influence people to purchase something or they're endorsing something. It's a bit hard, because they're not real." (Lou et al., 2023, 12).

Thus, this chapter presents the contributions to the literature, followed by the limitations of the study and suggestions for future research.

6.1. Theoretical Findings

Previous research provided the foundational evidence for this study, which pursued to bridge the gap between existing research from related fields and the context of VIs (Ki et al., 2020). Given the novelty of VIs, this study adapted and validated concepts from prior papers on social media influencers (Ki et al., 2020). Consequently, our study contributes significantly to the body of knowledge on VIs and marketing research of virtual influencer marketing.

Initially, this study developed a model inspired from Human Brand Theory and the study of Ki et al. (2020) to examine the attributes of VIs and their impact on social media users' needs fulfillment, as well as the influence of their attachment to these influencers. Further, explored the potential effect of this attachment on purchase intention towards brands endorsed by VIs. Beyond ideality, relatedness, and competence needs fulfillment, the model also integrated variables related to inspiration, visual aesthetics, enjoyability, similarity, and expertise as possible key determinants of social media users' attachment to VIs (Lou et al., 2023; Yu et al., 2023; Ki et al., 2020). Additionally, variables related to users' needs, such as ideality and competence, were considered as crucial factors influencing the attachment between users and VIs. However, the need for relatedness among social media users did not demonstrate significant influence on their attachment to VIs. Furthermore, the impact of this attachment on users' purchase intentions was tested but did not yield significant results.

Considering the early stage of VIs and the limited research that has not extensively explored the influence of VI attributes on the needs of social media users, this study provides a foundational framework for future research in virtual influencer marketing. It offers valuable theoretical insights that can inform and guide future studies on VIs and their impact on consumer behavior and brand engagement.

6.2. Managerial Contributions

This study is important for brands' marketing departments, businessmen exploring the virtual influencer marketing industry and all individuals and researchers interested in this topic and in the purchase of products or services from brands that have VIs as endorsers.

Based on the results obtained, marketers involved in this sector can make more informed decisions regarding the use of VIs. This research shows that potential followers of VIs believe that they can create connections with VIs. Therefore, marketers, to strengthen the relationship between social media users and VIs, should adopt a consistent strategy that effectively allows social media users to differentiate VIs from the others and get a larger benefit from following them. For that, benefits such as avoiding challenges like fatigue, scandals, and logistical constraints, enabling a more consistent and always-available online presence should be more frequent. Hence, this strategy will lead social media users that like to interact with VIs because they will feel that their relationship with the VI can be enhanced. This is supported by the significant impact of social media users' ideality and relatedness needs fulfillment on the attachment to VIs, verified in this study.

Furthermore, social media users who are highly attached with VIs tend to believe more in them and have the desire to follow VIs, which might, in the future, make them willing to buy from brands endorsed by VIs. This was not the

case in this study, due, for example, to the lack of interaction between the participants and the VIs.

This study also shows that inspiration, as well as enjoyability and similarity, are important factors in social media users' needs fulfillment. Therefore, marketers and entrepreneurs can adopt some strategies, for example when choosing the VIs they want to work with, by choosing the ones that emphasize these characteristics more than visual aesthetics and expertise, attributes that, in this study, did not show a significant impact on ideality need fulfillment and competence need fulfillment, respectively. Following the same goal, the business owners of the platforms and systems which create VIs can develop them, promoting and paying attention to the attributes that the participants in this study considered to be important to them. For instance, when designing a VI, creators may prioritize imbuing it with an inspirational persona to enhance its connection with social media users. Similarly, if a vegan brand intends to create a VI, it may emphasize the VI's similarity to its target consumers. This emphasis on similarity can affect whether consumers are influenced by the VI or not, as it was highlighted in this study, where similarity of VIs with social media users significantly impacted social media users' need for relatedness. Following this logic, platforms creating a VI for an Instagram account should focus on fostering the VI's entertaining persona. This approach can stimulate the interest of social media users, encouraging them to follow the VI and fostering a sense of enjoyment and attachment to the VI.

The lack of significant impact of social media users' attachment to VIs on the intention to purchase from brands endorsed by them highlights the influence of various factors. For instance, the diversity of influencers, their varying levels of trust and credibility, and the brand reputation and image associated with VIs can all affect how users connect with these influencers and, consequently, their purchase intentions. Again, marketers may use VIs as a strategy, guiding social

media users to a better understanding of the topic and consequent acceptance of them, increasing their impact on purchase intention.

6.3. Limitations and Future Research

Although this study contributes to the VIs' literature, it is not free of some limitations.

First, due to resource and time constraints, the sample collected was a convenience sample and focused on young Portuguese adults. Consequently, it consisted of highly educated young individuals which may bias the results since they are more willing to adopt new technologies. It also happened that a percentage of the studied sample had no previous knowledge about what VIs are, nor their utilities, since this type of influencer marketing has not yet taken its first steps in Portugal. Thus, although the concept of VIs and their attributes were explained to the participants, this may not have been fully understood by them and, possibly, may have led to some bias in the answers. Therefore, further research could focus on collecting data from other countries where the field of virtual influencer marketing is more widespread among the population, and where there are more brands using VIs as endorsers. For example, United States of America and Brazil are the countries that use VIs the most.

Second, this study seeks to fill the gap in current literature by adapting concepts and theories from related fields, such as social media influencers, to the distinctive context of VIs. Given the limited research specifically focused on how VI attributes influence the needs of social media users, some of the relationships explored in this study may lack well-established and widely accepted support in the literature. This underscores the necessity for further investigation and the advancement of knowledge regarding VIs.

Third, this study did not consider some other variables that may have an interesting impact on purchase intention from brands that have VIs as endorsers.

Future studies could analyze the impact of brands image and attachment, other personal and content-driven attributes like trust and informativeness, the parasocial relations, among others. Moreover, future research could try to assess the investment profile of brands in the use of VIs.

Finally, for future research, it would be valuable to investigate the impact of these variables on actual purchases from brands endorsed by VIs, as intention is only a proxy for the ultimate goal of real purchases. The inclusion of the real purchase would also allow studying some interesting outcomes such as how the purchase from brands endorsed by VIs impacts brand loyalty, brand equity, and value co-creation. This analysis would be highly relevant because, in addition to evaluating the inherent usefulness of VIs as points of reference for social media users, it would also shed light on whether they play a significant role in building brand equity and contributing to the ultimate marketing variable, brand loyalty. Therefore, understanding any potential advantages over competitors that VIs may offer is crucial, making it imperative to investigate the impact of this type of influencer.

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Appendix

Appendix I – Survey

Virtual Influencers

This survey, developed by a research group from Católica Porto Business School, aims to study the relationship between Virtual Influencers and their followers by focusing on their attachment development mechanism and its casual factors and effects. We therefore invite you to collaborate in this research by filling in the following questionnaire.

It will take about 6 minutes to complete the questionnaire.

All answers will be treated confidentially, according to the General Data Protection Regulation (EU GDPR 2016/679). Your participation is voluntary and you can withdraw at any point in the questionnaire.

We ask you to be as realistic and honest as possible in your answers. There are no right or wrong answers to the questions. Above all, we are interested in your opinions.

If you have any questions, please contact the data security officer at cmgfrancisco@ucp.pt.

Your cooperation is essential for this work to be carried out.

Thank you in advance for your participation!

Do you use social media platforms? *

Yes

No

Do you know who virtual influencers are?*

Yes

No

Have you ever interacted with a virtual influencer? (Like, comment or share)

*

Yes

No

Virtual influencers are AI (Artificial Intelligence) computer-generated characters designed to resemble and interact with humans on social media platforms. These digital personas are programmed to engage in marketing, influencer campaigns, and content creation, often blurring the lines between real and artificial identities in the online sphere.

Below, you'll find an example post from a well-known virtual influencer named Lil Miquela.

Now, we kindly ask you to respond to a series of questions about your opinions and perceptions regarding virtual influencers.

Please indicate your opinion on a scale ranging from 1 to 7, where **1 means 'Strongly Disagree'** and **7 means 'Strongly Agree'**.

Virtual influencers intrigue me with new ideas. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

Virtual influencers broaden my horizon. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

Virtual influencers inspire me to discover something new. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

Virtual influencers' content is aesthetically pleasing. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

Virtual influencers' content is attractive. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

Virtual influencers' content is visually appealing. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

I find virtual influencers funny.. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

I find virtual influencers hilarious. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

I find virtual influencers to be quite a bit like me. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

I find virtual influencers to have similar tastes and preferences as me. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

I find virtual influencers to have a lot in common with me. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

When looking at virtual influencers' content, I find they are experts. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

When looking at virtual influencers' content, I find they are competent. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

When looking at virtual influencers' content, I find they are knowledgeable.*

Strongly disagree

- 1
- 2
- 3
- 4
- 5
- 6
- 7

Strongly agree

In this section, respondents will be asked about the virtual influencers attributes that fulfill their ideality, relatedness and competence needs.

Virtual influencers make me feel like a mirror image of the person I would like to be (my ideal self). *

Strongly disagree

- 1
- 2
- 3
- 4
- 5
- 6
- 7

Strongly agree

Virtual influencers make me feel close to what is important to me in life with their statements. *

Strongly disagree

- 1
- 2

3

4

5

6

7

Strongly agree

Virtual influencers make me feel like the kind of person I would like to be with their statements. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

Virtual influencers make me feel very close to them. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

Virtual influencers give me a sense of intimacy. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

Virtual influencers make me feel competent. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

Virtual influencers make me feel adequate. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

Virtual influencers make me feel capable and effective. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

In this section, respondents will be asked about how their needs fulfillment affects their strong attachment to virtual influencers.

I find virtual influencers to be a part of me. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

I feel personally connected to virtual influencers. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

I feel emotionally attached to virtual influencers. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

In this section, respondents will be asked about their attachment transfer from virtual influencers to their endorsements, as well as their intention to purchase and speak well of recommended products or brands.

Given the chance, I predict that I would consider buying products that are endorsed by virtual influencers, in the future. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

It is likely that I will actually buy products that are endorsed by virtual influencers, in the near future. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

Given the opportunity, I intend to buy products that are endorsed by virtual influencers. *

Strongly disagree

1

2

3

4

5

6

7

Strongly agree

Demographic Section

What is your age? (In numbers) *

What is your gender? *

Masculine

Feminine

Non-binary/other

I'd rather not answer

What are your academic qualifications? *

High school

Bachelor's degree

Master's degree

Doctorate

Other:

Where are you from? *

What is your occupation? *

Student

Working student

Employed

Unemployed

Retired

Other: