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Challenges in the Digital Marketing Realm of Human-like Virtual Influencers: What Drives Instagram Users' Engagement Intentions?

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Abstract

Human-like virtual influencers (VIs) have become an increasingly important component of social media marketing. Their human-like appearance can simultaneously attract users and, meanwhile, evoke discomfort associated with the uncanny valley. This study utilized quantitative research via partial least squares structural equation modeling. A total of 845 Instagram users contributed to the dataset. The findings demonstrated that informative content did not significantly influence Instagram users' engagement intentions, whereas entertaining content exerted a favorable influence. Simultaneously perceived innovativeness was the strongest antecedent, while perceived personalization was also significant. In addition, both cognitive and affective empathy significantly strengthen parasocial relationships, which subsequently increase users' engagement intentions toward human-like VIs. This study contributes in three ways. First, it identifies the relative importance of content, social relationships, and personal gratifications in explaining engagement intentions with human-like VIs. Second, it extends research by distinguishing the complementary roles of cognitive and affective empathy in fostering parasocial relationships with human-like VIs. Third, the findings suggest that cognitive and affective empathy may help explain why users form meaningful social relationships with highly human-like VIs despite concerns associated with perceived artificiality, thereby offering a more nuanced understanding of engagement intentions in the context of virtual influencer marketing.

Keywords: empathy; parasocial relationships; uncanny valley theory; uses and gratifications theory; virtual influencers

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1. Introduction

Virtual influencers (VIs) are being increasingly incorporated into brand communication strategies (Khalfallah & Keller, 2026), and they have also exerted a significant amount of influence on the behavior of consumers (Y. Y. Lee et al., 2025). These VIs, developed by AI algorithms, closely mimic human personalities and actively engage with audiences across social media platforms such as Instagram (J. Kim & Kim, 2026). The global virtual influencer market, indicative of its increasing commercial importance, is valued at over USD 6 billion and is anticipated to reach USD 46 billion by 2030, exhibiting a compound annual growth rate of 40.8% (F. Liu, 2026). VIs are becoming more popular around the globe. They have endorsed businesses across various sectors, including retailers (e.g., Marks & Spencer, Amazon, and Alibaba) (Hedhli et al., 2023), food (e.g., KFC, McDonald's),

fashion (e.g., LVMH, Prada, Balmain), cosmetics (e.g., L'Oréal), lifestyle (e.g., IKEA), mobile technology (e.g., Samsung), and automobiles (e.g., Porsche) (H. Kim & Park, 2023; Gan et al., 2025). A survey conducted in the United States revealed that 58% of respondents reported following at least one VI. In the same vein, a survey conducted in the United Kingdom revealed that 54% of consumers followed VIs due to their appeal being similar to human influencers (Hedhli et al., 2023). This trend is further supported by E. Kim et al. (2023), who indicate that 58% of consumers have engaged with at least one VI, and 35% have had their purchases influenced by them.

All the ranked VIs share computer-generated imagery, but their anthropomorphic appearance varies. VI typologies can be distinguished based on their appearance and perceived level of realism. Three types of VIs have been identified in the recent literature: (1) nonhuman VIs, which are anthropomorphic objects, animals, toys, or imaginary creatures (@guggimon; @janky); (2) animated-human VIs, which are similar to stylized cartoon and anime-like VI characters (@anymalu_real; @imapoki; @KizunaAI), and doll-like VIs (@noonoouri; @realqaiqai); and (3) human-like VIs, which are almost identical to real humans (@magazineluiza; @imma.gram) (Conti et al., 2022; Dang et al., 2025). Figure 1 illustrates examples of VI categories.



Figure 1. Examples of virtual influencer categories.

Human-like VIs have attracted a lot of interest (Qu & Baek, 2024). Their realistic and anthropomorphic features not only provide a feeling of familiarity but also allow for greater emotional attachment to their audiences (Shao, 2024). Nonetheless, there is limited understanding of the influence of human-like VIs on consumer behavior, particularly concerning engagement intentions. Previous research provides an overview of typical VI categories and does not specifically address the typologies of human-like VIs. For example, the research of Xie-Carson et al. (2023b) explores user engagement across all types of VIs, such as toys, mascots, licensed characters, robots, and 2D and 3D animation VIs. Despite the growing scholarly interest in social media interactions with VIs, users' intentions to engage with human-like VIs remain inadequately comprehended due to the phenomenon's novelty, and this remains a highly specific issue. However, there are conflicts due to the fact that certain consumers are dismissive of VIs or refuse to engage with them. Although some individuals perceive VIs as a positive force in the fight against loneliness and isolation (Hedhli et al., 2023; Angmo & Mahajan, 2024), academic studies have found that the human-likeness of artificial entities can elicit a surge of negative reactions from consumers, which is explained by the uncanny valley theory (B. Kim et al., 2022). When consumers interact with AI that is nearly but not quite human-like, they may experience uneasiness and discomfort (Mori, 1970). Consumers' negative reactions are predicted by Mori's (1970) uncanny valley theory; as robots or avatars begin to increasingly resemble humans, users may start to react negatively to them because of their uncanny similarities to humans. Meanwhile, empirical results have not been consistent. The supporting evidence for the uncanny valley has been mixed, disputed, and often inconsistent in the setting of human-like VIs. For instance, Arsenyan and Mirowska (2021) conducted a study based on the uncanny valley theory to explore the emotions of human-like VI followers and discovered that these followers reacted more negatively than followers of anime-like VIs and human influencers. Supporting this evidence, Lou et al. (2022) discovered that the majority of

followers perceived human-like VIs as uncanny and authentically fake. Moreover, Qu and Baek's (2024) study revealed that human-like VIs were less trustworthy than anime-like VIs and human influencers. Additionally, there were more negative sentiments toward human-like VIs than toward anime-like VIs and human influencers. In contrast, the study of Block and Lovegrove (2021) found that a VI's persuasiveness relies on how human-like it is, with more human-like VIs having a greater effect on persuasion. Lu do Magalu is a prominent example of a human-like VI who successfully persuades her admirers with her attractiveness and uniqueness. Furthermore, empirical research by Rungruangjit et al. (2024) provides support, finding that consumers' willingness to follow and purchase intentions increase with the consumption of content posted by human-like VIs. Thus, based on the preliminary contradictory findings, this research gap serves as a way to ascertain the validity of the uncanny valley theory, and it is critical to understand users' engagement intentions in the context of human-like VIs. However, little research has been conducted on this topic in the literature. To fill this knowledge gap, the following research objective is proposed: **to investigate the motivational factors that influence Instagram users' engagement intentions toward human-like VIs.**

In addition, academics specializing in technology and media use the uses and gratifications (U&G) theory, which was introduced by Katz (1959), as a helpful technique for gaining a more profound understanding of people's goals and motivations when interacting with media. It is a method for understanding how and why people use media to fulfill particular needs (Katz, 1959; Raacke & Bonds-Raacke, 2008) and to comprehend the reasons behind consumers' preferences for and use of particular media types (Pelletier et al., 2020). The theory assists in identifying consumer motivations for consumption behaviors in order to achieve gratification by recognizing the inherent desires that draw consumers to a specific medium (H. Lim & Kumar, 2019). According to Kujur and Singh (2017), three gratifications for engagement behavior on social networking platforms are identified, each supported by distinct underlying factors, including content, social relationships, and personal gratifications. U&G theory has been used in earlier research to examine the motivational factors that influence followers' engagement with branded pages on social media (e.g., Kujur & Singh, 2019; Dolan et al., 2019; Fernandes & Castro, 2020; Ananyaa & Shobana, 2025; Kocak et al., 2026) and social media influencers (e.g., Gui & Huang, 2025; Pei et al., 2026; X. S. Hu et al., 2026; Hanyang et al., 2026), while a few studies have explored U&G theory related to VIs (e.g., Lou et al., 2022; Rungruangjit et al., 2024; Chen et al., 2026; Y. Fu et al., 2026). Nonetheless, in relation to human-like VI marketing, previous investigations have employed U&G theory. However, these studies have only explored select facets of gratification factors, rather than all three dimensions of gratification drivers. Thus, to bridge this gap, this study examines source factors from the perspective of U&G theory and classifies people's understanding of their goals and motivations regarding users' engagement intentions toward human-like VIs within three gratifications: content, social relationships, and personal gratifications. Each of these is addressed in the subsequent sections.

First of all, for content gratification, the principal aim of a brand on social networking sites is to engage an audience by providing value or satisfaction through its content (Malthouse et al., 2013; Ahiabor et al., 2023). Human-like virtual influencers possess the unique ability to create content continuously (Bringé, 2022), and they can generate content with an impact comparable to that of powerful human influencers by mimicking their physical characteristics (Sands et al., 2022). Human-like VIs can produce engaging content for their followers, particularly content that is frequently encountered, which includes informative and entertaining content (Rungruangjit et al., 2024). In today's fast-paced environment, where individuals often seek brief moments of relief and enjoyment, engaging and entertaining content provides enjoyment and pleasure for audiences (R. Liu et al.,

2026). Moreover, informative content significantly affects social media users' inclination to follow human-like VIs, as they like to interact with valuable information and be updated on emerging product trends. Human-like VIs should prioritize engaging consumers' attention and inspiring consumers with the creation of informative content (Rungruangjit et al., 2024). Therefore, this study identifies and conceptualizes two primary content motivations: (1) informative content, and (2) entertaining content. Thus, we propose the following research question:

RQ1. *What types of content, comprising informative and entertaining content, influence Instagram users' engagement intentions toward human-like VIs?*

In the second perspective of U&G theory, the necessity of social relationship gratification is emphasized (Kujur & Singh, 2017). The emergence of human-like VIs in digital marketing has garnered much attention for their function in cultivating parasocial relationships with followers. Despite their digital essence, virtual influencers frequently cultivate parasocial interactions with followers, fostering emotional connections (J. Kim & Kim, 2026), and they have altered the dynamics of parasocial relationships (F. Liu & Wang, 2025). They are digital beings with anthropomorphized appearances, human bodies, social roles, and identities (Byun & Ahn, 2023); their appealing looks and unique personalities make interactions with consumers more social (Gutuleac et al., 2024). However, in contrast, Mori's (1970) uncanny valley theory suggests that as human-like VIs become more realistic, they often induce anxiety and a sense of unease (I. Kim et al., 2024). Consumers' uneasiness increases when they engage deeply with VIs' content while being conscious of its artificiality, which may weaken parasocial relationships (R. E. Lim & Lee, 2023). Supporting this idea, the research of Lou et al. (2022) discovered that the majority of followers thought human-like VIs were uncanny and authentically fake and were unable to develop parasocial relationships with them. Consequently, based on the preliminary contradictory findings, research within the scope of U&G theory, from the perspective of social relationship gratification in terms of parasocial relationships toward human-like VIs, has been relatively contradictory. Our research gap serves as a way to clarify these contradictions and attempts to address this gap.

Moreover, this study investigated how the empathy model (cognitive and affective empathy) affects the parasocial relationships that occur between users and human-like VIs. Empathy can strengthen online parasocial relationships in virtual interactions by facilitating connections between virtual and physical realities (D. Shin, 2018), which is essential for fostering and reinforcing the intimate connection between influencers and users (Jung & Im, 2021). Online synchronous and textual conversations usually make use of and foster high degrees of empathy (K. Hwang & Zhang, 2018). Since people feel more comfortable disclosing their sensitive information online, online social support can be more efficient than in-person social support when experiencing empathy (Caplan & Turner, 2007). Technology cues have the potential to elicit empathy, leading users to view the virtual world as more lifelike (D. Shin & Biocca, 2017). AI can recognize and deduce its consumers' emotions with accuracy if it has sufficient programming knowledge and training. Research on the potential of AI to create emotional bonds is expanding as computers become more sophisticated and intelligent in terms of their broad uses (Huang & Rust, 2018).

However, prior studies examining the relationship between the empathy model and parasocial relationships have concentrated on the social relationships between human influencers and their followers (K. Hwang & Zhang, 2018). Meanwhile, in the emerging field of VIs, empathy is also essential for comprehending and elucidating the interactive relationship between VIs and their followers (Mirowska & Arsenyan, 2023). Furthermore, the research of Bhatnagr (2026) analyzes user sentiments through text-mining techniques

regarding virtual influencers on Instagram. The findings indicate that negative keywords such as "detachment," "disconnect," and "apathy" characterize users' feelings about the absence of a genuine emotional connection with virtual influencers. The statement "this influencer feels distant and indifferent" conveys disenchantment due to the seeming absence of concern, empathy, and authentic engagement. Moreover, the study of M.-H. Shin and Lee (2024) investigated the relationships between VIs and their followers, addressing the overall effect of empathy on parasocial interaction and its transition to parasocial relationships. A limitation of this prior research was its oversight of the cognitive and affective aspects of empathy. Thus, our study is the inaugural assessment of cognitive and affective empathy for human-like VIs, providing greater insights into consumer perspectives. This notion was integrated into the conceptual framework to meet the research gap. The research inquiry is as follows:

RQ2. *Do cognitive and affective empathy have an impact on parasocial relationships? And do parasocial relationships influence Instagram users' engagement intentions toward human-like VIs?*

Lastly, the ultimate aspect of U&G theory emphasizes personal fulfillment, reflecting an individual's perspective. In terms of perceived innovativeness, it can be considered the expression of an individual's propensity to assume risks in the realm of innovative technologies (Molinillo et al., 2023; Y. Liu et al., 2026). Previous research has established that perceived innovativeness is a significant psychological and cognitive determinant that profoundly affects users' behavioral intentions (Nan et al., 2025; Thi & Duong, 2025). Individuals who actively seek creativity are inclined to adopt technology innovations and changes, demonstrating an elevated degree of inventiveness and finding satisfaction in exploring new services (Alkawsi et al., 2021). Furthermore, consumers are predisposed to developing positive assessments of a technology when it is regarded as unique and innovative (J. Hwang et al., 2019). In particular, teenagers are highly aware of new innovations, often interacting with human-like VIs. They are interested in exploring new brand innovations through these VIs. Brands perceived as collaborating with human-like VIs are seen as more innovative and tech-savvy than those that collaborate with human influencers (Conti et al., 2022).

In addition, compared to recommendations made by humans, consumers thought AI-generated recommendations were more personalized. This is because the ability to deliver accurate and pertinent content to users through objective data analysis based on prior consumption behavior is a prerequisite for personalization (Adomavicius & Tuzhilin, 2005; Liang et al., 2008; Yoon & Lee, 2021). Moreover, consumers' expectations for interactions with human-like VIs may differ from those with human influencers (Mouritzen et al., 2024). Consumers want tailored interactions in a timely manner (Crolic et al., 2022), and personalized communications from human-like VIs engage a large number of consumers more effectively than those from human influencers (Mouritzen et al., 2024), because human-like VIs have more creative freedom when generating content than human influencers (Arsenyan & Mirowska, 2021) and can also be tailored to a brand's intended image and message for particular consumers (Gerlich, 2023). Based on the empirical evidence mentioned above, this study is among the first investigations into the potential use of the personal gratification perspective of U&G theory concerning perceived innovativeness and perceived personalization. As a result, the research question is presented as follows:

RQ3. *Do perceived innovativeness and perceived personalization impact Instagram users' engagement intentions toward human-like VIs?*

This study's contributions offer helpful theoretical and practical insights. These findings contribute to the literature about U&G theory in relation to human-like VIs, shed light on the uncanny valley's mitigating elements, and have theoretical and practical implica-

tions for the effectiveness of VIs in engagement intentions within marketing initiatives. Although U&G theory elucidates the motivational drivers that encourage individuals to actively consume media in order to satisfy their informative and entertaining content, social relationships, and personal gratifications, it inadequately accounts for the reasons users might still abstain from interacting with highly human-like VIs despite obtaining these gratifications. Conversely, uncanny valley theory explains the psychological discomfort and perceived artificiality that may discourage interactions with highly anthropomorphic virtual entities, yet it provides limited insight into the positive motivations that encourage users to overcome these negative reactions. Therefore, these two theories should be regarded as synergistic rather than adversarial viewpoints. The U&G theory elucidates the motivational factors that attract users toward human-like VIs, whereas uncanny valley theory delineates the deterrent processes that could impede such intention to engage. Integrating these theoretical perspectives provides a more comprehensive understanding of users' engagement intentions by concurrently considering the motivational advantages and the psychological obstacles linked to interactions with human-like VIs.

Furthermore, this study establishes theoretical linkages between the concepts of cognitive and affective empathy and parasocial relationships in the context of human-like VIs through focusing on Instagram users' engagement intentions. Ultimately, regarding the contextual gap, although the majority of studies on VIs have concentrated on Western markets or China (Dondapati & Dehury, 2024; Yi & Lee, 2024), the adoption of VIs is relatively recent and insufficiently examined in emerging markets (Kumar & Shankar, 2024) such as Malaysia (Gan et al., 2025), Vietnam (Dang et al., 2025), and Thailand, notwithstanding their swift digital transformation and growing integration of AI-driven technologies. As human-like VIs transform digital marketing and consumer-brand interactions, comprehending their efficacy has become a strategic need rather than only an academic endeavor (Dang et al., 2025). This study addresses theoretical, methodological, and contextual deficiencies in existing research, thereby advancing scholarly discourse on human-like VIs and offering brands actionable insights to enhance their influencer marketing efforts in a progressively AI-driven world.

2. Theoretical Background and Literature Review

2.1. Human-like Virtual Influencers and the Instagram Platform

Following the rise in human-like VIs such as Lil Miquela, Imma, and Lu do Magalu, a plethora of similar human-like VIs have emerged globally, cementing their positions as cultural and commercial icons, particularly in the beauty and fashion industries. Ads for several luxury labels have included human-like virtual fashion influencers, including Chanel, Louis Vuitton, Dior, and Versace. In the midst of fashion week in Shanghai, Moscow, and Helsinki, Forbes debuted a number of human-like virtual fashion influencers via online virtual runway presentations (Y. Shin & Lee, 2023). A lot of people follow popular human-like VIs, and their followers are similar to those of the most prominent human influencers (Y.-H. Lee & Yuan, 2023). Human-like VIs have the ability to exhibit emotions in a manner that avatars or other varieties cannot (Yu et al., 2024). They are created to resemble real people in appearance and behavior. They can have social media profiles and share content as advertisers (Gerlich, 2023), share made-up stories that simulate real-life experiences in an effort to emotionally connect with users (R. E. Lim & Lee, 2023), and post about their everyday activities, express human feelings such as love or happiness, and offer opinions on societal topics (Rungruangjit et al., 2024). Their goal is to gain influence over consumers by posting social media content and having interactive conversations as nonhuman virtual characters (Mouritzen et al., 2024). Marketers can tailor human-like VI personas to target consumers in a way that fits their image and aligns with their brand values (Conti et al., 2022).

Interestingly, in 2016, the Instagram platform launched a human-like VI, transforming the advertising industry (H. Kim & Park, 2023). Instagram's visual content has the potential to appeal to VIs in the fields of fashion and beauty, lifestyle and fitness, and other related fields (Bhatnagr, 2026). The platform's visually captivating aesthetics and filters create an ideal setting for marketing products, particularly beauty items, and promoting opulent lifestyles and premium businesses. Various fashion and beauty firms, like Dior, Giorgio Armani, and Gucci, have engaged in collaborations with VIs to adeptly market their products, particularly emphasizing new product launches (Barari, 2023). Moreover, Instagram is a highly visual platform of photos or videos, often augmented by short text (Casaló et al., 2020); the most human-like VIs are active on Instagram (Chan et al., 2023), and they use it to interact and communicate with their followers (Xie-Carson et al., 2023a), as it has a higher engagement rate than other social media platforms (Casaló et al., 2020). Furthermore, the most popular human-like VIs (Lu do Magalu, Lil Miquela, Shudu, and Imma) (Jhawar et al., 2023) all have Instagram accounts, but some do not have TikTok accounts, Facebook accounts, or YouTube channels. Therefore, this research focuses on studying Instagram, the platform most commonly used by all four popular virtual influencers.

2.2. Human-like Virtual Influencers and Users' Engagement Intentions

The term "engagement intentions" refers to people's inclination and willingness to actively connect with and participate in discussions, content, and activities on digital platforms (Van Doorn et al., 2010; Hollebeek et al., 2014). It encompasses active participation in online communities and conversations, as well as interactions such as likes, comments, and shares (Kabadayi & Price, 2014; Schultz, 2017). In the context of human-like VIs, researchers have revealed that human-like VIs can interact with consumers just as efficiently as human beings (Stein et al., 2024). Individuals' personal identities can be developed and displayed through interactions with them, particularly in highly visible settings like social media (Edwards et al., 2019). Human-like VIs can provide a window into an alternate reality, satisfying the requirement for distraction. Such a diversion from human influencers may be practicable, but it also bridges the real and fictional worlds, which may offer extra enjoyment or benefits for escape (Arsenyan & Mirowska, 2021). Marketers can effectively connect and interact with their target consumers on social media platforms by utilizing human-like VIs to generate content and campaigns (Gerlich, 2023). In this study, engagement intentions were defined as the degree to which Instagram users intend to interact, plan to interact, and anticipate interacting with human-like VIs, such as by reading, liking, commenting on, and sharing posts (M. L. Khan, 2017; Jin, 2023). This was outlined as users' engagement intentions.

2.3. Uncanny Valley Theory

The uncanny valley theory was developed by Mori in 1970. This theory posits a hypothetical graph illustrating the nonlinear correlation between a human perceiver's emotional response and the degree of anthropomorphism in a character. Consequently, the extent to which an object physically resembles a human may provoke either positive or negative feelings and thoughts when people observe human-like robots and computer-generated characters, such as virtual avatars (Mori, 1970; Cheetham et al., 2011). People may negatively react to AI if it appears to have human-like characteristics (Jin, 2023). To address this issue, Mori (1970) suggested designing AI (like robots) to be less human-like in order to maintain a safe level of acceptability among humans. Nonetheless, existing research has shown contradictory findings. For example, a study by Ciechanowski et al. (2019) found that a simpler text chatbot produced fewer negative reviews and had fewer eerie effects than an animated avatar chatbot. Conversely, Hanson et al. (2005) employed

an online survey to assess individuals' responses to movies depicting two robots emulating human facial emotions. Next, they used the same survey to investigate people's acceptance of six virtual influencer frames, which ranged from cartoon to realistic. They found that lifelike robots might be attractive. Furthermore, Arsenyan and Mirowska (2021) discovered that anime-like VIs and human influencers obtained more positive responses from users than human-like VIs based on their analysis of human-like VIs' posts and comments on Instagram. Thus, additional research is needed to explore the uncanny valley theory concerning consumers' engagement intentions toward human-like VIs.

2.4. Uses and Gratifications Theory

The concept of U&G theory was conceived by Katz (1959) with the intention of examining the effects of media from the point of view of consumers. This theoretical framework has been utilized to explore the ways in which and the reasons why consumers interact with various forms of media, as well as why they participate in interactive advertising and brand communications (Katz, 1959; Ruggiero, 2000). The U&G theory assumes that consumers' selection and utilization of various forms of media are both deliberate and motivated, with individuals taking the initiative to pick and make use of various communication instruments in order to fulfill their requirements in the pursuit of personal objectives based on their past media experiences. According to Kujur and Singh (2017), most aspects of consumer satisfaction with media use can be divided into three categories: (1) content gratification, which is dependent on media content; (2) social relationship gratification, which is dependent on interactions between media users and others (such as influencers); and (3) personal gratification, which is focused on individual needs and expectations for media consumption.

2.4.1. Content Gratification

Technology and media researchers usually use U&G theory as a framework to comprehend people's objectives and reasons for engaging with various types of content (Cvijikj & Michahelles, 2013). Social media users are encouraged to click on content and engage with a brand, which fosters a favorable attitude toward the business and influences long-term consumer online engagement practices (Kujur & Singh, 2017). Prior empirical studies in the field of social media have revealed that informative and engaging content are crucial components for users of social media (Kujur & Singh, 2019; Fernandes & Castro, 2020). According to the findings of early U&G theory studies, audience members seek a variety of gratifications within media content, which in turn influences their consumption of the content (Smock et al., 2011). The purpose of a brand's social media presence is to attract consumers by providing them with a sense of satisfaction or benefits through the content that it shares; in order to boost consumers' intentions to engage with a brand, content should be developed with the objective of offering value for target consumers (Malthouse et al., 2013). In the context of human-like VIs, compared to human influencers, they provide flexibility in content production. This content can be adjusted to match the intended image and message of the brand for particular consumers, such as those of various age groups, genders, or cultures (Gerlich, 2023). Human-like VIs can generate interesting content for their followers, particularly content that is regularly encountered, such as informative content and entertaining content (Rungruangjit et al., 2024). In a contemporary, fast-paced environment, where individuals frequently pursue fleeting instances of respite and pleasure, captivating and enjoyable content serves as a source of solace and delight for audiences (R. Liu et al., 2026). Furthermore, informative content is a crucial aspect influencing social media users' propensity to follow human-like VIs, as they seek to engage with useful content and stay informed about new product trends. Consequently, human-like VIs should focus on captur-

ing attention and motivating consumers by generating informative content (Rungruangjit et al., 2024). Thus, our study identifies content gratification in the context of human-like VIs through two contexts: informative and entertaining content.

2.4.2. Social Relationship Gratification

Social media facilitates a more dynamic form of communication in which audience reactions might influence the behavior of the poster (Bareket-Bojmel et al., 2016). Consequently, users may perceive that they are cultivating a more personal connection with their chosen influencers, wherein the user receives communication from the influencer while also having the capacity to respond to the influencer (Dibble et al., 2016). In the context of human-like VIs, Gratch et al. (2007) demonstrated that VIs have the ability to establish rapport, which is a sense of closeness, through the use of socio-emotional processes. Furthermore, research by Krämer et al. (2018) discovered that interactions with VIs have the potential to fulfill some social interaction demands that are comparable to those of human–human interactions. Furthermore, it has been discovered that humans even participate in imitation with virtual agents, just like they do with their human counterparts. In order to explain the social relationships that exist between consumers and influencers, including nonhuman influencers, the term parasocial relationships has been widely employed (Whang & Im, 2021). Creating emotional connections and establishing parasocial relationships with consumers can be accomplished through the use of personal narratives that are shared in the content posted by VIs (Jin et al., 2019).

Furthermore, empathy can enhance online parasocial relationships by bridging virtual and physical realities (D. Shin, 2018), which is crucial for cultivating and solidifying the intimate bond between influencers and users (Jung & Im, 2021). Online synchronous and textual communication typically utilizes and promotes elevated levels of empathy (K. Hwang & Zhang, 2018). Due to individuals' increased comfort in sharing sensitive information online, online social support may surpass in-person social support in terms of efficacy when fostering empathy (Caplan & Turner, 2007). In the nascent domain of VIs, empathy is crucial for understanding and clarifying the interaction dynamics between VIs and their followers (Mirowska & Arsenyan, 2023). Research on the capacity of artificial intelligence to forge emotional connections is proliferating as computational systems advance in sophistication and intelligence (Huang & Rust, 2018).

- Parasocial relationships;

Close relationships between celebrities and audiences are referred to as parasocial relationships. When people are regularly exposed to a media persona, they may develop parasocial interactions, as well as feel close to the celebrity, perceive friendliness, and identify with them (Horton & Wohl, 1956). Within the influencer marketing sector, a virtual social relationship arises between fans and digital celebrities; parasocial relationships serve as a helpful conceptual framework for understanding this type of relationship (K. Hwang & Zhang, 2018). Celebrities on social media facilitate reciprocal relationships by engaging with their supporters. As a result, their supporters are able to develop lasting socioemotional bonds with them (Kurtin et al., 2018). Parasocial relationships, which can inspire users to form pseudo-friendships and reduce anxiety in their real-life interpersonal connections, are comparable to interpersonal relationships in social media contexts (K. Hwang & Zhang, 2018). Teenage consumers usually consider online celebrities to be friends and idols (De Jans et al., 2018). Even if they have never met the celebrity in person, fans believe they know the star they support and admire on a personal level. In contrast, the relationship is one-sided, as the celebrity is unaware of the followers. As a result, a sense of intimacy appears to exist (Lueck, 2015). Furthermore, parasocial relationship theory has been used to describe social interactions between humans and nonhuman agents, such

as avatars and robots (Mrad et al., 2022). In particular, human-like VIs have changed the dynamics of parasocial relationships (F. Liu & Wang, 2025).

- Cognitive and affective empathy;

The most important aspect of communication in interpersonal relationships is empathy (Akgün et al., 2015), a basic psychological ability that allows people to identify, comprehend, and react appropriately to the emotional states of others (Čekić, 2025). The empathy model is primarily understood through two dimensions: cognitive empathy, the capacity to recognize and comprehend others' emotions and viewpoints, and affective empathy, which entails emotional resonance and responsiveness to others' feelings (Hogan, 1969; Mehrabian & Epstein, 1972; Omdahl, 1995; Prado & Siquara, 2023). As a result, empathy encompasses both thinking and experiencing the emotional state of others (Pei et al., 2022). Social media use fosters empathy because of the convenience and constancy of communicating with other people who are having similar experiences. Since people feel more comfortable disclosing their sensitive information online, online social support can be more efficient than in-person social support when experiencing empathy (Caplan & Turner, 2007).

For this study, the operationalization of cognitive empathy is defined as the follower's capacity to recognize, infer, and intellectually understand the human-like VIs' perspective and motives during interaction. Affective empathy is defined as the follower's emotional resonance, vicarious feeling, and emotional responsiveness toward the human-like VIs' posted emotions.

The domain of empathy is being further transformed by technologies such as virtual reality (VR) and AI, which enable users to enter the perspectives of others in an immersive way through simulations or interactions with emotionally intelligent AI (Čekić, 2025). Empathy is a crucial quality required for people to successfully connect with AI-based systems (Birnbaum et al., 2016), for example, in chatbots' human-like characteristics (e.g., J. Fu et al., 2023), and virtual influencers (e.g., Jin, 2023; M.-H. Shin & Lee, 2024). Cognitive and affective empathy create the basis for comprehending virtual empathy, a modern variant of empathic behavior arising in digitally mediated communication contexts (Čekić, 2025). In the context of the virtual world, cognitive empathy is demonstrated by the ability to grasp written messages, tone, and the communication context within which they are being communicated, whereas affective empathy is suggested by quick emotional responses, such as supporting emojis, sympathetic words, or visual symbols (Modak & Nath, 2024).

2.4.3. Personal Gratification

According to the uses and gratifications theory, individuals' media consumption expectations are founded on their self-assessment and beliefs about the gratifications they seek and attain. The consumer engages with media anticipating personal gratification, presuming that the media will satisfy their needs. If the media effectively fulfills their needs, they will engage with it more extensively. Otherwise, they will cease. The consumer's decision to continue consuming media is contingent upon their beliefs and evaluations of the media, which are either positive or negative (Malik et al., 2025). They are more likely to form positive evaluations of a technology when it is perceived as unique and innovative (J. Hwang et al., 2019). Furthermore, consumers have expectations for personal gratification, necessitating timely, tailored interactions (Crolic et al., 2022). Prompt responses and personalized interactions augment users' perception of worth and recognition, which is crucial for fostering enduring relationships (Ahn et al., 2022; K. Wang et al., 2024) and encouraging consumers' intention to engage. Human-like VIs are capable of engaging with a significantly greater number of consumers through personalized messaging than human influencers (Mouritzen et al., 2024). In order to enable rapid and personalized interactions,

which consumers anticipate and require, these digital qualities are essential (Crolic et al., 2022). Our study identifies personal gratification in the context of human-like VIs through two factors: perceived innovativeness and perceived personalization.

- Perceived innovativeness;

Perceived innovativeness reflects the degree to which people evaluate a product or service as possessing significant innovative attributes in the market, particularly originality and distinctiveness (Nan et al., 2025). An individual's display of openness to new experiences or eagerness to explore captivating possibilities may signify their perceived inclination toward innovativeness (Molinillo et al., 2023). Perceived innovativeness may be viewed as the expression of an individual's propensity to engage in risk-taking within the realm of innovative technologies, a characteristic evident in certain individuals but lacking in others (Y. Liu et al., 2026). Perceived innovativeness is recognized as a crucial determinant of the adoption of new products or innovations across several domains (Molinillo et al., 2023). Previous research has shown that perceived innovativeness is a significant psychological and cognitive aspect that profoundly affects users' behavioral intentions (Nan et al., 2025; Thi & Duong, 2025). Individuals who actively seek creativity are inclined to adopt technology innovations and changes, demonstrating an increased capacity for innovation and gaining satisfaction from trying new services (Alkawsi et al., 2021). Differences in individual personality result in varied views and behaviors regarding innovativeness, creating a duality in consumer behavior (Patil et al., 2020). In accordance with innovation diffusion theory, Rogers (2003) posits that varying degrees of personal innovativeness across individuals result in disparate reactions to an innovation. In order to better understand users' adoption of various innovations in target groups, Rogers (2003) separated all adopters into five categories and even assigned exact notional percentages to each segment: (1) Innovators: 2.5%; (2) Early Adopters: 13.5%; (3) Early Majority: 34%; (4) Late Majority: 34%; and (5) Laggards: 16%. Numerous studies have determined that individuals exhibiting elevated levels of personal innovativeness, especially innovators and early adopters, possess favorable attitudes toward new technology and persist in its utilization despite having limited information (Singh et al., 2021).

- Perceived personalization;

As a result of the significant advancements in AI that have been exhibited by machines, AI technology is now able to give personalized content, product, or service recommendations by analyzing the consumer's previous consumption experiences and preferences. AI is also capable of providing a high level of individualized suggestions in a manner that is comparable to that of human specialists (Liang et al., 2008; Wei et al., 2017; Yoon & Lee, 2021). In various industries (e.g., fashion, beauty, health), where expert knowledge is crucial for product and content recommendations, data for providing such services have been amassed based on the experience and expertise of professionals (Yang et al., 2018). While human experts can provide tailored recommendations to consumers based on their expertise, AI-driven recommendation systems can deliver a more consistent and precise service compared with human employees, owing to their capacity for analyzing extensive consumption data and their superior processing speeds (West et al., 2018; Gursoy et al., 2019). According to Thurman et al. (2019), it is also suggested that individuals perceive algorithmic selection by AI, which is based on the past consumption behavior of users, as a superior method of obtaining content in comparison to editorial curation by human experts. In this respect, it is probable that individuals will perceive AI-generated recommendations as more personalized than those generated by human experts. This is due to the fact that personalization is contingent upon the ability to provide users with relevant and precise content through objective data analysis (Adomavicius & Tuzhilin, 2005; Liang et al., 2008;

Yoon & Lee, 2021). In the context of virtual influencers, consumers desire customized interactions with human-like VIs in a timely manner (Crolic et al., 2022).

2.5. Research Framework and Formulation of Hypotheses

2.5.1. Informative/Entertaining Content and Instagram Users' Engagement Intentions

Based on earlier applications of U&G theory to social media and brand communities, consuming informative and entertaining content is a significant component of engaging in brand communities (Raacke & Bonds-Raacke, 2008). Furthermore, Kujur and Singh (2019) demonstrated that informative and entertaining content increased user engagement on social media platforms. Moreover, the study of Kefi and Maar (2020) showed that hedonic and informational content are equally important for encouraging followers to engage actively and passively on branded fan pages. In the context of human-like VIs, the results of Yu et al. (2024) revealed that pleasant emotions such as delight and surprise had an impact on user engagement. Supporting this, the research of Rungruangjit et al. (2024) showed that informative and entertaining content has a significant positive impact on consumers' willingness to follow popular human-like VIs. Based on the data mentioned above, the following hypothesis is formulated.

H1. *Informative content has a significant positive impact on Instagram users' engagement intentions toward human-like VIs.*

H2. *Entertaining content has a significant positive impact on Instagram users' engagement intentions toward human-like VIs.*

2.5.2. Cognitive/Affective Empathy and Parasocial Relationships

Empathy can strengthen online parasocial relationships by facilitating connections between virtual and physical realities (D. Shin, 2018). Empathy can be triggered by technological cues, which encourage consumers to perceive a more realistic impression of virtual reality (D. Shin & Biocca, 2017). Stronger friendships can result from empathic individuals because they are able to comprehend and feel others' ideas and feelings, as well as relate to others in a friendly manner (Chow et al., 2013). Weak empathy prevents the establishment of parasocial relationships or pseudo-friendships (Y. Wang et al., 2014) and impedes the development of existing friendships (Jamil et al., 2017). In addition, Derrick et al. (2008) revealed that empathy is a significant predictor of the formation of parasocial relationships due to its critical role in establishing such relationships. Moreover, K. Hwang and Zhang (2018) revealed that followers' parasocial relationships with digital celebrities are positively affected by their cognitive and affective empathy toward digital celebrities. In the context of human-like VIs, the research conducted by M.-H. Shin and Lee (2024) showed that empathy favorably influences parasocial interactions, subsequently improving parasocial relationships and brand attitudes. To test this assumption, the following hypothesis is developed in light of the previously provided data.

H3. *Cognitive empathy has a significant positive impact on parasocial relationships toward human-like VIs.*

H4. *Affective empathy has a significant positive impact on parasocial relationships toward human-like VIs.*

2.5.3. Parasocial Relationships and Instagram Users' Engagement Intentions

The relationships between influencers and their followers are fundamental to the formation of parasocial relationships (Sheng et al., 2023). It is well known from a previ-

ous study that parasocial relationships cause followers to react in cognitive, emotional, and behavioral ways through viewing and interactions with influencers, which also help reinforce parasocial relationships (Tsiotsou, 2015). The findings of Sheng et al. (2023) support that stronger parasocial relationships result in more significant reactions from followers toward endorsed brands and products, as well as increased interactions with micro-influencers. Stein et al. (2024) found no notable difference in audiences' parasocial interactions with human influencers versus those with VIs, despite perceiving VIs as less mentally human-like. Moreover, according to D. N. Nguyen and Hoang's (2026) research, consumers are more engaged with VIs when they have parasocial relationships with them. Thus, the following hypothesis is formulated.

H5. *Parasocial relationships have a significant positive impact on Instagram users' engagement intentions toward human-like VIs.*

2.5.4. Perceived Innovativeness and Instagram Users' Engagement Intentions

Consumers perceive the innovativeness of human-like VIs as a novel concept, expressing intrigue toward this technology and its mechanisms. They follow human-like VIs because they are drawn to them solely for their modernity, novelty, and innovativeness (Lou et al., 2022; J. Y. Lee & Park, 2022). They are predisposed to develop positive assessments of a technology when it is regarded as new and distinctive (J. Hwang et al., 2019). Furthermore, younger consumers regard businesses that partner with human-like VIs as more technologically adept and innovative compared to those that engage with human influencers (Conti et al., 2022). Empirical research by J. Hwang et al. (2019) indicates that perceived innovativeness significantly affects users' evaluative experiences and subsequent behavioral intentions. The research by Nan et al. (2025) found that perceived innovativeness increases consumer satisfaction with AI services, thereby fostering consumers' desire for continued use of these services. Furthermore, the research conducted by Paringan and Novani (2022) revealed that perceived innovativeness influences consumer engagement. In accordance with previous research, consumers' perceived innovativeness of a company positively influences consumer engagement (Omar et al., 2021; Thomas, 2023; S. Khan & Wahab, 2024). Based on the data mentioned above, the following hypothesis is formulated.

H6. *Perceived innovativeness has a significant positive impact on Instagram users' engagement intentions toward human-like VIs.*

2.5.5. Perceived Personalization and Instagram Users' Engagement Intentions

Human-like VIs are designed to share content and engage with their followers (Appel et al., 2020). They have the ability to engage with their followers in real time and at any time of day (Conti et al., 2022), reaching large numbers of followers with tailored messages, content, and recommendations to specific clients (Sands et al., 2022). With regard to customized communication with a target audience, human-like VIs outperform human influencers (Qu & Baek, 2024). They provide customizability in their self-presentations that is unmatched. Many human-like VIs are designed with a specific demographic in mind, expressing values that are consistent with their target group while also being very appealing (Y.-H. Lee & Yuan, 2023), and they are more attractive to engage with than human influencers (Arsenyan & Mirowska, 2021). Consumers are inclined to think of human-like VIs as autonomous. As a result, they can anticipate that these digital characters will be able to interact in a timely and personalized manner (Crolic et al., 2022), as well as facilitate speedy product searches, allow for product comparison, and offer tailored recommendations to consumers (J. Fu et al., 2023). Based on the data mentioned above, the following hypothesis is formulated.

H7. *Perceived personalization has a significant positive impact on Instagram users' engagement intentions toward human-like VIs.*

This study's conceptual framework is created in compliance with the literature review and theoretical background, as illustrated in Figure 2.

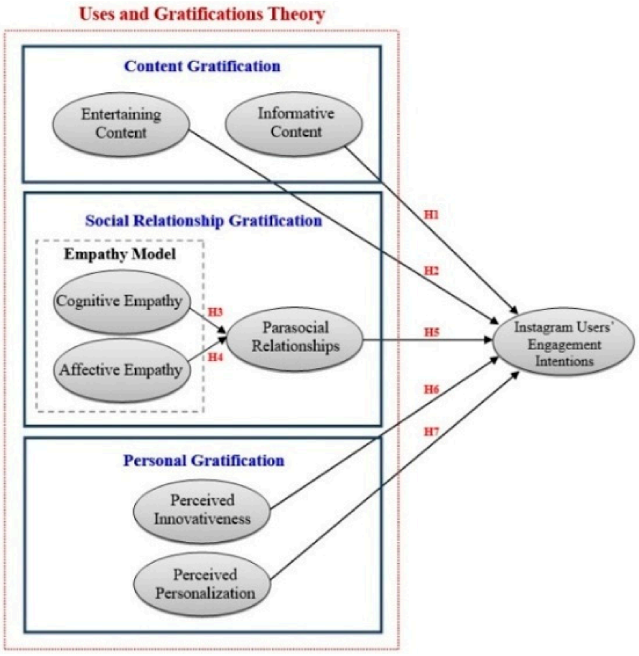


Figure 2. Conceptual Framework.

3. Methodology

3.1. Sample Characteristics

This study focuses on young consumers pursuing higher education (bachelor's, master's, and doctoral degrees) in Thailand who possess an Instagram account. The younger generation is the main audience for virtual influencer marketing (Angmo & Mahajan, 2024), because the elements of escapism and fantasy combined with technology in VIs' content appeal to that generation (E. Kim et al., 2023). VIs have become increasingly prominent and appealing to younger generations (Angmo & Mahajan, 2024). They interact with VIs on Instagram nearly three and a half times more frequently than they do with human influencers (Deng & Jiang, 2023). They have been raised in a technological environment and have consistently engaged with digital media. In contrast to other generations, they possess a more optimistic perspective on information and communication technologies, influencing their behavior, thought processes, and learning methods (Calvo-Porral & Perspeira-Sanchez, 2020).

Innovation theory posits that those who utilize technology are generally very imaginative and proactively pursue novel concepts. They are part of a certain user group that has adapted to significant uncertainty and developed a favorable disposition toward adopting new technologies (Akour et al., 2022). Research indicates that this cohort of consumers prioritizes enjoyment of shopping, convenience, authenticity, and social values more than brand loyalty. These traits render digital natives more amenable to the metaverse environment overall and to virtual interaction-based marketing specifically (Dang et al., 2025). This study collected data from both followers and non-followers to mitigate potential bias from parasocial relationships, familiarity with human-like VIs, or a propensity for favorable commentary associated with following them (Arsenyan & Mirowska, 2021).

3.2. Sample Size

An *a priori* analysis for SEM was employed to determine the sample size, utilizing the measurement and application of the conceptual framework (Soper, 2020). A prevalent application of second-generation multivariate data analysis methods (e.g., PLS-SEM) is to ascertain the *a priori* sample size for structural equation models. This web application is a compact tool for power analysis that determines the necessary sample size for SEM research. The model requires inputs for the number of latent and observable variables, the anticipated probability, the estimated effect size, and the level of statistical power. Given the model's structural complexity, the algorithm calculates the minimum sample size necessary to detect a particular effect (Memon et al., 2020). The research design proposed a minimum sample size of 818 participants, predicated on an assumed minimal effect size of 0.15. A total of 914 eligible participants were initially approached to participate in the study; however, 69 individuals were subsequently excluded from the participant list for failing to meet the criteria. Thus, the study's definitive sample size was n = 845.

3.3. Data Collection Procedure

Stratified sampling, a probability sampling technique, was employed in the present study. The first stage involved the categorization of all the universities in Thailand, totaling 298 universities, which could be divided into eight regional groups: Bangkok, vicinity of Bangkok, central, northern, southern, northeastern, eastern, and western regions. The second stage involved finding the list of university names in the categorized universities provided in the first stage (Office of the Higher Education Commission, 2025). In the third stage, 10% of the total number of universities were selected from all eight regions by using a simple random sampling method. A total of six universities in Bangkok were randomly selected, as were three in the vicinity of Bangkok, three in the central region, two in the northern region, five in the southern region, seven in the northeastern region, two in the eastern region, and two in the western region, totaling 30 universities, with the same number of data collected for each university. Subsequently, the researcher collected data from students at the bachelor's, master's, and doctoral levels of the 30 randomly selected universities in the major of marketing, the faculty of business administration, the faculty of commerce and accountancy, and the faculty of management science at public and private universities in Thailand.

The researchers conducted data collection sessions with the participants in the classroom from November 2024 to January 2025. The researchers provided them with a QR code to scan for access to the online survey. The researchers provided an explanation of the informed consent forms to the participants. The initial section of the questionnaire required information pertaining to voluntary informed consent. Participants who felt uneasy about completing the questionnaire could select the "Do not consent" button to terminate the survey. Volunteers who agreed could click the "Consent" button and advance to the subsequent step. The survey process was completed by individuals who voluntarily consented to complete the questionnaire. The initial phase included screening questions to ascertain the sample group, which was followed by inquiries regarding demographic information and reading Instagram profiles of popular human-like VIs, including Lu do Magalu, Lil Miquela, Shudu, and Imma (Jhawar et al., 2023). Participants were given URLs linking to Instagram accounts of these popular human-like VIs and instructed to browse their posts, videos, photos, and captions. In total, 914 individuals completed the questionnaire, of whom 69 did not meet the criteria, resulting in 845 valid responses.

3.4. Instruments

To evaluate the suggested framework, data from a closed-ended questionnaire were collected using a quantitative method. The measurement scales developed from earlier relevant research were included in the final section. This study, like several previous studies, evaluated 33 items using a 5-point Likert scale of agreement ranging from strongly disagree (1) to strongly agree (5). The informative and entertaining content measurements were modified based on Rungruangjit et al. (2023) and Rungruangjit et al. (2024). To assess cognitive affective empathy, well-established scales from Carré et al. (2013), Dadds et al. (2008), Prado and Siquara (2023), and Truong and Chen (2025) were used. The measures used to evaluate parasocial relationships were adapted from Claessens and Van den Bulck (2015), Chung and Cho (2017), and K. Hwang and Zhang (2018). The scale to measure perceived innovativeness was adapted from Patil et al. (2020). The measurement of perceived personalization was modified from Sands et al. (2022). Finally, the studies of Jin (2023) and Haq and Chiu (2024) served as the foundation for the scale used to assess Instagram users' engagement intentions.

4. Data Analysis and Results

4.1. Descriptive Analysis

The research encompassed 845 participants who completed the questionnaire. A total of 569 women (67.30%) constituted the largest group among the respondents, followed by 207 men (24.50%) and 69 respondents of other genders (8.20%). The majority of participants, 405 (47.93%), were aged 18–21 years, followed by 275 participants (32.54%) who were aged 22–25 years, and 165 participants (19.53%) who were aged 26–29 years. Regarding educational attainment, 465 participants (55.03%) possessed a bachelor's degree, followed by 324 participants (38.34%) with a master's degree, and 56 participants (6.63%) with a doctoral degree. For occupation, the majority of participants (n = 545) were students (64.50%), and 300 participants (35.50%) were both studying and working. Furthermore, a substantial portion reported monthly incomes between 10,000 and 30,000 baht (n = 388, 45.92%).

4.2. Data Analysis

Structural equation modeling was determined to be the most effective method for addressing the research objectives since it can handle a variety of dependent and independent variable relationships and examine overall data fit indices (Zweig & Webster, 2003). The partial least squares structural equation modeling (PLS-SEM) approach, version 4.1.1.4, was adopted in the present study. Based on Hair et al. (2019b), because PLS-SEM was developed to estimate causal-predictive correlations, it was utilized (Wold, 1985) to ensure that causal explanations are applicable and to show that PLS-SEM is more effective than regression analysis (Hair et al., 2019a). Furthermore, PLS-SEM can handle more complex models with multiple structural model relationships, is suitable for small- and medium-sized samples, and achieves high levels of statistical power with small sample sizes. It also imposes less strict assumptions regarding the distributional characteristics of the data (Hair et al., 2022).

4.3. Nonresponse Bias Test and Normal Distribution

Errors in assessing demographic characteristics arise when late respondents in a sample differ noticeably from early respondents. Therefore, the first (early) and last (late) responses were compared in this study using an extrapolation-based nonresponse bias test (Armstrong & Overton, 1977). The results showed that there was no response bias in the data collection process because there was no significant difference ($p > 0.05$) between the mean scores of the early and late respondents. Thus, it can be summarized that there was no issue with nonresponse bias in this study. To test for normality, we computed

skewness and kurtosis and used the Kolmogorov–Smirnov test. The box plot indicated a normal distribution. The Kolmogorov–Smirnov test confirmed the normal distribution of the data. Both tests had p-values > 0.05. All measurements in this study had skewness and kurtosis values between −2 and +2, indicating normal data. A total of 845 people completed the survey.

4.4. Common Method Variance and Multicollinearity

The single-factor test by Harman (Podsakoff & Organ, 1986) was employed in this study to investigate common method variance. The test was conducted using principal component analysis (PCA), as suggested by Tehseen et al. (2017). Based on the single-factor results of the unrotated primary axis factoring analysis, which revealed a variance of 43.293% (Table 1), which is less than 50%, Kock (2021) concluded that all the indicators passed the test. Consequently, this analysis showed no evidence of common method bias. To put it simply, there were no major concerns that could affect how different variables relate to each other. The independent variables' variance inflation factors (VIF) were calculated to test for multicollinearity. Diamantopoulos and Siguaw (2006) state that multicollinearity does not compromise results with a VIF value of 3.3 or lower. Multicollinearity was not a concern in this investigation, as all VIF values were ≤3.3.

Table 1. Harman's single-factor test.

Factor	Initial Eigenvalues			Extraction Sums of Squared Loading		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.051	43.293	43.293	14.051	43.293	43.293
2	3.524	11.255	54.548			
3	1.465	4.495	59.043			
4	1.266	3.559	62.602			

Extraction method: Principal component analysis.

4.5. Measurement Model Analysis

To evaluate the content validity and reliability of the measurement instrument before finalizing the questionnaire, two marketing professors and one brand manager validated the content. After the questionnaire was translated into Thai and back-translated to preserve its meaning, 45 community members participated in a pilot survey. The pilot survey and expert panel suggested minor item wording changes. Specific terminology was reworded to increase comprehension and avoid misunderstandings. To improve survey coherence and reduce respondent fatigue, the question order was changed (Kumar et al., 2025). Subsequent to the completion of the surveys by the 845 participants, further assessments were undertaken. The reliability of the constructs was assessed, and Cronbach's alpha (CA), a measure of internal consistency, was found to be greater than 0.7, above the criterion suggested by Hair et al. (2010). When all the items surpass the required threshold, and the composite reliability (CR) and scale are at a minimum value of 0.7 (Henseler et al., 2016), these outcomes are considered satisfactory. In terms of convergent validity, every value surpassed the average variance extracted (AVE) criterion, which is normally recommended to be at least 0.50 (Fornell & Larcker, 1981). In addition, the constructs' items had outer loadings exceeding 0.6, in accordance with Hair et al. (2010). The results are given in Table 2.

The discriminant validity of the correlation technique was evaluated utilizing the heterotrait–monotrait (HTMT) ratio. The correlation ratio of each construct with the HTMT, as indicated in Table 3, was lower than 0.9, in compliance with the HTMT threshold value (Henseler et al., 2015). As a consequence, this approach ensured the discriminant validity of the measurement model.

Table 2. Results of the measurement model.

Constructs	Items	Loading	CA	CR	AVE
Informative content			0.880	0.913	0.676
	INF1: The content of human-like VIs is beneficial.	0.804			
	INF2: The content of human-like VIs about products is fascinating.	0.806			
	INF3: The content of human-like VIs provides product reviews.	0.834			
	INF4: The content of human-like VIs provides product information.	0.864			
	INF5: The content of human-like VIs provides trending.	0.803			
Entertaining content			0.915	0.936	0.747
	ENT1: The content of human-like VIs is entertaining.	0.852			
	ENT2: The content of human-like VIs is funny.	0.872			
	ENT3: The content of human-like VIs is pleasant.	0.890			
	ENT4: The content of human-like VIs is amusing.	0.876			
	ENT5: The content of human-like VIs provides memes.	0.831			
Cognitive empathy			0.891	0.933	0.822
	COG1: I feel like human-like VIs can understand my happy feelings through comments on her posts.	0.914			
	COG2: I feel like human-like VIs can understand when I am feeling down.	0.921			
	COG3: I feel like human-like VIs can understand my specific needs.	0.884			
Affective empathy			0.871	0.912	0.723
	AFF1: I feel like human-like VIs are easily caught up in my feelings.	0.800			
	AFF2: If I interact with human-like VIs, when I'm sad, I feel like she usually feel sad.	0.897			
	AFF3: I feel like human-like VIs get upset when I am upset.	0.898			
	AFF4: I feel like my emotions affect human-like VIs greatly.	0.799			
Parasocial relationships			0.908	0.929	0.687
	PAR1: I do not feel uncomfortable if I interact with human-like VIs.	0.763			
	PAR2: I want to have a friendly conversation with human-like VIs.	0.811			
	PAR3: It seems that human-like VIs understand what I want to know.	0.820			
	PAR4: I am captivated by the gentle smiles of my favorite human-like VIs.	0.861			
	PAR5: When I have a conversation with human-like VIs, I feel as if I am talking to my friend.	0.877			
	PAR6: Following human-like VIs on Instagram makes me feel closer to her.	0.836			
Perceived innovativeness			0.848	0.898	0.689
	INN1: Among my peers, I am often the first to try new ways of interacting via human-like VIs.	0.673			
	INN2: I like to interact with human-like VIs through liking, sharing, or commenting on their content.	0.859			
	INN3: If I heard about new human-like VIs, I would start following them and experiment with engaging with them.	0.883			
	INN4: I am not hesitant to try interacting with human-like VIs.	0.887			
Perceived personalization			0.881	0.926	0.808
	PER1: I perceive that human-like VIs are able to offer products designed especially for me.	0.905			
	PER2: I perceive that human-like VIs post content tailored to suit my needs.	0.906			
	PER3: I perceive that human-like VIs are able to give advice on various matters that meet my needs.	0.885			
Instagram users' engagement intentions			0.898	0.936	0.831
	ENG1: In the near future, I intend to participate in content of human-like VIs on Instagram such as by liking, sharing, or commenting.	0.905			
	ENG2: In the near future, I expect to interact with human-like VIs on Instagram.	0.910			
	ENG3: In the near future, I plan to engage with human-like VIs' content on Instagram.	0.919			

Table 3. Discriminant validity using the Heterotrait-Monotrait (HTMT) ratio of correlations.

Variable	AFF	COG	ENT	INF	ENG	PAR	INN	PER
AFF								
COG	0.808							
ENT	0.588	0.628						
INF	0.416	0.477	0.617					
ENG	0.565	0.568	0.650	0.543				
PAR	0.657	0.734	0.716	0.589	0.765			
INN	0.586	0.667	0.711	0.685	0.780	0.767		
PER	0.566	0.649	0.683	0.670	0.696	0.803	0.809	

4.6. Model Fit

The standardized root mean square residual (SRMR) measures variance-based model fit. It is the standardized difference between observed and expected correlations. This statistic may be influenced in studies with small sample sizes and low degrees of freedom.

The SRMR is an absolute measure of fit; hence, 0 represents perfect fit. SRMR is not affected by model complexity. Fit scores below 0.08 suggest a good model fit (L. Hu & Bentler, 1999; Henseler & Sarstedt, 2013). In this study, the SRMR was 0.074. Furthermore, the Normed Fit Index (NFI), referred to as the Bentler and Bonett Index, is expected to approach 1, indicating better fit. The model exhibited a Normed Fit Index (NFI) of 0.815, indicative of an acceptable fit, as per Henseler et al. (2015) and L. Hu and Bentler (1999).

4.7. Structural Model Analysis

Following the assessment of the measurement model, the researchers examined the structural model by bootstrapping, utilizing 5000 subsamples derived from the original dataset (Henseler et al., 2009). This was conducted to ascertain the model's validity. During the preliminary assessment of the structural model, the R-square values (R^2) were examined as indicators of the model's explanatory capacity for each endogenous construct. Hair et al. (2022) classify R^2 values of 75%, 50%, and 25% as substantial, moderate, and weak, respectively. The study revealed that the R^2 value for parasocial relationships was 46.20% (0.462), while the R^2 value for Instagram users' engagement intentions was 58.40% (0.584), suggesting that the impacts are moderate. Figure 3 illustrates the R^2 values.

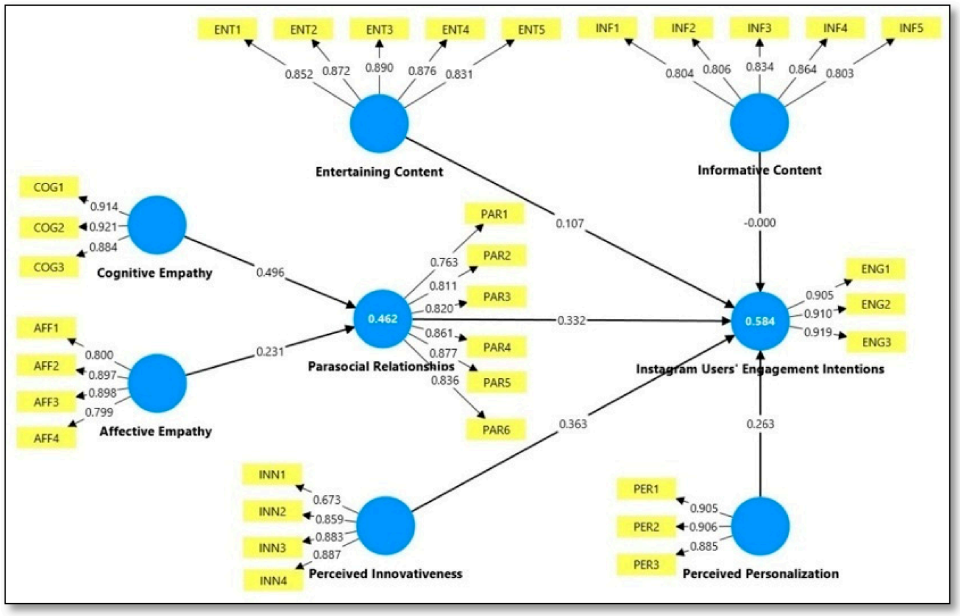


Figure 3. Results of the structural model.

The path coefficient (β) in the structural model elucidated the influence of independent variables on the dependent variable. Structural equation modeling, especially through maximum likelihood estimation, can evaluate intricate models and identify numerous relationships among multi-item variables (Berraies et al., 2017). The path coefficient indicates the direct influence of a latent predictor variable on predicted variables and is categorized by large effect sizes (>0.350), medium effect sizes (0.350–0.150), and small effect sizes (<0.150) (Cohen, 1988; Aparicio et al., 2021). Figure 3 and Table 4 illustrate the effect sizes of the path coefficients for this model.

Table 4. Results of hypothesis testing.

Hypotheses	Path	Path Coefficients (β)	*t*-Statistic	*p*-Value	VIF	Results
H1	INF → ENG	−0.000 $^{ns.}$	0.011	0.991	1.781	Not supported
H2	ENT → ENG	0.107 **	2.746	0.006	2.098	Supported
H3	COG → PAR	0.496 ***	12.506	0.000	2.025	Supported
H4	AFF → PAR	0.231 ***	5.415	0.000	2.025	Supported
H5	PAR → ENG	0.332 ***	7.410	0.000	2.590	Supported
H6	INN → ENG	0.363 ***	8.615	0.000	2.473	Supported
H7	PER → ENG	0.263 ***	6.198	0.000	2.675	Supported

*** = p value ≤ 0.001, ** = p value ≤ 0.01, $^{ns.}$ = not significant.

4.8. Hypothesis Testing

The findings showed that Instagram users' engagement intentions were not significantly influenced by informative content (β = −0.000, t = 0.991); hence, hypothesis H1 was rejected. In contrast, enjoyable content had a favorable impact on Instagram users' engagement intentions (β = 0.107, t = 2.746), supporting hypothesis H2. In addition, the results for H3 and H4 revealed that cognitive and affective empathy significantly influenced parasocial relationships (β = 0.496, t = 12.506; β = 0.231, t = 5.415). Parasocial relationships favorably affected Instagram users' engagement intentions (β = 0.332, t = 7.410), supporting hypothesis H5. Perceived innovativeness positively and significantly influenced Instagram users' engagement intentions (β = 0.363, t = 8.615), thereby supporting hypothesis H6. Finally, in line with hypothesis H7, perceived personalization positively and significantly influenced Instagram users' engagement intentions (β = 0.263, t = 6.198). The results of hypothesis testing are presented in Table 4.

5. Discussion and Implications

5.1. Discussion

This study's primary goal was to investigate the motivational elements influencing Instagram users' engagement intentions toward human-like VIs. The three primary motivating variables in this study were categorized using the theoretical underpinnings of U&G theory, which include (1) content gratification, comprising informative and entertaining content; (2) social relationship gratification, comprising empathy and parasocial relationships; and (3) personal gratification, comprising perceived innovativeness and perceived personalization. The first finding, which does not support hypothesis H1, shows that Instagram users' engagement intentions toward human-like VIs are unaffected by informative content. This finding contradicts earlier studies by Rungruangjit et al. (2024), which revealed that informative content influences consumers' willingness to follow human-like VIs. However, our study adds to the body of knowledge currently available about informative content in relation to the concept of human-like VIs. The informative content of human-like VIs does not drive Instagram users' engagement intentions. This is possibly because VIs are perceived as less trustworthy in providing useful information than human influencers are (Hofeditz et al., 2022; Qu & Baek, 2024). In order to obtain information and knowledge, users might access the informational or functional content of human-like VIs. Because human influencers may persuade consumers and offer comprehensive product information that is more beneficial for the purchasing process, together with actual product reviews and available sample products, some consumer groups prefer them (Rossi & Rivetti, 2023). It is impossible for human-like VIs to test products on their own skin or hair. Comparing conditions before and after utilizing a product is crucial for proving its efficacy as well as for revealing the potential for deepfakes and enhancing the legitimacy of virtual influencers (Lou et al., 2022; Rossi & Rivetti, 2023). Supporting these ideas aligning with the findings of Tian et al. (2026) and Pushparaj et al. (2025), VIs encounter an authenticity and bodily experience barrier, which is why informative content failed to generate engagement.

Trust and ethical skepticism are intensified when non-human entities endeavor to provide functional, real-world evaluations without physical experience.

Second, Instagram users' engagement intentions toward human-like VIs were motivated by entertaining content (H2). This finding is consistent with research on human influencers by Rungruangjit and Charoenpornpanichkul (2022). Moreover, given the novelty of human-like VIs in this field, our findings seem to be supportive. Instagram users intend to engage and interact with human-like VIs, such as by liking, sharing, commenting, or interacting with them, because they like content that is fun, exciting, and unique, including humorous content. Even if the VIs' portrayals of human emotions in everyday settings are fictitious, it is likely that followers find them appealing. A recent survey revealed that 38% of millennials and members of Generation Z follow VIs on social media due to interest and amusement (H. Kim & Park, 2023). Consistent with the findings of Xie-Carson et al. (2023c), the results showed that VIs that provide fun content with a sense of humor affect users' engagement as well.

The third finding, which shows that cognitive and affective empathy positively enhance parasocial relationships (H3 and H4), is consistent with earlier research conducted in the context of human influencers by K. Hwang and Zhang (2018). Moreover, our study broadens the corpus of knowledge currently available in the field regarding the empathy model based on human-like VIs. Establishing parasocial relationships with human-like VIs requires developing both cognitive and affective empathy. As a result, online parasocial relationship support can be more advantageous than in-person assistance because people feel safer and more comfortable providing private and sensitive information online. Cognitive and affective empathy are significant components of emotional support (Caplan & Turner, 2007). In addition, individuals who are isolated or lonely may utilize Instagram to engage in social interactions, which allows them to feel as though they have virtual companions in the form of human-like VIs, thereby alleviating their loneliness. Although human-like VIs are not human, they have the capacity to convey feelings in a manner that avatars do not. VIs can utilize animation and rendering techniques to mimic the subtleties of human expressions (Ahn et al., 2022). It may be difficult for their human counterparts to continuously express such a wide range of emotions as VIs can (Yu et al., 2024).

Interestingly, unlike previous studies that prioritized the detrimental effects of the uncanny valley, our results indicate that users' engagement intentions are not necessarily undermined by human-like VIs. Conversely, when human-like VIs can evoke cognitive and affective empathy, users are more inclined to form parasocial relationships, hence enhancing their engagement intentions. This discovery broadens the uncanny valley idea by proposing that empathy serves as a psychological tool that might mitigate the adverse impacts of perceived artificiality, rather than being an inevitable consequence of anthropomorphic design. Empathy fundamentally functions as a relationship process rather than a catalyst for behavior. Cognitive and affective empathy initially fortify parasocial relationships, which eventually evolve into intentions for engagement. This systematic approach offers a clearer elucidation of the impact of empathy on consumer behavior inside social relationships facilitated by human-like VIs. The divergence from earlier research indicating adverse responses to human-like VIs may be attributed to variations in the research environment. After users consistently connect with human-like virtual influencers on Instagram, cognitive and affective empathy, along with parasocial relationships, seem to emerge as more significant factors influencing users' intents to engage than their original views on artificiality. Moreover, this study's findings extend the uncanny valley theory by proposing that empathy might serve as a psychological shield against feelings of artificiality. The uncanny valley theory posits that virtual influencers resembling humans too closely can induce unease due to their near-human appearance; however, our findings suggest that

users with heightened cognitive and affective empathy are more inclined to form parasocial relationships despite this discomfort. Cognitive empathy allows individuals to comprehend the virtual influencer's motives, feelings, and viewpoints, prompting them to see the virtual influencer as a significant social creature rather than just a synthetic digital construct. Affective empathy concurrently enhances emotional connection, diminishing psychological distance and nurturing a sense of intimacy. Thus, empathy can diminish the adverse effects linked to perceived artificiality, facilitating users in establishing more robust parasocial relationships that eventually promote engagement intentions. Our empirical proof that cognitive and affective empathy significantly build parasocial relationships demonstrates how consumers overcome uncanny valley discomfort. Our empirical findings that cognitive and affective empathy significantly build parasocial relationships demonstrate how consumers overcome uncanny valley discomfort. Empathy functions as a psychological bridge, mitigating trust deficits identified in prior systematic reviews conducted by Pushparaj et al. (2025), which provides a concise summary of the findings.

Additionally, this investigation demonstrated that Instagram users' engagement intentions are substantially affected by their parasocial relationships (H5). This finding contributes to the expansion of the body of knowledge. The present research is one of the earliest studies to apply this concept in the context of human-like VIs. Parasocial relationships with human-like VIs can be established by Instagram users. They have the ability to respond to the comments of users. They can emphasize sociability and friendliness by engaging in warm conversations with consumers (J. Fu et al., 2023). According to the current study, these patterns and linkages are confirmed. For instance, the robot Sophia's response to a user's comment became the second most liked comment on the post, receiving likes from other users (Xie-Carson et al., 2023b). Interacting with human-like VIs can help consumers form pseudo-friendships; they do not feel uncomfortable and experience reduced anxiety in real-life interpersonal connections. They also feel more comfortable sharing personal information with these virtual friends, whom they perceive as similar to close friends.

Moreover, our results show that the main antecedent driving Instagram users' engagement intentions is perceived innovativeness (H6). The innovativeness of human-like VIs is perceived by Instagram users as a novel concept, and they express curiosity about the technology and its mechanisms. They are attracted to human-like VIs due to their modernity, novelty, and innovativeness. They desire to engage with human-like VIs in order to enhance their perception of themselves as tech-savvy. They are consistently the first to try out new ways of engaging with human-like VIs among their friends. They can exhibit their trendiness, inventiveness, and open-mindedness.

Finally, the noteworthy results imply that users' intentions to engage with Instagram tend to increase when they perceive a greater level of personalization (H7). The results of this study extend our understanding of human-like VI marketing. Instagram users want to interact or engage with human-like VIs that can offer products, give advice, or provide content that can be tailored to suit their needs. They should expect to be able to have brief and customized conversations with these human-like VIs (Crolic et al., 2022). As a result, they have different expectations and needs from human-like VIs compared with real-life influencers, particularly regarding more tailored messages that are delivered more effectively and quickly (Mouritzen et al., 2024). Our research findings are also supported by the proposal of Zhou et al. (2026), which states that marketers should focus on personalization that leads to strengthened engagement.

In conclusion, the fundamental mechanisms influencing engagement intentions with human-like VIs are highlighted, specifically how empathy models function as an emotional buffer against the uncanny valley phenomenon. Instead of directly inciting engagement

intentions, cognitive and affective empathy serves as a relational process that progressively converts cognitive comprehension and emotional connection into parasocial relationships, which in turn inspire behavioral engagement intentions. Cognitive and emotional empathy allows followers to discern the intents, feelings, and viewpoints of human-like virtual influencers, thus alleviating psychological ambiguity in human–AI interactions. When consumers view the VIs as psychologically comprehensible instead of merely algorithmic, they are more inclined to cultivate a parasocial connection. Moreover, the individual mechanism emphasizes the most significant perceived innovativeness. Due to the advanced nature of human-like virtual interfaces, users' desire for engagement is significantly influenced by their pursuit of novelty, prompting them to explore innovative interactions with these entities. On the other hand, informative content did not stimulate engagement intentions because of a barrier of authenticity—users recognize the information yet hesitate to engage, as virtual identities lack a physical presence to substantiate functional assertions. It is impossible for human-like VIs to truly test products, while entertaining content transcends this barrier as its hedonic worth relies on experiencing pleasure and emotional rather than physical existence.

5.2. Theoretical Contributions

This study enhances the theoretical understanding of human-like VIs and illuminates the significant influence of motivational factors on engagement intentions. These insights enhance the academic comprehension of user behavior on Instagram and establish a robust empirical foundation for augmenting users' engagement intentions. This study has several significant theoretical implications in addition to validating and expanding upon previous research findings. First, this study extends the existing literature by integrating uncanny valley theory and U&G theory into a unified explanatory framework. Unlike previous studies that primarily employed U&G theory to identify motivational factors or relied on uncanny valley theory to explain negative responses toward human-like VIs independently, the present study proposes that users' engagement intentions are jointly determined by motivational gratifications and psychological resistance. This integrated perspective offers a more balanced theoretical explanation of why some consumers actively interact with human-like VIs despite their artificial nature, whereas others remain reluctant. Consequently, the proposed framework advances existing knowledge by explaining both the drivers and users' engagement intentions within the same theoretical model.

Second, the empirical discrepancies of uncanny valley contradictions emerge as previous research examines virtual influencers, which some studies highlight as persuasiveness (Block & Lovegrove, 2021) and willingness to follow (Rungruangjit et al., 2024), whereas others highlight them as uncanniness, authentically fake (Lou et al., 2022), and consumers' negative reaction (Arsenyan & Mirowska, 2021). These empirical discrepancies emerge as previous research examines virtual influencers in isolation—concentrating solely on brief visual assessment of artificiality (which triggers uncanny feelings) or on functional persuasive results, neglecting the psychological processes that bridge the two. Our findings add to the body of knowledge on human-like VIs and the uncanny valley concept (Mori, 1970). Our research addresses this inconsistency by suggesting a cohesive paradigm that merges uncanny valley theory with U&G theory. Our research demonstrated that the uncanny valley phenomenon is dynamic and can be mitigated by the driving factors of content, social relationships, and personal gratification. Interestingly, psychological drivers—cognitive and emotional empathy—act as alleviating factors that diminish perceived uncanniness and promote parasocial relationships, facilitating users' engagement intentions. This result expands the uncanny valley by suggesting that cognitive and affective empathy might

attenuate the negative effects of perceived artificiality rather than being an inescapable consequence of anthropomorphic design.

In addition, for social relationship gratification, the empathy model and parasocial relationships have largely gone untapped, especially in the context of emerging markets such as ASEAN countries. These factors thereby enrich the discourse on social relationships between human-like VIs and followers, as well as their subsequent influence on users' engagement intentions. Our study extends the body of knowledge on these dimensions in relation to interactions between human-like VIs and Instagram followers. Prior investigations into empathy models and parasocial relationships have concentrated on the social relationships between human influencers and their followers (K. Hwang & Zhang, 2018). Simultaneously, the research conducted by M.-H. Shin and Lee (2024) examined the relationships between VIs and their followers, focusing on the overarching impact of empathy on parasocial interactions and the subsequent development of parasocial relationships. A drawback of this previous research was its neglect of the cognitive and affective dimensions of empathy. Our study distinguishes between cognitive and affective empathy and shows that both contribute to parasocial relationships independently. Previous virtual influencer studies have often viewed empathy as a single construct.

The discovery that understanding a virtual influencer's perspective and emotionally engaging with them are complementary rather than interchangeable strengthens the empathy literature. In this regard, our study developed U&G theoretical connections by incorporating cognitive and affective empathy as factors associated with parasocial relationships between human-like VIs and their followers, ultimately leading to engagement intentions. Therefore, underpinned by empirical evidence, our research provides new insights into how followers and human-like VIs build social ties through cognitive and affective empathy and parasocial relationships. Consumers want to have friendly conversations with human-like VIs as if they were friends. If human-like VIs have the ability to learn to understand consumer sentiment, share the same emotions during a conversation, or be sensitive to the feelings of followers by understanding the various emotions of consumers through chat messages, consumers will not feel afraid or concerned about engaging with human-like VIs. Thus, examining the associations between cognitive and affective empathy and parasocial relationships will help reduce feelings of uneasiness, eeriness, and negativity. In turn, it will help create interactions, engagement intentions, and meaningful conversations between consumers and VIs.

Third, our research adds to the literature on U&G theory, which has identified the main drivers of Instagram users' intentions to engage with human-like VIs. Prior studies have examined stereotypes related to brands (Kolbl et al., 2020), advertising (S. A. Lee & Oh, 2021), and human influencers (T. Kim & Read, 2022), but there is a lack of research examining the context of human-like VIs from the perspective of U&G theory. There are three primary driving forces behind the theoretical underpinnings of U&G theory that contribute to increasing Instagram users' intentions to engage with human-like VIs. The first driving force is content gratification, including entertaining content, which can be applied in the context of human-like VIs, while informative content cannot. Similar entertaining content can be supplied by VIs that resemble humans in the same manner as human influencers. Instagram users intend to engage with human-like VIs, such as by liking, sharing or commenting, because they like content that is amusing and enjoyable. Entertaining content created by human-like VIs results in enjoyment for consumers, humor for followers, and engagement with the content. When there is interaction, conversation, or teasing in entertaining content, consumers will feel comfortable, friendly, and relaxed, and will not be afraid or nervous about engaging in conversations with human-like VIs, even if they are not human.

Moreover, this study offers preliminary evidence that the engagement intentions of Instagram users are significantly predicted by parasocial relationships. The results of this study add to and validate the existing body of knowledge about the concept of parasocial relationships, which has been widely applied in earlier studies to investigate the relationship between social media influencers and their followers. This concept is applied in relation to human-like VIs in the present study. Despite resembling humans, VIs serve as digital entities that can cultivate emotional connections and have transformed the nature of parasocial relationships. They are digital entities with anthropomorphic forms, human physiques, social functions, attractive appearances, and distinctive personalities, which enhance interactions with followers and make them more sociable (Gutuleac et al., 2024). They can share their daily activities, articulate emotions, and provide perspectives on social issues. They are able to hold amicable chats and talk to their followers as if they were friends.

Lastly, regarding personal gratification, prior research from this perspective examines the personal gratification areas of human digital influencers, such as identification (Rungruangjit et al., 2023) and self-concept value (Jahn & Kunz, 2012). In contrast, our study offers important theoretical implications in the context of human-like VIs, where the perceived personalization and innovativeness of a brand have a significant impact on Instagram users' engagement intentions. Our findings support innovation diffusion theory; Rogers (2003) posits that varying degrees of personal innovativeness across individuals result in disparate reactions to an innovation. Individuals exhibiting elevated levels of personal innovativeness (Innovators and Early Adopters) possess favorable attitudes toward emerging technology and persist in its utilization despite possessing inadequate information (Xu & Du, 2018; Singh et al., 2021). Teenagers are frequently engaged in interactions with human-like VIs, and they are acutely aware of new technological advancements. They are likely to adopt technological innovations and embrace change, which indicates a greater degree of inventiveness and intention to engage with human-like VIs. Also, they actively seek creativity. They tend to form favorable evaluations of a technology when it is perceived as distinctive and innovative. Moreover, human-like VIs are CGI-based technological advancements developed using machine learning algorithms. AI technology can offer advantages over human influencers by introducing products, providing advice, or presenting content that can be tailored to suit users' needs. Their ability to deliver accurate and pertinent content to users through data analysis based on prior consumption behavior is a prerequisite for personalization (Adomavicius & Tuzhilin, 2005; Liang et al., 2008; Yoon & Lee, 2021). Consumers can anticipate that human-like VIs are able to communicate more quickly and provide more responsive and personalized communications.

5.3. Managerial Implications

Our findings can benefit marketers worldwide and offer insightful managerial implications for virtual influencer marketing approaches. Marketers and VI developers would undoubtedly benefit from identifying the driving forces behind users' intentions to engage with human-like VIs on the increasingly popular Instagram platform. Entertaining content is the primary driver of consumers' intentions to engage with human-like VIs. Through a range of entertaining content, developers may capture users' valuable attention. Content presented through telling interesting and funny stories that help consumers smile will encourage them to interact attentively and enjoyably, talk, and share ideas with VIs. Content presented through the sharing of hilarious, intriguing anecdotes or memes will attract viewers to follow VIs, as they will find it entertaining and delightful to participate with the content. Consuming entertaining content posted by human-like VIs that consumers follow will assist in the healing of the mind and the sharing of happiness among followers,

as well as the intention to engage with human-like VIs, in situations where consumers are subjected to stress, competition, and work or societal pressure. For example, Figure 4 shows examples of funny and playful content presented by Lil Miqueala, one of the most well-known human-like VIs worldwide. Her followers are involved in talking with and teasing each other enjoyably.

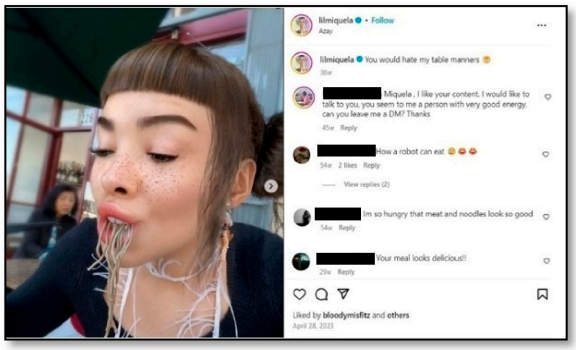


Figure 4. Entertaining content of VIs (Source @lilmiquela, Instagram).

However, informative content is not a key factor in driving Instagram users' engagement intentions; rather, users tend to read such content as a source of information (Rossi & Rivetti, 2023). Since informative content provides insight into a product's details, consumers are more likely to seek out additional information about new items or services (Kujur & Singh, 2019). Consequently, brands should prioritize the development of informative content that contributes to the expansion of their brand's awareness and knowledge, rather than merely engaging consumers. Nevertheless, brands should exercise caution when distributing informational content regarding products that rely on direct sensory experience, such as fragrances, skincare products, or food. To prevent virtual influencers from providing information about products that they are unable to physically handle, brands should refrain from doing so (Li et al., 2026).

Relationships between human-like VIs and Instagram users can be improved through cognitive and affective empathy. Thus, VI developers should design algorithmic systems that enable human-like VIs to learn and understand emotions, recognize various emotional sensitivities of human beings, and respond to chats with intelligent and empathetic phrases (cognitive empathy), such as "I understand how you're feeling right now." They should also demonstrate emotional resonance and responsiveness to followers' emotions (affective empathy) through emojis and conversational phrases such as "I feel sad with you 😢," or emotional expressions through pictures and videos, such as facial expressions, eye expressions, body language, and tone of voice.

Examples of sentences that express cognitive and affective empathy are provided below. **Cognitive empathy:** "Lately, I've noticed a lot of comments and messages saying that many people are starting to feel burned out, right?" **Affective empathy:** "I feel a pang in my heart too after reading this." (Lowering my voice a little and looking at the camera) "Even though I'm an AI, seeing the fans who have supported me all this time having to go through so much makes me really want to be by your side." **Cognitive empathy:** "From what I've read, the best way to relax isn't just to sleep, but also to get away from the internet. Put your phone down for 15 min and go outside for some fresh air." **Affective empathy:** "Get some rest. I'll always be here for you. Sending you all virtual hugs."

Human-like VIs are able to exhibit emotions. They are capable of simulating the nuances of human expressions through the use of animation and rendering techniques (Ngan & Yu, 2019; Ahn et al., 2022). Action Units (AUs) enable the objective analysis of prospective facial muscle activations that result in specific emotional expressions (Compos

et al., 2013; Schoner-Schatz et al., 2021). For instance, more emphasis should be placed on gentle smiles, eye contact, and positive physical cues such as leaning forward (e.g., showing interest and attentiveness), nodding, and open gestures (e.g., open palms), as these traits elicit openness and friendliness (T. H. D. Nguyen et al., 2015). Cognitive and affective empathy help bridge the gap between "robots" and "humans" (reducing the uncanny valley phenomenon), offer a more thorough and nuanced comprehension of the emotions conveyed by VIs through computer-generated graphics, foster a deep emotional connection, and in turn affect parasocial relationships with Instagram users. Marketers should also concentrate on developing parasocial relationships by providing enjoyable, friendly interactions, casual talk, and relaxed conversation, such as chatting like friends. Therefore, building a close, cordial relationship and the ability to establish engagement intentions with human-like VIs are crucial for marketers.

In addition, human-like VIs can customize advice or content in a manner similar to a human influencer. This is an externality resulting from users becoming more accustomed to AI recommendation systems (J. Kim et al., 2021), as used on platforms such as Netflix, which is thought to be able to recognize patterns in user behavior and provide smart advice. Thus, VI developers should highlight this feature as a primary advantage of VIs (Sands et al., 2022), develop human-like VIs to offer tailored product recommendations, and provide the ability to learn and offer advice to consumers on various matters as needed, such as giving advice on tourist attractions, restaurants, fashion, and clothing. Moreover, developers of VIs should design content that is tailored to suit consumers' preferences and needs across different groups and contexts, because content that has been designed and adjusted to be consistent with the preferences and lifestyles of consumers will receive more attention than broad content, which will lead consumers to have more engagement intentions toward human-like VIs.

Finally, although it was "quite daring" for brands to use human-like VIs in advertising, it helped them stand out from rivals. From the standpoint of consumers, who are innovators and early adopters, brands that partner with virtual influencers are perceived as contemporary. Thus, marketers should collaborate with human-like VIs to help revitalize and enhance innovative brand perception (Lou et al., 2022). In addition, marketers should collaborate with human-like VIs to formulate rebranding strategies for brands with an old, outdated image if they want to modernize their brand or target tech-savvy consumers. Human-like VI marketing strategies can be adopted to enhance a brand's image as a cutting-edge brand in the eyes of consumers, because VIs are original and attract consumers' curiosity about this new technology. Consumers possessing a heightened awareness of innovation perceive companies collaborating with human-like VIs as more technologically proficient and innovative than those partnering with human influencers (Conti et al., 2022). Virtual influencer marketing can enhance brand creativity by representing a form of technical innovation, allowing brands to align themselves with a high-tech image (Lou et al., 2022), which subsequently increases consumer intent to engage with human-like VIs or brands.

5.4. Limitations and Future Research

This study examines young consumers enrolled in universities in Thailand who possess Instagram accounts, as this demographic is a principal target for virtual influencer marketing and is characterized by a high level of digital awareness. The predominant age group of participants was between 18 and 29 years, classified as Generation Z. Future studies may seek to corroborate these findings by utilizing bigger sample sizes and including younger groups, such as Generation Alpha. Second, future research should be extended to other types of content, such as relational, positive, and negative emotional content, as

this study concentrates on content perspective areas with an emphasis on entertaining and informative content. Third, the questionnaire was employed to assess the hypotheses in the quantitative research conducted in this study, which employed a cross-sectional design. In an effort to enhance the external validity of the findings, the authors suggest that longitudinal research design and other methodologies, including field experiments, be implemented in forthcoming investigations. Furthermore, encouraging mixed-methods research. We recommend integrating quantitative surveys with qualitative interviews, focus groups, or in-depth interviews. Such approaches would shed light on how cognitive, affective empathy, and parasocial interactions evolve and why some users engage with them. It is prudent to employ behavioral responses, such as the number of likes, shares, and comments on posts featuring human-like VIs, to gauge engagement intentions, as well as the click-through rate and time spent viewing advertisements. This method would facilitate further examination of users' intentions to engage with human-like VIs in future research. This study primarily focuses on the favorable impact of human-like VIs on users' intentions to engage, despite the extensive studies on the subject. Nonetheless, future studies may examine the negative aspects of virtual influencer marketing.

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