

CONSUMER ACCEPTANCE OF VIRTUAL INFLUENCERS FROM THE PERSPECTIVE OF THE DIFFUSION OF INNOVATIONS THEORY: THE MEDIATING ROLE OF PERCEIVED HUMANNESS¹

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ABSTRACT

Virtual influencers, as emerging actors in digital marketing, increasingly shape brand communication. Grounded in the Diffusion of Innovations Theory (DIT), this study investigates consumer acceptance of virtual influencers and explores the mediating role of perceived humanness in this process. Data were collected from 572 participants residing in Istanbul. The analysis employed Partial Least Squares Structural Equation Modeling (PLS-SEM) through SmartPLS 4, while mediation effects were tested using Hayes's (2013) bootstrap approach. According to research findings, consumers perceive virtual influencers they find sincere as more human-like, and this human-like perception turns into positive attitudes and, consequently, purchase intention. The study contributes to digital marketing literature by highlighting the importance of human-like, adaptable features in the design of virtual influencers. Theoretical insights emphasize that anthropomorphic and relatable attributes enhance consumer engagement. Practical implications suggest that marketers should integrate sincerity, adaptability, and human resemblance into virtual influencer strategies to strengthen consumer attitudes and foster purchase intentions.

Keywords: Virtual Influencer, Perceived Humanness, Perceived Sincerity, Diffusion of Innovations (DIT), Digital Marketing

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YENİLİKLERİN YAYILMASI TEORİSİ PERSPEKTİFİNDE SANAL ETKİLEYİCİLERİN TÜKETİCİ KABULÜ: ALGILANAN İNSANSILIĞIN ARACILIK ROLÜ

ÖZ

Dijital pazarlamanın yükselen aktörleri arasında yer alan sanal etkileyiciler, markaların tüketiciyle kurduğu iletişimde giderek daha önemli bir rol üstlenmektedir. Bu çalışma, Yeniliklerin Yayılması Teorisi (YYT) perspektifinden hareketle, sanal etkileyicilerin tüketici kabulünü açıklamayı ve özellikle algılanan insansılığın bu süreçteki aracılık rolünü ortaya koymayı amaçlamaktadır. Araştırma verileri, İstanbul’da yaşayan 572 katılımcıdan elde edilmiştir. Çok değişkenli yapılar arasındaki ilişkileri analiz edebilmek amacıyla Kısmi En Küçük Kareler Yapısal Eşitlik Modellemesi (PLS-SEM) kullanılmış; analizler SmartPLS 4 programı aracılığıyla gerçekleştirilmiştir. Aracı etkilerin test edilmesinde Hayes’in (2013) bootstrap-temelli aracılık prosedürü kullanılmıştır. Araştırma bulgularına göre, tüketiciler samimi buldukları sanal etkileyicileri daha insansı olarak değerlendirmekte; bu insansı algı da olumlu tutumlara ve dolayısıyla satın alma niyetine dönüşmektedir. Çalışma, sanal etkileyici tasarımı insani ve uyarlanabilir özelliklerin önemini vurgulayarak dijital pazarlama literatürüne katkı sağlamaktadır. Teorik bakış açıları antropomorfik ve ilişkilendirilebilir özelliklerin tüketici etkileşimini artırdığını vurgulamaktadır. Pratik çıkarımlar, pazarlamacıların tüketici tutumlarını güçlendirmek ve satın alma niyetlerini teşvik etmek için samimiyeti, uyum sağlama yeteneğini ve insani benzerliği sanal etkileyici stratejilerine entegre etmeleri gerektiğini göstermektedir.

Anahtar Kelimeler: Sanal Etkileyiciler, Algılanan İnsansılık, Algılanan Samimiyet, Yeniliklerin Yayılması Teorisi (YYT), Dijital Pazarlama

1. Introduction

With the advancement of digital technologies, they have become a key driver of transformation in marketing. In this context, social media has become a central platform that has transformed the way brands interact with consumers. One of the most significant indicators of this is influencer marketing, which significantly shapes consumer behavior. One of the latest developments in this area is virtual influencers, which are endowed with real human characteristics through artificial intelligence. These digital entities offer brands new ways to communicate with their target audiences in a more personalized manner, while retaining complete control on the brand side. This raises the question of how consumers behave towards these new digital entities (Guthrie, 2020; Rizzo et al., 2023; Rossi & Rivetti, 2023; Allal-Chérif et al., 2024).

Virtual influencers can actively create content, promote brands, and interact with their followers on social media networks, just like real human influencers. (Gentsch, 2019). However, how consumers perceive these digital entities is very important in terms of marketing literature.

The Diffusion of Innovations Theory systematically reveals the process by which individuals adopt innovations. The model comprises five key determinants: Relative Advantage (RA), Compatibility (PC), Complexity (C), Observability (O), and Trialability (T) (Rogers, 2003). Considering virtual influencers as an innovation enables an analysis of which of these characteristics consumers recognize and accept. Specifically, the degree to which these characters are perceived as human-like may determine whether they are accepted as genuine social media influencers.

Perceived humanness refers to the degree to which digital actors are viewed as possessing human-like emotions, intentions, cognitions, and behaviors. This construct plays a central role in assessing the persuasive power and effectiveness of AI-based systems and virtual figures in interpersonal communication (Ciechanowski et al., 2019; Gong & Nass, 2007).

While virtual influencers have become a rising research area in the marketing literature in recent years, the majority of existing studies focus on a limited set of variables such as source credibility, attractiveness, uniqueness, parasocial interaction, advertising message source, consistency, originality, parasocial interaction, and perceived human-likeness (Laszkiewicz & Kalinska-Kula, 2023; Byun & Ahn, 2023; Pushparaj & Kushwaha, 2023; Hewapathirana & Perera, 2024). Laszkiewicz and Kalinska-Kula's (2023) systematic literature review on virtual influencers reveals that most studies focus on the persuasiveness and effects of virtual influencers on brand attitude; however, comprehensive measurement models based on diffusion of innovations theory (Rogers, 2003) have not yet been sufficiently developed. In the qualitative study by Garip and İnceli (2021), which investigated how Instagram users perceived virtual influencers, some participants accepted this innovation, while others expressed discomfort with their presence.

On the other hand, perceived sincerity is considered a determinant of attitude and purchase intention in the human influencer literature (Lee & Eastin, 2020; Zhafira et al., 2022). These studies indicate that perceived sincerity increases consumers' brand attitude and purchase intention; however, these findings have not been directly translated to the virtual influencer context, and perceived sincerity has not been tested within a holistic structural model with novelty characteristics.

In recent years, perceived human likeness has become an increasingly important topic in artificial intelligence research (virtual influencers, chatbots, etc.). Studies in the literature have generally addressed this variable within the framework of visual realism, physical and mental human-likeness, and their effects on consumer responses (Schuetzler et al., 2020; Lu et al., 2022). Existing studies have examined the effects of perceived human likeness and perceived sincerity toward virtual entities on customer satisfaction, behavioral intention, purchase intention, and trust (Söderlund & Oikarinen, 2021; Jang, 2022; Hofeditz et al., 2022). However, whether it plays a mediating role in a holistic structural model together with novelty characteristics (e.g., relative advantage, perceived compatibility) and perceived sincerity has not been comprehensively examined. Therefore, integrating perceived humanness into a broader framework explaining consumer responses addresses a significant gap in existing literature.

Virtual influencers have recently emerged as a prominent phenomenon in digital marketing. This concept attracts attention because virtual influencers can create content, interact with audiences, and promote brands through their computer-generated identities. Existing research has largely examined the effectiveness of virtual influencers from a persuasion perspective, focusing on variables such as credibility, attractiveness, anthropomorphism, and parasocial interaction (Dabiran et al., 2024; Yang et al., 2023). These studies demonstrate that human-like characteristics and social interaction cues can enhance consumer engagement, brand attitudes, and purchase intentions (Lin et al., 2025). However, the majority of this literature treats virtual influencers as communication sources rather than as technological innovations. As a result, limited attention has been paid to the process through which consumers cognitively evaluate and adopt these AI-generated entities within the broader context of technological innovation. Virtual influencers differ fundamentally from human influencers because they represent AI-generated digital agents rather than real social actors. Therefore, consumer responses to them cannot be fully explained using traditional influencer marketing frameworks.

From this perspective, the Diffusion of Innovations Theory (Rogers, 2003) provides an appropriate theoretical framework for explaining how individuals evaluate and adopt emerging digital technologies. According to this theory, innovation attributes such as relative advantage and compatibility play a critical role in shaping adoption decisions. Nevertheless, the integration of innovation adoption frameworks with anthropomorphism and influencer marketing literature remains limited. In particular, although previous studies have shown that human-like characteristics of artificial agents influence consumer responses, the mechanisms through which innovation attributes and relational cues shape perceptions of humanness and subsequent behavioral outcomes remain insufficiently explored (Dabiran et al., 2024). Addressing this gap, the present study conceptualizes virtual influencers as a form of digital innovation. It integrates Diffusion of Innovations Theory (DIT) with anthropomorphism and influencer marketing research to examine how perceived sincerity, relative advantage, and perceived compatibility influence perceived humanness, attitudes, and purchase intentions.

To address this limitation, the present study integrates the Diffusion of Innovations Theory with anthropomorphism and influencer marketing literature to explain how innovation attributes and perceived sincerity shape perceptions of humanness and subsequent consumer attitudes and purchase intentions. By positioning perceived humanness as a mediating mechanism within the innovation adoption process, this study extends existing research and offers a more comprehensive explanation of consumer acceptance of virtual influencers.

This study contributes to literature in several important ways. Prior studies demonstrate that anthropomorphic features and perceptions of sincerity significantly influence consumer engagement and purchase intention toward virtual influencers, highlighting their persuasive potential in digital marketing environments. While most existing studies have examined factors such as credibility, attractiveness, authenticity, and parasocial interaction related to persuasion, research on virtual influencers has mostly treated them as sources of communication rather than technological innovations (Dabiran et al., 2024; Sorosrungruang et al., 2024). Therefore, we can say it helps advance the emerging virtual influencer literature by analyzing these digital entities through the lens of the Diffusion of Innovations theory.

Second, the study contributes to anthropomorphism and artificial intelligence marketing research by positioning perceived humanness as a key psychological mechanism linking innovation attributes and relational cues to consumer responses. Previous research has demonstrated that anthropomorphic characteristics of artificial agents and virtual influencers influence trust, engagement, and consumer attitudes (Epley et al., 2007; Waytz et al., 2010; Barari et al., 2025). However, previous studies generally examine anthropomorphism as a direct predictor of consumer outcomes rather than as part of a broader innovation adoption process. By conceptualizing perceived humanness as a mediating construct within a diffusion-of-innovations framework, this study provides a more comprehensive explanation of how technological characteristics and relational perceptions jointly shape consumer attitudes and purchase intentions toward virtual influencers.

2. Conceptual Framework and Hypothesis

2.1. Diffusion of Innovations Theory (DIT)

The Diffusion of Innovations Theory (DIT) by Rogers (2003) explains how consumers adopt new products, services, or technologies. The model states that the adoption process has five stages: knowledge, persuasion, decision, implementation, and confirmation. During the knowledge stage, consumers learn about innovation and form a basic understanding of the product, service, or technology being presented. Consumers start to develop attitudes towards innovation in the persuasion stage during the formulation of the attitudes, wherein the characteristics of relative advantage (RA), perceived compatibility (PC), complexity (C), trialability (T), and observability (O) significantly influence their selection of the innovation. The buying phase is the point at which the consumer's judgment of the newness can be influenced by his/her social surroundings or opinions of the experts. The implementation stage is when the consumer experiences the product, service, or technology that is the subject of the innovation. The confirmation stage is when the consumer evaluates their decision. The consumer either changes or reinforces their decision based on their experience (Rogers, 2003).

Veerbeek (2024) has suggested that there is a difference between consumers' levels of trust and loyalty towards virtual and human influencers. Mrad et al. (2025) emphasized that parasocial interaction and social comparison mechanisms between consumers and virtual influencers are explanatory in terms of explaining the diffusion of innovation. Virtual influencers are intriguing digital entities, so the first consumer groups to engage with them are early adopters who are curious about innovations (Lou et al., 2023).

Moore and Benbasat (1991) expanded Rogers' theory by adding two new dimensions to the five dimensions (RA, PC, C, T, and O.RA): image and voluntariness. If consumers perceive a new technology as more innovative and modern, their intention to use it increases (image).

Voluntariness, on the other hand, concerns whether the individual uses the new technology of their own free will or out of necessity.

PC refers to how well the technology or innovation in question aligns with consumers' lifestyles, values, and beliefs. As PC increases, consumer acceptance of the innovation also increases to that extent (Agarwal & Prasad, 1997). C relates to the ease of understanding and using innovation; less complex innovations are adopted more quickly (Tornatzky & Klein, 1982). T is a concept related to the extent to which an innovation can be tried before it is adopted by the consumer (Moore & Benbasat, 1991: 195). O relates to the visibility of an innovation's results to others; as visible results increase, so does the adoption rate (Premkumar et al., 1994).

Virtual influencers offer various advantages over real-life influencers. Their ability to engage 24/7, pose no risk to brands, and maintain consistency makes them more appealing to brands (Thomas & Fowler, 2021). Consumers who are active on social media perceive virtual influencers as being compatible with their own lifestyles, and their adoption processes can be shorter (de Brito Silva et al., 2022). However, for some users, the non-human nature of these entities can create perceptual C; in particular, the fact that virtual influencers appear to lack emotional life or human experiences can make them difficult to understand or seem alien (Willemsen et al., 2025).

Consumers evaluate how similar and close virtual influencers are to real people and develop behavioral and psychological responses (Ciechanowski et al., 2019; Gerlich, 2023). The concept of perceived human-likeness comes into play at this point. When consumers perceive virtual influencers as human-like, their processes of accepting and adopting innovation are positively influenced (Munnukka et al., 2022).

The acceptance of virtual influencers is consistent with the processes proposed by DIT. In this process, perceived human-like qualities are a factor that influences both rational and emotional processes. Therefore, virtual influencers can influence consumers' purchasing behavior by satisfying their functional and emotional needs. In this context, the aim of the study is to explain how virtual influencers are accepted by consumers as a digital innovation within the framework of the DIT and to empirically examine the mediating role of perceived humanness in this process. Thus, it is aimed at contributing to digital marketing practices both theoretically and practically.

Virtual influencers can be considered a novel technological phenomenon emerging at the intersection of artificial intelligence, digital media, and influencer marketing. Unlike traditional human influencers, virtual influencers are computer-generated characters that interact with audiences through social media platforms and promote brands and products in digital environments. As such, they represent a new form of marketing communication that requires consumers to evaluate and adopt a technologically mediated source of influence. In this perspective, the Diffusion of Innovations Theory (Rogers, 2003) provides an appropriate theoretical framework for examining how individuals evaluate and adopt such emerging technological phenomena. The theory explains how the perceived characteristics of an innovation (such as relative advantage and compatibility) influence individuals' attitudes and behavioral responses toward that innovation. In the context of virtual influencers, consumers may evaluate these digital agents based on the perceived advantages they offer compared to traditional human influencers as well as the extent to which they align with users' existing

social media practices. Therefore, the Diffusion of Innovations framework offers a useful perspective for understanding how consumers evaluate and respond to virtual influencers as a novel digital marketing innovation.

2.2. Perceived Humanness

Virtual influencers are defined as digital entities that have a human-like appearance but are computer-generated and share content via social media. These figures, which are typically controlled by an agency or brand, are used as an alternative to human influencers in brand product promotions. Compared to human influencers, virtual influencers carry less risk of scandal, and their content can be easily integrated into brand strategies, making them attractive (Hofeditz et al., 2022, pp. 2-3). For example, as of 2023, the most popular virtual influencer is the robot Lil Miquela, who has over 2.4 million followers on Instagram and is also active on other platforms such as TikTok, Twitter, and Discord. Although AI-based virtual influencers appear with humanness, they essentially function as a digital form of communication (Jin & Viswanathan, 2025, pp. 117-118).

The way virtual influencers are perceived by people is related to the concept of perceived humanness. In this context, anthropomorphism refers to the tendency to attribute human-like characteristics to non-human entities (Epley et al., 2007). Perceived humanness, on the other hand, is a cognitive process that explains the extent to which individuals perceive this attribution as a realistic “human-like quality” and shapes their assessments of digital actors' trustworthiness, sincerity, and persuasiveness (Barari et al., 2025; Hofeditz et al., 2022, p. 4; Li et al., 2024, p. 2762).

Research shows that the anthropomorphic characteristics of virtual influencers increase trust among followers, thereby strengthening their purchase intent (Dabiran et al., 2024). Similarly, it has been found that chatbots with high levels of anthropomorphism also lead users to develop a stronger attachment to digital entities (Yu & Lan, 2024).

Li et al. (2024) define perceived humanness as the degree to which individuals attribute human-like characteristics to non-human actors, noting that it increases the persuasiveness and acceptance of technologies by influencing users' trust, social interaction intentions, and expectations of human-norm-compliant behavior from chatbots. This theoretical perspective is highly related to virtual influencers, since perceptions of humanness directly shape how followers judge their trustworthiness, authenticity, and persuasive power, which in turn influences engagement and purchase intentions.

Social agency theory suggests that when systems convey stronger social cues, users tend to respond in more socially oriented ways (Atkinson et al., 2005). In other words, when a technology or system presents human-like social cues such as friendliness, tone of voice, facial expression, name, etc., users are inclined to respond to such a system in a socially human way. There has been empirical evidence that supports this idea; Ghazali et al. (2018) suggested that if robots show some social cues, people are more likely to perceive the robot as human. Similarly, Gray et al. (2007) argued that people use traits such as emotional depth, individuality, and self-control to assess artificial agents. Expanding this view, Ho and MacDorman (2017:4) highlighted that humanness is not limited to physical resemblance but also involves cognitive and emotional capacities. Westerman et al. (2020:395) found that factors such as facial expressiveness, intelligence, and social sensitivity further strengthen these perceptions. Moreover, perceived humanness functions as a mechanism influencing interpersonal dynamics (Söderlund & Oikarinen, 2021, p. 96). Collectively, these findings

suggest that perceived humanness plays a crucial role in shaping how individuals evaluate and interact with artificial agents in digital environments and influences their attitudes and behavioral responses toward such technologies.

Studies focused on chatbots and digital agents go on to show that natural conversational style, the expression of emotionality, humor, and context-sensitive responses increase humanness perception (Svenningsson & Faraon, 2019; Schuetzler et al., 2020; Westerman et al., 2020). Warmth, friendliness, and personalized communication have been found to be especially effective in building trust, empathy, and closeness with users (Li et al., 2024, p. 2770; Wong & Wong, 2025, p. 7). Research on virtual influencers presents the same pattern: the degree to which virtual influencers are becoming more human-like by their characters is a strong predictor of user engagement. Da Silva Oliveira and Chimenti (2021) noted that focusing on human-like features of digital personas enhances relationships with audiences. Similarly, analyses of non-human characters such as Lil Miquela demonstrate their ability to attract considerable user interest (Block & Lovegrove, 2021). These findings suggest that even a moderate level of humanness is sufficient to boost user interaction. However, highly realistic and highly human-like avatars receive fewer positive and more negative comments compared to human influencers and more stylized (e.g., anime-style) virtual influencers (Arsenyan & Mirowska, 2021). This suggests that when the human likeness of virtual figures exceeds a certain threshold, it can create an effect known in the literature as the “uncanny valley,” causing discomfort in users and negatively affecting interaction (Mori et al., 2012). Belanche et al. (2024) state that virtual influencers should be designed to enhance the impact of human-like characteristics such as expertise, authenticity, and appearance.

Virtual influencers with more human-like characteristics are perceived as more authentic, appealing, and trustworthy, which increases purchase intent (Jang, 2022). As human-like characteristics increase, consumer trust in both the virtual influencer and the brand also increases (Hofeditz et al., 2022; Lu et al., 2022; Wong & Wong, 2025).

Therefore, perceived humanness is a multidimensional structure consisting of both physical appearance and emotional structure. Perceived humanness is an important variable that influences consumers' attitudes towards brands and their purchasing decisions.

2.2.1. The Connection Between Perceived Humanness in the Adoption of Virtual Influencers and the Diffusion of Innovations Theory

The perceived humanness can be directly associated with DIT, and this is why the process of adopting virtual influencers is a digital innovation. DIT proposes that relative advantage, compatibility, complexity, observability, and trialability are all perceptual evaluations of the adoption of an innovation. The anthropomorphic nature of virtual influencers, e.g., the human-like appearance, the emotional expression, and the social ability, makes these digital agents more realistic, trustworthy, and human-like to their followers, which cultivates a sense of relative advantage rather than traditional ones (Dabiran et al., 2024). At the same time, the results associated with anthropomorphic artificial intelligence products, such as the human-like look and human-like communication aspects of products, indicate that they play a significant role in consumers forming positive attitudes towards them and assessing the brand (Zhang & Wang, 2023). Furthermore, the feeling of emotional attachment towards artificial intelligence applications with human-like features causes users to perceive these artificial actors as a social/emotional person rather than as a tool, and this affects consumer behavior (Hermann,

2022). Here, perceived humanness acts as a highly important cognitive and emotional system in the process of innovation adoption and diffusion, thus enhancing the possibility of virtual influencers to get social acceptance and spread.

2.3. Perceived Sincerity

Perceived sincerity refers to how genuinely the consumer perceives the digital presence, which strengthens the bond between the consumer and the brand (Aaker, 1997, pp. 350-351). Perceived sincerity is measured by considering authenticity, transparency, and connection with consumers in influencers' content creation (Zhafira et al., 2022, p. 24). The influencer's sincerity creates a parasocial interaction environment with consumers who are their followers (Lee & Eastin, 2020, p. 77; Horton & Wohl, 1956, p. 216). This situation is decisive in terms of brand trust, brand attitude, and purchase intention (Zhafira et al., 2022, p. 30; Tsai & Men, 2017, p. 1852). It is also demonstrated that the application of anthropomorphic service robots in persuasion processes results in a decrease in the perceived sincerity of the salesperson; this has adverse impacts on consumer attitudes and behaviors (Lee & Yi, 2025).

Perceived sincerity is an evaluation that indicates to what degree consumers view a source as genuine, and it is one of the fundamental antecedents of authenticity, but in fact, authenticity is a multidimensional and broader framework, not reduced to sincerity only. The given approach is also compatible with the results of the consumer-based brand authenticity model, which empirically reveals that sincerity is one of the elements of authenticity (Napoli et al., 2014).

Jang et al. (2025) found that emotional approaches increase perceived sincerity, which in turn enhances consumer trust. This finding is consistent with studies showing that authenticity supports not only trust but also social closeness and bonding tendencies (Lou & Yuan, 2019). Therefore, perceived authenticity emerges as an important factor in forming emotional bonds between consumers and both human and virtual influencers. In this study, perceived humanness refers to the extent to which followers attribute human-like characteristics to virtual influencers. Authentic communication facilitates message delivery and helps establish trust-based relationships between followers and brands. Research also shows that perceiving digital or artificial characters as sincere and honest contributes to them being seen as more 'human-like.' In particular, virtual influencers communicating in a sincere manner make them more human and relatable (Jin, 2020). Recent studies also emphasize that when digital figures are endowed with qualities such as empathy, warmth, and sincerity, they are perceived more as "real people" by viewers (Lee & Park, 2023). According to social agency theory, individuals tend to respond to technological systems that display social cues as if they were interacting with real social actors (Nass & Moon, 2000). Building on this perspective, anthropomorphism research suggests that people attribute human-like characteristics to non-human entities when these entities display socially meaningful cues or behaviors (Waytz et al., 2010). Empirical studies in human-computer interaction further demonstrate that such social and communicative cues can increase users' perceptions of humanness in artificial agents (Go & Sundar, 2019; Dabiran et al., 2024). Hypothesis H1 was formulated based on this information.

H1: Perceived sincerity has an effect on perceived humanness.

Within the Diffusion of Innovations framework, relative advantage refers to the extent to which an innovation is perceived as providing superior benefits compared to existing alternatives (Rogers, 2003). In this study, relative advantage refers to the extent to which consumers perceive virtual influencers as providing superior benefits compared with traditional human

influencers. These advantages may include increased consistency of content, continuous availability, increased control of the brand, and improved access to product information. For instance, while Moustakas et al. (2020) mentioned some of the challenges that virtual influencers present, they proposed that it may be possible that virtual influencers, rather than human ones, offer some advantages, such as greater control and predictability of brand and cost efficiency for marketing managers. Moreover, it was said that innovations with obvious functional or experiential benefits elicit greater positive evaluation and greater user involvement (Tornatzky & Klein, 1982; Moore & Benbasat, 1991). In the context of AI-based technologies and digital agents, it has been found that technological features and interaction capabilities can modify the way users perceive and evaluate these systems, including how much they are perceived as human-like (Go & Sundar, 2019; Dabiran et al., 2024). Research on anthropomorphism suggests that individuals attribute human-like characteristics to non-human agents because of underlying psychological mechanisms such as elicited agent knowledge, effectance motivation (wanting to understand and predict other agents), and sociality motivation (need for social connection) (Epley et al., 2007; Waytz et al., 2010). Accordingly, when users feel that digital agents provide superior benefits over traditional sources of communication, they may be more inclined to think of their behaviors and interactions in human terms. Although there is still a lack of direct empirical evidence, the theoretical logic of innovation adoption and anthropomorphism implies that perceived benefits of digital agents may make them more perceived as human. Within this framework, the H₂ hypothesis is proposed.

H2: Relative advantage has an effect on perceived humanness.

From the perspective of Diffusion of Innovations Theory, individuals evaluate new technologies based on the perceived characteristics of the innovation, such as relative advantage and compatibility (Rogers, 2003). These innovation attributes shape users' evaluations of the usefulness and relevance of a technological system. In human–computer interaction research, such evaluations can also influence the extent to which individuals interpret technological agents as social actors. According to social agency theory, when technological systems exhibit characteristics that align with users' expectations and provide meaningful benefits, users are more likely to engage with them as if they were interacting with social entities (Nass & Moon, 2000). Similarly, anthropomorphism research suggests that individuals attribute human-like qualities to non-human agents when these agents behave in ways that appear socially relevant or functionally beneficial (Waytz et al., 2010). In this context, innovations that are perceived as advantageous and compatible with users' existing practices may increase the likelihood that digital agents are interpreted in human-like terms. Accordingly, innovation attributes such as relative advantage and compatibility may contribute to stronger perceptions of humanness toward virtual influencers.

Perceived compatibility refers to the extent to which a technology is compatible with the user's existing values, experiences, and needs, and this perception is a strong determinant of technology adoption and positive attitudes towards it (Davis, 1989; Venkatesh & Davis, 2000). Innovations that are consistent with people's everyday practices and expectations tend to be viewed as more familiar and easier to incorporate into people's daily activities. In the context of human-computer interaction, it has been shown that digital systems that behave in ways consistent with people's expectations are more likely to be interpreted as social actors rather than as purely technological tools (Go & Sundar, 2019; Schuetzler et al., 2020). When the way digital agents interact with users and communicate with them is parallel to existing experiences,

people may see agents as more natural and human than others. Accordingly, higher perceived compatibility may increase the likelihood that users attribute human-like qualities to virtual influencers. The attribution of human-like characteristics, or perceived humanness, generally increases when interaction is familiar, natural, and fluid (Airenti, 2018). High PC allows users to interact with technology more comfortably and naturally because users experience the system as consistent with their familiar ways of interacting with digital or social agents, paving the way for them to experience it as a social actor rather than a technical tool. Indeed, recent studies have shown that when the design and behavior of robots or AI-based systems align with user expectations and familiar patterns, the perceived level of humanness increases significantly (Liu et al., 2025). Based on this information, Hypothesis H3 was formulated:

H3: Perceived compatibility has an effect on perceived humanness.

2.4. Attitude

Attitude refers to an individual's tendency to evaluate a particular object, behavior, or situation positively or negatively (Fishbein & Ajzen, 1975:6–10) and is shaped by individuals' beliefs, values, and past experiences; it also forms a fundamental building block in the formation of behavioral intentions (Ajzen, 1991, p. 182). In the present study, attitude refers to consumers' overall evaluative tendency toward virtual influencers and the marketing content they deliver on social media platforms. Fishbein's (1963) attitude model, based on the expectancy-value theory, suggests that individuals develop attitudes through a combination of their beliefs and values toward an object. This approach later formed the basis of the Theory of Planned Behavior (TPB) by Fishbein and Ajzen (1974). TPB proposes that individuals' intentions to perform a behavior are determined by the combined effects of attitude, subjective norm, and perceived behavioral control. Positive attitudes increase the likelihood of individuals performing the behavior, while negative attitudes can weaken intentions (Ajzen, 1991, p. 182). Therefore, in social psychology literature, attitude is considered not only a cognitive tendency but also a determinant of behavior.

Research by Alalwan (2018:65) and Duffett (2015) demonstrates the role of social media ads in shaping consumer attitudes. Findings indicate that when advertising content is user-centric, engaging, and designed to foster an emotional connection, consumers develop more positive attitudes. Attitudes toward virtual influencers appear to have a direct impact on consumer behavior. Acar and Ekizler's (2023) study revealed that positive attitudes have a significant impact on purchase intentions, and emotional connection plays a critical role in this relationship. Similarly, Köse's (2025) research shows that attitudes toward virtual influencers are shaped by positive themes such as novelty, accessibility, and expertise, and negative themes such as artificiality, emotional inadequacy, and distrust.

It has been demonstrated that consumers' attitudes toward influencers have both direct and indirect effects on purchase intention (Tiwari et al., 2024). The positive attitudes create meaningful and positive effects on purchase intention (Eyel & Şen, 2020, p. 24). Similarly, positive attitudes developed towards micro-influencers strengthen brand image and purchase intention (Isyanto et al., 2020). Studies conducted on Instagram show that the attitudes and behaviors displayed by influencers in their content have an effect on consumer attitudes and the associated purchase intentions (Erdoğan & Özcan, 2020).

Perceived sincerity refers to the degree to which a communication source is perceived as genuine and honest (Ohanian, 1990). The literature indicates that influencers who are perceived as sincere facilitate the development of positive attitudes toward the brand by establishing an

emotional connection with the audience (Lou & Yuan, 2019; Lee & Eastin, 2020). Furthermore, it has been found that influencers' explicit disclosure of their earnings or commissions from the products they promote increases perceived sincerity and positively influences consumer attitudes (Lee, 2023). The literature directly proves that influencers who are perceived as sincere establish an emotional connection with their audiences, which in turn influences brand attitudes (Zhafira et al., 2022). In this study, the “attitude” variable specifically refers to consumers’ overall evaluative tendency toward the virtual influencer, which is consistent with the literature on influencer effectiveness and persuasion. Based on this information, the H4 hypothesis was formulated.

H4: Perceived sincerity has an effect on attitude.

RA, that is, the level of benefit that an innovation provides compared to existing alternatives, is a fundamental factor that shapes not only the potential for adoption but also users' attitudes toward technology (Rogers, 2003). The dimension of relative advantage has been the subject of numerous studies. A study investigating the determinants of gold dinar acceptance in Malaysia found that relative advantage had a positive impact on attitudes (Kosnina et al., 2019). Another study found that Generation Y university students' perceptions of the ease of use and relative advantage of mobile banking had a significant positive impact on their attitudes toward mobile banking (van Deventer et al., 2018). Hypothesis H5 was formulated based on this information.

H5: Relative advantage has an effect on attitude.

The results of studies conducted on this subject in the literature confirm the effect of PC on attitude in various contexts. Arli and Bakpayev (2023) revealed that RA, PC, and O have a significant and positive effect on consumers' attitudes towards mobile payments. Another study conducted on e-marketing systems revealed that PC has both a direct and indirect effect on e-marketing usage intention through attitudes toward e-marketing usage (Kanchanatanee et al., 2014). Similarly, in the field of internet banking, Al-Ajam and Nor (2013) reported that PC is a strong predictor of attitude and that this effect is also reflected in usage intention. Another development in which the effect of innovation diffusion on behavioral attitudes and the indication of using mobile banking was investigated was found to have a significant effect on the relationship between perceived compatibility (Yunus, 2014). Hypothesis H6 was formulated based on this information.

H6: Perceived compatibility has an effect on attitude.

Rao Hill and Troshani (2024) show that in users' interactions with AI-supported systems or figures, the perception of social presence—the feeling that the system exists as if it were a real person—supports the development of positive attitudes. This perception contributes to the formation of positive evaluations of the system or the brand it represents by increasing trust and the benefits gained from interaction. For example, the use of animated icons and human voices in chatbot design creates a higher perception of anthropomorphism among users, which strengthens the sense of social presence and consequently positively influences brand attitude (Go & Sundar, 2019:306). Similarly, the emotional (friendliness and “coolness”) and functional (security and competence) features of AI-powered service robots meaningfully shape users' attitudes, reinforcing the perception of social presence and positive attitude (Hlee et al., 2023). These findings show that humanness in virtual character design plays a critical

role in strengthening brand communication and message attitude. In this study, the “attitude” construct specifically refers to consumers’ evaluative tendency toward the virtual influencer and the content/messages they deliver. Based on this information, Hypothesis H7 was formulated.

H7: Perceived Humanness has an effect on Attitude.

2.5. Purchase Intention

According to Ajzen (1991), purchase intention is consumers' plan to purchase a specific product or service in the future. Purchase intention has been and continues to be the subject of numerous studies in marketing literature. For example, Malhotra and Ramalingam's (2025) study concluded that the anthropomorphism perceived by consumers in products utilizing artificial intelligence affects purchase intention. Another study also found that the visual and emotional anthropomorphic characteristics of virtual influencers positively affect consumers' purchase intention (Li & Huang, 2024). In a study investigating different degrees of visual anthropomorphization in virtual influencer design, virtual influencers represented by cartoon visuals and hyper-realistic visuals increased consumers' purchase intentions, while virtual influencers with moderately realistic visuals were observed to decrease consumer purchase intentions. Xu et al. (2025) revealed that the human-like features of avatars positively affect followers’ purchase intentions by increasing their identification with these virtual entities. Hypothesis H8 was formulated.

H8: Perceived Humanness has an effect on purchase intention.

Considering Fishbein and Ajzen's (1975) suggestion regarding attitude, it is thought that social media users' positive attitudes towards virtual influencers may influence their purchasing behavior. Various studies have demonstrated that positive attitudes towards influencers significantly increase purchase intent (Acar & Ekizler, 2023; Khan & Asim, 2025). Research indicates that positive attitudes toward social media influencer marketing content increase the purchase intention for the related product or service (Khan & Asim, 2025). Furthermore, based on this information, Hypothesis H9 was formulated.

H9: Attitude has an effect on purchase intention.

3. Methodology

The research population consists of social media users living in Istanbul. The research sample was determined using the convenience sampling method. This method is frequently preferred, especially in populations such as social media users, which are large and have unclear boundaries, as it allows the researcher to reach participants they can access. Istanbul being one of Turkey's largest and most heterogeneous cities, accommodating individuals with different socio-demographic characteristics, may contribute to the data obtained reflecting some characteristics of social media users in Turkey. However, since convenience sampling is not a probabilistic sampling method, it cannot be said that the sample fully represents the Turkish population.

The sampling method recommended by Terzis and Economides (2011) was used to calculate the research population. When the number of populations is unknown, calculations are made for an infinite population, and therefore, the minimum required sample size was calculated as 384 (Cochran, 1977). For this research, ethical committee approval was obtained from the Istanbul Niřantaşı University Ethics Committee on 08/22/2024 with the number 2024-08.

Data was collected using a convenience sampling approach through face-to-face surveys conducted with social media users living in Istanbul between September 1, 2024, and January 1, 2025. Participants were approached in public areas and invited to voluntarily participate in the study. Istanbul was selected as the research setting because it represents one of the largest and most digitally active metropolitan areas in Turkey with a high level of social media usage. Within the scope of the study, 600 survey forms were distributed, and 572 survey forms were found to be valid and analyzed due to reasons such as reluctance, unwillingness, and age group mismatch. The participants' demographic information is as follows: 67% were aged 21-29, 30.2% were aged 18-20, 2% were aged 30-39, 0.3% were aged 40-49, 0.2% were aged 50-59, and 0.3% were aged 60 and above. 60.5% of the sample are male and 39.5% are female; 85.3% have a bachelor's degree, 6.5% have an associate's degree, 5.2% have a high school diploma, 2.6% have a postgraduate degree, and 0.3% have a primary school diploma.

The study did not require participants to follow or interact with a virtual influencer. In this study, participants were given a brief introduction to virtual influencers and brand promotions from Turkey and around the world (Figures 1-2-3-4-5). They were then asked whether they followed any virtual influencers on social media. All participants, both those who accepted virtual influencers and those who did not, were included in the study. Participants in the study were asked to answer the survey questions by considering the virtual influencers whose examples were shown before the study.



Figure 1. Example of Virtual Influencer: Alara X



Figure 2. Example of Virtual Influencer: Alin



Figure 3. Example of Virtual Influencer: Asena İlik



Figure 4. Imma



Figure 5. Lil Miqela

3.1. Research Model

The current study model was developed using the variables PS, PC, RA, PH, A, and PI. The research model is shown in Figure 6. Scale statements related to RA and PC, two dimensions of the Diffusion of Innovations Theory, were reviewed in the literature and adapted for the current study (Rogers, 2002; Yuen et al., 2021; Rogers et al., 2014).

PS scale statements were adapted from Aaker's (1997) study; PH scale statements from Hildebrandt et al. (2023); A scale statements from Na et al. (2024); and PI scale statements from Shang et al. (2017). The scale statements were used with necessary adaptations to meet the purpose of the study.

The measurement items employed in this study were adapted to fit the objectives of the research through a series of steps. First, expressions such as "person" or "chatbot" appearing in the original scales were replaced with the term "virtual influencer" to ensure conceptual consistency with the study context. The scales were translated from their original language into Turkish and then verified through a back-translation procedure to ensure linguistic equivalence. Subsequently, the preliminary version of the questionnaire was evaluated by two marketing scholars to assess its suitability for the virtual influencer context and to improve the clarity of the wording.

In addition, several items were contextually modified to reflect the characteristics of virtual influencer marketing. While the original relative advantage scale measures the perceived benefits of adopting an innovation compared with existing alternatives (Rogers, 2003; Moore & Benbasat, 1991), the adapted version in this study specifically refers to the perceived advantages of virtual influencers compared with traditional human influencers.

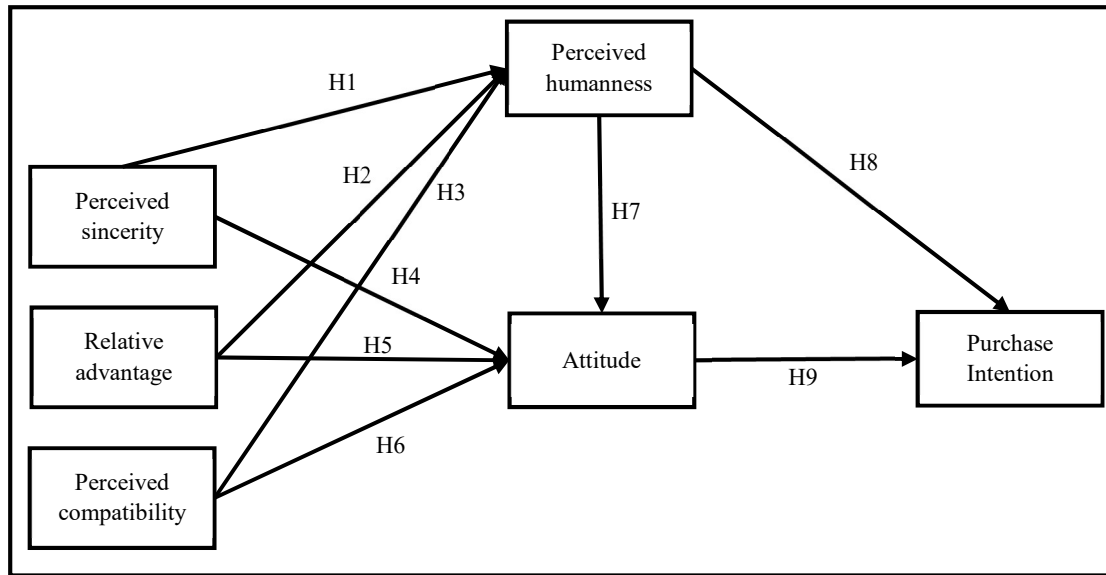


Figure 6. Conceptual Model of the Study

3.2. Analysis

When analyzing the research, Partial Least Squares Structural Equation Modeling (PLS-SEM), one of the frequently preferred structural modeling techniques for analyzing relationships between multivariate structures, was used (Hair et al., 2020). Furthermore, the analyses were performed using Smart PLS 4, one of the analysis programs that supports this model. In the next stage, reliability and validity analyses were performed. Hayes' (2013) Bootstrap mediation procedure was used to examine relationships related to research hypotheses.

Table 1. Factor Loadings and Cronbach's Alpha Values (Reliability Values) Related to Survey Results

Variable	Items	Factor Loadings	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Relative Advantage (RA)	RA1	0.888	0.922	0.945	0.811
	RA2	0.922			
	RA3	0.919			
	RA4	0.873			
Perceived Compatibility (PC)	PC1	0.916	0.950	0.962	0.834
	PC2	0.924			
	PC3	0.920			
	PC4	0.894			
	PC5	0.911			
Perceived Sincerity (PS)	PS1	0.810	0.930	0.944	0.706
	PS2	0.808			
	PS3	0.853			
	PS4	0.876			
	PS5	0.868			
Purchase Intention (PI)	PS6	0.854	0.933	0.957	0.881
	PS7	0.811			
	PI1	0.949			
	PI2	0.949			
Attitude (A)	PI3	0.919	0.935	0.959	0.885
	A1	0.946			
	A2	0.942			
Perceived Humanness (PH)	A3	0.934	0.930	0.948	0.783
	PH1	0.809			
	PH2	0.912			

PH3	0.905
PH4	0.917
PH5	0.877

Factor loadings, Cronbach's alpha, and CR values must be above 0.70, and AVE values must be above 0.50 (Hair et al., 2020).

Table 2. Fornell-Lacker Criterion Table, Results of Correlation Analysis Between Variables (Validity Values)

	A	PC	PH	PI	PS	RA
A	0.941					
PC	0.819	0.913				
PH	0.724	0.735	0.885			
PI	0.889	0.829	0.730	0.939		
PS	0.752	0.804	0.834	0.749	0.840	
RA	0.755	0.802	0.715	0.735	0.780	0.901

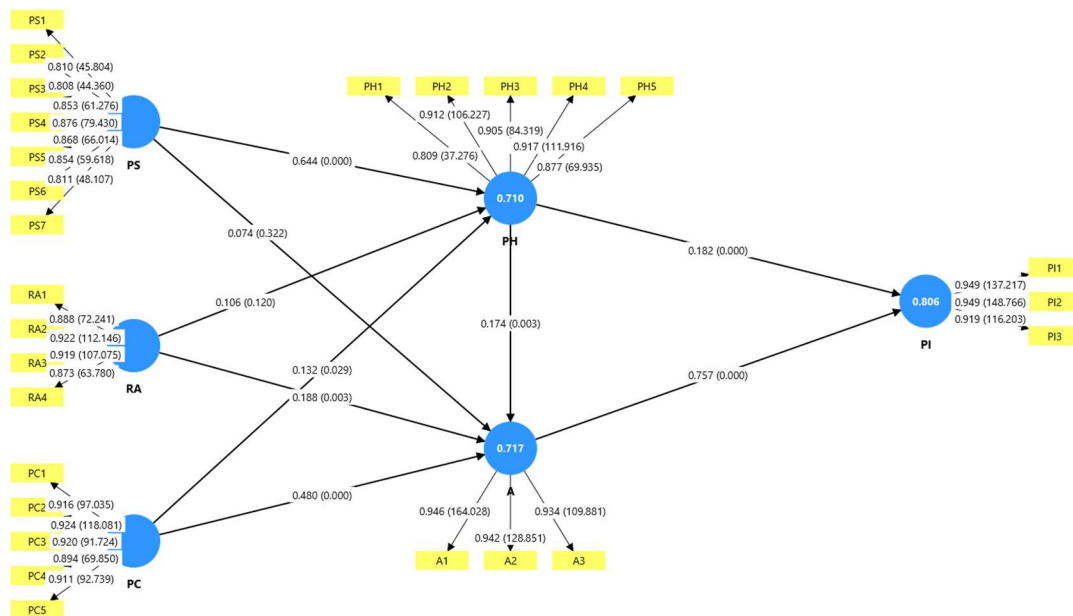


Figure 7. Path Analysis of the Study

The Fornell-Lacker Criterion table was used in the correlation analysis. The correlation analysis is shown in Table 2. In correlation analysis, it is expected that the variables themselves will have a high correlation coefficient. Upon examining the table, results parallel to the literature were obtained from the correlation analysis (Hair et al., 2021).

Table 3. Outputs of the Structural Model

Hypothesis	Relationship	Path Coefficient (β)	t-value	p-value	p<0,05 Hypothesis Supported?
H1	PS → PH	0.644	10.484	0.000	Yes
H2	RA → PH	0.106	1.554	0.120	No
H3	PC → PH	0.132	2.180	0.029	Yes
H4	PS → A	0.074	0.991	0.322	No
H5	RA → A	0.188	3.017	0.003	Yes
H6	PC → A	0.480	7.257	0.000	Yes
H7	PH → A	0.174	3.012	0.003	Yes
H8	PH → PI	0.182	4.781	0.000	Yes
H9	A → PI	0.757	21.253	0.000	Yes

The hypotheses of the study are presented in Table 3. The findings reveal the multi-layered effect of cognitive and emotional evaluations of virtual influencers on purchase intention.

In H1 hypothesis, the effect of perceived sincerity (PS) on perceived humanness (PH) was found to be highly significant ($\beta = 0.644$, $t = 10.484$, $p < 0.001$). This indicates that the perception of virtual influencers as sincere, strongly affects their perception as humanness.

In H2, the effect of relative advantage (RA) on perceived humanness (PH) is not significant ($\beta = 0.106$, $p = 0.120$). This result indicates that the rational benefits of virtual influencers do not affect perceived humanness.

In H3 hypothesis, perceived compatibility (PC) was found to have a significant effect on perceived humanness (PH) ($\beta = 0.132$, $p = 0.029$). This indicates that when virtual influencers are compatible with consumers' lifestyles, habits, and values, it becomes easier to perceive them as more human.

In the H4 hypothesis, the effect of perceived sincerity (PS) on attitude (A) was not found to be significant ($p = 0.322$). This indicates that users evaluate sincerity indirectly (e.g., through the perception of humanness) rather than directly.

Hypotheses H5 and H6 were supported, and both relative advantage (RA) and perceived compatibility (PC) variables were found to have significant effects on attitude (A) ($RA \rightarrow A$: $\beta = 0.188$, $p = 0.003$; $PC \rightarrow A$: $\beta = 0.480$, $p < 0.001$). This indicates that users' perceptions of benefit and suitability are effective in the process of developing positive attitudes.

According to hypothesis H7, the effect of perceived humanness (PH) on attitude (A) is significant ($\beta = 0.174$, $p = 0.003$). This finding indicates that social media users' perception of virtual influencers as human-like positively influences consumer attitudes.

Hypothesis H8 tested the direct effect of PH on purchase intention (PI) and obtained significant results ($\beta = 0.182$, $p < 0.001$). This finding suggests that social media users' perception of virtual influencers as human-like positively influences purchase intention.

Hypothesis H9 tested the effect of A on PI, and this effect was found to be the strongest relationship in the model ($\beta = 0.757$, $p < 0.001$). This situation once again confirms that attitude is a determining variable in consumer behavior (Ajzen, 1991; Fishbein & Ajzen, 1975; Schiffman & Wisenblit, 2019; Acar & Ekizler, 2023; Khan & Asim, 2025)

The hypothesis test results demonstrate substantial support for the model developed within the DIT framework. While perceived friendliness does not directly affect attitude, it does have indirect effects through humanness. Conversely, the effects of A and PH on PI are quite strong. In particular, the relationship between PC and A highlights the importance of individual value congruence in virtual influencer strategies.

Partial Least Squares Structural Equation Modeling (PLS-SEM), a frequently preferred structural modeling technique for analyzing relationships between multivariate constructs, was used in the research analysis (Hair et al., 2017:56-67). Furthermore, the analyses were performed using Smart PLS 4, one of the analysis programs that supports this model. During the analysis phase of the research data, inconsistent and missing values in the data set were first checked and corrected. In the next phase, reliability and validity analyses were performed. The Hayes (2013) Bootstrap mediation procedure was used to examine relationships related to

research hypotheses. This approach focuses on confidence intervals or p-values for the significance of indirect effects and does not require the direct effect to be significant. The analysis results of the mediating variables are presented in Table 4.

Table 4. Mediator Variable Analysis Table

Hypothesis	Relationship	Path Coefficient (β)	t-value	p-value	p<0,05 Hypothesis Supported?
H10	PS $\rightarrow$ PH $\rightarrow$ PI	0.117	4.711	0.000	Yes
H11	RA $\rightarrow$ PH $\rightarrow$ PI	0.019	1.478	0.140	No
H12	PC $\rightarrow$ PH $\rightarrow$ PI	0.024	1.727	0.084	No
H13	PS $\rightarrow$ A $\rightarrow$ PI	0.056	1.001	0.317	No
H14	RA $\rightarrow$ A $\rightarrow$ PI	0.142	3.068	0.002	Yes
H15	PC $\rightarrow$ A $\rightarrow$ PI	0.364	6.091	0.000	Yes
H16	PH $\rightarrow$ A $\rightarrow$ PI	0.132	3.006	0.003	Yes
H17	PS $\rightarrow$ PH $\rightarrow$ A	0.112	3.110	0.002	Yes
H18	PS $\rightarrow$ PH $\rightarrow$ A $\rightarrow$ PI	0.085	3.060	0.002	Yes
H19	RA $\rightarrow$ PH $\rightarrow$ A	0.019	1.229	0.219	No
H20	RA $\rightarrow$ PH $\rightarrow$ A $\rightarrow$ PI	0.014	1.231	0.219	No
H21	PC $\rightarrow$ PH $\rightarrow$ A	0.023	1.763	0.078	No
H22	PC $\rightarrow$ PH $\rightarrow$ A $\rightarrow$ PI	0.017	1.817	0.069	No

According to Table 4, the indirect effect of perceived sincerity on purchase intention through perceived humanness is significant ($\beta = 0.117$, $p = 0.000$). Therefore, H10 is supported. The indirect effect of perceived relative advantage on purchase intention through perceived humanness was not found to be significant ($p = 0.140$). The effect of perceived compatibility on purchase intention via humanness is not significant ($p = 0.084$). The effect of perceived sincerity on purchase intention via attitude is not statistically supported ($p = 0.317$). Accordingly, hypotheses H11, H12, and H13 are not supported. The indirect effect of relative advantage on purchase intention via attitude is significant ($\beta = 0.142$, $p = 0.002$). A significant indirect effect of perceived compatibility on purchase intention via attitude has been found ($\beta = 0.364$, $p < 0.001$). The indirect effect of perceived humanness on purchase intention via attitude was found to be significant ($\beta = 0.132$, $p < 0.003$). A significant indirect effect of perceived sincerity on attitude via perceived humanness was found ($\beta = 0.132$, $p < 0.003$). Therefore, hypotheses H14, H15, H16, and H17 are supported.

According to Table 4, perceived sincerity, perceived humanness, and attitude significantly influence purchase intention ($\beta = 0.085$, $p = 0.002$). Therefore, H18 is supported. Although perceived sincerity does not have a significant direct effect on purchase intention (H4 was rejected), this relationship appears to occur indirectly through humanness.

The indirect effect of perceived relative advantage on attitude through perceived humanness was not found to be significant ($p = 0.219$). Perceived relative advantage does not affect purchase intention through perceived humanness and attitude ($p = 0.219$). Therefore, H19 and H20 are not supported.

The indirect effect of perceived compatibility on attitude through perceived humanness was not found to be significant ($p = 0.078$). Perceived compatibility does not affect purchase intention through perceived humanness and attitude ($p = 0.069$). In this context, H21 and H22 are not supported.

Table 5. R² Values for Variables

Variable	R ²	Adj. R ²
A	0.717	0.715
PH	0.710	0.709
PI	0.806	0.806

The R² values of the study are shown in Table 5. Since all R² values are above 0.70, it can be said that the model is generally highly explanatory (Hair et al., 2021). The R² values were quite high for the variables of attitude (0.717), perceived humanness (0.710), and purchase intention (0.806). This indicates that the model has a very strong explanatory power for dependent variables.

Table 6. VIF Values

Variable	A1	A2	A3	PC1	PC2	PC3	PC4	PC5	PH1	PH2	PH3	PH4	PH5	
VIF	3.649	3.365	3.472	3.051	3.456	2.161	2.265	3.420	3.672	3.248	2.754	1.342	2.231	
Variable	PI1	PI2	PI3	PS1	PS2	PS3	PS4	PS5	PS6	PS7	RA1	RA2	RA3	RA4
VIF	3.527	2.252	2.850	1.492	1.353	2.403	2.121	3.537	2.389	1.937	2.437	3.330	3.117	2.463

All VIF values in the table range from 1.3 to 3.7. No VIF value exceeds the critical threshold of 5. This indicates that there is no serious multicollinearity problem among the measurement variables included in the model. Some items, such as PS1, PS2, PS7, and PH4, have VIF values below 2, indicating a very low level of multicollinearity. This enhances the stability of the measurement model.

The VIF values of all observed variables in the structural model fall within the limits suggested by Hair et al. (2021), indicating that multicollinearity between variables does not pose a serious problem in the model. This is a factor that increases the measurement reliability of the model and the reliability of the regression coefficients.

3.3. Findings and Discussion

This study examined consumer acceptance of virtual influencers within the framework of DIT (Rogers, 2003) and tested the mediating role of perceived humanness. The findings show that consumers' cognitive (attitude, perceived compatibility, relative advantage) and emotional-intuitive (sincerity, humanness) evaluations towards virtual influencers are effective at different stages of the adoption process.

The results of this study can be directly linked to the three primary stages of DIT: persuasion, decision, and confirmation (Rogers, 2003).

- **Persuasion Stage:** During this stage, consumers begin to develop positive/negative attitudes toward innovation. The research findings indicate that emotional and value-congruence-based evaluations, such as sincerity and compatibility, lead consumers to perceive the virtual influencer as humane, and this sense of humanness strengthens the persuasion stage. In particular, the PS → PH → A path demonstrates the central role of emotional evaluation in the persuasion stage.

- **Decision Stage:** During this stage, the consumer decides whether to adopt innovation. The findings indicate that the decision stage relies heavily on cognitive evaluations, with the RA and PC variables influencing purchase intention (PI) through attitude (A). While humanness plays an indirect role in this stage, the strength of the $RA \rightarrow A \rightarrow PI$ path confirms that the decision is shaped more by rational benefit and attitude.
- **Confirmation Stage:** The confirmation stage is the stage where the consumer consolidates their decision to adopt. The significance of the $PH \rightarrow A \rightarrow PI$ path suggests that humanness not only plays a role in the initial interaction but also strengthens confirmation processes at later stages, such as purchase intention.

Within this framework, the research demonstrates that the emotional-intuitive (humanness, sincerity) and cognitive (compatibility, usefulness, attitude) components of the Diffusion of Innovations Theory (DIT) operate at different stages in the adoption process. Thus, it offers a theoretical extension of how DIT can be adapted to modern digital environments in the context of virtual influencers.

The strong effect of perceived sincerity on humanness (H1) and the fact that sincerity does not directly affect attitude (H4) point to an important distinction. This finding suggests that consumers first process sincerity within an intuitive-humanistic framework, and then this perception shapes attitude. Thus, the significance of the $PS \rightarrow PH \rightarrow A \rightarrow PI$ path supports the sequential nature of the persuasion-decision-confirmation stages. This finding is consistent with the interactions of social presence, humanness, and intention in studies such as Chae (2022) and Van der Heide & Lim (2018). Mediation tests also confirmed this result and showed that perceived sincerity creates indirect effects on purchase intention through humanness perception and attitude (H10, H17, H18).

The effect of relative advantage on humanness was not found to be significant (H2 rejected). However, it was found to have a direct effect on attitude (H5) and an indirect effect on purchase intention through this attitude (H14). This finding confirms that relative advantage, emphasized in Diffusion of Innovations Theory, is a key determinant in the adoption process, but shows that it does not directly contribute to the humanness dimension.

The absence of a significant effect of relative advantage on humanness (H2) and its indirect influence on purchase intention by solely affecting attitude (H5, H14) indicates that the relative advantage dimension of Diffusion of Innovations Theory (DIT) is more powerful at the decision stage. In other words, functional benefit elements do not trigger emotional-humanistic evaluations but rather contribute to cognitive attitude formation.

Perceived compatibility has shown significant effects on both perceived humanistic nature (H3 supported) and attitude (H6 supported). The fact that virtual influencers who align with user values are perceived as more human and generate positive attitudes supports the compatibility dimension of Diffusion of Innovations Theory (DIT). The significant effects of the perceived compatibility variable on human-like qualities (H3) and attitude (H6) indicate that consumers find virtual influencers who align with their personal values to be more 'close' and 'human-like'. However, the fact that compatibility does not have an indirect effect on purchase intention through human-like qualities indicates that compatibility plays a greater role in the persuasion and decision-making stages.

However, mediation tests revealed that perceived compatibility did not create a meaningful indirect effect on purchase intention through humanness (H12, H21, H22 rejected). Therefore, the effect of compatibility on purchase intention operates more through direct attitude (H15 supported).

One of the strongest findings of this study is that perceived human-likeness influences both attitude (H7) and purchase intention (H8). This result is consistent with Epley et al. (2007), Waytz et al. (2010), and Seeger et al. (2021) in the anthropomorphism literature, who argue that human-like characteristics enhance social interaction, closeness, and persuasion processes. Furthermore, the significance of the PH → A → PI path confirms that personification functions not only in the persuasion stage but also in the endorsement stage. Moreover, the perceived human-like nature also has a significant indirect effect on purchase intention via attitude (H16 is supported). This demonstrates that human-like perception plays a critical role not only in cognitive evaluations but also in behavioral intentions.

The significance of the result is that the highest path coefficient is found in the relationship between attitude and purchase intention ($\beta = 0.757$, $p < .001$; H9) which is supported by the Diffusion of Innovations Theory that explains that the decision to adopt is embedded in the attitude evaluations (Rogers, 2003). The studies have consistently shown that attitude is one of the strongest cognitive determinants of purchase intention. Moreover, in the field of digital marketing, it has been found that positive attitudes have a strong positive impact on behavioral intention (Acar & Ekizler, 2023; Khan & Asim, 2025). Similarly, the present study has supported the fact that attitude is the primary precursor to purchase intention.

The explanatory power of the model is quite high (R^2 for perceived humanness = 0.710, attitude = 0.717, purchase intention = 0.806). These values indicate that more than 70% of the dependent variables are explained by the variables in the model. Additionally, all the variance inflation factor values for the model remain below the threshold levels, indicating that multicollinearity is not an issue for the model.

Overall, this study has revealed that perceived humanness plays a critical role in the acceptance of virtual influencers from a DIT perspective. Sincerity and compatibility influence attitudes and purchase intention by strengthening the perceived humanness, while relative advantage has been more effective through attitudes. The findings demonstrate the importance of considering human-like features and individual value alignment in virtual influencer strategies.

4. Conclusion and Recommendations

This study examines consumers' adoption of virtual influencers within the DIT framework, exploring the mediating role of perceived humanness and demonstrating how the DIT's persuasion–decision–confirmation stages operate in the context of virtual influencer interactions. Findings indicate that consumers' emotional and intuitive evaluations (perceived sincerity, perceived humanness) play a particularly important role in the persuasion stage, while cognitive evaluations (relative advantage, perceived compatibility, attitude) shape the decision stage. Purchase intention formation is supported by both human-like perceptions and attitudes, representing the confirmation stage.

The findings indicate that consumer decision-making processes are shaped not only by functional benefits but also by emotional and intuitive factors. Specifically, perceived sincerity was found to have no direct impact on attitude, but rather indirectly influences purchase intention through humanness. Relative advantage was found to be more associated with rational

evaluations and played a strong role in affecting intention through attitude. The significant effects of perceived compatibility on both humanness and attitude suggest that value congruence is a critical factor in consumer acceptance. Furthermore, the direct effects of perceived humanness on both attitude and purchase intention demonstrate that this variable is central to the process.

In sum, the results suggest that emotional and intuitive perceptions of virtual influencers, i.e., their authenticity and human qualities, have an indirect but significant impact on attitudes and intention to make a purchase. It is noteworthy that the capacity to form emotional bonds is a key aspect of how virtual characters interact with consumers. In contrast, rational dimensions like relative advantage are mainly related to outcomes through direct cognitive processes.

The research findings show significant parallels with the existing marketing and consumer behavior literature. In fact, when analyzed within the framework of variables based on the Diffusion of Innovations Theory by Rogers (2003), the logical structure and relationships of the model appear to coincide with previous findings.

The fact that perceived sincerity has an indirect effect on purchase intention, rather than a direct one, via perceived humanness and attitude implies that emotional evaluation plays a vital role in the first two stages of the DIT. The fact that relative advantage and compatibility have an indirect effect on purchase intention via attitude implies that a rational evaluation process underlies the decision stage. Furthermore, the fact that perceived humanness has a direct and indirect effect on purchase intention via attitude implies that human characteristics play a vital role in the persuasion and commitment processes of the confirmation stage.

This has been evidenced in past studies. For example, Chae (2022) argues that sincerity in itself does not have a direct impact on purchase intention; however, the impact is strengthened when the consumer perceives the virtual influencers as more human-like. Additionally, Van der Heide and Lim (2018) emphasize the indirect impact of social presence on consumer intention.

The significant effect of perceived compatibility on attitude and the conversion of this attitude into purchase intention is a result that has been emphasized in previous studies. For example, Zhou et al. (2021) showed that the extent to which digital characters align with individual values directly influences users' attitudes. This finding is consistent with consumer-value alignment theories (Sirgy, 1985). This study also revealed that the perception of alignment operates through cognitive pathways rather than through perceived human-like qualities.

Another important finding of the study is that perceived relative advantage affects purchase intention directly through attitude, rather than through perceived human-like qualities. This result confirms that benefit-oriented perceptions are mostly associated with rational evaluation processes, as emphasized in Rogers' (2003) Diffusion of Innovations Theory. Furthermore, studies on the Technology Acceptance Model (TAM) developed by Venkatesh & Davis (2000) also suggest that perceived utility affects behavioral intention not directly, but through attitude.

One of the noteworthy contributions of the study is that perceived humanness significantly affects purchase intention both independently and through attitude. This has also been observed in studies by Seeger et al. (2021), which stated that the more human-like individuals find a character to be, the more it increases their level of social interaction and emotional attachment.

Furthermore, Cowan & Little (2019) argue that the human-like characteristics of artificial entities increase consumer engagement and persuasion levels.

This study contributes to literature by expanding the applicability of Diffusion of Innovations Theory (DIT) in the context of virtual influencers. It also proposes a comprehensive framework on how the emotional-human and cognitive-functional characteristics of virtual influencers affect consumer acceptance at different stages. The study comprehensively addresses a significant gap in the literature regarding the underlying mechanisms through which perceived sincerity, relative advantage, and compatibility variables (Chae, 2022; Zhou et al., 2021), which are mostly examined at the level of direct effects in virtual influencer research, operate in consumer decision-making processes. While perceived human-likeness is mostly positioned as an outcome variable explaining human-like evaluations in the existing literature (Epley et al., 2007; Waytz et al., 2010), this study incorporates humanness as an intermediary process within a theoretical model in the context of the Diffusion of Innovations Theory, offering new conceptual depth in explaining virtual influencer interactions.

Also, by incorporating perceived humanness into the DIT framework, the study offers a reinterpretation of the persuasion–decision–confirmation stages proposed by Rogers (2003). In this context, emotional and relational cues such as sincerity contribute to the persuasion stage by strengthening perceptions of humanness, while cognitive evaluations related to innovation attributes shape the decision stage through attitudes. Consequently, the study expands the explanatory scope of DIT by demonstrating how technological adoption processes in anthropomorphic digital environments involve both cognitive and social–psychological mechanisms. While Diffusion of Innovations Theory (DIT) has traditionally been used to explain the adoption of technological innovations through cognitive evaluations (Rogers, 2003), emerging digital phenomena such as virtual influencers involve not only functional evaluations but also social and psychological interpretations. In digital environments where technological agents mimic human characteristics, consumers often evaluate these innovations not merely as technological tools but also as social actors.

Empirical evidence suggests that sincerity increases perceptions of similarity to humans through emotional attitude constructs, while compatibility and relative advantage seem to fit more accurately with the constructs of cognitive attitude. This provides implications for the extension of Rogers' (2003) persuasion, decision, and confirmation process to anthropomorphic digital constructs. As such, the current study provides a unique contribution to the theoretical framework within the realm of anthropomorphism, connecting processes of human perceptions to the acceptance of innovation, as there is relatively limited and still emerging research within the realm of consumer acceptance of virtual influencers.

This study offers important insights for practitioners, especially digital marketers. Virtual influencers designed to be real, human, and aligned with user values have been shown to strengthen consumer attitudes and purchase intentions. Instead of focusing solely on visual appeal, brands should integrate human characteristics like gestures, facial expressions, and tone of voice into their designs, building trustworthiness and rapport in consumer perceptions to accelerate acceptance.

This research has considerable implications for marketing practitioners also. Marketing professionals or brand managers can create virtual influencers who not only possess functional benefits but also possess attributes that are human-like, authentic, and harmonious. These aspects of empathy capacity, authenticity, and human-like features were found to be crucial to help increasing purchase intention. The congruence between the values of the virtual character

and the target audience could be the key to creating positive brand associations like attitudes and loyalty.

This research also has a few limitations that need to be addressed. Firstly, the research used self-report measures that can be subject to various biases. Secondly, the research had a cross-sectional design that limits the ability to make causal claims or to assess the possibility of changes in perception over time. Future research can be done to test the relationship between the variables through longitudinal or experimental research. Thirdly, the research was based on social media users from a particular cultural and geographical background. Future research can be done to assess the cultural differences between the two groups to understand the role of culture in the perception of virtual influencers. Fourthly, the research used a fixed set of virtual influencers. Future research can be done to test the effects of various types of virtual characters, their appearance, and level of interaction with consumers to develop a comprehensive understanding of the topic. Fifth, the research data was obtained from social media users living in Istanbul using a convenience sampling method. Although Istanbul's demographic diversity may reflect some characteristics of social media users in Turkey, the findings cannot be generalized to the entire Turkish population due to the sample not being selected using a probabilistic method. Furthermore, since individuals living in different cities may have different cultural, socio-economic, and technological usage habits, the results obtained may not fully reflect these differences. Therefore, it is recommended that future studies cover different regions and use probability sampling methods.

Recommendations for future studies: Longitudinal studies can more robustly test causal relationships between variables. Comparative studies conducted in different cultural contexts or among different age groups could reveal whether virtual influencers have a universal or cultural impact. Sub-dimensions of perceived humanness (visual reality, voice, facial expressions, etc.) could be tested separately to create more detailed models, or real influencers could be compared with virtual influencers.

Several directions for future research may extend the theoretical framework proposed in this study. First, other psychological factors influencing consumer behavior regarding virtual influencers, such as perceptions of authenticity, parasocial interaction, and trust, may be investigated to provide a more complete picture of the psychological dynamics of human-AI interaction. Second, experimental research designs manipulating different aspects of virtual influencers, such as interaction style, or interaction intensity, may provide more detailed information regarding the effects of anthropomorphism. Third, the moderating effects of different situational factors, such as product type, brand, or platform, may be investigated to provide more complete information regarding the interaction of virtual influencers with consumers. Moreover, as the technology behind marketing agents advances, research exploring the interaction of virtual influencers, human influencers, and hybrid human-AI influencers may provide interesting perspectives for the future of the influencer marketing phenomenon.

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Appendix A. Measurement Items

Construct	Code	Item
Relative Advantage (RA)	RA1	Compared to human influencers, Virtual Influencers create a positive difference in terms of access to products (that I can purchase).
	RA2	Compared to human influencers, Virtual Influencers make it easier for me to access products (that I can purchase).
	RA3	Compared to human influencers, Virtual Influencer makes/will make my experience with products (that I can buy) valuable.
	RA4	Compared to human influencers, Virtual Influencers will save time in accessing products (that I can purchase).
Perceived Compatibility (PC)	PC1	Virtual Influencer suits my needs.
	PC2	Virtual Influencer fits my needs.
	PC3	Virtual Influencer fits my lifestyle.
	PC4	Virtual Influencer is completely compatible with my current situation.
	PC5	Virtual Influencer suits my preferences.
Perceived Sincerity (PS)	PS1	The behavior and posts of virtual influencers are realistic.
	PS2	The content shared by virtual influencers is original.
	PS3	Virtual influencers are honest in their behavior and posts.
	PS4	Virtual influencers are sincere in their behavior and sharing.
	PS5	Virtual influencers exhibit a friendly attitude in their behavior and posts.
	PS6	Virtual influencers are emotional and sensitive in their behavior and posts.
	PS7	Virtual influencers are fun.
Perceived Humanness (PH)	PH1	When I saw the virtual influencer, I felt like the person in front of me was a real person.
	PH2	I felt a human warmth in the virtual influencer.
	PH3	I felt socialization in virtual influencer.
	PH4	I felt sincerity in the virtual influencer.
	PH5	I felt sensitivity in the virtual influencer.
Attitude (A)	A1	I have a positive outlook on following virtual influencers.
	A2	I have a positive outlook on the adoption of virtual influencers.
	A3	I embrace following virtual influencers.
Purchase Intention (PI)	PI1	If I have the opportunity, I would like to purchase a product/service from the brand promoted by the Virtual Influencer.
	PI2	I will probably purchase a product/service from the brand promoted by the Virtual Influencer in the near future.
	PI3	When the opportunity arises, I intend to purchase a product/service from the brand promoted by the Virtual Influencer.