

Virtual Influencers in Consumer Behaviour: A Social Influence Theory Perspective

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Although virtual influencers, that is, computer-generated personas, have been a growing trend in marketing, we still know very little about their impact on consumers' attitudes and behaviour. To bridge this gap, this study: (a) explores individuals' acceptance of influences induced by virtual influencers and (b) investigates how influence acceptance translates into behaviour. Drawing on Social Influence Theory, we first conducted a comprehensive literature review to extract the key attributes of virtual influencers (i.e. warmth, relatedness, interactivity, competence, empathy, uniqueness, fairness and credibility) as enablers of engagement that can determine influence acceptance. Then, based on 601 survey responses and using a fuzzy-set qualitative comparative analysis, we analysed the associations between the enablers of engagement, influence acceptance processes (i.e. compliance, identification and internalization) and behavioural responses (purchase intention and behaviour adoption). Our findings highlight various sets of virtual influencer attributes that lead to high degrees of compliance, identification and internalization, and behavioural responses. We contribute to the influencer literature by explaining the causes of the persuasiveness of virtual influencers and their effectiveness in stimulating behaviour. Our study also offers practical insights into how brand managers can leverage virtual influencers in online marketing strategies.

Introduction

In today's digital age, social media have become a valuable business tool for growth (Hoang *et al.*, 2023; Zhang *et al.*, 2023b). Evidence shows that there is an increasing interest in integrating social media into operational, management and marketing strategies (Wang *et al.*, 2021; Zhou, Ye and Liu, 2023a), with a special focus on influencer marketing (Campbell and Farrell, 2020; Hu, Milner and Wu, 2016; McMullan, 2023). The growth of influencer marketing is supported by empirical evidence showcasing the impact of influencers in driving sales and organizational profitability; thus, more and more companies are investing in partnerships with online influencers (Hu, Milner and Wu, 2016; Statista, 2022). However, the social media landscape is dynamic and constantly evolving. Advances in generative artificial intelligence, machine learning, and advanced computer-generated graphics are changing the way companies create content and engage with stakeholders (Chen, Fan and Sun, 2019; Sands *et al.*, 2022b; Zhuang and Wu, 2023). This evolution of the field has led to the emer-

gence of virtual influencers – 'digitised entities with anthropomorphized appearances that have human bodies, social roles, and their own identity; they can play the role of human influencers by interacting with other humans, controlled either by humans or computer algorithms' (Byun and Ahn, 2023, p. 298). One such influencer is Lil Miquela (@lilmiquela), a performer, fashion model, and musician with about three million followers on Instagram. Lil Miquela has worked with premium and luxury brands and has collaborated in campaigns with human celebrities as well.

Despite the widespread application of non-human influencers in marketing practice, research on virtual influencers, although growing, still lacks sufficient insights into how to effectively integrate them to drive engagement and purchase behaviour. We know little about the perceptions of virtual influencers by followers (e.g. Ferraro *et al.*, 2024; Franke, Groeppel-Klein and Müller, 2023), consumers' motivations to follow virtual influences (e.g. Lou *et al.*, 2022; Shao, 2024) and the behavioural and attitudinal responses of consumers when interacting with virtual influencers (e.g. Belanche,

Casaló and Flavián, 2024; Sands *et al.*, 2022a). Research on responses delves into the role of anthropomorphism and associated perceptions of influencers' credibility, interactional capabilities and authenticity, explaining the differential effect of virtual influencers on behaviour (e.g. Arsenyan and Mirowska, 2021; Jiang, Zheng and Luo, 2024; Kim and Park, 2024). As such, studies have primarily focused on how the absence of inherent human characteristics undermines the positive implications of virtual influencers for marketing practices (Jiang, Zheng and Luo, 2024; Lim and Lee, 2023; Munoz and Cohen, 2017). Considering the predominant focus in the existing literature, the attributes of virtual influencers crucial for enhancing follower engagement, the varied impact of the attributes on the processing of information communicated by influencers, and the consequent behavioural responses have remained under-researched. Thus, there is a need for a more granular empirical examination of the preconditions of individuals' acceptance of influences induced by virtual influencers, influence acceptance processes, and their impact on consumer behaviour and actions.

Given these challenges, we drew on Social Influence Theory (Kelman, 1958, 1979) and conducted two lines of inquiry. First, we followed a rigorous three-step approach (i.e. quantitative content analysis, a qualitative review of the relevant literature, and an empirical quantitative survey among followers of virtual influencers) to develop the baseline of conditions that drive the acceptance of influence induced by virtual influencers. Our approach made it possible to identify eight attributes that contribute to the differential influence of virtual agents on consumers, namely: uniqueness, empathy, competence, fairness, interactivity, credibility, warmth and relatedness. Second, we conducted a survey-based study among 601 followers of virtual influencers and applied a set-theoretic analytical approach, namely fuzzy-set qualitative comparative analysis (fsQCA), to (a) extract the configurations of the aforementioned eight attributes for the compliance, internalization, and identification processes of influence acceptance and (b) explore how compliance, internalization, and identification can simultaneously lead to behaviour adoption and purchase intention.

The current study contributes to the literature of virtual influencers and social influence in multiple ways. *First*, through a rigorous methodological approach, we suggest a baseline of eight antecedent preconditions of influence acceptance. The findings augment our knowledge of the perceived characteristics of virtual influencers (e.g. Kim and Park, 2024; Lou *et al.*, 2022), by providing a comprehensive list of factors, beyond those rooted in the anthropomorphism literature, that are considered important by their followers for encouraging engagement and attitudes and behaviour.

Second, we provide empirical evidence about the distinctive combinations of virtual influence attributes that lead to high degrees of compliance, internalization and identification, respectively. Our findings offer novel insights into the consequences of the application of virtual opinion leaders in marketing and into the social influence research by extending our knowledge on social influence mechanisms. Unlike prior research (e.g. Arsenyan and Mirowska, 2021; Jiang, Zheng and Luo, 2024), we examine the relationships between virtual influencer attributes and influence acceptance levels and offer practical insights into how firms can enhance the persuasiveness of their communication with customers and other stakeholders. Because individuals' behavioural commitment differs depending on the level of influence acceptance (Goodwin, 1987; Kelman, 1958; O'Reilly and Chatman, 1986), our study also considers the attributes of virtual influencers that can help maintain the induced behaviour.

Third, the relationships identified between influence acceptance factors, purchase intention and behaviour adoption provide new insights into the body of research that investigates the opportunities and challenges of virtual influencer marketing in inducing consumer behaviour (Sands *et al.*, 2022b; Zhou *et al.*, 2024). The study findings complement research exploring social influence strategies for sales growth, improved firm performance and stakeholder relationships (Hu, Milner and Wu, 2016; Zhou, Ye and Liu, 2023a). Our results demonstrate that purchase intention is predicted by followers' compliance with the influence, identification with virtual opinion leaders, or internalization of their influence. The causal configurations of behavioural responses and associated virtual influencers' attributes explain the mechanisms and the conditions under which an intended behaviour can take place. These findings enrich our understanding of the effectiveness of virtual spokespersons in stimulating favourable behaviours and actions.

Literature review and theoretical foundation

Virtual influencers

Virtual influencers are computer-generated personas with a unique physical appearance and roles that can perform tasks similar to those undertaken by human influencers (Sands *et al.*, 2022b; Thomas and Fowler, 2021). As far as physical appearance is concerned, they can be categorized into human-like (mimicking real humans and anime) and non-human-like (toys and animals) influencers (Arsenyan and Mirowska, 2021; Baumgarth, Kirkby and Kaibel, 2021; Choudhry *et al.*, 2022). As to their roles, similar to humans, virtual agents can vary in their relationship to commercial brands (Mrad, Ramadan and Nasr, 2022; Rundin and



Figure 1. Virtual influencers. Note: From left to right: Nobody Sausage (@nobodysausage), Miquela (@lilmiquela), Lu of Magalu (@magazineleiza [Colour figure can be viewed at wileyonlinelibrary.com])

Colliander, 2021). For example, some virtual influencers (e.g. @nobodysausage) can be led by digital creators, who hide their human identity behind avatars and publish mainly entertaining content not related to commercial brands (Mrad, Ramadan and Nasr, 2022). Others (such as @lilmiquela, @knoxfrost) can be designed and managed by developers for commercial purposes and collaborations with multiple brands. Such influencers typically have a highly anthropomorphic appearance, resemble human opinion leaders in the way they endorse brands, and advertise products (services) by showcasing how they are integrated into daily life (de Brito Silva *et al.*, 2022; Rundin and Colliander, 2021). A third type is a brand mascot (e.g. @magazineleiza, @Yoox), a humanized identity designed to represent and promote a commercial brand and its service offerings (Rundin and Colliander, 2021). Figure 1 illustrates the three types of virtual influencer: a non-human-like influencer known for entertaining content, a human-like influencer actively collaborating with commercial brands, and a human-like brand mascot.

The increasing popularity of virtual influencers has begun to garner attention within the academic community, resulting in a growing, albeit still limited, body of research exploring people's perceptions of and responses to these virtual opinion leaders (Choudhry *et al.*, 2022; Lou *et al.*, 2022; Sands *et al.*, 2022a). Studies focusing on the perceptions of virtual influencers have shown that followers highlight their aesthetics, their creative and novel content, and the entertainment value of the interaction (Ferraro *et al.*, 2024; Franke, Groeppel-Klein and Müller, 2023; Lou *et al.*, 2022). However, they fail to create the feeling of authenticity, credibility, and similarity to users (Alboqami, 2023; Lou *et al.*, 2022; Ozdemir *et al.*, 2023). They emanate a sense of limited agency and realism, inhibiting engagement (Choudhry *et al.*, 2022; Mrad, Ramadan and Nasr, 2022). For example, an examination of the comments under the posts of virtual influencers captured followers' sceptical feelings due to perceptions of influencers' creepiness and robotic nature (Arsenyan and Mirowska, 2021; Xie-Carson, Benckendorff and Hughes, 2023a).

As far as responses are concerned, the visual appeal and coolness of virtual influencers can drive attention and interaction with them (Lou *et al.*, 2022; Zhang *et al.*, 2023a). However, owing to their low credibility, virtual brand endorsers are not instrumental in enhancing attitudes towards brands (Jiang, Zheng and Luo, 2024; Ozdemir *et al.*, 2023). In addition, although virtual influencers can evoke strong word-of-mouth behaviour (Sands *et al.*, 2022a), they fall short of inducing purchase intention (Belanche, Casaló and Flavián, 2024). This is because of the limited capabilities of virtual influencers to experience physical sensations (Zhou, Yan and Jiang, 2023b) and develop parasocial interactions (Zhou *et al.*, 2024), which distinguishes them from humans. However, impulsive buying can be stimulated if virtual influencers manifest their congruence with followers (Zhang *et al.*, 2023a). Additionally, it has been found that for followers to engage with virtual influencers, they need to perceive influencers as possessing high levels of either anthropomorphism or intelligence, though this effect is mainly observed in extroverted followers (Shao, 2024).

The dissimilarity among virtual influencers in terms of their anthropomorphic features has spurred research into reactions to virtual influencers with varying degrees of human likeness (e.g. Arsenyan and Mirowska, 2021; Jiang, Zheng and Luo, 2024; Kim and Park, 2024). Studies in this field have yielded consistent results regarding the valence of responses (Jiang, Zheng and Luo, 2024; Xie-Carson *et al.*, 2023b). Highly anthropomorphic virtual influencers were found to be a preferred choice for users (Xie-Carson *et al.*, 2023b), explained by users' stronger perceptions of such influencers' credibility (Muniz, Stewart and Magalhães, 2023), warmth (El Hedhli *et al.*, 2023), and capability to create parasocial interaction (Lim and Lee, 2023). These perceived characteristics render non-human virtual influencers less effective in eliciting positive attitudinal and affective reactions, purchase intention and engagement (Jiang, Zheng and Luo, 2024; Kim and Park, 2024), which is particularly evident when influencers endorse high-involvement products (Jiang, Zheng and Luo, 2024).

The emerging research on the characteristics of virtual influencers, particularly regarding their anthropomorphism (e.g. Belanche, Casaló and Flavián, 2024; Jiang, Zheng and Luo, 2024; Muniz, Stewart and Magalhães, 2023) has limited implications. Specifically, the current literature falls short in explaining under which conditions virtual influencers can become effective spokespeople in the digital environment and in driving sales. Considering the existing challenge in the literature, there is a need to shed more light on how virtual personas influence their followers, and, more specifically, on which factors affect their persuasiveness. Consequently, this paper sets out to explore the attributes of influencers, their relationship to the processes through which the acceptance of influence takes place, and the consequent behavioural responses.

Social Influence Theory

Social Influence Theory has been instrumental in explaining the underpinnings of user behaviour on social media platforms (e.g. Oliveira, Garcia and Vivacqua, 2021; Sánchez-Fernández and Jiménez-Castillo, 2021; Santiago, Magueta and Dias, 2020) and the attitudinal and behavioural implications of online influencer marketing (e.g. Fan and Chan, 2022; Tafesse and Wood, 2021). Specifically, the theory explains how the influences within social groups enforce behaviour (Lucero-Romero and Arias-Bolzmann, 2020) and posits that individuals accept social influence by deriving meaning from the attributes and communication of influencing agents (DeShields Jr *et al.*, 1996; Kelman, 1958, 2017a). Changes in attitude and behaviour following influence exposure occur at multiple levels, namely *compliance*, *identification* and *internalization*. Compliance happens when the acceptance of influence helps individuals receive rewards and avoid punishments for non-compliant behaviour (Kelman, 1958, 2017b). Identification occurs when behaviour is adopted to affiliate oneself with an influencing agent or an associated group of people and to achieve self-definite goals. As with compliance, the adoption of behaviour following identification does not manifest individuals' personal values, but it is intrinsically satisfying (Cialdini and Goldstein, 2004; Kelman, 1958, 2017b). Influence internalization takes place when induced behaviour is construed as being congruent with personal values and views (Kelman, 1958, 2017b; O'Keefe, 2016).

Compliance, identification and internalization are characterized by a set of antecedent conditions reflecting the nature of an anticipated outcome of behaviour, the power sources of an influencing agent, and the manner in which the induced behaviour has become dominant (Kelman, 2017b; O'Keefe, 2016). Compliance is likely to occur under conditions of close interaction, enabling an influencing agent to exert the power of control

and authority in relation to the recipients of communication (Bagozzi and Lee, 2002; Cialdini and Goldstein, 2004). Identification is based on salience and the attractiveness of the source inducing an influence (Goodwin, 1987; Kelman, 1958). The main condition for internalization is the relevance of the promoted behaviour and the cues in communication that make it easy to relate the behaviour to personal goals (Kelman, 1979, 2017b). The three levels of influence acceptance can result in different behavioural responses (Bagozzi and Lee, 2002; Tsai and Bagozzi, 2014). Out of the three acceptance processes, internalization is considered to be the strongest predictor of long-term commitment to the induced behaviour, as it does not depend on a social and situational context or normative beliefs (Goodwin, 1987).

For the purposes of our study, we adopt Social Influence Theory to explore the interrelationships between perceptions of virtual influencers and the associated cognitive and behavioural responses. In line with the main tenets of the theory, influence acceptance levels are defined by different sets of characteristics of virtual influencers. We posit that their role in predicting different levels of influence acceptance vary. In addition, we argue that Social Influence Theory helps in the investigation of consumers' behavioural responses following influence acceptance. In this research, behavioural responses include purchase intention and behaviour adoption, capturing the commercial and non-commercial outcomes of engagement.

Methodology

As shown in Figure 2, the current study was carried out in two stages. The first stage follows an exploratory design, aiming to identify the factors reflecting the sources of agents' power and manner of communication that determine influence acceptance. We conducted a literature search and followed a three-step approach to extract the key attributes that determine influence acceptance: (1) a quantitative content analysis of the relevant literature, (2) a qualitative review of the extracted articles and (3) the ranking of the attributes identified using a consumer panel of followers of virtual influencers. Such an approach was necessary given the limited and inconsistent knowledge regarding the attributes of virtual influencers facilitating the adoption of induced behaviour. Then, the results of the three steps were evaluated to select the set of important factors for engagement with virtual influencers. The output of stage 1 was used as the stepping stone for the second stage of our approach. In the second stage, we empirically tested the associations between the identified attributes of virtual influencers and compliance, internalization and identification, as well as the predictive role of influence acceptance factors in purchase intention and behaviour adoption.

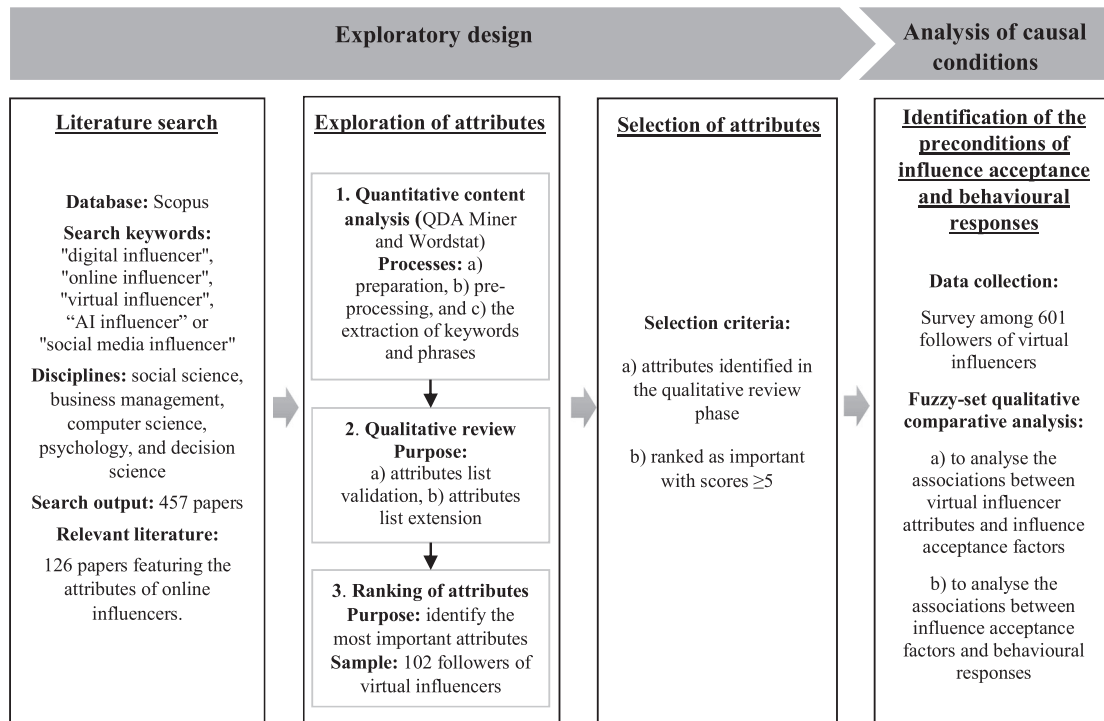


Figure 2. The methodological approach of the study

Stage I: Exploratory design

Quantitative content analysis. The quantitative content analysis involved a systematic approach to searching and extracting the relevant literature on the underpinning factors of engagement in influencer marketing. Similar to other studies (e.g. Davlembayeva, Papagianidis and Alamanos, 2019; Marikyan, Papagiannidis and Alamanos, 2019), we used the Scopus multidisciplinary database to search for relevant papers. As the literature on virtual influencers is still in its infant state and is dominated by the focus on virtual influencers' anthropomorphism and the resulting perceptions, the scope of the search was extended to the literature on human and non-human influencers. To ensure the comprehensiveness of the search output, we used five relevant keywords: *digital influencer*, *online influencer*, *virtual influencer*, *AI influencer* and *social media influencer*. To include journals covering the social and psychological aspects of online relationships between influencers and followers, the search was limited to the social science, business management, computer science, psychology, and decision science disciplines. Search results were limited to papers published in English. No additional filtering was used to limit the scope of the literature. Our search generated 457 journal papers published in English in the period between 2011 and 2023. To exclude papers that did not focus on the attributes and characteristics of online influencers and their communication, two researchers reviewed the

paper titles, abstracts, and keywords. We removed 331 papers that were deemed irrelevant. The remaining 126 documents were downloaded and used further in the quantitative content analysis.

Quantitative content analysis made it possible to automatically distinguish meaningful concepts based on unstructured data extracted from the literature, thus increasing the replicability and objectivity of the findings (Riff, Lacy and Fico, 2013). For the analysis, QDA Miner with its Wordstat extension was used. To ensure that the software identified meaningful concepts, we followed prior studies (Deng et al., 2019; Solberg and Kirchhoff, 2023) and set 30 as the minimum frequency of times that concepts should occur in the dataset. By doing so, we limited the possibility of the extraction of non-theoretically relevant concepts. We followed three steps, namely, the preparation of papers, pre-processing, and the extraction of keywords and phrases based on the analysis of the entire dataset (Davi et al., 2005). Preparation and pre-processing techniques are important for ensuring the accuracy of results. Preparation involved steps such as removing characters that may interfere with the analysis. Pre-processing included lemmatization, which replaced terms with their roots. Also, the frequency list was manually checked to exclude irrelevant terms (Davi et al., 2005). The quantitative content analysis produced a frequency table with 20 keywords denoting the characteristics of virtual influencers: *authenticity*, *empathy*, *competence*, *fairness*, *interactivity*, *credibility*, *warmth*, *relatedness*, *social attractiveness*,

reciprocity power, expertise, homophily, referent power, closeness, parasocial relationship, physical attractiveness, trustworthiness, similarity, congruence and likability.

Qualitative review of the literature. To ensure the reliability of the findings in the quantitative stage and the comprehensiveness of the list of attributes, we conducted a qualitative review of the 126 downloaded papers that were deemed relevant in the previous stage. To ensure the credibility and transferability of the results, we followed the procedures established by Kaid and Wadsworth (1989). We followed an open approach to identify coding categories – ‘patterns or themes that are directly expressed in the text’ (Hsieh and Shannon, 2005, p. 1285). This means that the coding process was not guided by a predefined coding scheme. However, owing to the objectives of the study, we limited the theme of coding categories to the attributes of virtual influencers. As such, while the coding process did not aim to fit codes to a pre-existing structure, the focus of coding was restricted to the area of research interest. We coded the characteristics of virtual influencers and the manner of their communication mentioned in the documents, and recorded all the coded data, which we then analysed. The results were compared with the results of the quantitative content analysis, and this led to the extension of the initial list, with seven new attributes that had not been included in the quantitative analysis output owing to low frequency (i.e. *anthropomorphism, creativity, familiarity, impartiality, reputation, sincerity and uniqueness*). Despite the low frequencies of these attributes, the qualitative exploration of the context in which they appeared confirmed their relevance to the study. All the attributes that were generated in the qualitative phase were further reviewed to eliminate variables with identical meanings and to group constructs with similar connotations (i.e. likability and attractiveness, and congruence and homophily). The final list of attributes was: *warmth, competence, referent power, parasocial interaction, interactivity, reciprocity power, creativity, uniqueness, authenticity, social attractiveness, physical attractiveness, expertise, credibility, homophily, empathy, sincerity, familiarity, reputation, closeness, relevance, fairness, anthropomorphism and impartiality.*

Ranking of attributes. The third approach was ranking the attributes produced during the qualitative and quantitative content analysis that are important in driving followers’ engagement with virtual influencers. For the data collection, we employed an independent research company (Prolific), which provided online access to a panel of social media users. In terms of gender, the sample was balanced (42.2% males and 52.9% females). The majority of the respondents were 20–29 years old (72.5%) with an annual income up to £24,999 (60.8%). Education-wise, most of the respondents were school

graduates (26.5%), high school graduates (24.5%) or postgraduate degree holders (21.6%). Given the study objectives, only individuals who followed virtual influencers were eligible to participate. The respondents were given a list of factors with their definitions and were asked to indicate the level of importance that the factors have for their engagement with virtual influencers on a scale ranging from 1 to 7 (*1–not important at all, 2–very low importance, 3–low importance, 4–neutral, 5–moderately important, 6–quite important and 7–extremely important*). A total of 102 eligible responses were gathered anonymously. Table 1 presents the results of all three approaches to attribute identification and selection.

The protocol for selecting the final list of attributes for further analysis was set by three experienced researchers. For an attribute to be selected, it had to appear in the results of the qualitative review of the literature and had to be ranked as important by the followers of virtual influencers. For ranking, the score of ‘5’ was adopted as a cut-off point as it suggests some degree of importance. The attributes that met all criteria were: *creativity, uniqueness, authenticity, empathy, sincerity, competence, fairness, interactivity, credibility, warmth and relatedness*. Table 2 demonstrates the definitions of these attributes, the roles they play in consumers’ behaviour, and indicative studies where they were examined.

Causal conditions of influence acceptance and behavioural responses

After identifying the attributes deemed important for followers engaging with virtual influencers, we embarked on the analysis of the associations between these attributes, influence acceptance factors and behavioural responses. We adopted a survey design to collect data and measure the construct of interest. The collected data was first analysed to confirm its validity and reliability; then, fuzzy-set qualitative comparative analysis (fsQCA) was used to examine the causal conditions of influence acceptance (i.e. compliance, identification and internalization) and behavioural responses (i.e. behaviour adoption and purchase intention).

Data collection. For data collection, we employed Prolific – the same research company as we used for the exploratory stage of the study to gain access to a panel of virtual influencer followers (Table 3). The survey was administered online and consisted of questions measuring the virtual influencers’ attributes and socio-demographic information. Prior to completing the survey, respondents were asked to refer to the virtual influencer that they follow the most. The survey

Table 1. Attributes of virtual influencers

Attribute	Quant. content analysis		Qualitative review	Survey-based ranking	
	Frequency	%		Mean	Std deviation
Creativity			√	5.87	1.09
Uniqueness			√	5.77	1.18
Authenticity	868	43.65%	√	5.45	1.47
Empathy	116	10.32%	√	5.21	1.40
Sincerity			√	5.19	1.41
Competence	292	20.63%	√	5.16	1.27
Fairness	129	9.52%	√	5.14	1.43
Interactivity	234	27.78%	√	5.13	1.45
Credibility	1682	72.22%	√	5.09	1.41
Warmth	154	3.97%	√	5.03	1.45
Relatedness	111	6.35%	√	5.01	1.22
Social attractiveness	111	8.73%	√	4.93	1.52
Reputation			√	4.90	1.45
Reciprocity power	88	8.73%	√	4.76	1.48
Expertise	957	60.32%	√	4.75	1.38
Homophily	251	20.63%	√	4.60	1.52
Impartiality			√	4.47	1.65
Familiarity			√	4.34	1.62
Referent power	27	0.79%	√	4.30	1.58
Anthropomorphism			√	4.29	1.79
Closeness	157	24.60%	√	4.25	1.54
Parasocial relationship	1046	56.35%	√	4.09	1.74
Physical attractiveness	251	28.57%	√	3.96	1.85

Note: Frequency, the number of times the attributes were mentioned in the literature; %, the percentage of papers where the attributes appeared relative to the entire scope of the analysed documents; '√', the presence of the attribute in the reviewed documents; mean, average score on a scale from 1 to 7.

was completed in November 2022, and resulted in the collection of 601 valid and usable responses.

Measurements, data validity and reliability. Owing to sample size restrictions, it was necessary to divide the scales into two groups: the first measurement model included 43 items of the scales of virtual influencer attributes; the second model comprised 33 items of the scales measuring influence acceptance, behavioural response and purchasing intention. To ensure that all factors were loading on the respective scales, and that there was high discriminant validity and reliability of the data, we tested Cronbach's alpha (>0.7), average variance extracted (AVE) (>0.5) and composite reliability (CR) (>0.7) values (Hair *et al.*, 1998). The goodness of fit of the measurement models was assessed based on chi-square results, the root mean square error of approximation (RMSEA) value below 0.08, and the comparative fit index (CFI) and Tucker–Lewis index (TLI) above 0.90 (Hair *et al.*, 1998).

At the exploratory factors analysis stage of the first measurement model, owing to factor cross-loadings, the sincerity and authenticity scales were removed from the analysis. Confirmatory factor analysis confirmed the reliability of all scales but creativity. The average variance extracted for creativity was 0.48, which is below the recommended threshold (Hair *et al.*, 1998). Therefore, creativity was excluded from further anal-

ysis. Tables 4 and 5 present the results of the confirmatory factor analyses of the two models encompassing the data on the perceptions of virtual influencer attributes, and influence acceptance and behavioural responses, respectively. CR values were above 0.8, and AVE values exceeded 0.5, confirming the reliability and convergent validity of all the scales (Hair *et al.*, 1998). The square roots of AVE values (bold diagonal) were higher than the squared between-constructs correlations, which confirms the discriminant validity of the data in both measurement models (Fornell and Larcker, 1981).

Tables 6 and 7 present the measurements for the variables (virtual influencer attributes and influence acceptance factors, behavioural response and purchase intention) that were statistically valid at the exploratory and confirmatory factor analysis stages. All items were measured on a 7-point Likert scale (from '1 – strongly disagree' to '7 – strongly agree'). The tables present the factor loadings (>0.6) supporting high convergent validity, Cronbach's alpha values, mean and standard deviation scores for each item, and the satisfactory goodness-of-fit indexes for both measurement models.

Common method bias. We followed ex ante procedural remedies (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) to limit the possibility of common method bias

Table 2. Definitions of attributes and examples of related research

Attribute	Definition	Role in consumer behaviour	Source
Creativity	Ability to produce refreshing and novel content	Creativity directly and indirectly contributes to engagement and purchase behaviour through wishful identification, parasocial interaction and trust.	Cheung <i>et al.</i> (2022); Lee <i>et al.</i> (2022)
Uniqueness	The belief that an influencer is different from others	Uniqueness creates the desire to emulate influencers and facilitates positive behavioural responses	Cheng, Chen and Hung-Baesecke (2021); Sands <i>et al.</i> (2022a)
Authenticity	The belief that influencers have an intrinsic motivation in promoting products	Authenticity correlates with trust, attachment and purchase behaviour	Jun and Yi (2020); Lee <i>et al.</i> (2022)
Empathy	The ability to understand followers' feelings	Empathy shapes positive attitudes	Jung and Im (2021)
Sincerity	The perception of an influencer as being caring, honest and considerate	Sincerity correlates with positive attitudes and purchase intention	Lee and Eastin (2020)
Competence	Intelligence, skilfulness and efficacy of influencers	Perceived competence leads to positive attitudinal responses and purchase decision	Crisafulli and Singh (2022); Kim and Read (2021)
Fairness	Respectful treatment of followers to ensure beneficial outcomes of influencer–follower relationships	Perceived fairness is undermined by vague advertising disclosure. Fairness drives influencer–follower relationships and purchase intention	Woodroof <i>et al.</i> (2020); Yuan and Lou (2020)
Interactivity	Ability to provide responsive and personalized communication	Perceived interactivity drives commitment to influencers and trust, underpinning purchase intention	Li and Peng (2021); Lyu and Kim (2020)
Credibility	The believability of influencers due to their expertise and trustworthiness	Credibility increases the perception of information usefulness and trust, which predict behaviour and information adoption	Leite and Baptista (2021); Nadlifatin <i>et al.</i> (2022)
Warmth	The perception of an influencer as being friendly, helpful, sincere and good-natured	Perceived warmth leads to positive attitudinal and behavioural responses	Crisafulli and Singh (2022); Kim and Read (2021)
Relatedness	Perceived psychological connectedness and closeness to influencers	Relatedness is correlated with attachment to influencers and source credibility	Ki <i>et al.</i> (2020); Leite, Pontes and de Paula Baptista (2022)

(CMB) in the data: when designing the questionnaire, we ensured that the questions and statements measuring the constructs were clear, specific and comprehensive. Also, the survey was anonymous, which eliminated the possibility of the social desirability effect on respondents' answers (MacKenzie and Podsakoff, 2012). In addition, we ran ex post statistical tests to detect possible CMB in the data. Initially, Harman's single-factor test was employed, which showed that a single generated factor accounted for 33% of the variance, which is below the acceptable threshold (Podsakoff and Organ, 1986). Then, we introduced a common latent factor and compared the standardized regression weights for all items in the research model including and excluding the latent factor. This test resulted in a minimal difference in the regression weights (Ruiz-Ortega, Rodrigo-Alarcón and Parra-Requena, 2023; Serrano Archimi *et al.*, 2018). Finally, we employed a marker variable technique proposed by Lindell and Whitney (2001). As a marker vari-

able, we chose a theoretically unrelated 'job satisfaction' scale adopted from the study by Schaufeli, Bakker and Salanova (2006). In line with prior studies (Henkens, Verleye and Larivière, 2021; Hu *et al.*, 2023), we tested the correlation of the marker variable with the research variables and found that the average correlation was 0.25, which is below the cut-off point of 0.30 (Beke *et al.*, 2022; Malhotra, Kim and Patil, 2006).

fsQCA for data analysis. For the analysis of the set of factors associated with compliance, identification, internalization and behavioural responses, fsQCA was used. Given the exploratory nature of this study, the fsQCA approach was preferred because it conceptualizes cases as unique combinations of predictors and draws comparisons between all the configurational parameters and the outcome of interest (Rihoux and Ragin, 2008). The fsQCA provides combinations of causal conditions and multiple solution pathways that can lead

Table 3. The profile of the respondents

	Demographic data	Frequency (N = 601)	Percentage of respondents
Gender	Male	347	57.7
	Female	242	40.3
	Other	12	2
Age	Under 20	23	3.8
	20–29	348	57.9
	30–39	146	24.3
	40–49	50	8.3
	50–59	25	4.2
	Over 60	9	1.5
Education	Some high school or less	1	0.2
	High school graduate or equivalent	112	18.6
	Vocational/technical school (two-year program)	20	3.3
	Some college, but no degree	91	15.1
	College graduate (four-year program)	178	29.6
	Some graduate school, but no degree	21	3.5
	Graduate degree (MSc, MBA, PhD, etc.)	165	27.5
Annual income	Professional degree (MD, JD, etc.)	13	2.2
	£0–£24,999	318	52.9
	£25,000–£49,999	179	29.8
	£50,000–£74,999	69	11.5
	£75,000–£99,999	21	3.5
	Over £100,000	14	2.3

Table 4. Results of the convergent and discriminant validity of virtual influencer attributes

	AVE	CR	WAR	REL	INT	COM	EMP	UNI	FAIR	CRED
Warmth	0.54	0.85	0.73							
Relatedness	0.84	0.97	0.60**	0.91						
Interactivity	0.56	0.88	0.52**	0.66**	0.75					
Competence	0.66	0.91	0.66**	0.48**	0.44**	0.81				
Empathy	0.58	0.84	0.61**	0.61**	0.65**	0.56**	0.76			
Uniqueness	0.63	0.87	0.40**	0.35**	0.27**	0.48**	0.39**	0.77		
Fairness	0.57	0.84	0.56**	0.53**	0.57**	0.60**	0.65**	0.43**	0.76	
Credibility	0.56	0.86	0.67**	0.64**	0.61**	0.67**	0.64**	0.47**	0.64**	0.75

WAR - warmth; REL - relatedness; INT - interactivity; COM - competence; EMP - empathy; UNI - uniqueness; FAIR - fairness; CRED - credibility.
 ***p < 0.001,
 **p < 0.01,
 *p < 0.05

Table 5. Results of the convergent and discriminant validity of influence acceptance factors, behavioural response and purchase intention

	AVE	CR	PI	COMP	ID	INTER	BAD
Purchase intention	0.854	0.959	0.924				
Compliance	0.701	0.933	0.661**	0.837			
Identification	0.737	0.965	0.695**	0.810**	0.858		
Internalization	0.715	0.945	0.592**	0.713**	0.784**	0.846	
Behaviour adoption	0.792	0.958	0.700**	0.837**	0.797**	0.715**	0.890

PI - purchase intention; COMP - compliance; ID - identification; INTER - internalization; BAD - behaviour adoption.
 ***p < 0.001,
 **p < 0.01,
 *p < 0.05

to the same outcome (Schneider, Schulze-Bentrop and Paunescu, 2010).

To derive solution pathways, fsQCA proceeds in three steps. Step 1 comprises the calibration of the data into fuzzy sets. Fuzzy sets are groups of values that

represent the degrees of membership in a specific variable category. Fuzzy sets may take any value between 0 and 1 (Skarmas, Leonidou and Saridakis, 2014). The fsQCA applies three breakpoints for set calibration: 0.05 as the threshold for full non-membership, 0.50 as

Table 6. Measurement items for the attributes of virtual influencers

Item	Factor loading	Cronbach's alpha	Mean	Std deviation
Uniqueness (Moulard, Raggio and Folse, 2016) <i>The virtual influencer...</i>		0.84	5.57	0.92
has distinctive characteristics	0.75			
has something that makes it stand out	0.90			
has something special	0.75			
has something that separates it from human online influencers	0.77			
Empathy (Parasuraman, Zeithaml and Berry, 1994) <i>The virtual influencer...</i>		0.88	4.42	1.19
gives followers individual attention	0.80			
deals with followers in a caring manner	0.68			
understands the specific needs of its followers	0.77			
takes its followers' best interests to heart	0.75			
Competence (Güntürkün, Haumann and Mikolon, 2020) <i>The virtual influencer is...</i>		0.90	5.31	1.01
competent	0.84			
capable	0.83			
efficient	0.84			
intelligent	0.76			
skilful	0.80			
Fairness (Carr, 2007) <i>The virtual influencer...</i>		0.88	4.98	1.04
is consistent in its dealings with all followers	0.81			
treats its followers in a fair and balanced way	0.75			
treats its followers in an unbiased way	0.82			
tries to address the needs of followers fairly	0.64			
Interactivity (Thorson and Rodgers, 2006)		0.91	4.17	1.26
Interacting with the virtual influencer is like having a real conversation	0.35			
The virtual influencer responds to me quickly and efficiently	0.79			
The virtual influencer allows me to communicate with it directly	0.83			
The virtual influencer will talk back to me if I post a message	0.91			
The engagement with the virtual influencer is interpersonal	0.66			
The virtual influencer is very interactive	0.81			
Credibility (Roberts, 2010) <i>The virtual influencer is...</i>		0.91	4.67	1.20
believable	0.69			
accurate	0.65			
trustworthy	0.70			
not biased	0.92			
tells the whole story	0.75			
Warmth (Güntürkün, Haumann and Mikolon, 2020) <i>The virtual influencer...</i>		0.90	4.77	0.95
behaves in a sympathetic or considerate manner	0.83			
is compassionate	0.85			
is a genuinely dependable and responsible person	0.78			
behaves in a giving way toward others	0.72			
tends to arouse liking and acceptance in people	0.69			
is protective of those close to it	0.74			
is calm and relaxed in manner	0.63			
appears candid in dealing with others	0.67			
arouses nurturant feelings	0.67			
Relatedness (Thomson, 2006) <i>When I interact with the virtual influencer ...</i>		0.95	3.63	1.47
I feel loved and cared about	0.89			
I do not feel distance from it	0.80			
I feel like I am in contact with someone who cares for me and who I care for	0.94			
I feel close and connected to a person who is important to me	0.98			
Makes me feel cared about	0.95			
I feel very close to it	0.93			

Note: Goodness-of-fit indexes: $\chi^2(860) = 2148.16$, $p = 0.000$, $\chi^2/d.f. = 2.49$, CFI = 0.93, TLI = 0.93, RMSEA = 0.05.

Table 7. Measurement items for influence acceptance factors, behavioural response and purchase intention

Item	Factor loading	Cronbach's alpha	Mean	Std deviation
Compliance (Santor, Messervey and Kusumakar, 2000) <i>I accept the values and behaviour of the virtual influencer (e.g. music choices, hobbies, clothing style, environmental beliefs, participation in social movements), because ...</i>		0.93	3.23	1.35
this is what I do if the virtual influencer recommends me to do it	0.88			
this is what I do if the virtual influencer suggests I do it	0.90			
I tend to comply with the values and behaviour of the virtual influencer if they are different from mine	0.77			
I tend to comply with values and behaviour even if I disagree	0.70			
I tend to follow the recommendations of the virtual influencer	0.86			
I tend to stick to the recommendations of the virtual influencer	0.88			
Identification (Brown <i>et al.</i> , 1986) <i>I accept the values and behaviour of the virtual influencer (e.g. music choices, hobbies, clothing style, environmental beliefs, participation in social movements), because I believe that ...</i>		0.95	3.57	1.50
it will enable me to identify with people who follow virtual influencers	0.80			
identifying with people who follow virtual influencers is important	0.87			
it will enable me to develop strong ties with people who follow virtual influencers	0.86			
I am a person who is glad to belong to people who follow virtual influencers	0.88			
I am a person who sees myself as belonging to people who follow virtual influencers	0.89			
I am a person who is willing to belong to people who follow virtual influencers	0.88			
it will enable me to demonstrate belongingness to people who follow virtual influencers	0.90			
I am a person who feels inspired by people who follow virtual influencers	0.87			
I am proud to show that I belong to people who follow virtual influencers	0.86			
I approve of what people who follow virtual influencers do	0.73			
Internalization (Ryan, Rigby and King, 1993) <i>I accept the values and behaviour of the virtual influencer (e.g. music choices, hobbies, clothing style, environmental beliefs, participation in social movements), because I believe that ...</i>		0.94	3.86	1.64
accepting them will bring me joy	0.92			
accepting them will bring satisfaction	0.94			
accepting them will be enjoyable	0.89			
accepting them will be important	0.84			
accepting them will be satisfying	0.91			
accepting them will be approved by others	0.73			
this is what I am supposed to do	0.63			
Purchase intention (Dodds, Monroe and Grewal, 1991) <i>If the virtual influencer endorses a brand's products or services ...</i>		0.96	3.61	1.50
I will purchase that brand's products or services	0.94			
I will choose that brand's products or services	0.95			
there is a strong likelihood that I will buy that brand's products or services	0.91			
I will recommend that brand's products or services to other people	0.89			
Behaviour adoption (Cenkci, 2018) <i>When it comes to my behaviour and values, ...</i>		0.96	3.11	1.48
I comply with the instructions of the virtual influencer	0.84			
I do what the virtual influencer does	0.88			
I follow the example of the virtual influencer	0.91			
I like to do what the virtual influencer recommends	0.87			
I act in line with the values and behaviour of the virtual influencer	0.90			
I prefer to follow the values and behaviour of the virtual influencer	0.91			

Note: Goodness-of-fit indexes: $\chi^2(485) = 2287.44$, $p = 0.000$, $\chi^2/d.f. = 4.71$, CFI = 0.92, TLI = 0.91, RMSEA = 0.07.

the crossover point of maximum ambiguity, and 0.95 as the breakpoint for full membership (Ragin, 2009). Step 2 comprises the construction and reduction of the truth table. The truth table consists of 2000 rows, where k is the number of predictors incorporated in the analysis

(Crilly, 2011). The rows of the truth table represent specific combinations between the predictors and the outcome; the entire table demonstrates all the possible combinations (Fiss, 2011). The rows of the truth table are reduced on the basis of the minimum number of

cases (i.e. one) and consistency levels required for a solution to be considered (Ragin, 2000). Step 3 involves simplifying the relevant causal combinations and assessing solutions. The truth table algorithm helps reduce the rows and simplify the relevant combinations (Ragin, 2000). The algorithm is based on the counterfactual analysis of causes, which allows the classification of causal conditions into core and peripheral (Fiss, 2011; Ragin and Fiss, 2008). Distinguishing between easy and difficult counterfactuals, fsQCA provides complex, intermediate and parsimonious solutions (Ragin, 2009). Complex solutions do not make any simplifying assumptions and include neither easy nor difficult counterfactual cases (Fiss, 2011). Parsimonious solutions include easy and difficult counterfactuals, regardless of their plausibility (Crilly, 2011). Intermediate solutions integrate only simplifying assumptions about easy counterfactuals (Greckhamer, 2011).

To assess and interpret the fsQCA results, consistency and coverage statistics are used (Ragin, 2009). Consistency reflects the ‘degree to which a combination of causal conditions is reliably associated with the outcome’ (Crilly, 2011, p. 705). It ranges from 0 to 1 and should be closer to 1 to enable inferences that a subset relationship exists (Greckhamer, 2011). The minimum recommended consistency threshold is 0.75 (Ragin, 2009). Coverage gauges the empirical importance of solutions to reach the outcome of interest. Specifically, it demonstrates how much of the outcome is explained by each solution pathway and by the solution as a whole (Fiss, 2011). If multiple combinations are sufficient for an outcome, the scores of raw and unique coverages are used to assess the empirical importance of each solution (Ragin, 2000). A model solution is considered explanatory when coverage ranges between 0.25 and 0.65 (Rihoux and Ragin, 2008). Adequate consistency is a precondition for examining coverage. The measure of coverage is analogous to the coefficient of determination and consistency with the correlation coefficient (Woodside, 2013).

To interpret cause–effect relationships, fsQCA identifies conditions that are necessary (i.e. they produce the outcome but, by themselves, may not be enough) and/or sufficient (i.e. they always lead to the outcome). Depending on the counterfactual analysis of causes, fsQCA distinguishes between core (i.e. essential elements that have a strong causal relationship to the outcome of interest) and peripheral (i.e. expendable or exchangeable elements that have a weaker causal relationship to the outcome of interest) causal conditions (Ragin, 2000). The core–periphery distinction allows for the notion of neutral permutations. This notion suggests that within a given configuration, ‘more than one constellation of different peripheral causes may surround the core causal condition’ (Fiss, 2011, p. 394). These permutations of

Table 8. Causal combinations for high compliance

	Solutions			
	1	2	3	4
Causes of virtual influencers				
Uniqueness	∅	•	•	∅
Empathy	◦	•	•	•
Competence	◦	•	•	•
Fairness	◦	•	•	•
Interactivity	●	●	●	●
Credibility	◦	•	•	•
Warmth	◦	•	∅	•
Relatedness	•	∅	•	•
Goodness of fit				
Raw coverage	0.31	0.43	0.49	0.46
Unique coverage	0.10	0.01	0.04	0.02
Consistency	0.90	0.92	0.92	0.94
Solution coverage			0.63	
Solution consistency			0.89	
Frequency cutoff			5.00	
Consistency cutoff			0.91	

Note: Black and white circles represent the high and low presence of an antecedent condition, respectively. ‘∅’ indicates the absence of an antecedent condition. Large black or white circles indicate a core (necessary) condition of presence. Small black or white circles indicate a peripheral (not necessary) condition.

peripheral elements are equally effective for the outcome of interest.

Results and findings

To derive fsQCA solution pathways, we first calibrated all the variables included in the study into fuzzy sets (i.e. uniqueness, empathy, competence, fairness, interactivity, credibility, warmth, relatedness, compliance, identification, internalization, behavioural response and purchasing intention) using the calibration breakpoints (i.e. 0.05, 0.50 and 0.95) suggested by Ragin (2009). Next, we constructed five truth tables: (1) a table consisting of 2^8 possible combinations of virtual influencer characteristics for compliance; (2) a table consisting of 2^8 possible combinations of virtual influencer characteristics for identification; (3) a table consisting of 2^8 possible combinations of virtual influencer characteristic for internalization; (4) a table consisting of 2^3 possible combinations of compliance, identification and internalization for behavioural response and (5) a table consisting of 2^3 possible combinations of compliance, identification and internalization for purchase intention. For each fsQCA analysis, we simplified the relevant causal combinations and used *consistency* and *coverage* statistics to assess the derived solutions and extract meaningful insights. Tables 8–12 present the derived solutions for high levels of compliance, identification, internalization, behavioural response

Table 9. Causal combinations for high identification

	Solutions		
	1	2	3
Causes of virtual influencers			
Uniqueness	•	•	∅
Empathy	•	•	•
Competence	•	•	•
Fairness	•	•	•
Interactivity	•	•	•
Credibility	•	•	•
Warmth	•	∅	•
Relatedness	∅	•	•
Goodness of fit			
Raw coverage	0.43	0.49	0.45
Unique coverage	0.01	0.07	0.04
Consistency	0.92	0.91	0.93
Solution coverage		0.53	
Solution consistency		0.89	
Frequency cutoff		5.00	
Consistency cutoff		0.90	

Note: Black circles represent a high presence of an antecedent condition. '∅' indicates the absence of an antecedent condition. Large black circles indicate a core (necessary) condition of presence. Small black circles indicate a peripheral (not necessary) condition.

Table 10. Causal combinations for high internalization

	Solutions		
	1	2	3
Causes of virtual influencers			
Uniqueness	•	∅	◦
Empathy	•	•	◦
Competence	•	•	◦
Fairness	•	•	◦
Interactivity	•	•	•
Credibility	•	•	◦
Warmth	∅	•	◦
Relatedness	•	•	•
Goodness of fit			
Raw coverage	0.48	0.44	0.29
Unique coverage	0.04	0.02	0.08
Consistency	0.92	0.94	0.92
Solution coverage		0.60	
Solution consistency		0.90	
Frequency cutoff		8.00	
Consistency cutoff		0.92	

Note: Black and white circles represent the high and low presence of an antecedent condition, respectively. '∅' indicates the absence of an antecedent condition. Large black or white circles indicate a core (necessary) condition of presence. Small black or white circles indicate a peripheral (not necessary) condition.

and purchase intention, respectively. All solutions in Tables 8–12 exhibit acceptable consistency (i.e. ≥0.75) and explain a satisfactory number of cases (i.e. ≥0.25 coverage ≤0.65) in compliance, identification, internalization, consumer behaviour and purchase intention, respectively.

Table 11. Compliance, identification, and internalization for high behavioural response

	Solutions	
	1	2
Level of influence		
Compliance	∅	•
Identification	•	◦
Internalization	•	◦
Goodness of fit		
Raw coverage	0.81	0.39
Unique coverage	0.47	0.05
Consistency	0.88	0.83
Solution coverage		0.86
Solution consistency		0.84
Frequency cutoff		27.00
Consistency cutoff		0.83

Note: Black circles represent the high presence of an antecedent condition. '∅' indicates the absence of an antecedent condition. Large black circles indicate a core (necessary) condition of presence.

Table 12. Compliance, identification and internalization for high purchase intention

	Solution
Level of influence	
Compliance	•
Identification	•
Internalization	•
Goodness-of-fit	
Raw coverage	0.72
Unique coverage	0.72
Consistency	0.86
Solution coverage	0.71
Solution consistency	0.86
Frequency cutoff	30.00
Consistency cutoff	0.86

Note: Black and white circles represent the high and low presence of an antecedent condition. Large black or white circles indicate a core (necessary) condition of presence.

Digital influencer characteristics for high levels of compliance, identification and internalization

Table 8 presents the derived solutions of fsQCA for high levels of compliance. It shows four solution pathways (or configurations or recipes). The first recipe indicates the absence of uniqueness and low levels of empathy, competence, fairness, credibility and warmth, and high levels of interactivity and relatedness. The second solution highlights high levels of uniqueness, empathy, competence, fairness, interactivity, credibility and warmth, and an absence of relatedness. The third configurational pathway presents high degrees of uniqueness, empathy, competence, fairness, interactivity, credibility and relatedness and an absence of warmth. Finally, the fourth solution offers a combination of high levels of empathy, competence, fairness, interactivity, credibility, warmth and relatedness, and an absence of uniqueness. Our

findings indicate that for high levels of compliance, a high level of interactivity is core across all four solution recipes. Uniqueness, empathy, competence, fairness, credibility, warmth and relatedness, and the trade-offs between these characteristics, are peripheral causes of high levels of compliance.

The solutions for high levels of identification are presented in Table 9. There are three solution pathways that lead to high levels of identification. Specifically, the first recipe highlights high levels of uniqueness, empathy, competence, fairness, interactivity, credibility and warmth, and an absence of relatedness. The second configuration indicates high levels of uniqueness, empathy, competence, fairness, interactivity, credibility and relatedness, and an absence of warmth. The third solution showcases the absence of uniqueness, and high degrees of empathy, competence, fairness, interactivity, credibility, warmth and relatedness. These three solution recipes highlight the existence of five core causal conditions for high levels of identification, namely: empathy, competence, fairness, interactivity and credibility. The virtual influencer characteristics of uniqueness, warmth and relatedness, and their trade-offs, are peripheral for the identification process of social influence.

The fsQCA solutions for high levels of internalization are presented in Table 10. There are three solution pathways that lead to high levels of internalization. Specifically, the first solution pathway highlights high levels of uniqueness, empathy, competence, fairness, interactivity, credibility and relatedness, and an absence of warmth. The second recipe is an absence of uniqueness, and high levels of empathy, competence, fairness, interactivity, credibility, warmth and relatedness. The third configurational solution demonstrates low levels of uniqueness, empathy, competence, fairness, credibility and warmth, and high degrees of interactivity and relatedness. These three solutions make it possible to distinguish interactivity and relatedness as core predictor characteristics for high levels of internalization, whereas uniqueness, empathy, competence, fairness, credibility and the warmth characteristics of virtual influencers are peripheral causes of high levels of internalization.

Influence acceptance processes for high levels of behavioural response and purchasing intention

The solutions for high levels of behavioural response are shown in Table 11. For high levels of behavioural response, there are two solution pathways. The first configuration recipe showcases high levels of identification and internalization and an absence of compliance. The second solution pathway presents a configuration with high levels of compliance and low levels of identification and internalization. Table 12 presents the solution pathway for high levels of purchase intention. For high degrees of purchasing intention, there is only one so-

lution pathway, which comprises high levels of compliance, identification and internalization.

Discussion

Findings and theoretical implications

Against the backdrop of the increasing application of virtual influencers in marketing (Sands *et al.*, 2022a), this study sought to provide insights into the factors explaining the persuasiveness of virtual influencers and their effectiveness in stimulating behaviour. We adopted Social Influence Theory, postulating the three routes of influence acceptance (i.e. compliance, identification and internalization) associated with different sets of predictors and behavioural responses (Kelman, 1958, 2017b). We aimed to identify the attributes of virtual influencers that influence compliance, identification and internalization, as well as how influence acceptance translates into behaviour and actions. The study's findings augment the existing literature in several ways, as discussed below.

Identifying virtual influencer attributes: Our first contribution lies in the development of a comprehensive baseline of characteristics underscoring engagement with virtual influencers, namely, warmth, relatedness, interactivity, competence, empathy, uniqueness, fairness and credibility. The identified characteristics reflect the perception of influencers' distinctive appearance, psychological closeness, interpersonal qualities (i.e. developing caring, friendly, equitable and trustworthy relationships) and the relevant professional skills and knowledge which enable efficient interactions and a responsive environment. To develop this baseline of characteristics, we conducted a quantitative and qualitative review of the attributes of influencers, followed by an empirical evaluation of the identified factors by virtual influencers' followers. The adopted approach was crucial for reconciling existing evidence about the role of credibility, visual/physical characteristics and hedonic aspects of interaction in attracting followers (Lou *et al.*, 2022; Ozdemir *et al.*, 2023). Unlike prior studies that have neglected features not rooted in anthropomorphism (e.g. Jiang, Zheng and Luo, 2024; Kim and Park, 2024; Lou *et al.*, 2022), this study brings to light the significance of the perceived psychological, relational and professional capabilities and characteristics of virtual influencers. Such considerations are typically central to sustaining social relations (Bayram and Holmes, 2020; Corning, 2011; Schilke, Reimann and Cook, 2021). This evidence broadens our understanding of the necessary conditions for engagement and potentially long-term interactions with virtual influencers.

Examining psychological and attitudinal reactions: Second, this study augments the literature by providing a nuanced explanation of the conditions defining pos-

itive psychological and attitudinal reactions following exposure to communication by virtual influencers. We deployed fsQCA to establish a set of distinctive configurations of uniqueness, empathy, competence, fairness, interactivity, credibility, warmth and relatedness for high degrees of the compliance, internalization and identification processes of acceptance. Specifically, our study provides the first empirical evidence that for influence acceptance through compliance, the only core predictor is interactivity. Compliance happens in conditions of surveillance and control, making individuals conform to the influence by producing the expected behaviour (Bagozzi and Lee, 2002; Goodwin, 1987). Hence, it is probable that interactivity provides more opportunities for control and enhances followers' susceptibility to influence and dependence on virtual influencers' expectations. This finding is much needed as it offers a practical understanding of the main premise for modifying followers' decisions, even though such decisions may go against their intrinsic needs and values.

For identification, the core predictors are interactivity, empathy, competence, fairness and credibility. Interactivity is a necessary condition for establishing a responsive environment, as postulated by prior research (Jiang *et al.*, 2010). However, the findings about the predicted role of empathy, competence and fairness are novel. These factors represent the qualities that are generally salient and favourable in social relationships (Bayram and Holmes, 2020; Corning, 2011; Schilke, Reimann and Cook, 2021). Their importance in the virtual influencer context may be attributed to the heightened need to find socially acceptable qualities that would resonate with the desirable identity with which followers want to affiliate. Lastly, although the significance of credibility for identification had previously been confirmed in the research on human influencers (Ki, Park and Kim, 2022; Li and Peng, 2021), our study shows that it is a non-tradable condition when it comes to relationships with virtual influencers. This is because credibility defines 'default' social responses – that is, standard behaviour set by common expectations in society (Ki, Park and Kim, 2022; Park, Jun and MacInnis, 2000). The indication of the virtual agent's credibility may work as a cue, simplifying the deliberation of the possible outcomes of influence acceptance. This study establishes foundational knowledge about the features that enhance the persuasiveness of virtual influencers in contexts where normative influence is at play. These insights are important for understanding the heuristics that people employ in decision-making when interacting with virtual personas, considering that previous studies have mainly focused on interpersonal interactions (Cheung *et al.*, 2022; Ki, Park and Kim, 2022).

For influence internalization, the core variables are interactivity and relatedness, while other attributes play a peripheral role. Interactivity is a necessary condition

for sustaining relationships in the online environment (Yoon, Choi and Sohn, 2008). While relatedness is the major impetus for internalization and commitment within social groups (Deci and Ryan, 2000; Kim, Kim and Lee, 2019), this is the first account of the significance of the factor in the context of virtual influencers. The manifestation of relatedness in virtual influencers' posts and appearance could signal a deep meaning and congruence with followers' existing systems of values and needs. Unless followers establish a psychological connection with virtual influencers, internalization of the induced influence will not take place.

The findings about the unique conditions conducive to compliance, identification and internalization are important for the emerging research on virtual influencers. Our study elucidates the differential aspects of virtual influencers' styles of interaction, appearance and produced content, which would ensure the effectiveness of their messages and potentially their wider outreach. This study also augments our understanding of how to craft social influence strategies, with implications not only for marketing but also for broader corporate relationship management and business performance (Hu, Milner and Wu, 2016; McMullan, 2023; Zhou, Ye and Liu, 2023a). Additionally, the study findings contribute to Social Influence Theory. By establishing new theoretical linkages between the routes of influence acceptance and their respective conditions (i.e. interactivity, empathy, competence, fairness and relatedness) that have not been promulgated in past research, we strengthen the explanatory power of the theory and its instrumentality in a new context like virtual influencers.

Shedding light on the interplay between influence acceptance and behavioural responses: The third contribution of the study is in providing insights into the interplay between influence acceptance and behavioural responses. In particular, the study findings indicate that behaviour adoption is conditioned either by a high level of compliance and low levels of identification and internalization or by high levels of identification and internalization. This means that followers can emulate certain behaviours owing to social pressure, even if they do not fully assimilate virtual influencers' beliefs, values and choices or view them as a significant reference point. Alternatively, the behaviour can be adopted because it is intrinsically satisfying and addresses personal needs. However, for purchase intention, the only combination of core predictors consists of compliance, internalization and identification processes, which is contrary to prior studies (Cheung *et al.*, 2022; Ki, Park and Kim, 2022). In a virtual influence context, to trigger purchases the induced behaviour has to be socially imposed, highly relevant to needs, and instrumental for achieving self-definite goals. This evidence is different from prior research that has explored how the attractiveness of virtual influencers drives purchasing

intention (Kim and Park, 2023), and how virtual influencer marketing contributes to engagement on social media and to word-of-mouth behaviour (Arsenyan and Mirowska, 2021; Sands *et al.*, 2022b). Our findings help explain how individuals' considerations about the social context, normative pressure and individual genuine motivations underpin the reasoning behind the behaviours. These findings offer several scenarios in which firms' virtual representatives could be instrumental for brands to shape desired behaviours and expand the customer base and stakeholder network.

Practical implications

The findings of this study offer valuable managerial implications for improving marketing practices and sales performance outputs and for managing relationships with stakeholders. Marketing implications arise from understanding the combinations of virtual influencer traits associated with compliance, identification and internalization. For example, when virtual influencers are involved in a rapid promotion of time-sensitive offerings, practitioners need to trigger compliance, which is characterized by a more short-term effect (Kemp, Bui and Porter III, 2021). The main condition for a short-term effect is the creation of interactive relationships between an influencer and a follower. However, to ensure a longer-term effect, such as building brand engagement and affiliation with a brand, marketers need to prioritize characteristics that encourage identification and internalization processes (Huang and Cheng and Chen, 2017). Virtual influencers should exhibit emotional intelligence and demonstrate professional attributes (e.g. through credible advertising, a caring and responsive communication style, a sense of belongingness), which are important for social relationships to be sustained. To foster influence identification and internalization, brands must possess a deep understanding of the needs and concerns of target customers. This can be achieved by analysing the followers' characteristics and their behavioural patterns through comment analysis and other web analytics tools.

Our study expands the understanding of the implications of social media influencers for driving sales (Hu, Milner and Wu, 2016; McMullan, 2023) by providing recommendations for integrating virtual influencer marketing into strategies. These recommendations are based on evidence about the core predictors of purchase intention and associated attributes, suggesting the necessary combination of appealing verbal cues, personality traits and qualities. Our research showed that alongside identification and internalization, compliance is a core predictor of purchase intent. Hence, companies need to tailor virtual influencers to maintain constant follower engagement, possibly by developing proprietary virtual representatives and integrating them with auto-

mated communication tools such as chatbots. This integration could facilitate continuous access to services, enabling the observation of customer behaviour, scalable service provision irrespective of inquiry volume, cost efficiency and interaction with large customer bases. Virtual influencers must visually embody socially desirable traits to effectively connect with audiences.

The study's findings on the causal conditions of behaviour adoption have implications beyond marketing, in areas including post-crisis service recovery, corporate social responsibility management and stakeholder relationship building, where human representatives have proved to be useful (Wang *et al.*, 2021; Zhou, Ye and Liu, 2023a). Companies could design the type and characteristics of virtual spokespersons to suit specific needs. For instance, in crisis management, companies could prioritize interactivity when utilizing company-owned virtual influencers as points of contact to address urgent customer concerns and disseminate timely updates. For corporate social responsibility management and reputation building, companies could engage independent influencers that possess credibility, competence and impartiality to be associated with and enhance the company's image. Alternatively, as the influence of corporate executives through social media has been proved to improve corporate social performance (Zhou, Ye and Liu, 2023a), firms can benefit from utilizing virtual representatives of companies' officials for constant conversations with stakeholders. This will not only improve stakeholders' perception of firms' social responsibility but also build stronger relationships with stakeholders in general.

Conclusions, limitations and future research suggestions

Aiming to address the gaps in the literature about virtual influencer marketing, the present study identified the desirable attributes of influencers—warmth, relatedness, interactivity, competence, empathy, uniqueness, fairness and credibility—following a three-step approach to data validation and filtering. We then analysed the associations between the identified variables and the influence acceptance factors. We found that compliance is preconditioned by influencers' interactivity, enabling a higher possibility of control over the outcome of communication. The core predictors of identification are interactivity, empathy, competence, fairness and credibility, which resonate with qualities commonly desirable in social relationships. For internalization, the core variables are interactivity and relatedness, signalling influencers' congruence with followers' existing systems of values and needs. The influence acceptance factors were analysed in relation to behavioural responses, showing that for behaviour adoption, the influence can be either

socially imposed (via compliance) or intrinsically satisfying (via identification) and personally relevant (via internalization). For purchase intention, the core predictors include compliance, internalization and identification processes. The interplay between the attributes of virtual influencers, influence acceptance factors and behavioural responses provides information about the conditions required to ensure the effectiveness of online influencer marketing using non-human personas.

The study has some limitations and offers new directions for future research. The first possible avenue is to explore the persuasive capabilities of different types of virtual influencers by comparing the causal conditions of influence acceptance elicited by human-like versus non-human-like virtual agents. Second, to understand the tangible impact of virtual influencers on business, future studies could extend beyond assessing purchase intention by measuring actual sales performance with and without the influence of virtual personas. Third, the findings about the relationships between influence factors and behavioural responses open up new research directions. Researchers could investigate moderators that may explain the variance in the variables predicting purchase intention and behaviour adoption. In addition, while this study suggests that influence acceptance through compliance, identification and internalization will result in varying levels of commitment to behaviour, a longitudinal perspective is needed to discern the correlation between the characteristics of virtual influencers and the value of a customer over time. Such an approach would facilitate a deeper understanding of the long-term business value of virtual influencers possessing diverse sets of characteristics. Finally, it is worth exploring the applications of virtual influencers in other business areas. Researchers could investigate responses to the influence elicited by virtual personas when they are used for building relationships with stakeholders or crisis communication and reputation management.

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