International Journal of Human–Computer Interaction

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/hihc20

Designing Authentic Customer-Chatbot Interactions: A Necessary Condition Analysis of Emotional Intelligence and Anthropomorphic Features in Human-Computer Interaction

Md Irfanuzzaman Khan, Arun Kumar Tarofder, Sharmini Gopinathan & Ahasanul Haque

To cite this article: Md Irfanuzzaman Khan, Arun Kumar Tarofder, Sharmini Gopinathan & Ahasanul Haque (28 Apr 2025): Designing Authentic Customer-Chatbot Interactions: A Necessary Condition Analysis of Emotional Intelligence and Anthropomorphic Features in Human-Computer Interaction, International Journal of Human–Computer Interaction, DOI: 10.1080/10447318.2025.2495118

To link to this article: https://doi.org/10.1080/10447318.2025.2495118

INTERNATIONAL JOURNAL OF HUMAN–COMPUTER INTERACTION
https://doi.org/10.1080/10447318.2025.2495118

Designing Authentic Customer-Chatbot Interactions: A Necessary Condition Analysis of Emotional Intelligence and Anthropomorphic Features in Human-Computer Interaction

Md Irfanuzzaman Khan[a], Arun Kumar Tarofder[b], Sharmini Gopinathan[b], and Ahasanul Haque[c]

[a]Canberra Business School, University of Canberra, Australian Capital Territory, Australia; [b]Taylor's University, Selangor, Darul Ehsan, Malaysia; [c]Department of Business Administration, International Islamic University Kuala Lumpur Malaysia

ABSTRACT

This study offers a novel framework of perceived authenticity (PA) in chatbot-mediated service interactions by drawing on insights from Mind Perception Theory, Theory of Mind, the Authenticity Model of Computer-Mediated Communication, and Uncanny Valley Theory. The model integrates emotional and anthropomorphic cues by including perceived humanness, empathy, warmth, and humor. Survey data from 396 participants were analyzed using Partial Least Squares Structural Equation Modeling. The results indicate that empathy exerts the strongest influence on perceived authenticity, followed by perceived humanness and warmth, while humor plays a complementary role. PA significantly enhances trust, rapport, and satisfaction but has limited effect on frustration. Necessary Condition Analysis identifies minimum thresholds of key predictors needed to achieve high PA. Moderation analysis reveals that empathy and humanness are more effective for male-presenting chatbots, while humor enhances authenticity for female-presenting ones. The findings offer significant theoretical and practical implications in the domain of human -chatbot interaction.

KEYWORDS

Chatbot; authenticity; humanness, trust; empathy; warmth; rapport

1. Introduction

Can a machine ever feel authentic? As chatbots increasingly take center stage in customer service, this question becomes critical. This reality is already here as chatbots transform how businesses engage with customers in the service and hospitality industries. Designed to simulate human-like conversations, chatbots are increasingly relied upon to handle routine queries through features like empathy (Markovitch et al., 2024), humor (Xie, Liang, Zhou, & Zhu, 2024), and perceived humanness (Khan et al., 2025). Yet, as chatbot technology evolves, so do customer expectations (Rapp et al., 2024). The challenge has shifted from deploying functional systems to enabling meaningful, authentic interactions by mimicking human intelligence and replicating human-like skills (Beerends & Aydin, 2025).

Perceived authenticity, defined as the psychological judgment of genuineness in mediated interactions (Lee, 2020), is gradually emerging as a determinant of brand preference (Ligaraba et al., 2024), trust, and usage intentions (Seitz, 2024). Central to this concept is a chatbot's ability to convey empathy and social intelligence, often operationalized through anthropomorphic designs that imbue chatbots with human-like traits (Nguyen et al., 2023; Vo et al., 2025). However, while these features hold the potential to enhance authenticity perceptions, research suggests their effectiveness is highly context-dependent and fraught with challenges. For example, humor and motivational language can elicit positive emotional responses but may fail to translate into perceptions of authenticity (Zhang, Lu, et al., 2024). Similarly, empathetic responses in healthcare chatbots have been shown to suppress perceived authenticity and diminish trust and usage intentions (Seitz, 2024). Even anthropomorphic designs such as hyper-realistic avatars can heighten feelings of eeriness, reduce trust and discourage purchase intentions (Song & Shin, 2024). An experiment by Huang (2024) manipulating avatar realism (hyperrealistic-animated vs. cartoonish-still) and familiarity (celebrity vs. non-celebrity) revealed that increasing human likeness heightened eeriness, which in turn undermined trust and purchase intentions. These findings underline a paradoxical challenge: while human-like features are intended to enhance customer experiences, they may inadvertently evoke skepticism or frustration, particularly when they are perceived as inauthentic.

Adding complexity to this discourse is the influence of contextual factors, for instance gender and emotional cues, on perceived authenticity. Tsai et al. (2021) discovered that in emotionally charged situations such as those involving anger or embarrassment, chatbots often fall short compared to human representatives in terms of satisfaction and disclosure. While chatbots can mimic emotional intelligence, their inability to fully replicate human warmth in these contexts poses

CONTACT Arun Kumar Tarofder arunkumar.tarofderrinku@taylors.edu.my Taylor's University, Lakeside Campus, No. Jalan Taylor's, 47500, Subang Jaya, Selangor, Darul Ehsan, Malaysia

challenges for authenticity. Similarly, Jin and Eastin (2024) demonstrated that gender cues significantly shape user perceptions, with female doctor-like chatbots enhancing warmth, satisfaction, and social presence. Interestingly, this effect is magnified when the user's gender aligns with the chatbot's gender cues, thus demonstrating the importance of tailoring chatbot design to demographic and contextual factors.

Furthermore, strategically designed avatars have been shown to amplify perceptions of authenticity. Jones et al. (2022) found that professionally dressed avatars or those representing different races enhanced customer engagement, loyalty, and satisfaction. Similarly, Fatima et al. (2024) revealed that anthropomorphic chatbot designs significantly influence rapport, leading to higher electronic word-of-mouth (e-WOM) engagement. Vo et al. (2024) examined the mediating role of perceived authenticity in value co-creation through AI-powered branded applications, addressing young customers' app fatigue. Findings from two online experiments reveal that media richness (chatbot, AI text, augmented reality) significantly impacts value co-creation via authenticity. These studies highlight the potential for chatbot customization for the purpose of improving user experiences, but they also point to the challenges of balancing functionality with emotional resonance.

While Song and Shin (2024), Huang (2024) and Seitz (2024) have attempted to uncover the effects of perceived authenticity in chatbot interactions, the existing body of work remains fragmented. Lee's (2020) Authenticity Model of Computer-Mediated Communication (CMC) provides a conceptual framework for understanding how expectancy, accuracy motivation, and authenticity markers influence perceived authenticity in computer mediated interactions. The model identifies three dimensions (source, message, and interaction authenticity), and demonstrates their impact on affective, cognitive, and behavioral outcomes. Lee's (2020) work highlights how authenticity perceptions can amplify both positive and negative responses, influence in-depth information processing, emotional reactions, and behavioral changes. This framework informs our understanding of how authenticity functions in mediated contexts and its downstream effects on user engagement. While Lee's (2020) work provides foundational insights into computer-mediated communication and perceived authenticity, the specific drivers and outcomes of chatbot-mediated interactions remain relatively underexplored, particularly regarding the role of human-like traits in shaping user experiences.

Current studies in the domain of perceived authenticity often address specific elements such as hyper realistic avatars leading to feelings of eeriness (Song & Shin, 2024), empathetic expressions backfiring by lowering perceived authenticity (Seitz, 2024), and anthropomorphism enhancing rapport but not consistently influencing authenticity (Nguyen et al., 2023). However, they do not offer a holistic model and consequently, the effect of human traits such as perceived humanness, emotional warmth, humor, and empathy on the broader construct of perceived authenticity remains untapped. Furthermore, while the literature has identified authenticity as a significant mediator of user trust and satisfaction (Zhang, Lu, et al., 2024), it often overlooks the nuanced outcomes of perceived authenticity such as frustration and rapport.

Building on the seminal work of Seitz (2024) and Song and Shin (2024), this study addresses this knowledge gap by proposing a comprehensive framework that integrates human-like characteristics—such as perceived humanness, emotional warmth, humor, and empathy into the construct of perceived authenticity. It further examines the impact of authenticity and revisits mixed findings in the literature, particularly the backfiring effects of emotional cues and anthropomorphic designs (Seitz, 2024; Song & Shin, 2024). As well, this research examines the moderating role of gender cues, particularly those tied to emotional and authenticity-related factors, in forming user perceptions. Consequently, this study seeks to answer the following research questions: *How do emotional and anthropomorphic characteristics, such as perceived humanness, empathy, warmth, and humor, influence perceived authenticity and its impact on trust, satisfaction, rapport, and frustration in chatbot interactions? To what extent do gender cues moderate these antecedent-authenticity relationships?*

To develop the conceptual model, this study draws on four interrelated theoretical frameworks offering a multidimensional lens for understanding perceived authenticity in chatbot-mediated service encounters: Mind Perception Theory, Uncanny Valley Theory, Theory of Mind, and the Authenticity Model of Computer-Mediated Communication (CMC). Mind Perception Theory (Gray et al., 2007) posits that individuals attribute human-like qualities to both human and non-human agents along two core dimensions: agency (the capacity for intentional action) and experience (the capacity to feel and express emotion). This theory informs the study's focus on emotional cues as antecedents of authenticity judgments. Secondly, The Uncanny Valley Theory adds an emotional aspect to this cognitive lens (Mori et al., 2012), highlighting human-like design's emotional perspective and suggesting that moderate human-likeness can build trust and engagement. However, when realism is pushed too far, it can reduce perceived authenticity and cause frustration among users. This paradox is especially salient as organizations increasingly adopt emotionally expressive AI interfaces. Additionally, this study draws insights from the Theory of Mind (ToM), which refers to the capacity to attribute mental states to others (Baron-Cohen, 1999). This theory highlighted how users evaluate a chatbot's ability to demonstrate empathy, intentionality, and context-sensitivity (Mou et al., 2020), which are foundational to establishing a sense of genuine interaction. Finally, the Authenticity Model of Computer-Mediated Communication (Lee, 2020) offers a foundational framework for understanding how source, message, and interactional cues converge to influence users' perceptions of authenticity in digital environments This model links authenticity to key relational outcomes such as trust rapport and satisfaction and offers a pathway to evaluate the broader impact of emotionally intelligent chatbot design. The following section explains the theoretical frameworks that underpin this study and describes the conceptual foundations of how users perceive authenticity in chatbot-mediated interactions.

2. Theoretical framework

Mind Perception Theory provides a foundational framework for understanding how individuals attribute mental states such as emotions, intentions, and cognition to both human and non-human agents, including chatbots. According to Gray et al. (2007), this theory posits that humans ascribe minds based on two dimensions: agency (the ability to act independently) and experience (the capacity to feel emotions). The automatic nature of mind perception is well-documented and often triggered by physical cues, such as facial expressions and body language, which serve as indicators of another person's mental state (Mandell et al., 2017). However, this process is also influenced by top-down factors, including social context and individual motivations. For instance, Powers et al. (2014) found that when individuals seek social connection they are more likely to perceive non-human agents, like chatbots, as having human-like qualities. This need-driven perception highlights the nuanced relationship between environmental cues and cognitive processes. In terms of human-chatbot interaction, Lee and Hahn (2024) highlight that when users perceive chatbots as mindful entities, their interactions feel more meaningful which leads to higher satisfaction and engagement.

The design and personality of chatbots transform users' perceptions of mind. Rajaobelina et al. (2021) argue that friendly and engaging chatbot personalities can reduce user anxiety and enhance perceptions of anthropomorphism. Similarly, Shin et al. (2023) found that humor and relatable personality traits contribute to improved user evaluations by fostering a sense of human-like interaction. Jacobs et al. (2023) emphasize that individual differences in the tendency to anthropomorphize affect mind perception. Users attributing human-like qualities to machines are more likely to engage deeply with chatbots and highlight the necessity of personalized designs. Furthermore, the context of the interaction influences mind perception. Pizzi et al. (2023) argue that nonverbal cues, for example gaze direction and warmth, can significantly impact users' trust and willingness to disclose personal information during interactions with chatbots. Rostami and Navabinejad's (2023) research on emotionally intelligent chatbots revealed that users' experiences with these AI systems are heavily influenced by their perceptions of authenticity.

However, the Uncanny Valley Theory (Mori et al., 2012) introduces a paradox in mind perception. While subtle anthropomorphic traits enhance engagement and authenticity, hyper-realistic designs risk evoking feelings of eeriness and discomfort (Ciechanowski et al., 2019). Song and Shin (2024) examined this phenomenon in a 2×2 experimental study, finding that hyper realistic chatbot avatars increased eeriness, reducing trust and negatively impacting behavioral intentions. Familiarity with the avatar moderated these effects, underscoring the importance of balancing human-like features with user comfort.

The attribution of agency and experience through mind perception directly impacts the perceived authenticity of chatbots. Authenticity is evaluated based on the extent to which a chatbot's interactions align with human-like mental states, such as empathy, intentionality, and emotional resonance (Lee, 2020). Mou et al. (2020) demonstrated that humanoid robots with advanced Theory of Mind (ToM) capabilities elicited stronger perceptions of authenticity and usefulness, which in turn enhanced trust and satisfaction. However, perceived authenticity is not universally beneficial. Söderlund (2022) noted that while higher perceived ToM capabilities often enhance service quality, they can also evoke discomfort if the chatbot appears insincere or overly artificial. Trzebiński et al. (2023) similarly reported that empathetic chatbots could still be perceived as eerie if they mimic human interactions too closely without achieving full human-like authenticity. Despite the risks associated with hyper-realism, mind perception remains critical for designing effective chatbots. Finally, while the literature identifies significant benefits of mind perception in chatbot design, contradictions remain. Advanced anthropomorphism can enhance trust and rapport but risks falling into the uncanny valley when poorly calibrated (Gutuleac et al., 2024; Kim et al., 2019; Song & Shin, 2024). These findings highlight the need for further investigation into how mind perception attributes such as perceived humanness, empathy, warmth, humor and authenticity interact to shape user experiences.

2.1. Hypothesis development

2.1.1. Perceived humanness

Perceived humanness refers to the extent to which users attribute human-like qualities to chatbots. Research highlights the role of anthropomorphic features, such as emotional cues like text, emoticon and images (Zhang, Wang, et al., 2024), empathy (Liu & Sundar, 2018), competence and warmth in enhancing perceived humanness (Dwivedi et al., 2023). For example, Lee et al. (2024) found that virtual influencers were perceived as more authentic, particularly among those who strongly believe in the machine heuristic. Perceived authenticity positively influenced trust in influencers, which, in turn, boosted purchase intentions. In hindsight, Almalki (2021) found that while anthropomorphic designs in health chatbots increase their perceived humanness, the absence of emotional sensitivity can hinder user acceptance. This suggests that while human-like qualities may enhance perceptions of authenticity in some cases, the lack of emotional engagement can create a disconnect and lead to questions about the consistent impact of perceived humanness on authenticity. However, Tsai et al. (2021) noted that these perceptions may vary depending on the context, such as health-related inquiries, where higher empathetic expectations shape users' judgments. Adding to the debate, Neururer et al. (2018) documented that perceptions of authenticity are enhanced when chatbots appear more human-like, fostering trust and engagement. However, Croes and Antheunis (2021) highlighted that these effects might diminish over time as users grow familiar with the limitations of chatbot functionalities, further complicating the understanding of this relationship. This apparent contradiction between studies suggests that while perceived humanness may influence authenticity, its effect is neither uniform nor fully understood. Given these inconsistencies, a contextual investigation is warranted to determine whether and how perceived humanness affects

perceptions of authenticity in various interaction scenarios. Building on these insights we posit the following hypothesis:

H1: The perceived humanness of a chatbot influences users' perceptions of its authenticity.

3. Chatbot empathy and perceived authenticity

Empathy refers to the chatbot's ability to understand and respond to users' emotional states in a way that feels genuine and supportive (Park et al., 2023; Preston, 2007; Ruane et al., 2021). Empathy signals emotional awareness, making users more likely to attribute human-like qualities to the chatbot, which enhances their perception of authenticity (Seitz, 2024). This relationship is particularly evident in scenarios where emotional connection is paramount, such as healthcare, customer service, or medical support (Q. Jiang et al., 2022).

Empathy enhances perceived authenticity by fostering trust and emotional resonance (Seitz, 2024). For instance, when a chatbot acknowledges a user's frustration or disappointment with statements like "I am sorry that this happened to you" it creates a sense of understanding and connection. This empathetic interaction bridges the gap between human and machine, allowing users to perceive the chatbot as more authentic and relatable (De Gennaro et al., 2019). For example, Markovitch et al. (2024) highlights that consumers exhibit significantly lower satisfaction, repatronage intentions, and recommendations following interactions with chatbots compared to human agents, regardless of positive or negative service outcomes. This discrepancy is fully mediated by perceived empathy, emphasizing its critical role in shaping consumer evaluations. The findings further demonstrate that enhancing a chatbot's empathetic communication (rather than its human-like appearance) improves consumer perceptions, aligning chatbot evaluations with those of human agents. However, the link between empathy and authenticity is not without challenges. Poorly executed empathy, such as generic or overly scripted responses, can come across as mechanical or insincere, undermining the perception of authenticity (Seitz, 2024). For example, a chatbot in customer service that repeatedly uses stock phrases like "I'm sorry for your inconvenience" without adapting to the user's specific context may fail to establish genuine emotional connection. Conversely, well-calibrated empathetic responses that reflect situational understanding can significantly enhance perceived authenticity (Zhang, Lu, et al., 2024).

The relationship between empathy and authenticity is also shaped by contextual factors. In emotionally sensitive contexts, such as complaint handling or mental health discussions, users expect higher levels of empathy from chatbots. For example, Xygkou et al. (2024) examined human-chatbot interactions through a thematic analysis of autistic and non-autistic adults engaging with a conversational virtual human (CVH) over 1–4 weeks. Autistic participants expressed heightened expectations for empathetic and meaningful interactions with the chatbot, viewing empathy as essential for building trust and engagement. Meeting such expectations can reinforce authenticity and foster trust and value creation for chatbot users (Agnihotri & Bhattacharya, 2024; Vo et al., 2024). While empathy in chatbots is often seen as a way to enhance warmth and trust. Literature also points towards an apparent contradiction. Seitz (2024) found that empathetic and sympathetic responses can suppress perceived authenticity, undermining their positive impact on trust and usage intentions. Likewise Yu et al. (2024) identified a paradox where lower consumer expectations of chatbots' flexibility during service rejections led to less dissatisfaction compared to interactions with human agents, suggesting that empathy may not always be necessary to mitigate negative outcomes. Such contradictions in the literature highlight the need for further investigation into the dynamics of empathy and its role in enhancing or undermining perceived authenticity. Accordingly, the following hypothesis is proposed:

H2: Empathy in chatbots is positively associated with perceived authenticity, such that higher levels of empathetic responses lead to greater perceptions of authenticity.

3.1. Chatbot warmth

Chatbot warmth is defined as the degree to which chatbots convey friendliness, sociability, and care in their interactions, and has emerged as a critical determinant of user satisfaction and engagement (Kull et al., 2021). Warmth is primarily communicated through elements such as conversational tone, emotional intelligence, and social presence. Bilquise et al. (2022) emphasize that emotionally intelligent chatbots, capable of detecting and responding to user sentiments, are essential for fostering a sense of connection and warmth. For example, chatbots employing inviting language and informal conversational styles have been shown to foster stronger feelings of closeness and trust (Tsai et al., 2021). This perceived warmth plays a significant role in bridging the gap between human and machine interactions, making chatbots appear more relatable and authentic.

Warmth is closely tied to the concept of perceived authenticity, which refers to the psychological judgment of genuineness in interactions (E.-J. Lee, 2020). We argue that chatbots that exhibit warmth are more likely to be perceived as authentic because they mimic the social and emotional cues typical of human interactions which is based on good intentions (Roy & Naidoo, 2021). Past research also posits that warmth has more relational focus and encourages social proximity between people For instance, Yu and Zhao (2024) recently demonstrated that human-like conversational cues, such as emojis shape perceptions of chatbot interactions. Specifically, emojis significantly enhance the chatbot's perceived warmth, which directly contributes to increased service satisfaction. Similarly, Huang et al. (2021) found that nonverbal cues, such as emoticons and photographs, significantly enhance perceptions of warmth and creates more human and engaging interaction. However, achieving warmth that resonates with users requires careful calibration. While informal or "cute" communication styles can evoke warmth and engagement (K. Jiang et al., 2022), overuse of such strategies may risk being perceived as inauthentic or overly scripted. This highlights the fine balance

required in designing chatbot interactions to foster perceived warmth without compromising authenticity. Considering these insights, warmth serves as an important pathway through which chatbots can enhance user perceptions of authenticity. Based on this understanding the following hypothesis is proposed:

H3: Chatbot warmth is positively associated with perceived authenticity, such that higher levels of warmth in chatbot interactions lead to greater perceptions of authenticity.

3.2. Chatbot humor

Humor is a conversational element that enhances user engagement and satisfaction in chatbot interactions, particularly in emotionally sensitive or task-oriented settings. It fosters relatability and enjoyment, transforming interactions from transactional exchanges to meaningful engagements. In digital health applications, for example, lighthearted anecdotes and humor have been shown to positively influence users' emotional states, providing empathetic communication and emotional support (Xue et al., 2023). Humor also strengthens trust and user engagement, as chatbots with humorous traits and distinct personalities create more positive and memorable user experiences (Farah et al., 2021). This is specifically effective in task-oriented settings, where humor, including self-mockery and light-hearted quips, enhance social intelligence and humanize chatbot interactions (Liu et al., 2022). Such interactions build rapport and create a conversational dynamic, reinforcing user satisfaction (Zhang et al., 2020). However, the effectiveness of humor is also dependent on its contextual appropriateness (Park et al., 2025). Humor that aligns with users' expectations can deepen emotional attachment and increase engagement, as demonstrated by the positive impact of humorous greetings on conversion rates in marketing contexts (Lekaviciute et al., 2023). Conversely, poorly executed or mistimed humor risks alienating users and detracting from the overall experience (Schanke et al., 2021). Thus, the strategic deployment of humor must balance its appeal with situational and cultural sensitivities, since humor is often culturally specific and may not resonate universally (Farah et al., 2021). Based on the extant literature we argue that humor can significantly influence the perceived authenticity of chatbots. However, balancing humor's emotional appeal with chatbot functionality is essential to avoid detracting from the chatbot's core tasks and utility (Schanke et al., 2021). Building on the above argument, we put forward the following hypothesis:

H4. Chatbot humor positively influences perceived authenticity, such that contextually appropriate and engaging humor enhances the user's perception of the chatbot's authenticity.

4. Outcome of perceived authenticity

The outcomes of perceived authenticity in chatbot-mediated interactions span relational, emotional, and cognitive dimensions, offering critical implications for user experience. Research has indicated that authentic interactions can enhance rapport, trust, and service satisfaction (Fatima et al., 2024; Gelbrich et al., 2021; Gratch et al., 2006; Neururer et al., 2018). Although humanized interactions have been leveraged to create customer value, at the same time they may bring eeriness (Song & Shin, 2024) and result in a backfiring outcome (Seitz, 2024) which may ultimately lead to customer frustration (Chhabra et al., 2024). Consumers might view chatbots as quasi-human entities separate from the service provider, lacking the ability to demonstrate care or address customers' personalized needs effectively (Whang & Im, 2021). Thus, incorporating highly anthropomorphic visual elements can sometimes backfire, as such cues may be perceived as insincere, reducing users' sense of similarity, positive attitudes, and behavioral intentions (Chhabra et al., 2024). Despite its importance, the nuanced mechanisms and boundaries of these outcomes of perceived authenticity remain underexplored in the literature, particularly in chatbot-mediated settings where human-like features are meant to foster relational depth but may also risk user discomfort when poorly calibrated (Seitz, 2024; Song & Shin, 2024). Building on these insights, we propose the following hypotheses:

H5a: Perceived authenticity is positively associated with rapport in chatbot interactions, such that higher perceived authenticity enhances users' relational connection with the chatbot.

H5b: Perceived authenticity is positively associated with trust in chatbot interactions, such that higher perceived authenticity strengthens users' trust in the chatbot.

H5c: Perceived authenticity is positively associated with service satisfaction in chatbot interactions, such that higher perceived authenticity increases users' overall satisfaction with the chatbot.

H5d: Perceived authenticity is negatively associated with frustration in chatbot interactions, such that higher perceived authenticity reduces users' frustration during the interaction.

5. Role of gender

Social role theory argues that societal expectations about gender roles influence how individuals perceive and respond to gendered cues (Eagly et al., 2000). In the context of chatbots, gender cues such as a feminine or masculine name, voice, or avatar can shape customer expectations about the chatbot's behavior. For instance, a female-presenting chatbot might be expected to exhibit empathy and warmth, whereas a male-presenting chatbot may be expected to demonstrate competence and authority (Bastiansen et al., 2022; Nejat et al., 2020). Similarly, The expectancy Violation Theory (Burgoon et al., 2016) explains how users respond when these expectations are met or violated. When a chatbot's behaviour aligns with gender-based expectations, the outcome is interpreted as a positive expectancy confirmation,

reinforcing perceptions of authenticity. On the other hand, when behavior contradicts expectations in ways that feel inauthentic (e.g., a male chatbot attempting to show empathy or warmth in a way that seems forced), users may experience a negative violation, which can weaken the perceived authenticity of the chatbot.

Thus, we argue that when these expectations are met, the chatbot is perceived as more authentic, which enhances the positive effects of perceived humanness, empathy, warmth and humor (Borau et al., 2021). Jin and Eastin (2024) found that healthcare chatbots designed with female-doctor cues significantly enhanced perceived warmth and communication satisfaction, leading to increased social presence and intentions to use the chatbot. Moreover, a gender congruence effect was observed, where female users reported higher satisfaction with female-doctor chatbots.

Conversely, Bastiansen et al. (2022) found no significant evidence to support the effect of warmth or assigned gender on user perceptions of chatbots, such as trust, helpfulness, or competence. Their study revealed that neither warm language nor the gender assigned to chatbots evoked stereotypical responses, such as female chatbots being perceived as more trustworthy and friendly or male chatbots being seen as more competent. Moreover, the hypothesized interaction effect between warmth and assigned gender on trust, helpfulness, and competence was also unsupported. These findings suggest that warmth and gender cues in chatbots may not consistently influence user perceptions as anticipated in gender-stereotypical frameworks. Such contradictory results warrant further investigation to better understand the moderating role of gender in shaping user perception of authenticity. Thus, we propose the following hypotheses:

H6a: The presence of gender cues moderates the relationship between perceived humanness and perceived authenticity, such that the relationship is stronger when female gender cues are present compared to male cues.

H6b: The presence of gender cues moderates the relationship between empathy and perceived authenticity, such that the relationship is stronger when female gender cues are present compared to male cues.

H6c: The presence of gender cues moderates the relationship between humor and perceived authenticity, such that the relationship is stronger when male gender cues are present compared to female cues

H6d: The presence of gender cues moderates the relationship between warmth and perceived authenticity, such that the relationship is stronger when female gender cues are present compared to male cues.

Figure 1 below depicts the proposed conceptual model for this study.

6. Method

6.1. Research design

This study employed a survey-based quantitative research design to test the proposed hypotheses regarding the effects of chatbot characteristics. The survey method was chosen because it makes possible the collection of a large volume of standardized data from a diverse population, making it particularly suitable for capturing general perceptions and experiences of the respondents (Rea & Parker, 2014). A survey-based approach is justified in this study as it aligns with the aim of understanding broad user attitudes and behaviors across various service contexts, specifically in restaurant and tourism industries. Data were collected from a well-known online survey panel based in Kuala Lumpur, ensuring access to a diverse pool of respondents with experience in chatbot interactions. Use of an established panel provided several advantages, including access to a broad demographic range in terms of age, gender, education, and occupation, which enhanced the study's external validity. Moreover, the use of a professional panel ensured higher response rates and data quality compared to conventional sampling methods (Porter et al., 2019).

6.2. Participants

The study sampled 396 participants who had interacted with chatbots in the restaurant or tourism service industries within the past six months. Participants were screened to ensure they met the inclusion criteria of prior chatbot interaction, while those without such experience were excluded. Respondents were recruited from an established panel, ensuring, firstly, data reliability and secondly, a broad demographic representation. Of the respondents, 51% identified as male, 41% as female, and 8% preferred not to disclose their gender. Generational analysis revealed that 32.1% were from Generation Y, 24% from Generation X, 17.7% from Generation Z, and 14.4% from the Baby Boomer generation, with the remaining 11.9% representing Generation Alpha. Most participants held a Bachelor's degree (39.6%), followed by Master's degrees (21%), with occupations ranging from engineers (25.3%) and administrative professionals (24.7%) to academics (19.7%). This distribution provided a diverse respondent profile, capturing perspectives from various demographic and professional backgrounds. Table 1 outlines the demographic characteristics of the respondents.

6.3. Measures

A structured survey instrument was developed using validated scales from existing literature. All constructs were measured using seven-point Likert scales (1 = strongly disagree, 7 = strongly agree) to capture nuanced perceptions. Independent variables included perceived humanness (Söderlund & Oikarinen, 2021), empathy (Seitz, 2024), humor (Xie, Liang, Zhou, & Jiang, 2024), and warmth (Kim & Hur, 2024). Perceived authenticity was based on the measures devised by Seitz (2024) which capture the extent to which chatbots were perceived as genuine and credible. Dependent variables included trust (Fu et al., 2023), rapport (Fatima et al., 2024) frustration (Chen et al., 2024), and service satisfaction (Rea & Parker, 2014). Gender cues were

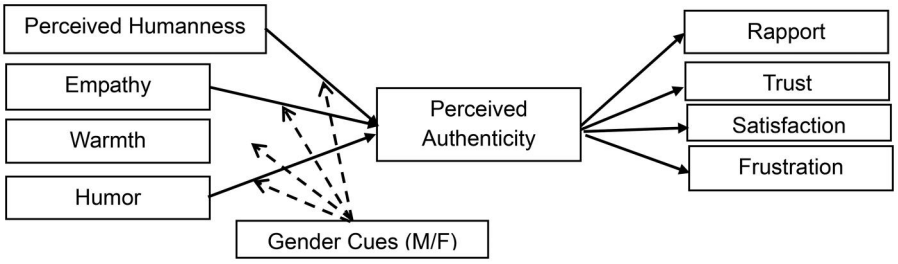


Figure 1. Antecedents and outcome of perceived authenticity.

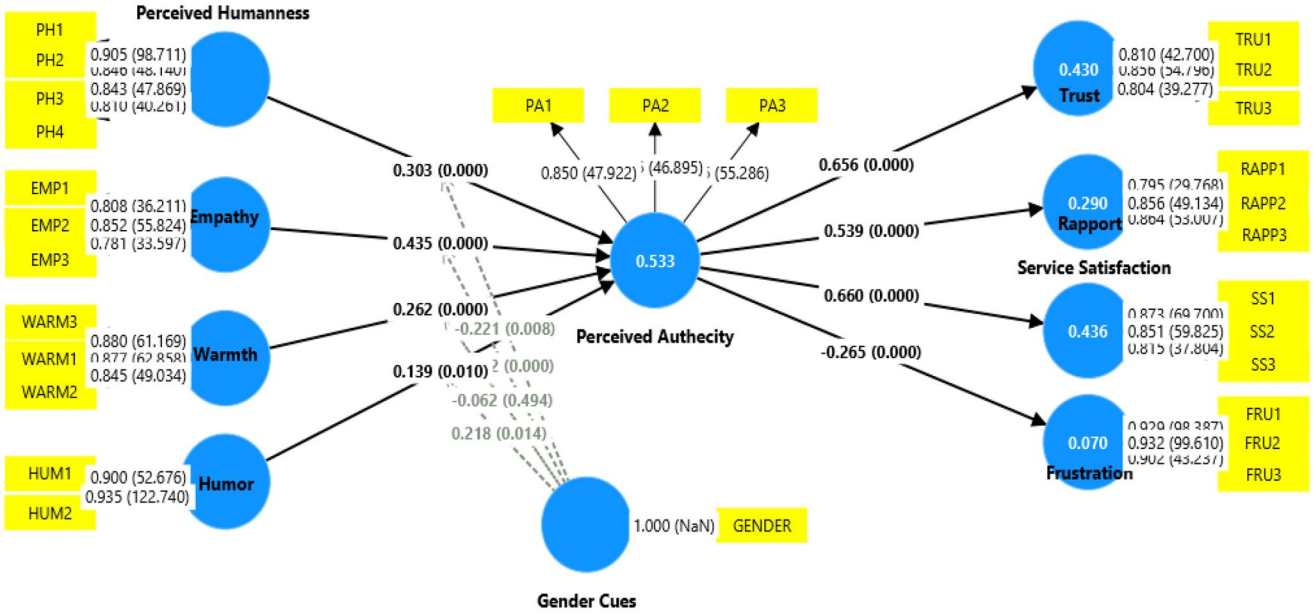


Figure 2. Bootstrapping model.

assessed as a moderating variable, categorized based on the chatbot's use of gendered language, names, or avatars.

6.4. Data analysis

PLS-SEM was used for hypothesis testing and model evaluation. This method is suitable for complex models with mediating and moderating variables (Becker et al., 2023). The model fit indices—SRMR (0.053) and NFI (0.867)—indicated a good fit. The bootstrapping technique with 5,000 resamples served to test the significance of path coefficients.

6.5. Reliability and validity

The measurement model was evaluated to ensure reliability and validity, with all constructs meeting the thresholds for Cronbach's alpha (>0.7), composite reliability (>0.8), and average variance extracted (AVE >0.5) (see Table 2). AVE values for all constructs exceeded the threshold of 0.5, as recommended by Fornell and Larcker (1981). This finding indicates that the measurement items effectively capture the variance of their respective constructs, providing evidence of convergent validity. Discriminant validity was tested using the Heterotrait-Monotrait (HTMT) ratio, which provides a more stringent and reliable test than traditional methods. All HTMT ratios were below the threshold of 0.85, as proposed by Henseler et al. (2015), confirming adequate discriminant validity. Indicated by this result is that the constructs in the model are distinct and measure different underlying dimensions. As specified in Table 3, HTMT values ranged between 0.178 and 0.714 across all constructs, demonstrating that none of the constructs overlapped excessively. The Fornell-Larcker criterion further supported discriminant validity by showing that the square root of each construct's AVE exceeded its correlations with other constructs.

6.6. Common method bias

To address Common Method Bias (CMB), a combination of procedural and statistical remedies was employed to ensure the validity and reliability of the results (Podsakoff et al., 2012). Procedural controls were implemented during the survey design to minimize potential biases from respondents. First, respondents were assured that their participation was anonymous and that their data would remain confidential, reducing the likelihood of social desirability bias. Second, the order of survey items was randomized to prevent systematic response patterns that could artificially inflate relationships between variables. Additionally, proximal and temporal separation techniques were utilized by interspersing unrelated questions between key items to

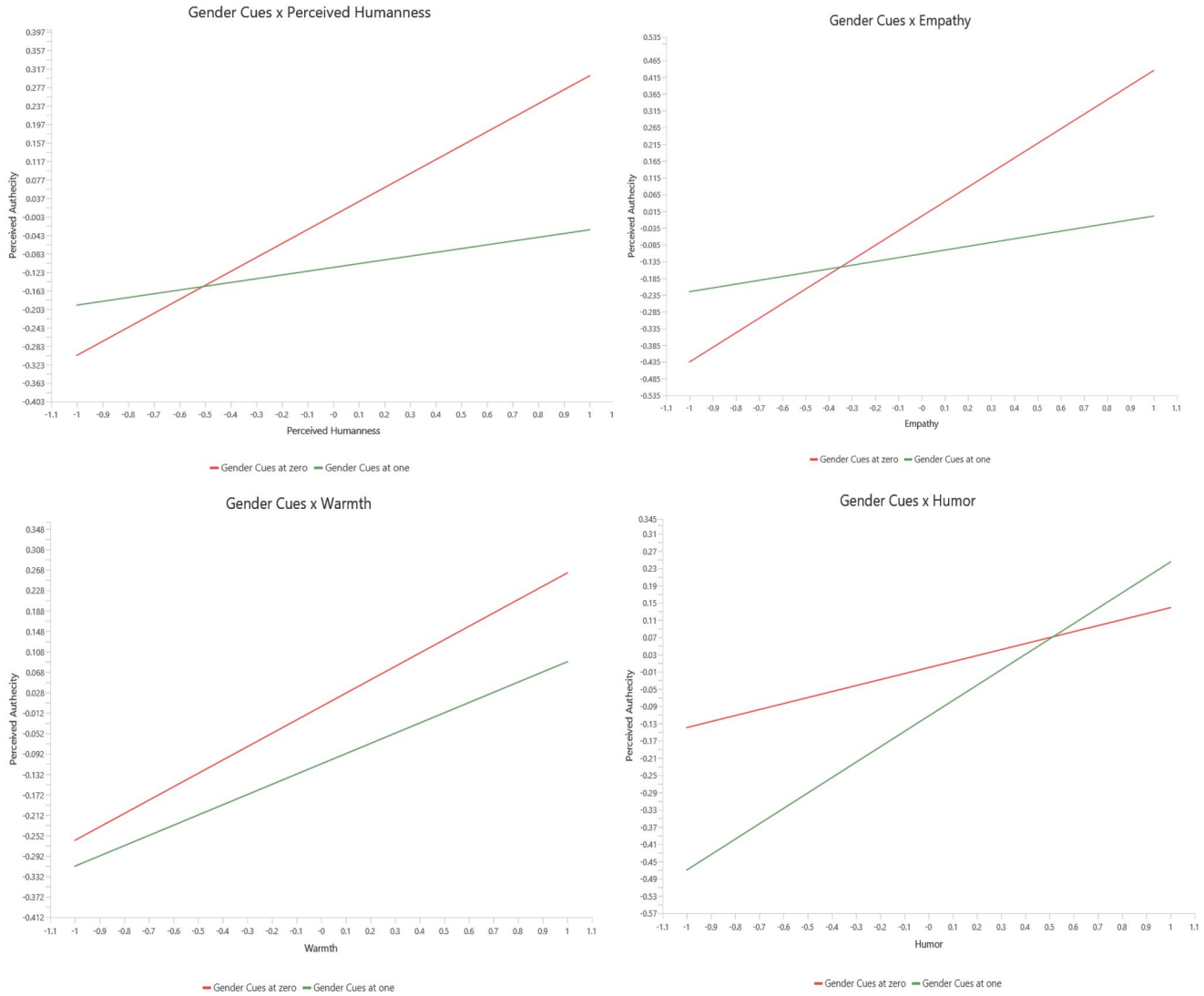


Figure 3. Simple slope analysis.

Table 1. Demographic profile of respondents.

Variable	Category	Frequency	Percentage (%)
Gender	Male	202	51.0
	Female	162	40.9
	Prefer not to disclose	32	8.1
Generation	Baby Boomers (1946–1964)	57	14.4
	Generation X (1965–1980)	95	24.0
	Generation Y (1981–1996)	127	32.1
	Generation Z (1997–2010)	70	17.7
	Generation Alpha (2010–2024)	47	11.9
Education	Bachelor's Degree	157	39.6
	Master's Degree	83	21.0
	Diploma	75	18.9
	STPM/SPM	44	11.1
Occupation	Engineer	100	25.3
	Administrative	98	24.7
	Academic	78	19.7
	Entrepreneur	43	10.9
	Student	36	9.1

reduce the salience of potential associations, further mitigating response bias. Statistical remedies were also applied to evaluate and control for any residual common method variance. Harman's single-factor test was conducted as an exploratory factor analysis to assess whether a single factor dominated the variance in the data.

The analysis revealed that no single factor accounted for more than 50% of the variance; the largest factor explained only 36%, well below the critical threshold. This finding indicated that common method bias was not a significant concern. Further, multicollinearity diagnostics were executed by examining Variance Inflation Factor (VIF) values. All VIF values fell below the recommended threshold of 3.0, ranging between 1.413 and 3.485, confirming that multicollinearity was not an issue (Kock, 2015). Finally, a marker variable test was conducted as an additional statistical control for CMB. This test involved including a theoretically unrelated marker variable to measure and adjust for any shared variance attributable to common method effects. The results indicated that the marker variable showed no significant correlations with the key constructs of the study, further reinforcing the findings' robustness. Collectively, these procedural and statistical approaches ensured that common method bias was minimized, building confidence in the integrity and validity of the study results.

Table 2. Measurement model.

	VIF	EMP	FRS	HUM	PA	PH	RAP	SS	Tru	War	Alpha	CR	AVE
The chatbot understood my concerns.	1.530	0.808									0.746	0.855	0.663
The chatbot showed genuine care in its responses.	1.553	0.852											
The chatbot made me feel understood.	1.413	0.781											
I felt frustrated during my interaction with the chatbot.	3.057		0.929								0.911	0.944	0.848
I became frustrated because of the chatbot's responses.	3.485		0.932										
The chatbot made the interaction more difficult than it needed to be.	2.848		0.902										
The chatbot used humor in an appropriate way during our interaction.	1.898			0.900							0.815	0.915	0.843
The chatbot's humor made the interaction enjoyable.	1.898			0.935									
The chatbot's responses seemed authentic.	1.760				0.850						0.797	0.881	0.712
I felt that the chatbot was genuine in its responses.	1.619				0.825								
The chatbot appeared honest and trustworthy.	1.738				0.855								
The chatbot felt more like a human than a machine.	2.989					0.905					0.873	0.914	0.726
The chatbot seemed to have emotions.	2.057					0.846							
The chatbot was capable of human-like interactions.	2.206					0.843							
The chatbot appeared intelligent and lifelike.	1.941					0.810							
I felt a personal connection with the chatbot.	1.535						0.795				0.790	0.877	0.704
I would look forward to interacting with this chatbot again.	1.777						0.856						
The chatbot took a personal interest in me.	1.742						0.864						
I was satisfied with the chatbot's overall service.	1.837							0.873			0.802	0.883	0.716
The chatbot met my expectations during the interaction.	1.801							0.851					
I would use the chatbot again based on this experience.	1.594							0.815					
I would trust the chatbot's recommendations.	1.527								0.810		0.763	0.864	0.679
I felt confident in the chatbot's advice.	1.662								0.856				
The chatbot seemed reliable in its responses.	1.493								0.804				
The chatbot was friendly.	2.106									0.877	0.835	0.901	0.752
The chatbot was approachable and caring.	1.771									0.845			
The chatbot was warm and inviting.	2.043									0.880			

Table 3. HTMT values.

HTMT	EMP	FRU	Hum	PA	PH	Rap	SS	Tru	War
EMP									
FRU	0.202								
Hum	0.412	0.199							
PA	0.655	0.306	0.618						
PH	0.510	0.196	0.596	0.655					
Rap	0.486	0.321	0.518	0.675	0.565				
SS	0.594	0.397	0.529	0.823	0.691	0.714			
Tru	0.560	0.361	0.450	0.838	0.425	0.641	0.719		
War	0.360	0.178	0.459	0.602	0.514	0.385	0.546	0.450	

Table 4. Hypothesis testing.

Hypothesis	Relationship	β	SE	t-value	p-value	f^2	VIF	BCI LL	BCI UL
H1	PH → PA	0.303	0.053	5.719	$p < 0.001$	0.072	2.726	0.199	0.407
H2	EMP → PA	0.435	0.048	9.091	$p < 0.001$	0.162	2.496	0.339	0.527
H3	WARM → PA	0.262	0.063	4.181	$p < 0.001$	0.058	2.543	0.131	0.380
H4	HUM → PA	0.139	0.054	2.586	$p < 0.010$	0.018	2.256	0.032	0.244
H5a	PA → RAP	0.539	0.048	11.238	$p < 0.001$	0.409	1.000	0.438	0.627
H5b	PA → TRU	0.656	0.039	16.631	$p < 0.001$	0.756	1.000	0.570	0.726
H5c	PA → SS	0.660	0.035	19.051	$p < 0.001$	0.773	1.000	0.587	0.723
H5d	PA → FRU	−0.265	0.052	5.132	$p < 0.001$	0.075	1.000	−0.364	−0.162
H6a	GCU*PH → PA	−0.221	0.083	2.673	0.008	0.016	3.146	−0.386	−0.062
H6b	GCU*EMP → PA	−0.322	0.074	4.328	$p < 0.001$	0.044	2.436	−0.469	−0.178
H6c	GCU*HUM → PA	0.218	0.089	2.457	0.014	0.017	2.617	0.045	0.392
H6d	GCU*WARM → PA	−0.062	0.090	0.684	0.494	0.002	2.731	−0.230	0.120

7. Results

7.1. Path analysis

The study utilized PLS-SEM to test the direct, indirect, and moderating hypotheses, offering the ability to evaluate multiple relationships within a single model while ensuring robust construct and content validity (see Figure 2). The results demonstrate strong explanatory power for the proposed framework, with four key factors - perceived humanness (PH), empathy (EMP), humor (HUM), and warmth (WARM) - accounting for 54% of the variance in perceived authenticity (PA). In turn, PA explained 43% of the variance in trust and service satisfaction. However, PA's ability to account for variance in frustration was minimal, with an adjusted R^2 below the acceptable threshold of 0.26. Table 4 outlines the results of the hypotheses testing.

Among the antecedents, perceived humanness (H1) demonstrated a moderate relationship with PA ($\beta = 0.303$, $p < 0.001$, $f^2 = 0.072$), emphasizing the importance of designing chatbots that exhibit human-like traits in fostering user engagement. Empathy (H2) emerged as the strongest predictor of PA ($\beta = 0.435$, $p < 0.001$, $f^2 = 0.162$),

highlighting the fundamental role of emotional intelligence in building authentic interactions. Warmth (H3) had a significant impact on PA ($\beta = 0.262$, $p < 0.001$), contributing 26.2% of the variance. While impactful, the small effect size ($f^2 = 0.058$) indicates that warmth alone cannot fully explain perceptions of authenticity, pointing to the multidimensional nature of user evaluations. Humor (H4), while significant ($\beta = 0.139$, $p < 0.010$, $f^2 = 0.018$), played a smaller role compared to the other factors. Possibly indicated here is that the effectiveness of humor lies in complementing rather than substituting for empathy, warmth, or humanness.

The effects of PA on user outcomes further reinforce its relevance in chatbot-mediated interactions. PA played an important role in enhancing rapport (H5a), demonstrated by a strong positive effect ($\beta = 0.539$, $p < 0.001$, $f^2 = 0.409$). The relationship between PA and trust (H5b) was particularly pronounced ($\beta = 0.656$, $p < 0.001$, $f^2 = 0.756$), reflecting the centrality of authenticity in fostering confidence in automated interactions. Service satisfaction (H5c) showed the largest effect size ($\beta = 0.660$, $p < 0.001$, $f^2 = 0.773$). This finding indicates the strong relationship between authenticity and user satisfaction. PA significantly reduced frustration (H5d), as evidenced by the negative relationship ($\beta = -0.265$, $p < 0.001$, $f^2 = 0.075$). This indicates that users are less likely to experience dissatisfaction when they perceive the chatbot's responses as genuine and thoughtful.

7.2. Moderation of gendered cues

The moderation analysis of gendered cues (GCU) on the relationships between predictors and perceived authenticity (PA) yielded varying results across the hypotheses. For H6a, the moderating effect of gender cues on the relationship between perceived humanness (PH) and PA was significant but contrary to expectations ($\beta = -0.221$, $p = 0.008$). For H6b, the moderation of gender cues on the relationship between empathy and PA also produced a significant negative effect ($\beta = -0.322$, $p < 0.001$). Similar to H6a, empathy had a stronger impact on PA when male-gender cues were present (see Figure 3). This indicates that empathetic responses from male chatbots may be perceived as more novel and engaging, enhancing their authenticity evaluations. In contrast, the moderation of GCU for H6c showed a significant positive effect ($\beta = 0.218$, $p = 0.014$). As depicted in Figure 3, humor exhibited more impact in enhancing PA when female gender cues were present, suggesting that humor challenges traditional stereotypes for female personas and enhances their relatability and authenticity. For H6d, the moderating effect of gender cues on the relationship between warmth and PA was insignificant ($\beta = -0.062$, $p = 0.494$). This indicates that warmth operates independently of gendered cues, maintaining its effectiveness across both male and female-presenting chatbots. Figure 3 illustrates the results of the simple slope analysis, depicting the interaction effects of gender cues (coded as 0 for male and 1 for female) on the relationships between chatbot attributes (perceived humanness, empathy, warmth, and humor) and perceived authenticity.

7.3. Necessary Conditioning analysis

The Necessary Conditioning Analysis (NCA) was conducted to determine: (a) the minimum levels of empathy, humor, perceived humanness (PH), and warmth required for higher chatbot authenticity (PA); and (b) the minimum PA levels needed to achieve desired trust, service satisfaction, rapport, and frustration outcomes. Following Dul et al. (2023), three key criteria were assessed: ceiling regression, permutation p-values of effect size, and bottleneck tables.

Results indicate that all four antecedents have a moderate impact on perceived authenticity (PA), with perceived humanness (PH) exerting the most influence, followed by empathy, humor, and warmth. For outcomes, PA demonstrates a substantial effect on trust, followed by service satisfaction and rapport, while its effect on frustration is non-significant. As shown in Tables 5–8, steep ceiling lines are evident for all determinants and outcomes except frustration, reflecting the distinct role of authenticity in chatbot interactions.

Condition inefficiency values reveal that moderate levels of empathy (50.58%), humor (34.77%), PH (45.25%), and warmth (71.31%) are sufficient to achieve higher PA. Similarly, achieving high levels of trust, service satisfaction, and rapport requires only 84.81%, 77.2%, and 82.57% PA, respectively. However, the non-significant slope for frustration underscores the fact that PA is less critical in mitigating this outcome.

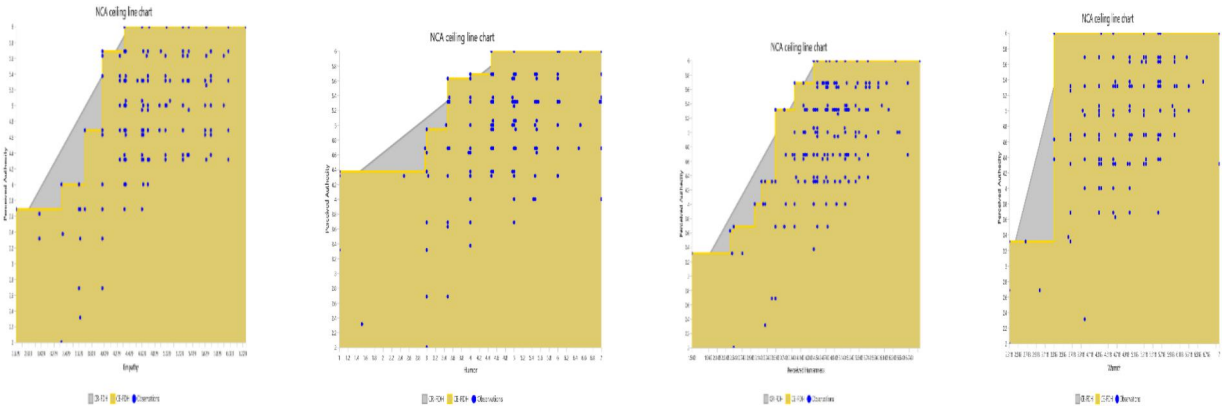
Bottleneck analysis further identifies the conditions necessary for specific levels of PA and user outcomes. For example, low levels of PA require PH and warmth, with scores of 1.87 and 2.4 needed to achieve 30% PA. To reach 40% PA, a starting score of 2.77 in empathy is necessary, while humor becomes essential only for medium to high levels of PA. Achieving 100% PA highlights the pivotal role of warmth (3.614), followed by empathy (4.43), PH (4.53), and humor (4.91), reaffirming empathy's critical importance in chatbot interactions, as reflected in path analysis. A noteworthy finding is the indispensable role of PA in influencing outcomes. Even achieving 0% trust requires an initial PA value of 2.13, while 10% service satisfaction and rapport require PA values of 2.33 and 2.30, respectively. These results emphasize the necessity of PA in driving meaningful chatbot conversations and enhancing user perceptions

8. Discussion

8.1. Antecedents and outcome of PA

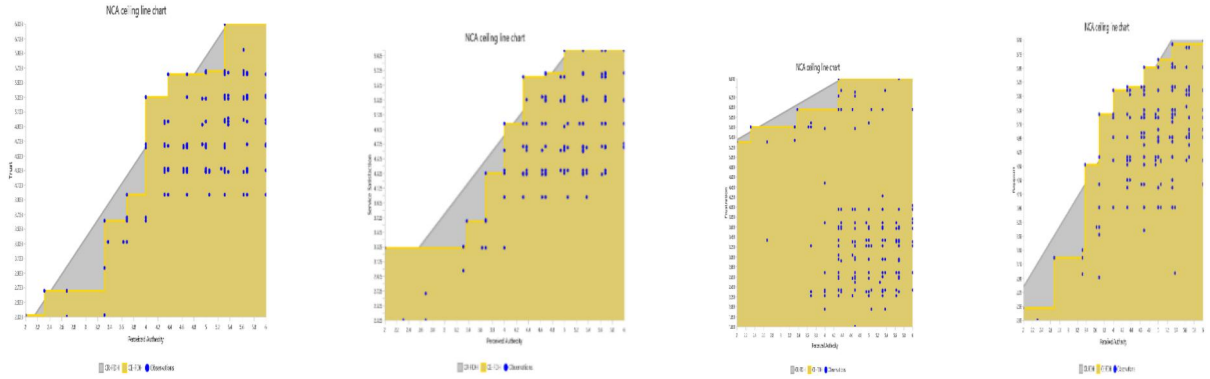
The findings of this study contribute significantly to the discourse on perceived authenticity (PA) in chatbot interactions. They also offer a nuanced understanding of the relationship between human-like traits, authenticity perceptions, and user outcomes.

Table 5. Necessary conditioning analysis for perceived authenticity.



	Empathy	Humor	Perceived Humanness	Warmth
0.000%	NN	NN	NN	NN
10.000%	NN	NN	NN	NN
20.000%	NN	NN	NN	NN
30.000%	NN	NN	1.873	2.404
40.000%	2.773	NN	2.253	2.577
50.000%	3.050	NN	2.632	2.750
60.000%	3.326	1.530	3.012	2.923
70.000%	3.603	2.376	3.392	3.096
80.000%	3.879	3.222	3.771	3.269
90.000%	4.156	4.068	4.151	3.441
100.000%	4.432	4.914	4.531	3.614

Table 6. Necessary conditioning analysis of perceived authenticity.



	Trust	Service Satisfaction	Rapport	Frustration
0.000%	2.134	NN	NN	NN
10.000%	2.457	NN	NN	NN
20.000%	2.780	2.336	2.305	NN
30.000%	3.103	2.680	2.680	NN
40.000%	3.426	3.024	3.054	NN
50.000%	3.749	3.368	3.429	NN
60.000%	4.071	3.712	3.804	NN
70.000%	4.394	4.056	4.179	NN
80.000%	4.717	4.400	4.553	2.452
90.000%	5.040	4.744	4.928	3.425
100.000%	5.363	5.088	5.303	4.398

In terms of the antecedents, empathy emerged as the most influential determinant of PA. Furthermore the NCA findings reveal that empathy does not only exert an impact, but is indispensable for PA. For instance, bottleneck analysis shows that empathy is crucial, especially at moderate and high levels of PA. In other words, users are more likely to perceive a chatbot as authentic if it can express understanding and emotional intelligence during interactions. This finding aligns with Seitz (2024), who emphasized empathy as a bridge between human and machine and creating perceptions of genuine connection. However, caution must be exercised here: while well-calibrated empathetic responses enhance authenticity, poorly executed or overly scripted ones risk undermining it. This nuance echoes Xygkou et al. (2024), who argue for the importance of tailoring empathy to user expectations to avoid perceptions of insincerity.

Table 7. Effect size on PA.

	Perceived Authenticity				
	Effect size	Permutation *p*-Value	Accuracy	Condition inefficiency	Outcome inefficiency
Empathy	0.161	0.000	97.475	50.589	34.793
Humor	0.151	0.000	95.960	34.771	53.729
Perceived Humanness	0.215	0.000	96.465	45.252	21.317
Warmth	0.104	0.000	98.990	72.310	24.976

Note(s): $0 < d < 1$: Small Effect; $0.1 \leq d < 0.3$: Medium Effect; $0.3 \leq d < 0.5$ Large effect; $d \geq 0.5$ very Large effect.

Table 8. Effect size of PA.

	Perceived Authenticity			
	Trust	Service Satisfaction	Rapport	Frustration
Effect size	0.477	0.373	0.363	0.073
Permutation *p*-Value	0.000	0.000	0.000	0.690
Accuracy	93.93	93.93	89.89	98.98
Condition inefficiency	15.91	22.80	17.425	40.04
Outcome inefficiency	0.00	10.21	11.86	75.35

Note(s): $0 < d < 1$: Small Effect; $0.1 \leq d < 0.3$: Medium Effect; $0.3 \leq d < 0.5$ Large effect; $d \geq 0.5$ very Large effect (Dul et al., 2023).
Source(s): Prepared by Author.

Perceived humanness (PH) also played a significant role in shaping PA, as shown by the path analysis. The NCA results add to this by showing that PH is a necessary condition for authenticity at moderate levels, meaning chatbots must exhibit some degree of human-like traits to feel authentic. This finding builds on the work done by Nguyen et al. (2023), who highlighted that both linguistic and behavioral human-like traits effectively foster user engagement and trust. Similarly, Ma and Huo (2023) and Zhang, Lu, et al. (2024) emphasized that human attributes manifested through language and behavior facilitate authentic and meaningful customer interactions. Reinforcing these insights, studies by Borau et al. (2021) and Hsieh and Lee (2024) identified conversational tone and emotional cues as key attributes that shape perceptions of authenticity. Together, these findings affirm the multifaceted value of humanness and confirm that human-like features are essential for establishing authentic connections. However, the findings also address concerns raised by Song and Shin (2024) about hyper-realistic designs, which can sometimes feel unsettling. This study confirms that PH enhances authenticity without causing frustration. Importantly, PH works best when combined with other relational traits like empathy and warmth, as it cannot drive authenticity on its own.

Warmth also contributed significantly to PA, albeit with a smaller effect size than empathy or PH. Path analysis supports previous studies such as Kull et al. (2021) and others (Nejat et al., 2020; Seitz, 2024) that position warmth as a vital relational factor. NCA results show that warmth becomes increasingly important as PA levels rise, making it a key element for building trust and rapport. For example, Tsai et al. (2021) demonstrated that warmth communicated through informal conversational styles and inviting language strengthens user trust and closeness, a notion further supported by Yu and Zhao (2024), who highlighted the use of emojis to amplify perceived warmth. NCA findings further showed that warmth is especially important as authenticity levels increase, indicating it works best when paired with empathy and PH. This supports Roy and Naidoo's (2001) assertion that warmth operates most effectively when integrated into a broader relational framework, resolving debates about its standalone impact on authenticity.

Humor emerged as the factor with the smallest effect size on PA in path analysis. However, NCA revealed that humor becomes necessary only when authenticity is already high, meaning it works best as a complementary feature rather than a standalone one. The contextual dependency of humor is particularly evident in Schanke et al.'s (2021) assertion that its effectiveness hinges on situational appropriateness, where poorly timed or misplaced humor can alienate users and detract from the overall experience. Expanding on these findings, the literature highlights humor's potential to transform transactional chatbot interactions into meaningful engagements, especially in emotionally sensitive or task-oriented settings. For instance, Xue et al. (2023) demonstrated that humor positively influences users' emotional states in digital health applications, providing empathetic communication and emotional support. Similarly, Farah et al. (2021) emphasize that humorous traits and distinct personalities in chatbots foster trust and create memorable user experiences. This supports the notion that humor, when well-calibrated, can serve as an effective tool for enhancing social intelligence and humanizing interactions (Liu et al., 2022). Thus, our findings frame humor as a context-dependent supplementary factor in determining PA.

The study's insights into the outcomes of PA further enrich the literature. The strong relationship between PA and trust broadly aligns with earlier research. For example, Cai et al. (2024) showed that social-oriented communication style chatbots enhance the level of consumers' interaction satisfaction and trust. Similarly, PA's significant impact on service satisfaction and rapport reinforces its centrality in driving relational and experiential outcomes, echoing findings documented by Fatima et al. (2024).

However, the NCA analysis reveal that PA's effect on frustration is limited and inconsistent. This aligns with the notion that frustration might stem from unmet functional expectations (e.g., errors, lack of efficiency) rather than a lack of authenticity. While emotionally intelligent chatbots hold significant promise for transforming user experiences through artificial empathy, their effectiveness is intertwined with critical challenges (Seitz, 2024). Ensuring the authenticity of empathetic responses requires careful calibration to avoid perceptions of insincerity. Moreover, ethical concerns, including privacy, security, and transparency, underscore the complexity of deploying such technologies responsibly (Rostami & Navabinejad, 2023).

Overall, the combination of path analysis and NCA findings provide clarity on how emotional and anthropomorphic

cues shape authenticity perceptions. For example, while Seitz (2024) argued that empathetic responses might backfire in healthcare contexts, this study demonstrates that empathy enhances authenticity when appropriately tailored. Similarly, while Song and Shin (2024) warned against hyper-realistic designs, the findings highlight the potential of balanced human-like traits to enhance user engagement and trust. These reconciliations offer a more cohesive understanding of human-chatbot interactions.

8.2. Moderating effect of gender cues on PA

The findings on the moderating role of gender cues in the relationship between antecedents and perceived authenticity (PA) provide nuanced insights that challenge traditional assumptions about gender roles in human-computer interactions. Contrary to expectations grounded in Social Role Theory (Eagly et al., 2000), which suggests that female-presenting chatbots would be better aligned with relational qualities like empathy, warmth, and humor, the results reveal a more context-dependent interplay between gender cues and user perceptions.

The significant negative moderating effect of gender cues on the perceived humanness (PH)–PA relationship shows that human-like traits enhance authenticity more for male-presenting chatbots than for female-presenting ones. This finding challenges earlier studies, such as Borau et al. (2021), which posited that female personas are better positioned to leverage anthropomorphic attributes due to their alignment with relational stereotypes. Similarly, the significant negative moderating effect of gender cues on the empathy–PA relationship further complicates assumptions about the alignment of empathy with female personas. Empathy was found to have a stronger positive influence on PA for male-presenting chatbots, implying that users may perceive empathic behaviors from male personas as more effortful or unexpected, thus amplifying their authenticity.

One plausible explanation derives from the Expectancy Violation Theory (Burgoon et al., 2016), which posits that unexpected characteristics, such as human-like traits in a male chatbot, can disrupt user expectations and prompt deeper cognitive processing. This increased engagement can lead to heightened evaluations of authenticity. In contrast, when female chatbots exhibit similar traits, they may align with existing gendered expectations (Borau et al., 2021), reducing their perceived novelty and impact. While prior research, such as Jin and Eastin (2024) has highlighted the effectiveness of female-associated empathy in healthcare contexts, the present findings suggest that the impact of empathy is not universally stronger for female personas and is instead shaped by the interplay of context, stereotypes, and user expectations. In contrast, the positive moderating effect of gender cues on the humor–PA relationship highlights that humor enhances authenticity more effectively for female-presenting chatbots. This finding aligns with the broader literature emphasizing the humanizing effects of female chatbots (Liu & Yao, 2023; Prakash, 2024); however, it adds a new layer by demonstrating that humor can challenge traditional gender norms. Humor in female chatbots may disarm stereotypes and create a sense of relatability and authenticity, particularly in informal or social contexts. This supports the notion that humor is a relational equalizer, capable of fostering service satisfaction (Xie, Liang, Zhou, & Jiang, 2024).

Interestingly, no significant moderating effect was observed for the warmth–PA relationship. This finding diverges from prior research, such as Jin and Eastin (2024), which indicated that female-associated warmth enhances relational outcomes in healthcare settings. However, it broadly aligns with Bastiansen et al. (2022) who found that warmth and gender cues did not significantly influence trust, helpfulness, or competence as expected. These results collectively reveal that gender cues do not exert uniform effects on the relational attributes of chatbots but instead interact with user expectations, context, and the novelty of behaviors to shape perceptions of authenticity.

8.3. Implications

8.3.1. Theoretical implications

This study offers significant theoretical contributions by extending and refining the understanding of PA in chatbot-mediated interactions. Drawing upon the seminal work of Seitz (2024) and building on the critical insights provided by Song and Shin (2024), this research offers a novel framework that integrates emotional, anthropomorphic, and contextual factors. Seitz (2024) concluded that empathetic chatbot responses enhance perceived warmth but can reduce authenticity, which in turn weakens trust and usage intentions. Similarly, Song and Shin (2024) showed that increasing a chatbot's human likeness can heighten feelings of eeriness, leading to lower trust and reduced behavioral intentions. These findings highlight the nuanced and sometimes conflicting effects of emotional traits and human-like design. These insights provide the foundation for the theoretical advancements discussed below.

First, this study advances the experience dimension of the Mind Perception Theory (Gray et al., 2007) and shows how emotional experiences such as perceived humanness (PH), empathy, warmth, and humor affect the notion of perceived authenticity. These emotional traits emerge as central to fostering rapport, trust and satisfaction. Thus, our findings confirm that emotional intelligence in chatbots is a decisive factor in their perceived authenticity. This reinforces the theory's assertion that emotional experience is essential in attributing human-like qualities but situates these findings within a practical service-oriented context (Gray et al., 2007).

Second, this study addresses the uncanny valley paradox (Mori et al., 2012). Our findings diverge from Song and Shin's (2024) cautionary stance on hyper-realistic designs by showing that well-balanced anthropomorphic traits, such as perceived humanness (PH) and empathy, can enhance trust and satisfaction without triggering feelings of eeriness. We argue that while overly human-like designs may evoke discomfort and lead to feelings of eeriness or mistrust, our findings reveal that carefully calibrated anthropomorphic

traits can significantly enhance trust, satisfaction, and even reduce customer frustration. While Seitz (2024) cautioned that empathetic responses could backfire and diminish perceived authenticity in certain contexts, we argue that- when tailored appropriately, empathy strengthens PA.

Third, this research also applies the Theory of Mind (ToM) (Baron-Cohen, 1999) to the chatbot authenticity literature by studying how users assess a chatbot's ability to infer and respond to their emotional states. The findings suggest that when chatbots demonstrate empathic and context-sensitive behaviors, users are more likely to attribute mind-like qualities to them, which significantly enhances perceptions of authenticity. This finding reinforces ToM research in human-computer interaction (e.g., Mou et al., 2020), illustrating its relevance for understanding how users form relational perceptions in chatbot-mediated services.

Fourth, this study's findings partially support Lee's (2020) Authenticity Model of Computer-Mediated Communication. Findings confirmed that authenticity markers like empathy, humour, perceived humanness, and warmth directly enhance perceived authenticity, which eventually influences key relational outcomes such as rapport, trust, and satisfaction. In other words, when chatbots express these socially meaningful cues, users are more likely to experience the interaction as genuine and emotionally engaging.

Fifth, the study's focus on the moderating role of gender cues introduces a novel dimension to the literature. Contrary to expectations derived from Social Role Theory (Eagly et al., 2000), the findings suggest that male-presenting chatbots benefit more from empathy and PH, while female-presenting chatbots leverage humor to greater effect. These results align with the Expectancy Violation Theory (Burgoon et al., 2016), which posits that unexpected behaviors, such as empathic responses from male personas, disrupt user expectations and amplify evaluations of authenticity. This contribution challenges prior research, such as Borau et al. (2021) and Jin and Eastin (2024), which emphasized gender congruence in chatbot design, and calls for a more context-sensitive approach to gendered interactions in digital environments.

Sixth, the inclusion of NCA brings a unique contribution to this study by identifying the minimum levels of emotional attributes (i.e., empathy, warmth, and humor) required for PA. Unlike traditional methods, NCA highlights non-negotiable conditions for achieving authenticity and offers precise thresholds for each attribute (Dul et al., 2023). This approach provides actionable insights for chatbot design and highlights the critical elements needed to foster engagement and trust.

Seventh and finally, the study offers a cohesive framework for understanding the role of emotional and anthropomorphic factors in shaping user perceptions. We call for a balanced approach to chatbot design, where human-like traits are used to foster emotional connections without crossing into territory that feels unnatural or misaligned with user expectations. These findings refine our understanding of human chatbot interaction and offer practical guidance for developing chatbots that are both effective and user-friendly.

8.3.2. Managerial implications

The findings of this study provide actionable strategies for organizations to enhance customer engagement through chatbots by focusing on relational and functional design elements. In case of empathy, businesses can invest in chatbots equipped with advanced emotional intelligence capabilities to detect and respond to user emotions contextually. For instance, in healthcare, chatbots like Woebot offer empathetic responses such as, "I understand how you're feeling; let's work through this together," which helps users feel understood and supported (Qi, 2024). However, generic or overly scripted empathy risks appearing insincere, emphasizing the need for tailored responses that align with individual user needs, as highlighted by Xygkou et al. (2024).

Anthropomorphic features, such as perceived humanness (PH) is critical in building trust and satisfaction but must be balanced with other relational traits like empathy and warmth. For example, e-commerce platforms like Amazon Alexa leverage approachable language and non-threatening avatars to humanize interactions while maintaining a functional focus (Xu et al., 2024). This calibrated approach allows businesses to optimize user trust without risking discomfort.

Warmth, though less impactful than empathy and perceived humanness (PH), remains essential for building trust and rapport. Informal conversational styles and inviting language, such as emojis, can enhance users' emotional connections with chatbots. For example, Domino's Pizza's chatbot uses playful phrases like, "Let's get you your favorite pizza in no time!" to create an engaging and approachable experience. Similarly, well-executed humor can boost social intelligence and humanize interactions. However, findings from Xie, Liang, Zhou and Zhu (2024) highlight the nuanced role of humor, which varies based on the interaction context. Their study shows that humor in chit-chat dialogues enhances perceived entertainment, significantly mediating higher service satisfaction. Conversely, humor in task-oriented dialogues tends to cause distraction, ultimately lowering satisfaction. These insights emphasize that humor's effectiveness depends on aligning it with the interaction's purpose. Thus, in casual settings, a humorous remark like, "This jacket is so cool—it might start a fashion revolution!" can foster relatability and user engagement. Yet, in task-specific contexts, humor can detract from the chatbot's functionality, reducing its perceived value. Thus, businesses must carefully align humor with user expectations and interaction goals, as cultural nuances and the dialogue context play pivotal roles in shaping its effectiveness (Zhai & Wibowo, 2023).

In terms of humor, practitioners should prioritize context-appropriate humor integration and ensure that humor is applied selectively and only after foundational elements like trust and basic satisfaction are established (e.g., medium PA levels). Moreover, maintaining consistent levels of PA is important for developing trust because the findings indicate a minimum PA threshold of 2.13 is required to foster trust, even at the lowest desired outcome levels. Managers can

achieve this by designing chatbots that deliver clear, accurate, and transparent responses. Additionally, testing chatbot responses across diverse user groups can help ensure clarity and prevent misinterpretations and further support consistent user satisfaction and trust.

The study also highlights the importance of tailoring gender cues in chatbot design to match user expectations and context. Male-presenting chatbots, for example, may excel in technical support scenarios where empathy is perceived as an unexpected and authentic trait, enhancing trust. In contrast, female-presenting chatbots can utilize humor effectively to challenge stereotypes and foster relatability. Siri and Google Assistant are examples of female-voiced chatbots that balance professionalism with relatable humor, helping them connect with a diverse audience.

8.3.3. Social implications

This study provides profound social implications for the development of emotionally intelligent chatbots in the public-facing digital service domain. Our findings underscore the imperative of designing chatbot experiences that align with users' emotional and relational expectations. The moderating effect of gender cues highlights the need for inclusive, context-aware design that accounts for diverse user preferences and interpretations. With the tremendous use of chatbots in emotionally sensitive domains such as healthcare, education, and community services, the authenticity-driven design emerges as a strategic priority for enhancing user experience, minimizing frustration, and facilitating digital environmental inclusiveness (Rafikova & Voronin, 2025).

This study's findings further contest the dominant efficiency-driven narrative of automation by assessing the importance of authenticity as a relational construct grounded in emotional and anthropomorphic cues. This reconceptualization signifies the rationale for an ethical design framework that prioritizes authentic user experience and fosters user trust (Al-Shafei, 2025).

Moreover, emotional cues such as empathy, warmth and perceived humanness should be treated as essential design features. Chatbot designers and developers should focus on creating authentic and psychologically safe interactions. Gender and context also influence how users respond. Chatbot responses should be tested across diverse user groups to ensure clarity and relevance. Prioritising these elements will ensure chatbot interactions are not only functional but also meaningful, inclusive and emotionally engaging.

8.3.4. Methodological implications

This study shows the value of using both PLS-SEM and NCA analysis to understand how users experience chatbot interactions. While PLS-SEM helped identify which emotional traits have the strongest impact on perceived authenticity, NCA revealed the minimum levels of these traits needed to make users feel that a chatbot is genuine. Together, these methods offer a complete picture of what really matters in designing authentic chatbot experiences.

8.4. Limitations and future research

Despite its contributions, this study has limitations that nonetheless provide opportunities for future research. First, the study focused primarily on perceived authenticity (PA) in chatbot interactions across specific antecedents like empathy, warmth, humor, and perceived humanness. However, other potential determinants, such as agency, privacy and security, and prior experience with chatbots, remain untapped. Future studies may integrate these factors to propose and test a more comprehensive and robust framework. Second, although this research assessed the moderation effect of gender cues, it did not account for broader demographic or psychographic variables such as age, cultural background, or personality traits, which may play a critical role in shaping users' perception of perceived authenticity. Third, the study primarily relied on user perceptions, leaving room for behavioral or longitudinal assessments to evaluate how PA impacts long-term outcomes such as loyalty, advocacy, and retention. Fourth and lastly, as AI technology evolves, incorporating emerging features like generative AI capabilities or multi-modal interactions (e.g., text combined with voice or video) could enrich the perception of authenticity.

Author contributions

Md Irfanuzzaman Khan: Conceptualization, Writing – original draft, review & editing. Arun Kumar Tarofder: Investigation, Data curation, Formal analysis, Methodology, Writing – original draft. Sharmini Gopinathan: Supervision. Ahasanul Haque: Validation.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Ethical approval

Participants provided informed consent before completing the survey, and all responses were collected anonymously to ensure confidentiality. The relevant institutional review board (EA-L1-01-GSM-2024-06-0009) approved the research.

Funding

This research received no specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

ORCID

Md Irfanuzzaman Khan http://orcid.org/0000-0003-2671-7053
Arun Kumar Tarofder http://orcid.org/0000-0002-3364-262X

References

Agnihotri, A., & Bhattacharya, S. (2024). Chatbots' effectiveness in service recovery. *International Journal of Information Management*, *76*, 102679. https://doi.org/10.1016/j.ijinfomgt.2023.102679

Almalki, M. (2021). Exploring the influential factors of consumers' willingness toward using COVID-19 related chatbots: An empirical

study. *Medical Archives (Sarajevo, Bosnia and Herzegovina)*, *75*(1), 50–55. https://doi.org/10.5455/medarh.2021.75.50-55

Al-Shafei, M. (2025). Navigating human-chatbot interactions: An investigation into factors influencing user satisfaction and engagement. *International Journal of Human–Computer Interaction*, *41*(1), 411–428. https://doi.org/10.1080/10447318.2023.2301252

Baron-Cohen, S. (1999). The evolution of a theory of mind. In M. C. Corballis & S. Lea (Eds.), *The descent of mind: Psychological perspectives on hominid evolution* (pp. 261–277). Oxford University Press.

Bastiansen, M. H., Kroon, A. C., & Araujo, T. (2022). Female chatbots are helpful, male chatbots are competent? *Publizistik*, *67*(4), 601–623. https://doi.org/10.1007/s11616-022-00762-8

Becker, J.-M., Cheah, J.-H., Gholamzade, R., Ringle, C. M., & Sarstedt, M. (2023). PLS-SEM's most wanted guidance. *International Journal of Contemporary Hospitality Management*, *35*(1), 321–346. https://doi.org/10.1108/IJCHM-04-2022-0474

Beerends, S., & Aydin, C. (2025). Negotiating the authenticity of AI: How the discourse on AI rejects human indeterminacy. *Ai & Society*, *40*, 263–276. https://doi.org/10.1007/s00146-024-01884-5.

Bilquise, G., Ibrahim, S., & Shaalan, K. (2022). Emotionally intelligent chatbots: A systematic literature review. *Human Behavior and Emerging Technologies*, *2022*(1), 1–23. https://doi.org/10.1155/2022/9601630

Borau, S., Otterbring, T., Laporte, S., & Fosso Wamba, S. (2021). The most human bot: Female gendering increases humanness perceptions of bots and acceptance of AI. *Psychology & Marketing*, *38*(7), 1052–1068. https://doi.org/10.1002/mar.21480

Burgoon, J. K., Bonito, J. A., Lowry, P. B., Humpherys, S. L., Moody, G. D., Gaskin, J. E., & Giboney, J. S. (2016). Application of expectancy violations theory to communication with and judgments about embodied agents during a decision-making task. *International Journal of Human-Computer Studies*, *91*, 24–36. https://doi.org/10.1016/j.ijhcs.2016.02.002

Cai, N., Gao, S., & Yan, J. (2024). How the communication style of chatbots influences consumers' satisfaction, trust, and engagement in the context of service failure. *Humanities and Social Sciences Communications*, *11*(1), 1–11. https://doi.org/10.1057/s41599-024-03212-0

Chen, Q., Gong, Y., Lu, Y., & Luo, X. (2024). The golden zone of AI's emotional expression in frontline chatbot service failures. *Internet Research*. https://doi.org/10.1108/INTR-07-2023-0551

Chhabra, S., Kaushal, V., & Girija, S. (2024). Determining the causes of user frustration in the case of conversational chatbots. *Behaviour & Information Technology*, 1–19. https://doi.org/10.1080/0144929X.2024.2362956

Ciechanowski, L., Przegalinska, A., Magnuski, M. & Gloor, P. (2019). In the shades of the uncanny valley: An experimental study of human-chatbot interaction. *Future Generation Computer Systems*, *92*, 539–548. https://doi.org/10.1016/j.future.2018.01.055

Croes, E. A., & Antheunis, M. L. (2021). Can we be friends with Mitsuku? A longitudinal study on the process of relationship formation between humans and a social chatbot. *Journal of Social and Personal Relationships*, *38*(1), 279–300. https://doi.org/10.1177/0265407520959463

De Gennaro, M., Krumhuber, E. G., & Lucas, G. (2019). Effectiveness of an empathic chatbot in combating adverse effects of social exclusion on mood. *Frontiers in Psychology*, *10*, 3061. https://doi.org/10.3389/fpsyg.2019.03061

Dul, J., Hauff, S., & Bouncken, R. B. (2023). Necessary condition analysis (NCA): review of research topics and guidelines for good practice. *Review of Managerial Science*, *17*(2), 683–714. https://doi.org/10.1007/s11846-023-00628-x

Dwivedi, Y. K., Balakrishnan, J., Baabdullah, A. M., & Das, R. (2023). Do chatbots establish "humanness" in the customer purchase journey? An investigation through explanatory sequential design. *Psychology & Marketing*, *40*(11), 2244–2271. https://doi.org/10.1002/mar.21888

Eagly, A. H., Wood, W., & Diekman, A. B. (2000). Social role theory of sex differences and similarities: A current appraisal. In T. Eckes & H. M. Trautner (Eds.), *The developmental social psychology of gender* (pp. 123–174). Lawrence Erlbaum Associates.

Farah, J. C., Sharma, V., Ingram, S., & Gillet, D. (2021). Conveying the perception of humor arising from ambiguous grammatical constructs in human-chatbot interaction. Proceedings of the 9th International Conference on Human-Agent Interaction (HAI '21), Virtual Event, Japan. https://doi.org/10.1145/3472307.3484677

Fatima, J. K., Khan, M. I., Bahmannia, S., Chatrath, S. K., Dale, N. F., & Johns, R. (2024). Rapport with a chatbot? The underlying role of anthropomorphism in socio-cognitive perceptions of rapport and e-word of mouth. *Journal of Retailing and Consumer Services*, *77*, 103666. https://doi.org/10.1016/j.jretconser.2023.103666

Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research*, *18*(3), 382–388. https://doi.org/10.1177/002224378101800313

Fu, J., Mouakket, S., & Sun, Y. (2023). The role of chatbots' human-like characteristics in online shopping. *Electronic Commerce Research and Applications*, *61*, 101304. https://doi.org/10.1016/j.elerap.2023.101304

Gelbrich, K., Hagel, J., & Orsingher, C. (2021). Emotional support from a digital assistant in technology-mediated services: Effects on customer satisfaction and behavioral persistence. *International Journal of Research in Marketing*, *38*(1), 176–193. https://doi.org/10.1016/j.ijresmar.2020.06.004

Gratch, J., Okhmatovskaia, A., Lamothe, F., Marsella, S., Morales, M., van der Werf, R. J., & Morency, L.-P. (2006). Virtual rapport. Intelligent Virtual Agents: 6th International Conference, IVA 2006, Marina Del Rey, CA, USA, August 21-23, 2006.

Gray, H. M., Gray, K., & Wegner, D. M. (2007). Dimensions of mind perception. *Science (New York, N.Y.)*, *315*(5812), 619–619. https://doi.org/10.1126/science.1134475

Gutuleac, R., Baima, G., Rizzo, C., & Bresciani, S. (2024). Will virtual influencers overcome the uncanny valley? The moderating role of social cues. *Psychology & Marketing*, *41*(7), 1419–1431. https://doi.org/10.1002/mar.21989

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

Hsieh, S. H., & Lee, C. T. (2024). The AI humanness: How perceived personality builds trust and continuous usage intention. *Journal of Product & Brand Management*, *33*(5), 618–632. https://doi.org/10.1108/JPBM-10-2023-4797

Huang, J. (2024). *Understanding individuals' experience with virtual characters from the perspective of perceived authenticity* [Doctoral thesis, Nanyang Technological University]. Nanyang Technological University. https://hdl.handle.net/10356/175025

Huang, Y., Gursoy, D., Zhang, M., Nunkoo, R., & Shi, S. (2021). Interactivity in online chat: Conversational cues and visual cues in the service recovery process. *International Journal of Information Management*, *60*, 102360. https://doi.org/10.1016/j.ijinfomgt.2021.102360

Jacobs, O., Pazhoohi, F., & Kingstone, A. (2023). Brief exposure increases mind perception to ChatGPT and is moderated by the individual propensity to anthropomorphize. *PsyArXiv*. https://doi.org/10.31234/osf.io/pn29d

Jiang, K., Qin, M., & Li, S. (2022). Chatbots in retail: How do they affect the continued use and purchase intentions of Chinese consumers? *Journal of Consumer Behaviour*, *21*(4), 756–772. https://doi.org/10.1002/cb.2034

Jiang, Q., Zhang, Y., & Pian, W. (2022). Chatbot as an emergency exist: Mediated empathy for resilience via human-AI interaction during the COVID-19 pandemic. *Information Processing & Management*, *59*(6), 103074. https://doi.org/10.1016/j.ipm.2022.103074

Jin, E., & Eastin, M. (2024). Gender bias in virtual doctor interactions: Gender matching effects of chatbots and users on communication satisfactions and future intentions to use the chatbot. *International Journal of Human–Computer Interaction*, *40*(23), 8246–8258. https://doi.org/10.1080/10447318.2023.2279402

Jones, C. L. E., Hancock, T., Kazandjian, B., & Voorhees, C. M. (2022). Engaging the Avatar: The effects of authenticity signals during chat-

based service recoveries. *Journal of Business Research*, *144*, 703–716. https://doi.org/10.1016/j.jbusres.2022.01.012

Khan, M. I., Fatima, J. K., Bahmannia, S., Chatrath, S. K., Dale, N. F., & Johns, R. (2025). Investigating the influence of perceived humanization of service encounters on value creation of chatbot-assisted services. *Journal of Service Theory and Practice*, *35*(1), 56–88. https://doi.org/10.1108/JSTP-10-2023-0282

Kim, S. Y., Schmitt, B. H., & Thalmann, N. M. (2019). Eliza in the uncanny valley: Anthropomorphizing consumer robots increases their perceived warmth but decreases liking. *Marketing Letters*, *30*(1), 1–12. https://doi.org/10.1007/s11002-019-09485-9

Kim, W. B., & Hur, H. J. (2024). What makes people feel empathy for AI chatbots? Assessing the role of competence and warmth. *International Journal of Human–Computer Interaction*, *40*(17), 4674–4687. https://doi.org/10.1080/10447318.2023.2219961

Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration*, *11*(4), 1–10. https://doi.org/10.4018/ijec.2015100101

Kull, A. J., Romero, M., & Monahan, L. (2021). How may I help you? Driving brand engagement through the warmth of an initial chatbot message. *Journal of Business Research*, *135*, 840–850. https://doi.org/10.1016/j.jbusres.2021.03.005

Lee, E.-J. (2020). Authenticity model of (mass-oriented) computer-mediated communication: Conceptual explorations and testable propositions. *Journal of Computer-Mediated Communication*, *25*(1), 60–73. https://doi.org/10.1093/jcmc/zmz025

Lee, H., Shin, M., Yang, J., & Chock, T. M. (2024). Virtual influencers vs. human influencers in the context of influencer marketing: The moderating role of machine heuristic on perceived authenticity of influencers. *International Journal of Human–Computer Interaction*, 1–18. https://doi.org/10.1080/10447318.2024.2374100

Lee, I., & Hahn, S. (2024). On the relationship between mind perception and social support of chatbots. *Frontiers in Psychology*, *15*, 1282036. https://doi.org/10.3389/fpsyg.2024.1282036

Lekaviciute, V., Auruškevičienė, V., & Reardon, J. (2023). Should your chatbot joke? Driving conversion through the humour of a chatbot greeting. *Organizations and Markets in Emerging Economies*, *14*(2(28), 220–241. https://doi.org/10.15388/omee.2023.14.89

Ligaraba, N., Cheng, J., Ndungwane, N. F., & Nyagadza, B. (2024). Brand authenticity influence on young adults' luxury sneakers brand preference: The mediating role of brand image. *Future Business Journal*, *10*(1), 33. https://doi.org/10.1186/s43093-024-00312-w

Liu, B., & Sundar, S. S. (2018). Should machines express sympathy and empathy? Experiments with a health advice chatbot. *Cyberpsychology, Behavior and Social Networking*, *21*(10), 625–636. https://doi.org/10.1089/cyber.2018.0110

Liu, C., Zhou, S., Zhang, Y., Liu, D., Peng, Z., & Ma, X. (2022). *Exploring the effects of self-mockery to improve task-oriented chatbot's social intelligence* [Paper presentation]. Proceedings of the 2022 ACM Designing Interactive Systems Conference. https://doi.org/10.1145/3532106.3533461

Liu, W., & Yao, M. (2023). Gender identity and influence in human-machine communication: A mixed-methods exploration. *Computers in Human Behavior*, *144*, 107750. https://doi.org/10.1016/j.chb.2023.107750

Ma, X., & Huo, Y. (2023). Are users willing to embrace ChatGPT? Exploring the factors on the acceptance of chatbots from the perspective of AIDUA framework. *Technology in Society*, *75*, 102362. https://doi.org/10.1016/j.techsoc.2023.102362

Mandell, A. R., Smith, M., & Wiese, E. (2017). Mind perception in humanoid agents has negative effects on cognitive processing. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, *61*(1), 1585–1589. https://doi.org/10.1177/1541931213601760

Markovitch, D. G., Stough, R. A., & Huang, D. (2024). Consumer reactions to chatbot versus human service: An investigation in the role of outcome valence and perceived empathy. *Journal of Retailing and Consumer Services*, *79*, 103847. https://doi.org/10.1016/j.jretconser.2024.103847

Mori, M., MacDorman, K. F., & Kageki, N. (2012). The uncanny valley [from the field. *IEEE Robotics & Automation Magazine*, *19*(2), 98–100. https://doi.org/10.1109/MRA.2012.2192811

Mou, W., Ruocco, M., Zanatto, D., & Cangelosi, A. (2020). *When would you trust a robot? a study on trust and theory of mind in human-robot interactions* [Paper presentation]. 2020 29th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN) (pp. 956–962), Naples, Italy. https://doi.org/10.1109/RO-MAN47096.2020.9223551.

Nejat, P., Bagherian, F., & Hatami, J. (2020). Do perceptions of warmth and competence explain moral norms regarding different social roles? *Analyses of Social Issues and Public Policy*, *20*(1), 613–637. https://doi.org/10.1111/asap.12217

Neururer, M., Schlögl, S., Brinkschulte, L., & Groth, A. (2018). Perceptions on authenticity in chat bots. *Multimodal Technologies and Interaction*, *2*(3), 60. https://doi.org/10.3390/mti2030060

Nguyen, M., Casper Ferm, L. E., Quach, S., Pontes, N., & Thaichon, P. (2023). Chatbots in frontline services and customer experience: An anthropomorphism perspective. *Psychology & Marketing*, *40*(11), 2201–2225. https://doi.org/10.1002/mar.21882

Park, G., Yim, M. C., Chung, J., & Lee, S. (2023). Effect of AI chatbot empathy and identity disclosure on willingness to donate: The mediation of humanness and social presence. *Behaviour & Information Technology*, *42*(12), 1998–2010. https://doi.org/10.1080/0144929X.2022.2105746

Park, J. E., Fan, A., & Wu, L. (2025). Chatbots in complaint handling: The moderating role of humor. *International Journal of Contemporary Hospitality Management*, *37*(3), 805–824. https://doi.org/10.1108/IJCHM-05-2024-0762

Pizzi, G., Vannucci, V., Mazzoli, V., & Donvito, R. (2023). I, chatbot! the impact of anthropomorphism and gaze direction on willingness to disclose personal information and behavioral intentions. *Psychology & Marketing*, *40*(7), 1372–1387. https://doi.org/10.1002/mar.21813

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, *63*(1), 539–569. https://doi.org/10.1146/annurev-psych-120710-100452

Porter, C. O., Outlaw, R., Gale, J. P., & Cho, T. S. (2019). The use of online panel data in management research: A review and recommendations. *Journal of Management*, *45*(1), 319–344. https://doi.org/10.1177/0149206318811569

Powers, K. E., Worsham, A. L., Freeman, J. B., Wheatley, T., & Heatherton, T. F. (2014). Social connection modulates perceptions of animacy. *Psychological Science*, *25*(10), 1943–1948. https://doi.org/10.1177/0956797614547706

Prakash, M. (2024). *Gender Perceptions in chatbots: The Role of Linguistic features* [Master's thesis, University of Twente]. University of Twente Student Theses. https://purl.utwente.nl/essays/103822.

Preston, S. D. (2007). A perception-action model for empathy. In T. F. D. Farrow & P. W. R. Woodruff (Eds.), *Empathy in Mental Illness* (pp. 428–447). Cambridge University Press. https://doi.org/10.1017/CBO9780511543753.024.

Qi, Y. (2025). Pilot Quasi-Experimental Research on the Effectiveness of the Woebot AI Chatbot for Reducing Mild Depression Symptoms among Athletes. *International Journal of Human–Computer Interaction*, *41*(1), 452–459. https://doi.org/10.1080/10447318.2023.230125.

Rafikova, A., & Voronin, A. (2025). Human–chatbot communication: A systematic review of psychologic studies. *Ai & Society*, 1–20. https://doi.org/10.1007/s00146-025-02277-y

Rajaobelina, L., Prom Tep, S., Arcand, M., & Ricard, L. (2021). Creepiness: Its antecedents and impact on loyalty when interacting with a chatbot. *Psychology & Marketing*, *38*(12), 2339–2356. https://doi.org/10.1002/mar.21548

Rapp, A., Boldi, A., Curti, L., Perrucci, A., & Simeoni, R. (2024). How do people ascribe humanness to chatbots? An analysis of real-world human-agent interactions and a theoretical model of humanness. *International Journal of Human–Computer Interaction*, *40*(19), 6027–6050. https://doi.org/10.1080/10447318.2023.2247596

Rea, L. M., & Parker, R. A. (2014). *Designing and conducting survey research: A comprehensive guide*. (4th ed.). Jossey-Bass.

Rostami, M., & Navabinejad, S. (2023). Artificial Empathy: User Experiences with Emotionally Intelligent Chatbots. *AI and Tech in Behavioral and Social Sciences*, *1*(3), 19–27. https://doi.org/10.61838/kman.aitech.1.3.4

Roy, R., & Naidoo, V. (2021). Enhancing chatbot effectiveness: The role of anthropomorphic conversational styles and time orientation. *Journal of Business Research*, *126*, 23–34. https://doi.org/10.1016/j.jbusres.2020.12.051

Ruane, E., Farrell, S., & Ventresque, A. (2021). User perception of text-based chatbot personality. In A. Følstad, et al. (Eds.), *Chatbot Research and Design. CONVERSATIONS 2020. Lecture Notes in Computer Science* (vol. 12604). Springer. https://doi.org/10.1007/978-3-030-68288-0_3.

Schanke, S., Burtch, G., & Ray, G. (2021). Estimating the impact of "humanizing" customer service chatbots. *Information Systems Research*, *32*(3), 736–751. https://doi.org/10.1287/isre.2021.1015

Seitz, L. (2024). Artificial empathy in healthcare chatbots: Does it feel authentic? *Computers in Human Behavior: Artificial Humans*, *2*(1), 100067. https://doi.org/10.1016/j.chbah.2024.100067

Shin, H., Bunosso, I., & Levine, L. R. (2023). The influence of chatbot humour on consumer evaluations of services. *International Journal of Consumer Studies*, *47*(2), 545–562. https://doi.org/10.1111/ijcs.12849

Söderlund, M. (2022). Service robots with (perceived) theory of mind: An examination of humans' reactions. *Journal of Retailing and Consumer Services*, *67*, 102999. https://doi.org/10.1016/j.jretconser.2022.102999

Söderlund, M., & Oikarinen, E.-L. (2021). Service encounters with virtual agents: An examination of perceived humanness as a source of customer satisfaction. *European Journal of Marketing*, *55*(13), 94–121. https://doi.org/10.1108/EJM-09-2019-0748

Song, S. W., & Shin, M. (2024). Uncanny valley effects on chatbot trust, purchase intention, and adoption intention in the context of e-commerce: The moderating role of avatar familiarity. *International Journal of Human–Computer Interaction*, *40*(2), 441–456. https://doi.org/10.1080/10447318.2022.2121038

Trzebiński, W., Claessens, T., Buhmann, J., De Waele, A., Hendrickx, G., Van Damme, P., Daelemans, W., & Poels, K. (2023). The effects of expressing empathy/autonomy support using a COVID-19 vaccination chatbot: Experimental study in a sample of Belgian adults. *JMIR Formative Research*, *7*, e41148. https://doi.org/10.2196/41148

Tsai, W. H. S., Lun, D., Carcioppolo, N., & Chuan, C. H. (2021). Human versus chatbot: Understanding the role of emotion in health marketing communication for vaccines. *Psychology & Marketing*, *38*(12), 2377–2392. https://doi.org/10.1002/mar.21556

Vo, D.-T., Nguyen, L. T. V., Dang-Pham, D., & Hoang, A.-P. (2024). When young customers co-create value of AI-powered branded app: The mediating role of perceived authenticity. *Young Consumers*, *25*(5), 557–578. https://doi.org/10.1108/YC-06-2023-1759

Vo, D.-T., Nguyen, L. V. T., Dang-Pham, D., & Hoang, A.-P. (2025). What makes an app authentic? Determining antecedents of perceived authenticity in an AI-powered service app. *Computers in Human Behavior*, *163*, 108495. https://doi.org/10.1016/j.chb.2024.108495

Whang, C., & Im, H. (2021). "I Like Your Suggestion!" the role of humanlikeness and parasocial relationship on the website versus voice shopper's perception of recommendations. *Psychology & Marketing*, *38*(4), 581–595. https://doi.org/10.1002/mar.21437

Xie, Y., Liang, C., Zhou, P., & Jiang, L. (2024). Exploring the influence mechanism of chatbot-expressed humor on service satisfaction in online customer service. *Journal of Retailing and Consumer Services*, *76*, 103599. https://doi.org/10.1016/j.jretconser.2023.103599

Xie, Y., Liang, C., Zhou, P., & Zhu, J. (2024). When should chatbots express humor? Exploring different influence mechanisms of humor on service satisfaction. *Computers in Human Behavior*, *156*, 108238. https://doi.org/10.1016/j.chb.2024.108238

Xu, X., Wang, Y., Shang, Z., Jiang, L., & Luo, H. (2024). Using Chatbots to teach English as a foreign language: A systematic literature review from 2010 to 2023. *2024 International Symposium on Educational Technology (ISET)*, 97–102. https://doi.org/10.1109/ISET61814.2024.00028

Xue, J., Zhang, B., Zhao, Y., Zhang, Q., Zheng, C., Jiang, J., Li, H., Liu, N., Li, Z., Fu, W., Peng, Y., Logan, J., Zhang, J., & Xiang, X. (2023). Evaluation of the current state of Chatbots for digital health: Scoping review. *Journal of Medical Internet Research*, *25*, e47217. https://doi.org/10.2196/47217

Xygkou, A., Siriaraya, P., She, W.-J., Covaci, A., & Ang, C. S. (2024). "Can I be More Social with a Chatbot?": Social connectedness through interactions of autistic adults with a conversational virtual human. *International Journal of Human–Computer Interaction*, *40*(24), 8937–8954. https://doi.org/10.1080/10447318.2023.2292880

Yu, S., & Zhao, L. (2024). Emojifying chatbot interactions: An exploration of emoji utilization in human-chatbot communications. *Telematics and Informatics*, *86*, 102071. https://doi.org/10.1016/j.tele.2023.102071

Yu, S., Xiong, J., & Shen, H. (2024). The rise of chatbots: The effect of using chatbot agents on consumers' responses to request rejection. *Journal of Consumer Psychology*, *34*(1), 35–48. https://doi.org/10.1002/jcpy.1330

Zhai, C., & Wibowo, S. (2023). A WGAN-based dialogue system for embedding humor, empathy, and cultural aspects in education. *IEEE Access*, *11*, 71940–71952. https://doi.org/10.1109/ACCESS.2023.3294966

Zhang, J., Lu, J., Wang, X., Liu, L., & Feng, Y. (2024). Emotional expressions of care and concern by customer service chatbots: Improved customer attitudes despite perceived inauthenticity. *Decision Support Systems*, *186*, 114314. https://doi.org/10.1016/j.dss.2024.114314

Zhang, J., Oh, Y. J., Lange, P., Yu, Z., & Fukuoka, Y. (2020). Artificial intelligence chatbot behavior change model for designing artificial intelligence chatbots to promote physical activity and a healthy diet. *Journal of Medical Internet Research*, *22*(9), e22845. https://doi.org/10.2196/22845

Zhang, J., Wang, X., Lu, J., Liu, L., & Feng, Y. (2024). The impact of emotional expression by artificial intelligence recommendation chatbots on perceived humanness and social interactivity. *Decision Support Systems*, *187*, 114347. https://doi.org/10.1016/j.dss.2024.114347

About the authors

Md Irfanuzzaman Khan is a Senior Lecturer at Canberra Business School, University of Canberra. His research explores human–technology interactions, including chatbot engagement, consumer attitudes toward social media, and the use of AI in marketing and healthcare. He teaches marketing at both undergraduate and postgraduate levels.

Arun Kumar Tarofder is an Associate Professor at Taylor's University, Malaysia. He earned a Doctorate in 2012. His research interests include consumer behaviour, AI in Marketing, and Business Analytics. He teaches marketing research, digital marketing and big data analysis.

Sharmini Gopinathan is an Associate Professor at Taylor's University, Malaysia. She is head of the department at Taylor's University. Her research interests include social media marketing, digital marketing, and consumer behaviour. She teaches social media and digital marketing at the post-graduate level.

Ahasanul Haque is a Professor in Marketing at the International Islamic University Malaysia. He obtained PhD from UPM 2001. His prolific research interests include consumer psychology, electronic buying behavior and uses of AI in electronic retail marketing. He published numerous articles in international scholarly journals and received several international awards.