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# Anthropomorphism in artificial intelligence: a game-changer for brand marketing

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## Abstract

The expansion of brands adopting artificial intelligence services with human characteristics, such as chatbots, has revolutionized digital marketing strategies, transforming how companies reach and engage customers. This technological innovation is reshaping digital interactions between companies and consumers, offering a more personalized and efficient experience. This study explores the influence of chatbot anthropomorphism on customer engagement and purchasing decision-making with brands that use this artificial intelligence service. Data from a questionnaire with 1319 participants was analyzed using partial least squares method. Chatbot anthropomorphism has a more positive influence on purchasing decision-making when this relationship is mediated by customer engagement. In turn, customer involvement also has a positive influence on decision-making. The results emphasize that for a greater influence of the chatbot's anthropomorphism on purchasing decision-making, the customer must first be engaged with the chatbot. This research illuminates a new path in the domain of AI-enabled brand interactions, showing the distinct influence of anthropomorphism in chatbots on customer satisfaction, trust and loyalty, thus revolutionizing traditional paradigms of consumer-brand engagement and decision-making processes. By exploring the intricate dynamics between customer engagement with anthropomorphized chatbots and purchasing decisions, this study breaks new ground, offering unprecedented insight into the transformative potential of human-like chatbot interactions in shaping consumer behavior and brand relationships.

**Keywords** Artificial intelligence, Anthropomorphism, Chatbot, Customer engagement, Customer decision-making

## Introduction

AI-powered chatbots are increasingly popular tools for customer service and support, playing a vital role in digital marketing strategies [1]. By simulating human conversation, they offer personalized assistance. A key feature is chatbot anthropomorphism—designing chatbots to mimic human traits like tone, expressions, and personality [2, 3]. This is a strategic choice that significantly

impacts customer engagement and purchasing decisions, making thoughtful design essential [2, 4].

In 2020, 7% of EU companies used AI, with Portugal slightly above average at 9% [5]. Despite this, only 2% of companies used chatbots for virtual interactions, though adoption in Portugal's customer service sector reached 23% [5, 6]. In the B2B sector, 58% of companies used chatbots on websites in 2023 [7]. While overall adoption is low, chatbots have the potential to transform communication, enhancing digital marketing by improving customer engagement and operational efficiency [8, 9].

Chatbots offer benefits like improved efficiency and customer service, but challenges remain. Only 8% of customers used a chatbot in their last service experience, as some prefer traditional methods like email or phone [10]. Yet, 50% enjoy interacting with chatbots, highlighting their potential [11]. A major barrier is the lack of chatbots

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capable of understanding European Portuguese, underscoring the need for linguistic adaptability [12]. Despite these hurdles, chatbot adoption in Portugal shows promise for improving industries and customer experiences.

Studying the influence of anthropomorphism in chatbots on customer engagement and purchasing decisions is particularly relevant in the current context of digital marketing, where personalization and efficiency in interactions are essential. Anthropomorphism allows chatbots to simulate human characteristics, such as language and behavior, increasing the perception of authenticity, competence, and trust—key factors in building customer loyalty and influencing purchasing decisions [13, 14]. In a highly competitive market, these characteristics can transform ordinary interactions into more engaging experiences, promoting greater satisfaction and purchase intentions [15]. Additionally, by optimizing operating costs and fostering stronger relationships with customers, brands can strategically leverage anthropomorphic design to enhance their digital marketing strategies, strengthening market presence and boosting profitability. Studies further suggest that anthropomorphic chatbots displaying empathy and warmth can significantly enhance customer trust, engagement, and purchase intent [16–18]. However, challenges arise when chatbots exhibit overly human-like traits or fail to meet customer expectations, which can negatively impact satisfaction [4]. Research also highlights the influence of anthropomorphic features on consumer behavior and brand perception across various products [19]. While the benefits of anthropomorphism are evident, further research is needed to understand how emotions, trust, and privacy concerns mediate their impact on purchasing decisions [20, 21], particularly within the context of Portugal.

Thus, two important questions need to be answered: What is the influence of chatbot anthropomorphism on purchasing decisions with brands using chatbots in Portugal? How will AI-based marketing activities, such as chatbots, change consumer behavior? This study explores the influence of chatbot anthropomorphism on customer engagement and purchasing decision-making with brands that use this AI service. To this end, 1319 responses from Portuguese citizens were collected.

This study makes four important contributions. Firstly, the study contributes to the development of the literature on anthropomorphism in artificial intelligence, more specifically on the anthropomorphism of chatbots in the context of digital marketing strategies. Secondly, it reveals the existence of a significant mediating effect of customer engagement in relation to chatbot anthropomorphism on customer decision-making, emphasizing the role of AI-driven marketing tools in shaping consumer behavior. Thirdly, it leaves important guidelines

for companies, encouraging a thoughtful adoption of AI and considering the impact of human characteristics on chatbots during design, as well as highlighting the importance of modern interfaces to promote social interaction and enhance digital marketing efforts. Finally, it highlights the need for managers to consider the attributes of chatbots when formulating strategies for digital tools to ensure effective and positive interactions with customers.

## Theoretical framework

### AI-enabled technology

AI-enabled technology (AIET) refers to the application of artificial intelligence (AI) in diverse technological systems, allowing machines to simulate human intelligence processes like problem-solving, learning, and decision-making [24, 25]. It includes advancements such as machine learning, deep learning, and natural language processing, enabling machines to perform complex tasks previously requiring human intervention [26]. This makes AIET a cornerstone of modern technology with wide-ranging applications.

The applications of AIET are varied and impactful across industries. In daily life, AIET powers tools like chatbots, digital assistants, facial recognition systems, and autonomous vehicles [27]. In manufacturing, it improves efficiency, minimizes downtime, and enhances product quality [28]. In healthcare, AIET contributes to diagnosing diseases, tailoring treatments, and improving patient outcomes [29]. Similarly, in the financial sector, it aids in detecting fraud and optimizing investment strategies [30]. These examples illustrate the transformative potential of AIET across different domains.

Despite its benefits, the growing adoption of AIET raises significant ethical and societal concerns. One critical issue is the potential displacement of human workers, leading to job losses and economic disruption [31]. Additionally, AIET prompts debates on privacy, transparency, and accountability [32, 33]. These challenges highlight the need to ground the development and deployment of AIET in ethical principles to maximize its societal benefits and mitigate harm [34–36]. As AIET continues to evolve, it is vital to ensure its responsible and ethical use to balance technological advancement with societal well-being.

### Chatbot anthropomorphism in the AI-enabled technology context

Chatbot anthropomorphism involves designing chatbots with human-like qualities, such as personality, emotions, and language, aiming to make interactions more engaging and personalized [37, 38]. Recent advances in AI have significantly enhanced chatbots' ability to mimic human

behaviors, enabling them to interact in increasingly realistic ways [24]. Anthropomorphism, a natural human tendency, helps users feel more at ease by attributing human-like qualities to AI, ranging from politeness to perceiving chatbots as social entities [39–41]. This design strategy has proven to positively influence digital interactions, improving user experience, trust, pleasure, and attitude toward the chatbot [8, 42].

However, chatbot anthropomorphism also presents challenges. While it fosters user engagement and loyalty, it can lead to unrealistic expectations about the chatbot's capabilities and result in user frustration or disappointment when limitations become apparent [43, 44]. Emotional attachments to chatbots are another concern, potentially causing dependency or dissatisfaction [4, 44]. These complexities highlight the importance of balancing human-like qualities with transparent communication about the chatbot's capabilities to ensure users maintain realistic expectations [45, 46].

## Developing and formulating hypotheses

### Chatbot anthropomorphism and customer engagement with brands that use chatbot AI service

Customer engagement refers to the level of involvement and commitment a customer devotes to interacting with a brand [47]. It can be regarded as a condition rather than a continuous process, applicable to a particular interaction as well as the broader relationship between the customer and the brand [48]. Adapting the functionalities and traits of robots is essential for maximizing customer engagement within distinct service settings [49]. The incorporation of chatbots with human-like signs facilitates the cultivation of emotional engagement [37] and satisfaction (Konya-Baumbach et al. 2023). Fostering satisfaction relies on ensuring authenticity in AI interactions within online chat services [50]. Furthermore, human-like attributes, including empathy and the standard of communication, enhance satisfaction in interaction amidst consumers and AI device [51]. So, the following hypothesis was formulated:

*H1a* Chatbot anthropomorphism positively affects customer satisfaction with brands that use this AI service.

Chatbots anthropomorphism predicts trust [52]. Moreover, empathy exhibited in interactions between AI devices and consumers is vital for building trust in brands [51]. Additionally, it was found that when chatbots were perceived to possess more human-like qualities, there was a tendency for trust levels to increase [53]. It should also be noted that chatbots are expected to foster trust when they demonstrate a high level of human-like traits

[1, 54, and 55]. Therefore, the following hypothesis was framed:

*H1b* Chatbot anthropomorphism positively affects customer trust with brands that use this AI service.

The usefulness of chatbots is understood as a complex concept that plays a significant role in shaping consumer interaction [21]. An avatar has the capacity to evoke an authentic interaction, thereby influencing levels of loyalty [50]. The similarity between robots and humans significantly influences the formation of customer loyalty [56]. Furthermore, the extent to which customers identify with chatbots impacts their loyalty to the brand [57]. As a result, the following hypothesis was articulated:

*H1c* Chatbot anthropomorphism positively affects customer loyalty with brands that use this AI service.

### Chatbot anthropomorphism and purchasing decision-making in brands that use chatbot AI service

Customers are increasingly networking with companies via chatbots, prompting a significant demand for chatbots with enhanced human-like attributes [4]. Anthropomorphic elements in chatbot applications hold significant potential as it positively impacts customer satisfaction [42]. Consequently, integrating anthropomorphic elements into chatbots positively influences the customer journey [23]. The anthropomorphism of chatbots has been shown to have a positive influence on purchase intention [58]. Furthermore, when consumers encounter a chatbot with human-like characteristics, it influences their inclination towards purchasing a specific product [37]. Elevated levels of anthropomorphism have been found to positively influence consumers' purchase intention, suggesting a correlation between the perceived human-like qualities of chatbots and the likelihood of consumers intending to make a purchase [18]. Consequently, the ensuing hypothesis was proposed:

*H2* Chatbot anthropomorphism positively affects purchasing decision-making in brands that use this AI service.

### Customer engagement with brands that use chatbot AI service and the customer decision-making

The utilization of chatbots to streamline or assist consumers in making purchase decisions is becoming increasingly prevalent [59]. The frequent use of a technology can cultivate a sense of social connection, suggesting

that the dynamics observed in human interactions may also apply [60]. Consequently, the degree of satisfaction derived from interactions with AI chatbots has a direct influence on the purchase intentions [61]. Moreover, satisfaction from consumer interactions with chatbots supports purchase intention [62]. Thus, the subsequent hypothesis was developed:

*H3a* Customer satisfaction with brands that use AI-enabled chatbots positively affects their purchasing decision-making at brands that use this AI service.

Within the field of research examining brands that employ Chatbot AI services, trust emerges as a crucial factor in shaping users' intentions to make purchases [63]. Moreover, a positive correlation has been observed between the degree of trust consumers have and their overall intention to complete a purchase, underscoring the importance of building trust in AI-driven interactions. [52, 64]. Consequently, the subsequent hypothesis was crafted:

*H3b* Customer trust with brands that use AI-enabled chatbots positively affects their purchasing decision-making at brands that use this AI service.

Consumer loyalty, which is largely influenced by the satisfaction derived from previous interactions, plays a significant role in encouraging individuals to make repeat purchases [65]. When consumers are pleased with their past experiences, they are more likely to remain committed to a brand or service, fostering long-term engagement. Additionally, research highlights a strong and measurable correlation between loyalty and the intention to make future purchases. This connection is especially strong in the mobile in-game app market, where loyal customers not only continue making purchases but also share positive experiences, amplifying word-of-mouth and further strengthening brand loyalty and repeat purchases [66]. Therefore, the following hypothesis was generated:

*H3c*: Customer loyalty with brands that use AI-enabled chatbots positively affects their purchasing decision-making at brands that use this AI service.

#### **The mediating effect of customer engagement**

When the anthropomorphic design of a chatbot aligns effectively with the psychological mindset and expectations of consumers, it leads to a notable improvement in the satisfaction levels experienced by users during their interactions [59]. This heightened satisfaction is expected to act as a mediating factor, creating a positive influence

on customers' intentions to make purchases [61]. Consequently, the subsequent hypothesis was formulated:

*H4a* The anthropomorphism of the chatbot positively affects purchasing decision-making in brands that use this AI service, when this relationship is mediated by customer satisfaction, with brands that use this AI service.

Human-like features in chatbot applications show considerable potential, as they are linked to higher customer satisfaction, mediated by factors such as trust [67]. Chatbot agents are also successful in eliciting purchase intent [68]. Additionally, the social cues exhibited by anthropomorphic chatbots play a role in shaping users' perceptions of source credibility, thereby fostering trust, which subsequently plays a positive and significant role in influencing purchase intentions [52, 63], highlighting its mediator role in the relationship between chatbot anthropomorphism and purchase behavior. Hence, the ensuing hypothesis was constructed:

*H4b* The anthropomorphism of the chatbot positively affects purchasing decision-making in brands that use this AI service, when this relationship is mediated by customer trust, with brands that use this AI service.

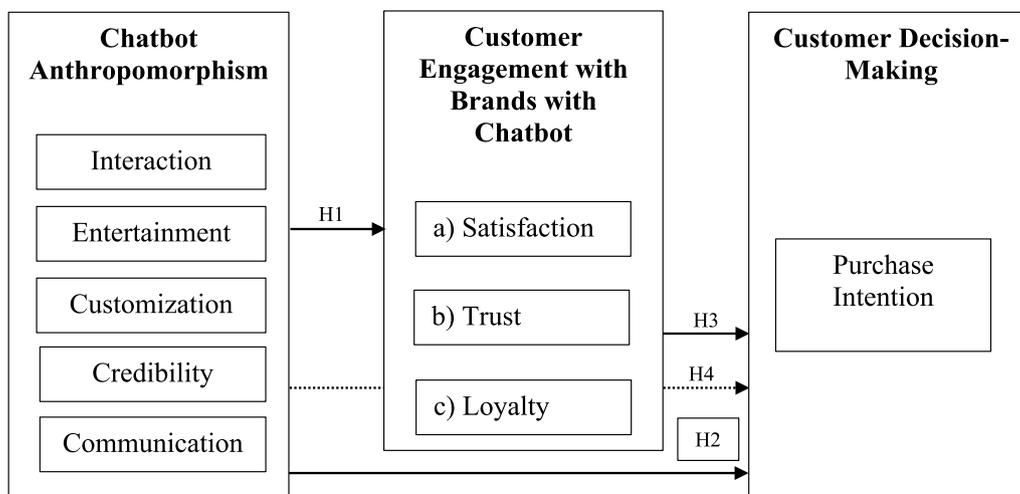
Recognizing competence in a chatbot with human-like traits positively affect customers' levels of optimism [69] and reduces skepticism, especially among individuals confident in their ability to interpret others' intentions, thereby promoting loyalty [22]. This loyalty positively influences users' intention to engage in purchase behavior [70]. Thus, incorporating anthropomorphic features in this retail context enhances transaction outcomes [55]. Then, the following hypothesis was posited (Fig. 1):

*H4c* The anthropomorphism of the chatbot positively affects purchasing decision-making in brands that use this AI service, when this relationship is mediated by customer loyalty, with brands that use this AI service.

## **Methods**

### **Sample and measures**

The sample for this study was collected in October and November 2022 through an online questionnaire whose link was published on the authors' social networks and contacts. Therefore, this is a sample collected for convenience, not probabilistic. The target audience was Portuguese consumers. The cumulative conditions of participation were: (i) respondents were at least 18 years old and residents of Portugal, and (ii) in the last year,



**Note:** Direct Effects (→) and Mediating Effects (→→)

**Fig. 1** Research model and hypotheses. Note direct effects (→) and mediating effects (→→)

they had made at least one purchase in an online store that used a chatbot. 1319 participants who constituted the final sample met these participation conditions. The questionnaire was anonymous, and informed consent was obtained from participants in the questionnaire. To evaluate the participants’ understanding of the questions and the average response time, a pre-test was carried out on 15 participants. The average response time was 5 min, and there were no difficulties understanding the questions.

The questionnaire was divided into three sections (details in Appendix A.1), adapted from Cheng and Jiang [71], and Chung et al. [72]. The first section began with the following assumption: “Think of a brand of the shop that makes purchases online and uses a chatbot. Answer the following questions.” In this first section, chatbot anthropomorphism was measured by five constructs: (i) interaction with three items; (ii) entertainment with four items; (iii) customization with four items; and (iv) communication with three items; and (v) credibility with three items. The second section refers to customer engagement with brands that use chatbots by three constructs: (i) satisfaction with four items, (ii) trust with five items, and (iii) loyalty with four items. The last section refers to the purchasing decision-making in brands that use chatbots, measured by three items. All these items were measured on a 7-point Likert scale, 1—Strongly Disagree to 7—Strongly Agree, except for the purchasing decision-making items, which were measured in three 7-point Likert scales: 1—Dislike to 7—Like; 1—Unlikely to 7—Likely and 1—Impossible to 7—Possible.

**Data analysis**

In this study, a quantitative methodology was applied. Firstly, a statistical analysis of the items that measured the constructs was carried out using the SPSS software (v. 25). Then, an exploratory factor analysis (EFA) was carried out to divide the items by factors and a confirmatory factor analysis (CFA) to evaluate the confirmatory factor loads and the reflective nature of the research model. Next, the Partial Least Square (PLS) method was applied to the research model using Smart PLS (v. 4.0) software. PLS combines factor analysis with regression estimation using the Ordinary Least Square method. This method has already been applied in similar studies (e.g. Cheng et al. [17]; Lee et al. [62]. When the research objective is the exploration of a research model, such as our study, then the appropriate method is PLS-SEM instead of CB-SEM, which aims to confirm models and theories [73]. Conceptually and in practice, PLS-SEM It is similar to using multiple regression analysis. The main objective is to maximize the variance explained in the dependent constructs and evaluate data quality based on measurement model characteristics [74]. Additionally, PLS quickly estimates cause and effect relationships (complex). The model obtained after applying the PLS logarithm to the research model was evaluated in terms of convergence, reliability and discriminant validity, according to measures suggested by Hair et al. [75]. Thus, to assess convergence and reliability, the Cronbach alpha ( $\alpha > 0.70$ ), Composite Reliability ( $CR > 0.70$ ) and Average Variance Extracted ( $AVE > 0.50$ ) coefficients were considered. Discriminant validity was assessed by

the Heterotrait–Monotrait (HTMT) ratio (<0.85 implying good discriminant validity according to Benitez et al. [76]. The good fit of the model, the relevance of path coefficients, and the predictive and explanatory power were also evaluated. The evaluation of these key indicators allows you to mitigate the risk in interpreting the results of the non-representative sample. Finally, the relationships established in the research model were estimated using bootstrapping analysis in Smart PLS (v. 4.0) software. As the sample in this study is not representative and as such, in order to reduce potential bias resulting from the sample and increase confidence in the results, the number of bootstrap samples in Smart PLS was increased to better estimate the statistical significance of the model relationships structural, with 5000 subsamples being used in bootstrapping, ensuring greater precision in the results.

**Results**

**Sociodemographic characterization of participants**

The sample comprises 1319 consumers over the age of 18 who reside in Portugal and who, in the last year, made at least one online purchase in stores with an AI chatbot service. The majority of participants are women (51.3%), and the average age is 29.6 (minimum 18 years and maximum 76 years). 45.9% are students, and 32.7% are employees.

**Statistical description of construct items**

The statistical description of the items is contained in Appendix A.2. Regarding the items that measure chatbot anthropomorphism, those that, on average, generated greater agreement among participants were communication (M=4.90), credibility (M=4.87) and interaction (M=4.81). Regarding customer engagement with brands that use chatbot AI service, satisfaction with the brand (M=5.02) and brand loyalty (M=4.91) were the items that generated the greatest agreement in average terms. Participants revealed, on average, high agreement with the items that measure customer purchasing decision-making with Brands that use Chatbot AI service.

**Factor analysis**

The results of the implementation of EFA and CFA are shown in Appendix (A.3). With the implementation of EFA, the items were divided into five factors according to the research model. Factor 1 refers to the Chatbot Anthropomorphism items, factor 2, 3 and 4 refers to the Customer Engagement with Brands that use Chatbot AI service items, and factor 5 refers to the purchasing decision-making construct. The accumulated variance of the items is 72.2%, and no individual factor has a variance greater than 50%. All items have high communalities (>0.70). The CFA results demonstrate that all items have high confirmatory factor loadings (>0.70) and, therefore, no item was eliminated, confirming the reflective nature of the model.

**Tests for convergence, reliability and validity**

Table 1 contains the results of the measurement model evaluation. The model presents convergence and reliability since the coefficients obtained for Cronbach’s alpha (Cα>0.70), Composite Reliability (CR>0.70), and AVE (AVE>0.50) are higher than the reference values [75]. The model also presents discriminant validity, given that the correlation ratios obtained are lower than 0.85 [76].

The model also presents a good fit according to the following measures [75]: Chi-Square (p=0.095), Goodness-of-Fit (0.98; reference >0.90), the Comparative Fit Index (0.97; reference value >0.90) and Standard Root Mean Square Residual (0.068; reference value <0.08). The variance inflation factor (VIF) was also evaluated to verify the existence of potential collinearity problems. The largest VIF is related to “BL1” (2.996), so the model does

**Table 2** Significance and predictive relevance of model

	R <sup>2</sup>	Q <sup>2</sup>
Customer decision-making (CDM)	0.697	0.610
Satisfaction (SAT)	0.582	0.498
Trust (TR)	0.596	0.485
Brand loyalty (BL)	0.509	0.390

**Table 1** Evaluation of the measurement model

	Cα	CR	AVE	CA	CDM	SAT	TR	BL
Chatbot Anthropomorphism (CA)	0.964	0.967	0.634					
Customer decision-making (CDM)	0.932	0.957	0.881	0.678				
Satisfaction (SAT)	0.946	0.961	0.861	0.792	0.815			
Trust (TR)	0.945	0.958	0.820	0.706	0.757	0.798		
Brand loyalty (BL)	0.901	0.931	0.771	0.762	0.790	0.784	0.767	

not present collinearity problems. Table 2 contains the results on the significance and relevance of path coefficients assessed through  $R^2$ . According to Cohen [77] criterion, all dependent variables present a “substantial effect” ( $>0.26$ ). The predictive relevance of the estimated model was assessed by the Stone-Geisser measure ( $Q^2$ ). The  $Q^2$  values obtained for the dependent variables are greater than zero, so the model has predictive relevance.

**Estimation of research model**

Table 3 contains the results of implementing the bootstrapping analysis to estimate the relationships between constructs established in the research model.

The results demonstrate that the anthropomorphism chatbot positively and, in a very significant way, affects customer engagement with brands that use this AI service. Thus, the more the chatbot is anthropomorphized, the more satisfaction ( $\beta=0.763$ ), trust ( $\beta=0.772$ ), and loyalty ( $\beta=0.713$ ) tend to exist with brands that use chatbots, confirming the Hypotheses H1a to H1c. Furthermore, the anthropomorphism chatbot positively affects, although in a residual way ( $\beta=0.042$ ), customer purchasing decision-making in brands that use this AI service, confirming hypothesis H2.

The results also demonstrate that customer engagement with brands that use chatbots positively affects customer purchasing decision-making in brands that use this AI service. However, within the constructs considered in this study to measure customer engagement, brand loyalty is the one that most affect customer purchasing decision-making ( $\beta=0.572$ ), followed by satisfaction

( $\beta=0.275$ ) and trust ( $\beta=0.111$ ). In this way, hypotheses H3a to H3c are confirmed.

The mediating effect of customer engagement with brands that use chatbots confirms the positive relationship between chatbot anthropomorphism and customer purchasing decision-making, confirming hypotheses H4a to H4c. However, the mediating effect reinforces this relationship. That is, the association between chatbot anthropomorphism and customer purchasing decision-making in brands that use this AI service is more intense when mediated by customer engagement with brands that use chatbots.

**Discussion**

Numerous valuable insights have been gleaned from this study, which examines the influence of chatbot anthropomorphism on customer engagement and purchasing decision-making within brands utilizing AI-enabled chatbots. The results obtained in this study reinforce previous findings. Observations reveal that chatbot anthropomorphism positively impacts customer engagement. This underscores the importance of human-like attributes in enhancing satisfaction [51], fostering trust [53], and shaping customer loyalty [56] in interactions involving consumers and AI-powered chatbots. It becomes evident that investing in chatbot anthropomorphism is a winning strategy for enhancing customer engagement by reinforcing satisfaction, trust, and loyalty. The study furnishes corroborating evidence demonstrating that incorporating human-like attributes into chatbots, equipped with suitable capabilities and personalities tailored to

**Table 3** Direct and mediating effects

Effects on endogenous variables	Path ( $\beta$ )	t value (Bootstrap)	P value	Confidence interval		Hypothesis support
				2.5%	97.5%	
Direct effects						
H1a: Chatbot anthropomorphism → satisfaction	0.763	42.837	0.000	0.721	0.793	Yes
H1b: Chatbot anthropomorphism → trust	0.772	43.868	0.000	0.735	0.802	Yes
H1c: Chatbot anthropomorphism → brand Loyalty	0.713	37.132	0.000	0.675	0.747	Yes
H2: Chatbot anthropomorphism → customer decision-making	0.042	1.374	0.007	-0.017	0.102	Yes
H3a: Satisfaction → customer decision-making	0.275	6.701	0.000	0.198	0.360	Yes
H3b: Trust → customer decision-making	0.111	0.290	0.002	0.085	0.164	Yes
H3c: Brand loyalty → customer decision-making	0.572	15.047	0.000	0.493	0.643	Yes
Mediating effects						
H4a: Chatbot anthropomorphism → satisfaction → customer decision-making	0.210	6.668	0.000	0.153	0.275	Yes
H4b: Chatbot anthropomorphism → trust → customer decision-making	0.209	0.290	0.002	0.066	0.249	Yes
H4c: Chatbot anthropomorphism → brand loyalty → customer decision-making	0.408	14.147	0.000	0.348	0.466	Yes

specific service contexts, significantly influences customer engagement [49].

The findings of previous studies have been corroborated by the identification of a positive correlation between chatbot anthropomorphism and customers' decision-making. Research shows that integrating anthropomorphic features into chatbots relates with increased purchase intention [58], influencing consumers' product choices [37]. Following the previous rationale, investing in chatbot anthropomorphism is also a successful strategy for enhancing customer decision-making by reinforcing customers' purchase intentions.

Furthermore, it has been observed that the engagement of customers with brands employing Chatbot AI services has a favorable impact on their decision-making processes regarding purchases. This positive influence on the purchase intentions of customers has been identified across various dimensions of customers' engagement, derived from interactions with AI chatbots, including the satisfaction [61], the establishment of trust [52], and the fostering of loyalty [65].

Other noteworthy findings pertain to the mediating effects. When chatbot anthropomorphism aligns with consumers' mindsets, it creates a more understandable and empathetic interaction experience that aligns with their preferences and expectations. This personalized engagement fosters a sense of satisfaction as customers feel understood and valued by the brand. As a result, they develop more positive perceptions of the brand and its offerings, increasing their willingness to make a purchase [61]. The identified positive mediating effect of trust in the relationship between anthropomorphic chatbots and purchase behavior stems from the role of trust as a bridge between consumers and brands. Anthropomorphic chatbots play a pivotal role in enhancing users' trust in both the information they disseminate and the associated brand, thereby exerting a significant influence on purchase behavior, as consumers are more inclined to make decisions based on trusted sources, ultimately leading to heightened purchase intentions and actual purchases [52, 63]. The positive mediator effect of loyalty occurs because when users perceive competence in an anthropomorphic chatbot, it reduces their skepticism and fosters a sense of trust and allegiance towards the chatbot. This loyalty, in turn, positively influences their intention to engage in purchase behavior, as loyal customers are more inclined to make purchases from brands they trust, ultimately leading to increased purchase intentions and actual purchases [70]. It is essential to explore the behavior of the trust variable, as its pathways exhibited lower beta coefficients compared to satisfaction and loyalty. This disparity can be explained by the intrinsic nature of trust, which develops gradually over time through

consistent and reliable interactions, unlike satisfaction and loyalty, which often arise as immediate responses to positive experiences.

The results of the study have yielded valuable insights, revealing that the mediating effect of customer engagement serves to enhance the influence of chatbot anthropomorphism on customer decision-making within brands that deploy this AI service. This underscores the significance of nurturing customer engagement within these contexts. However, the use of AI in company-consumer interactions raises significant concerns about potential future risks. Its ability to store vast amounts of behavioral data and process it with exceptional speed has raised fears that such systems could surpass human intelligence and influence decision-making [78]. Over-reliance on AI technologies may heighten the risk of consumer manipulation, foster dependency on these systems, and consequently impair cognitive abilities, alter thought processes and personality, and disrupt social relationships (Pelau et al. 2021).

#### **Theoretical implications**

The current investigation provides noteworthy contributions to the body of research concerning the role of chatbot anthropomorphism within the context of AI-enabled technology. First, the findings support the notion that human-like attributes in digital interfaces influence consumer perceptions and interactions. This highlights the need for academics to further investigate the role of anthropomorphic features in fostering customer satisfaction, trust, and loyalty within the theoretical framework of AI-powered chatbots. Second, the study further enhances the understanding of customer engagement as a mediating factor in the relationship between chatbot anthropomorphism and purchase behavior. It demonstrates that customer satisfaction, trust, and loyalty are pivotal in amplifying the impact of chatbot anthropomorphism on purchase intentions. This finding underscores the need for further theoretical exploration of emotional and relational factors as critical drivers of consumer decision-making in AI-powered interactions. The fact that the research suggests customer engagement is not merely an outcome of positive experiences but also functions as a mechanism through which anthropomorphic chatbots influence purchasing decisions also warrants the attention of researchers. Third, the validation of the research model and the expansion of existing theories provide a more nuanced perspective on the mechanisms through which chatbot anthropomorphism influences consumer behavior, thereby opening new avenues for future investigations. Fourth, this research offers a theoretical context that facilitates the application of key constructs within the chatbot-consumer interaction framework, providing

a deeper understanding of how these concepts function in AI-driven interactions. These findings make a valuable contribution to ongoing theoretical studies and deserve the attention of researchers, as they can serve as a basis for further strengthening and developing these constructs. Finally, the results imply the need for serious ethical reflection, as the influence of anthropomorphic chatbots on customer engagement and decision-making raises concerns about the potential for these chatbot features to manipulate consumer behavior. Researchers must investigate the subtle ways in which chatbots could encourage purchases or influence decisions without customers fully realizing the persuasive tactics being used. Scientists have other ethical issues that require investigation, particularly concerning transparency. Additionally, specific consumer groups, particularly those with limited knowledge of AI or digital technologies, may be more susceptible to the influence of anthropomorphic chatbots, and this matter also requires further attention from academic research. Finally, academia must acknowledge, investigate, and explore the threats posed by the use of anthropomorphic chatbots, such as the potential for exploitation, as chatbots may be designed to exploit psychological vulnerabilities, concerns about informed consent, and the impact of chatbot anthropomorphism on vulnerable populations. It is imperative for academia to acknowledge and critically examine the potential adverse effects associated with emerging technological developments in human-anthropomorphic chatbot interactions.

### **Practical implications**

In practical implications, numerous valuable insights can be derived from this research for managers and consumers. Firstly, this research findings suggest that properly implemented robotics have the potential to streamline operations, enhance customer experiences, and create new business opportunities. Therefore, companies should embrace and strategically leverage the robotic revolution, as neglecting its adoption or implementing it hastily may result in significant risks [79]. Secondly, as this research identifies that the human-like characteristics attributed to chatbots significantly increase customer satisfaction, trust, and loyalty toward brands that use them, as well as influence purchasing decision-making, it is vital for companies to adopt the most appropriate human-like traits during the design phase of their chatbots. Thirdly, the research highlights the positive outcomes of human-like traits in chatbots. Therefore, companies should invest in modern designs and advanced communication capabilities that enhance engagement and ensure seamless interactions, as these features are essential for improving user experience and achieving key goals such as retention and conversion. Fourthly, when formulating

digital service tools, managers should consider the significant influence of chatbots' attributes on customers' responses and actions [22] because, as the research has shown, these attributes are crucial in shaping customer behavior. Fifthly, improving customer interactions with chatbots requires a balance between technology, personalization and user experience. To this end, online stores can make the chatbot more human (but without exaggerating anthropomorphism) using a more natural, friendly language adapted to the target audience; include more empathetic responses to customer problems; adopt humanized voices (in voice chatbots) or avatars that represent the brand, but avoid exaggerations that could generate distrust; personalize responses to make the customer feel more valued, improving their experience; ensure clarity and transparency, informing customers from the beginning that they are interacting with a chatbot, avoiding confusion and providing multichannel functionalities, integrating the chatbot into platforms such as WhatsApp, social networks, websites and mobile applications and ensuring a consistent experience across all channels. Finally, the insights from this research on anthropomorphism in chatbots can be applied to various sectors beyond e-commerce, offering valuable guidance on how different industries can leverage this technology to enhance customer engagement and influence purchase intentions or adoption. For instance, in healthcare, humanized chatbots can assist patients by providing emotional support, answering questions about symptoms or treatments, and reminding them of appointments, ultimately improving patient trust in healthcare providers and encouraging better adherence to treatments. In the banking and finance sector, chatbots with a formal yet empathetic tone can facilitate discussions on sensitive topics like financial planning and problem resolution. Humanized voices and avatars can foster a deeper emotional connection in financial advisory interactions. In education, chatbots with human-like characteristics can serve as virtual tutors or academic advisors, motivating students and creating a more engaging learning experience. Their personalities can be tailored to suit different age groups—playful for children and more direct for adults—resulting in increased engagement on educational platforms and a more personalized learning journey. In public services, humanized chatbots can improve interactions related to tasks such as document scheduling, social benefits, and emergency assistance, making public services more accessible and efficient. This leads to a better public perception of the government and enhanced digital inclusion for those with limited technological familiarity.

For consumers, the results demonstrate that the anthropomorphism of chatbots positively influences

customer engagement in online stores and their purchase intention. Therefore, there are several practical implications for consumers that can be inferred from these results: (i) greater emotional connection with the shopping experience since consumers tend to feel more comfortable and emotionally connected with an online store when interacting with a chatbot humanized; (ii) the presence of a chatbot that demonstrates empathy and "understanding" can reduce consumers' anxiety or uncertainty when browsing a website or making online purchasing decisions; (iii) anthropomorphized chatbots that use personalization create the feeling that the service is unique and adapted to the customer's needs, increasing the likelihood of the consumer returning to the online store, making them loyal to the brand; (iv) consumers can feel that their doubts or problems are resolved more clearly and quickly when interacting with humanized chatbots, which simulate interaction with a human attendant, reducing customer effort, improving the overall experience and reducing the chances of cart abandonment; (v) anthropomorphism can make consumers perceive the online store as more reliable and accessible, making consumers more willing to provide personal data or carry out financial transactions when interacting with chatbots that appear friendly and trustworthy; (vi) interacting with a humanized chatbot can transform the shopping experience into something more satisfactory, even when there are small problems or doubts in the process, causing consumers to leave more positive reviews and share good experiences with friends or social networks, strengthening reputation from the store. In short, consumers benefit from interactions with humanized chatbots because these interactions make purchases more enjoyable, reliable, and easier to complete. This improves brand perception and reduces the effort required to resolve issues, making the online shopping journey more satisfying and efficient.

Beyond all these practical implications, a critical reflection on the ethical challenges posed by the use of anthropomorphized chatbots is necessary, as AI technologies raise significant concerns, including privacy erosion, consumer manipulation, diminished human agency, and the perpetuation of biases. Moreover, such technologies may impair cognitive skills, weaken social connections, and create accountability issues. Over-reliance on AI could also result in job displacement, economic inequality, misinformation, and vulnerabilities stemming from dependency on technology. To mitigate these risks and promote responsible use, transparent development, robust regulation, and active human oversight are essential.

### Limitations

This study has limitations. These results can only be interpreted for a sample of this study. Although the sample size was large, it was obtained for convenience and did not represent Portuguese consumers. Most of the sample are young (average age is 29.6 years) and students (without professional occupation). As the sampling technique used was non-probabilistic, they cannot be extrapolated to the general population referring to the sample, which is only valid for the group studied. Furthermore, there is the possibility of selection bias because the selection of participants may have been influenced by being carried out due to convenience. The study's results could be different if the sample were representative of Portuguese consumers and, therefore, more balanced in age and professional experience. In this study, five chatbot functionalities were considered human characteristics (interaction, entertainment, credibility, communication and customization). Other characteristics such as confidence, competence, sensitivity, commitment and emotions could alter the model's results. Customer engagement with brands that use chatbots was also evaluated through satisfaction, loyalty and trust. Finally, purchase intention for brands that use chatbots was measured by just three items. Although the factor analysis demonstrated that the items reflect the customer purchasing decision-making construct, more items could be used, such as: I prefer to buy products from brands that use chatbots when compared to brands that do not; I would like to increase purchasing from brands that use chatbots; and I recommend purchasing from brands that use chatbots to my friends and others.

### Directions for future research

In future studies, it is suggested that a representative probabilistic sample be obtained and sociodemographic characteristics (e.g., gender, age, education, and income) be used to moderate the association between customer engagement and purchasing decision-making. In forthcoming studies, brand preference and commitment to the brand may also be used as customer engagement items. Furthermore, future studies would also be engaging in defining a specific brand that uses chatbots and exploring the characteristics of chatbots and the experience, engagement, and purchase intention of that brand's customers. Exploring the role of prior experiences with chatbots as a mediator in the relationship between anthropomorphism and purchasing decisions would be a valuable direction for future research. It would also be important to study the anthropomorphism of chatbots in different cultures or with different technological interfaces. Therefore, it would be important, for example, to evaluate which aspects of a chatbot (voice, appearance,

language) are best accepted in different cultures and whether there is a difference in the way different cultures attribute emotions or intentions to chatbots. Moreover, at the level of the variety of technological interfaces, it would be, for example, important to explore how the perception of anthropomorphism varies between text, audio, and visual interfaces; whether the level of multimodal interaction (combination of text, image, and voice) increases or reduces the impact of anthropomorphism and whether the more advanced interfaces, such as chatbots with facial expressions in virtual reality, affect users' emotions or confidence more. Considering the differences in the type of product or service, it would be important in future studies to analyze whether the impact of chatbot anthropomorphism varies depending on the type of product (durable vs. non-durable consumer goods) or service (banking, health, entertainment) and explore which levels of anthropomorphism are most effective for different product categories.

### Conclusion

The proliferation of brands using AI services with human characteristics, such as chatbots, has revolutionized customer decision-making and behaviors. This study explores the influence of chatbot anthropomorphism on customer engagement with brands that use this AI service and their purchasing decision-making.

The results reveal that higher levels of anthropomorphism in chatbots significantly increase satisfaction, trust and loyalty with brands that use chatbots. It also increases, albeit residually, customer purchasing decision-making. It was also found that customer engagement with brands that use chatbots, especially brand loyalty, increases their purchasing decision-making. The association between chatbot anthropomorphism and customer purchasing decision-making is much more intense when it is mediated by customer engagement with brands that use chatbots. Therefore, for chatbot services with human characteristics to more significantly influence customer purchasing decision-making, it is necessary to generate satisfaction, trust and loyalty to the brand through chatbots.

### Appendix A

A.1 Questionnaire available at: [https://drive.google.com/file/d/1yCOvoAyuLe4Uwb-vV55SsYFibFnbCbFA/view?usp=drive\\_link](https://drive.google.com/file/d/1yCOvoAyuLe4Uwb-vV55SsYFibFnbCbFA/view?usp=drive_link)

### A.2 Mean and standard deviation of construct items

Constructs	Items	Mean	Std. deviation
Chatbot anthropomorphism (CA)	Interaction (INT)	4.81	1.583
	INT1	4.87	1.517
	INT2	4.90	1.507
	INT3	4.65	1.724
	Entertainment (ENT)	3.72	1.909
	ENT1	4.05	1.840
	ENT2	3.76	1.874
	ENT3	3.46	1.929
	ENT4	3.59	1.992
	Credibility (CRE)	4.87	1.540
	CRED1	4.86	1.569
	CRED2	4.85	1.518
	CRED3	4.91	1.533
	Communication (COM)	4.90	1.563
	COM1	4.74	1.571
	COM2	4.88	1.540
	COM3	5.07	1.578
	Customization (CUS)	4.45	1.647
	CUS1	4.34	1.637
CUS2	4.49	1.651	
CUS3	4.40	1.680	
CUS4	4.57	1.620	
Customer engagement with brands that use Chatbot AI service (CEB)	Satisfaction (SAT)	5.02	1.516
	SAT1	5.06	1.504
	SAT2	4.95	1.526
	SAT3	5.02	1.518
	SAT4	5.03	1.517
	Trust (TR)	4.75	1.604
	TR1	5.00	1.518
	TR2	4.55	1.703
	TR3	4.78	1.586
	TR4	4.59	1.663
	TR5	4.81	1.549
	Brand Loyalty (BL)	4.99	1.550
	BL1	5.28	1.456
BL2	5.15	1.530	
BL3	4.64	1.574	
BL4	4.88	1.638	
Purchasing decision-making at brands that use Chatbot AI service (PDM)	Purchase Intention (PI)	5.26	1.447
	PI1	5.21	1.476
	PI2	5.24	1.443
	PI3	5.32	1.422

## A.3 EFA and CFA results

	<b>Confirmatory factor loads</b>	<b>Factor 1</b>	<b>Factor 2</b>	<b>Factor 3</b>	<b>Factor 4</b>	<b>Factor 5</b>	<b>Communalities</b>
Interaction (INT)							
INT1	0.754	0.752					0.571
INT2	0.761	0.783					0.586
INT3	0.760	0.781					0.571
Entertainment (ENT)							
ENT1	0.796	0.746					0.749
ENT2	0.758	0.842					0.813
ENT3	0.710	0.877					0.825
ENT4	0.749	0.820					0.779
Credibility (CRE)							
CRED1	0.766	0.714					0.682
CRED2	0.825	0.750					0.762
CRED3	0.826	0.762					0.785
Communication (COM)							
COM1	0.817	0.773					0.700
COM2	0.843	0.717					0.765
COM3	0.792	0.792					0.723
Customization (CUS)							
CUS1	0.848	0.718					0.738
CUS2	0.827	0.782					0.695
CUS3	0.822	0.750					0.680
CUS4	0.860	0.713					0.738
Satisfaction (SAT)							
SAT1	0.913		0.729				0.748
SAT2	0.925		0.725				0.742
SAT3	0.937		0.739				0.766
SAT4	0.935		0.780				0.773
Trust (TR)							
TR1	0.880			0.743			0.749
TR2	0.905			0.660			0.728
TR3	0.921			0.728			0.733
TR4	0.906			0.663			0.724
TR5	0.916			0.756			0.782
Brand loyalty (BL)							
BL1	0.896				0.792		0.755
BL2	0.907				0.797		0.741
BL3	0.822				0.630		0.591
BL4	0.886				0.736		0.674
Purchase intention (PI)							
PI1						0.772	0.738
PI2						0.756	0.710
PI3						0.757	0.719

## Abbreviations

AI	Artificial intelligence
AIET	AI-enabled technology
BL	Brand loyalty
CA	Chatbot anthropomorphism
CDM	Customer decision-making
COM	Communication
CRE	Credibility
CUS	Customization
ENT	Entertainment
INT	Interaction
PI	Purchase intention
SAT	Satisfaction
TR	Trust

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## Author contributions

JL and SG conceived the core idea of the manuscript and conducted empirical studies, analyzed the data, and drafted the manuscript. EN helped with the literature review and discussion. All authors have read and approved the manuscript.

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## Availability of data and materials

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

## Declarations

### Ethics approval and consent to participate

Written consent was obtained from all the participants involved in the study.

### Consent for publication

We attest to the fact that all authors have contributed significantly to the work, have read the manuscript, attest to the validity and legitimacy of the data and their interpretation, and agree for publication this manuscript in the *Future Business Journal*.

### Competing interests

The authors declare no potential Competing interests.

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