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Interactivity, humanness, and trust: a psychological approach to AI chatbot adoption in e-commerce

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Abstract

This study aims to investigate the impact of interactivity and perceived humanness on trust toward AI chatbots in the e-commerce setting. Moreover, this study also aims to examine the mediation effect of trust toward AI chatbots in the relationship between interactivity and intention to adopt AI chatbots for e-commerce as well as in the relationship between perceived humanness and intention to adopt chatbots for e-commerce. This study used a time lag approach to collect the data from 343 customers from the southern region of China. The data were collected online through a questionnaire designed in Chinese language using a survey firm. The findings of this study indicated that there is a significant impact of interactivity and humanness on the trust toward chatbots. Moreover, the findings of this study indicated that there is a significant mediating effect of trust toward chatbots in the relationships of interactivity and perceived humanness to adopt chatbots for e-commerce. In addition, this study found a significant moderating influence on the perceived enjoyment of using chatbots in e-commerce settings. This study provides a unique perspective of expectation-confirmation theory for adopting emerging technologies for online shopping and also provides insights for designers and business firms to develop businesses to facilitate the AI chatbot feature for e-commerce.

Keywords Interactivity, Perceived humanness, Trust toward Chatbot, Perceived enjoyment, Intention to adopt Chatbot, Expectation-confirmation theory

Introduction

Artificial intelligence (AI) and machine learning technologies are growing exponentially, and they have influenced many fields, one of the areas that have been substantially affected is the e-commerce field [36, 39, 66]. Among the myriad of AI-powered innovations, chatbots have emerged as a cornerstone for enhancing customer satisfaction [27]. These chatbots can mimic human interactions, engage customers, and take on service responsibilities that were once the realm of human agents [29]. As more businesses incorporate chatbots into their operations and customer interactions, the perception and willingness to adopt these technologies have become paramount [41]. According to the literature, interactivity is an essential aspect that influences consumer trust toward the AI chatbot [67]. Interactivity, on the other hand, refers to the extent to which users can engage in interactive communication with the chatbot [64]. High interactivity in chatbots can be described as fast, friendly, and capable of answering many questions. The authors of the works under analysis believe that the embedded interactive features positively impact user engagement because the interactions appear to be more genuine and

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the technology is trusted [2, 37, 75, 79]. For instance, Araujo [6] noted that interactivity has a positive impact on the perceived usefulness and trust users have in the chatbot, making them more inclined to adopt the chatbot. As shown above, interactivity has a positive effect on trust, stressing the need to design effective chatbots with the ability to engage users through interactivity [77].

Another essential aspect that would lead to improved consumer trust in AI chatbots is humanness. Thus, humanness is a measure of how human-like the chatbot is, including recognizing natural language, demonstrating empathy, and adapting to the conversation context [21]. The ability to endow a chatbot with human-like features has been demonstrated to be beneficial in making the user consider the chatbot a viable source of information [26]. Wessel et al. [72] opined that since customers are inclined to speak to a human being, the perceived credibility of chatbots such as personalized language, emotional expression, and conversational tone is high [71, 76]. This is in line with Nass and Moon [53] whereby human-computer interaction has shown that people expect machines to behave like humans, hence they trust machines that have human-like qualities.

However, there are still some research gaps in the area of AI chatbots that can help define the detailed dependencies between the design features of chatbots and consumer trust, including e-commerce. The relationship between interactivity and humanness and consumer trust has been studied separately, but their joint effect on trust and how trust impacts the consumers' adoption to use AI chatbots for e-commerce needs to be researched further. Furthermore, the role of perceived enjoyment in mediating the relationship between trust and adoption intention, as well as the mediated effects of interactivity and humanness, remains largely unexplored. Recognizing these gaps, there is a need for a more extensive study that incorporates these variables into a model that gives a better understanding of how the consumer develops trust and makes a decision to adapt the AI chatbot in the context of online shopping [81]. Addressing this knowledge gap is crucial for advancing our theoretical understanding of the phenomenon and offering practical guidelines for improving chatbot design to foster perceived trust and drive greater adoption in e-commerce.

The main research question of this study is to examine the multiple interactions between the interactivity of chatbots, the humanness of chatbots, consumer trust, and willingness to use AI chatbots in the e-commerce environment. More precisely, in this study, the following research questions will be asked: What role does interactivity play in consumer trust toward AI chatbots? What role does humanness play in consumer trust toward AI chatbots? How does the perceptual variable of consumer trust impact the relationship between interactivity/humanness and the intention to use AI chatbots in e-commerce?

In addition, the research works to extend our understanding of perceived enjoyment as a moderator: its impact on moderating the relationship between trust and adoption intention, and on moderation of the mediating role of trust in the indirect effects between interactivity, humanness, and adoption intention. The key research questions guiding this study are: Based on the literature, the following research question is proposed: (1) What is the impact of interactivity of chatbots on consumer trust regarding AI chatbots in the e-commerce context? Its second research question is (2) How does the concept of humanness in the chatbots' design shape consumers' trust in AI chatbots? (3) How does the trust act as a mediator between interactivity, humanness, and the intention of e-commerce consumers to adopt AI chatbots? This paper seeks to answer the following questions: (4) To what extent does perceived enjoyment mediate the effect of trust on the intention to adopt AI chatbots? Understanding of how perceived enjoyment influences the relationship between interactivity, humanness, and adoption intention in the study is as follows: (5) The impact of perceived enjoyment on the mediating role of trust in the indirect relationships between interactivity, humanness, and adoption intention. As a result, this research will try to answer the following questions: Thus, the purpose of this study is to advance knowledge about consumers' trust and AI chatbot adoption factors and contribute both theoretical and practical value for academics and practitioners.

This study also focuses on the moderating role of perceived enjoyment for the relationship between trust in AI chatbots and the use of these technologies in e-commerce. Perceived enjoyment therefore refers to the perceived pleasure or satisfaction of a user in the usage of a technology. From the literature, it can be postulated that whenever users perceive a technology as fun the use, a positive emotional response can boost the usage experience, thus, increasing the chances of using the technology. Perceived enjoyment was pointed out by Venkatesh, Thong, and Xu [70] as one of the major perceived usefulness in technology adoption particularly those that revolve around user-centric applications such as in the present study that mainly involve interaction with technology. Huang and Benyoucef [25] indicated that contextually, enjoyment has a moderating effect on trust in the usage intention of AI chatbots. It also indicates that designers of chatbots and businesses need to make the interactions as engaging as possible in order to fully utilize the AI chatbot [24].

This study anticipates contributing to the existing body of literature is multifaceted. First, this study extends the understanding of how interactivity and humanness, as design elements of AI chatbots, influence consumer trust and, subsequently, the intention to adopt these technologies in the e-commerce sector. While previous studies have explored the individual effects of interactivity and humanness on trust, this study integrates these factors into a comprehensive model that includes trust as a mediator and perceived enjoyment as a moderator. This holistic approach provides a deeper understanding of the complex relationships between these variables, offering valuable insights for both researchers and practitioners. Second, this study also expects to stress the moderator role of perceived enjoyment in the moderated mediation model between trust and adoption intention and in the moderated mediation model of the indirect effect of interactivity and humanness on the intention to adopt chatbot for e-commerce. This research will argue that interface experience and fun aspects should be incorporated into the development of AI chatbots. This research will contribute to the understanding that designing chatbots should not only consider such factors as interactivity and humanness as the functional elements for the business but also the pleasure of using these elements. Finally, this study will also create a context for the general knowledge of AI implementation in e-commerce by offering insights into factors that shape consumer trust and adoption intentions. Thus, knowing these factors is essential for companies that want to harness AI chatbots to strengthen the online shopping experiences of consumers using the theoretical framework of expectation confirmation. This study will have implications for e-commerce firms especially in adopting strategies that lead to higher interactivity, perceived humanness, and user enjoyment with a view of entrenching consumer trust in the adoption of chatbots. The study model is displayed in Fig. 1.

Theory and hypothesis

Theoretical support

The Expectation-Confirmation Theory (ECT), introduced by Oliver [54] is a well-established model of consumer satisfaction and technology acceptance. In ECT theory it is believed that there are expectations of a product or service by the consumer before its consumption and afterward the experience of the product or service is compared to the expectations [54]. If the performance is satisfactory, then the consumer gets a feeling of satisfaction, which then affects his or her attitude toward the likelihood of continuing to patronize the same product or service. In the realm of information systems and technology adoption, ECT has been used to explain how satisfaction with a particular technology results in continued usage or adoption intentions among users [40]. ECT is a well-developed framework in the domain of consumer satisfaction and technology acceptance.

In regards to the role of AI chatbots in e-commerce, the ECT framework has the potential to contribute to the construction of trust towards the chatbot to be used for mediating the impact of interactivity and perceived humanness on the behavioral intention towards the adoption of AI chatbots for e-commerce. The arguments concerning ECT reveal that the level of interactivity and humanness of the AI chatbot can be regarded as key factors that affect the level of trust in such AI-based tools by consumers. When chatbots exhibit a high degree of interactivity and possess features that simulate human characteristics, they tend to be favored over other chatbot types. This preference arises from their ability to meet or surpass user expectations, leading to enhanced satisfaction and increased levels of trust. This trust then becomes the pivotal factor influencing the user's decision to engage the same chatbot in the future [61].

Chatbot interactivity is a measure of how well a chatbot can actively interact with the customers, how well it

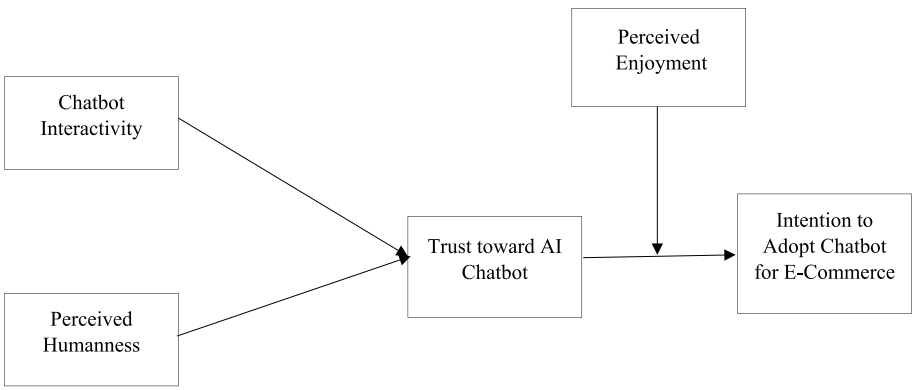

Fig. 1 Research Model

can respond to the concerns raised by the users, and how quickly the chatbot responds to such concerns. From the standpoint of ECT, individuals approach interactions with chatbots with specific expectations regarding the timeliness and interpersonal nature of the communication [7]. When these expectations are fulfilled characterized by timely and effective response through the chatbot, consumers are likely to develop the 'rabbit syndrome' and this improves on the trust that the consumers have on the chatbot [52]. This supports the work of other scholars such as [18] who observed that user interaction in online systems has a positive impact on the level of user trust by meeting user expectations.

Furthermore, the ECT model concerned with interactivity appeared that if a chatbot interacts more than customers' expectations of interactivity the perceptions of reliability and competence of the chatbot also increase which in turn strengthens the trust. Araujo [6] also elaborated on this; where highly interactive chatbots are considered more competent and trustworthy this leads to a higher level of user engagement and chance of technology acceptance. Thus, ECT sheds light on how the interactivity features of the chatbot relate to the expectations of the user and contributes to the increase in consumer trust which is essential in the adoption of the AI chatbot in e-commerce. AI in chatbot means the degree of similarity with human lifestyle, especially in terms of understanding human language, considering human emotions, and being able to talk with persons in a different context. ECT put it that individuals engage AI Chatbot's interface with certain expectations of the naturalness of the Artificial Intelligence communication [59]. Therefore, when a chatbot goes above and beyond these expectations and displays a very high level of humanness in conversation, the users should feel content with the interaction that has just occurred and in doing so will increase their confidence in the chatbot.

Research carried out in the human-computer interaction area reveals that if people project human-like qualities to non-human entities, trust is likely to be inspired provided that the attributes are in harmony with the user expectations [53]. For instance, in a paper by Adam, Wessel, and Benlian [1], it was established that trust in chatbots increases where the latter incorporates features like empathy and personalization in their responses and interactions, and as per the users' canonical understanding of how an AI agent should be [74]. Thus, the identification of users' expectations with the reality that is supported by the design of chatbot based on human values enhances the level of trust and acts as a mediator that contributes to the integration of the innovation.

In the ECT framework, satisfaction that arises out of the confirmation of expectations is very central to determining continued use or adoption intentions. In the case of AI chatbots, trust can be therefore regarded as the outcome of this satisfaction. In the e-commerce context, trust in AI can serve as a catalyst, connecting user engagement with the propensity to adopt AI, thereby broadening the applicability of the ECT theory. This mediating role of trust is in line with other studies conducted on technology adoption that identified trust as a central requisite in the minimization of perceived risks and uncertainties relating to new technology [20]. Moreover, perceived enjoyment refers to the intrinsic pleasure or satisfaction derived from using a technology. In the context of ECT, perceived enjoyment can enhance the positive effects of expectation confirmation on satisfaction and subsequent trust. When users find interactions with a chatbot enjoyable [28], the satisfaction they derive from confirmed expectations is amplified, leading to stronger trust and a greater intention to adopt the technology. This moderating role of perceived enjoyment is supported by Venkatesh et al. [70], who found that enjoyment significantly influences users' intentions to use technology, particularly when the technology meets or exceeds their expectations.

Hypothesis development

Interactivity can be defined as the two-way communication between the users and either a system, platform, or environment. It includes the level at which one or many users can interact with the content or its delivery [32]. The two factors, interactivity, and information quality have been proven to have a positive and highly significant impact on the anticipation of potential tourists towards purchase intention towards AI chatbots with perceived usefulness as the moderator [82] besides, social factors incorporated in AI chatbots also make consumers perceive more intimacy with the chatbots, thus they trust the chatbots [60]. For businesses that want to integrate chatbots for brand promotion and customer leads, efficiency testing is still crucial. There is a remaining need for the continuous improvement of the methods used in chatbot testing to cover performance measurement, user satisfaction assessment, and the identification of problem effects [3, 13, 56]. However, in the case of mobile commerce, feelings of constant connectivity, and the provision of appropriate offers have been reported to enhance customer trust and buying willingness [35]. The impact of interactivity on behavior has been extensively studied in various contexts and consistently found to be significant [18]. Based on these findings, the following hypothesis is proposed:

H1 Interactivity has a positive impact on consumer trust toward AI chatbots.

Perceived humanness and virtues like benevolence and integrity of the automated systems have a significant relationship with the levels of trust of such systems thus implying that intentional human-like qualities appear to be fundamental in creating trust in the identified automation models [12, 47]. In addition, studies that compared trusting beliefs that have characteristics of humans to those that resemble a system, have identified that human-like trusting beliefs tend to have more impact on the factors that are used in decision-making such as joy and perceived usefulness by the users of the platforms such as Airbnb [10, 11]. This explains why human functions are vital in the building of trust. Furthermore, extant research has also revealed that human-like robots can enhance the level of trust towards humans. Such robots can engage in acts of promise, making the corresponding researcher's psychophysiological metrics rise [17].

H2 Perceived humanness positively impacts consumer trust toward AI chatbot.

Users tend to develop a positive attitude toward chatbots primarily due to utilitarian factors such as authenticity and convenience. However, factors like privacy concerns and the perceived immaturity of the technology can negatively affect their acceptance [48]. The study suggests that when these concerns are mitigated, trust in the chatbot increases, thereby enhancing the likelihood of adoption [30]. Moreover, the adoption of chatbots in e-commerce is significantly influenced by the credibility of the information they provide, various technology-related factors, users' attitudes toward AI, and perceived usefulness. These elements collectively shape the users' intention to make purchases through the chatbot [41]. Importantly, when consumers perceive chatbots as empathetic and friendly, their trust in the chatbot grows. This trust not only increases their reliance on the chatbot but also reduces their resistance to using it in future interactions, further solidifying their intention to adopt the chatbot for e-commerce purposes [69]. Thus, this study assumes that:

H3 Trust toward AI chatbot has a positive impact on the intention to adopt the chatbot for e-commerce.

The AI chatbot has perceived humanness as one of the paramount characteristics that enable the AI chatbot to do human-like things and they have become popular in the e-business [33]. Other authors examined the perceived humanness feature in e-shopping which shows the trust toward AI chatbots [12, 21]. Based on the evaluations of the user toward the chatbot, it was established that the perception of the user toward the chatbot is mainly positive because of the utilitarian factors relating to authenticity and convenience [68]. However, increased privacy concerns and perceived technology maturity create negativity in the acceptance process [48]. Addressing the aforementioned concerns can significantly enhance trust in chatbots, thereby increasing the likelihood of adoption. However, there is the trustworthiness of the information that the chatbots offer, specific technological characteristics, the perception of AI, and perceived usefulness amongst other factors that determine the use of chatbots by e-commerce companies [50]. Altogether, these elements determine the users' desire to buy products via the chatbot [41]. However, when consumers are interacting with the chatbots, there is an increase in trust level if the chatbots are perceived to be empathetic and friendly [80]. This trust makes them rely on the chatbot even more and less likely to resist its usage in future interactions, thus strengthening their and the company's intention to use a chatbot for e-commerce purposes [69]. The role of trust in a mediating technology has been proposed in several past papers as a mediator whereby trust has been recognized as an important mediator in different industrial contexts [8, 58]. The existence and influence of trust have been acknowledged by previous studies as mediators in diverse industrial settings [8, 39, 57, 65]. The mediating role of trust toward chatbot in the relationship between interactivity and intention to adopt chatbot as well as in the relationship between perceived humanness and intention to adopt chatbot for technology and AI domain thus can be assumed as in this study as:

H4 Consumer trust toward chatbot mediates the relationship between interactivity and intention to adopt the chatbot for e-commerce.

H5 Consumer trust toward AI chatbot mediates the relationship between humanness and intention to adopt the chatbot for e-commerce.

In the e-commerce context, perceived enjoyment plays a crucial role in influencing the impact of AI chatbots. When users perceive interactions with chatbots as fun, the connection between their trust in the chatbot and their willingness to use it is significantly strengthened [33]. Together with the attitude and the perceived usefulness, perceived enjoyment emerges as one of the significant factors that determine the adoption of AI-based finds that it positively amplified the overall attitude toward chatbots in the context of online shops [63]. Whenever users find joy in interacting with the chatbot, their perceived trust is also high and therefore, their intention to use the chatbot for

e-commerce transactions [48]. Studies conducted in the future back the moderating function of perceived enjoyment, especially in regard to AI chatbot recommendations [55]. The perceived enjoyment in using chatbots increases the users' trust in the recommendation given by the chatbot and hence enhances their intention to use this recommendation in the e-commerce domain [15]. That is why, it is crucial to develop the concepts of the Chatbot's interaction with users that will be not only useful but also interesting and fun, chatbots [43, 45]. A moderating role of perceived enjoyment has been discussed in different past studies [46]. Therefore, this study postulated the following hypothesis.

H6 Perceived enjoyment moderates the relationship between trust toward AI chatbot and intention to adopt the chatbot for e-commerce in this way as the level of perceived enjoyment increases this relationship strengthen.

Perceived enjoyment is found to be a determinant of continuance intention towards chatbot-based customer service, which means that when the users are pleased, they are more likely to keep using the application [7]. This 'reaffirms' the notion that enjoyment also moderates the impact of trust on the adoption intentions. Regarding customer's perception towards SMEs, perceived enjoyment and perceived usefulness have been confirmed as significant predictors of customers' shopping and usage intentions of the chatbots, and this reaffirms the significance of enjoyment as an important driver in improving engagement and usage [43, 45, 64]. Previous academic claims regarding perceived Enjoyment as a moderator especially in the interaction of interactivity [44, 45] and the intention to adopt AI as well as perceived humanness, and the intention to adopt the chatbot through trust in AI can be advanced in the following hypothesis. Thus, this study assumes that:

H7 Perceived enjoyment moderates the indirect relationship between interactivity and intention to adopt the chatbot for e-commerce through trust toward the chatbot in this way as the level of perceived enjoyment increases this indirect relationship strengthens.

H8 Perceived enjoyment moderates the indirect relationship between humanness and intention to adopt the chatbot for e-commerce through trust toward the chatbot in this way as the level of perceived enjoyment increases this indirect relationship strengthens.

Method

Data Collection and Sampling

This study focused on customers of e-commerce platforms, which are rapidly gaining popularity in China. The decision to target only e-commerce platforms, such as Taobao, was driven by several factors. First, the Chinese market was chosen because, in 2018, China became the world's second-largest e-commerce market, experiencing an aggressive annual growth rate of 27%—more than four times the growth rate in the U.S. in 2017. Moreover, it is projected that by 2022, China's e-commerce market will nearly match the size of the U.S. market [73]. Second, e-commerce platforms in China are increasingly supported by chatbot services, with users becoming more accustomed to interacting with these services [19]. To ensure that our participants had relevant experience with AI chatbots and had received product recommendations through them, we implemented specific screening questions and guidelines in the survey. For example, the questionnaire clearly stated that the study was intended for users who had interacted with an AI chatbot and received product suggestions. Participants who were unfamiliar with AI chatbots or who had not received product recommendations were instructed not to participate. Additionally, participants were asked to recall their most recent experience using an AI chatbot. Only working professionals were considered eligible for the study. All respondents were required to provide written informed consent and the participation was voluntary.

The data were collected online. The survey was conducted over four weeks in March 2023, resulting in the collection of 435 survey responses from which 415 surveys were validated as proper for final analysis. The complete survey included 55.0% male and 45.0% female. A majority of the responders are in age group between 21 and 30, which is 32.9% of the total sample. Table 1 presents the statistical data of participants.

Scale measurement

This study used measurement scales adopted by past studies. As per past studies, this study rated responses on a point Likert scale [4, 31, 34, 38] In this regard, this study measures chatbot interactivity by using a three-item scale adopted by Cho, Lee, and Yang [16]. Perceived humanness was measured by using a four-item scale adopted by Ramadhani et al. [62]. This study measured trust toward chatbots by using a six-item scale adopted by Zarantonello and Pauwels-Delassus [78]. The intention to adopt chatbots for e-commerce was measured by using the scale adopted by Ramadhani et al. [62]. Similarly, this study measured perceived enjoyment by using

Table 1 Details about demographic variables

Variables	N	Percentage	Variables	N	Percentage
Gender			**Education**		
Male	201	58.60	Under-graduate	75	21.92
Female	142	41.40	Graduate	169	49.27
Age			Masters or Above	99	28.82
Up to 20 years old	30	08.77	**Frequency of everyday use**		
Between 21–30	125	36.41	Less than- 2 h	130	37.87
Between 31–40	94	27.43	2–4 h	136	39.65
Between 41–50	72	21.02	5–7 h	55	16.03
> 50 year old	22	06.41	More than 7 h	22	6.41
Job Nature					
Private employees	201	58.60			
Civil servant	142	41.40			

a six-item scale developed by Mikalef, Giannakos, and Pateli [51].

Data analysis

Demographics

Table 1 Indicates information regarding the demographic characteristics of the respondents. The majority of the respondents, 58.60% were male while 41. 40% were female. Regarding the educational background of the respondents, the majority (49. 27%) had a graduate degree, followed by undergraduates (21. 92%) and those with masters or above (28. 82%). The majority of respondents were within the age range of 21–30 years which comprised 36. 41%, second was 31–40 years at 27. With regards to the type of use, 2–4 h were mentioned by 39. 65% of the respondents while 37. 87% of the respondents indicated that they use the internet less than 2 h. finally, the majority of the respondents were private employees (58.60%), while civil servants only comprised 41.40%.

Reliability and validity analysis

Table 2 shows the factor loadings and cross-loadings of Trust toward AI chatbot, perceived enjoyment, Intention to Adopt chatbot for e-commerce, chatbot interactivity, and perceived humanness. The factor loadings of each construct's items are between 0.703 and 0.870. The construct validity of the study was established where the lowest value was 0.873, which showed that the study had a strong construct validity. The cross-loadings are relatively low, which indicates that there is little or no contamination of constructs. These results also support the notion that the constructs are unidimensional and different from each other.

Model measurement

Table 3 indicates the results of the measurement analyses for the five constructs: Perceived interactivity of the chatbot, perceived human-like characteristics of the chatbot, Trust in the AI chatbot, perceived enjoyment of the chatbot, and the Intention to use the chatbot for e-commerce. The reliability coefficients (Cronbach's alpha) for all the constructs are between 0.863 and 0.915, and the composite reliability values range from 0.865 to 0. 915. The average of the variance extracted (AVE) for all the constructs is above 0.50, which can be considered a satisfactory level of convergent validity. These findings show that the measurement scales used in this study are valid and reliable [5, 34, 38, 49].

Descriptive and correlation analysis

Table 4 shows the descriptive analysis of the variables under study, and the correlation matrix of the chatbot interaction constructs, such as mean, standard deviation, alpha reliability coefficient, and inter-variable correlation coefficients. Chatbot interactivity has a mean of 3.57 (SD = 0. 96) and has a positive correlation with perceived humanness, trust toward AI chatbot, and perceived enjoyment 0.49, 0.43, and 0. 29 respectively at 0. 001 level of significance. The mean of perceived humanness is 3.66 (SD = 0.90) and has a significant positive relationship with trust toward AI chatbot ($r = 0.42$, $p < .001$) and intention to adopt chatbot for e-commerce, $r = .52$, $p < .001$. The mean of trust toward AI chatbot is 3.60 (SD = 0.84) and the correlation between trust toward AI chatbot and perceived enjoyment is 0.20, $p < .01$, and between trust toward AI chatbot and intention to adopt chatbot is 0.48, $p < .001$. Perceived enjoyment has a mean of 3.59 (SD = 0.84) and has a significant positive

Table 2 Factor loadings and cross-loadings

Constructs	Items	AIT	PE	INT	CBI	PH
Trust toward AI Chatbot (AIT)	AIT1	**0.830**	0.002	−0.005	−0.024	0.007
	AIT2	**0.781**	0.021	−0.071	−0.004	0.004
	AIT3	**0.779**	−0.014	−0.022	0.021	0.041
	AIT4	**0.811**	0.010	0.020	0.074	0.035
	AIT5	**0.703**	−0.004	0.041	−0.074	−0.045
	AIT6	**0.783**	0.081	0.014	0.047	0.011
Perceived Enjoyment (PE)	PE1	0.010	**0.776**	0.050	−0.071	−0.082
	PE2	−0.044	**0.770**	0.041	−0.009	−0.001
	PE3	−0.004	**0.792**	0.084	0.041	−0.029
	PE4	0.047	**0.826**	0.077	−0.022	0.076
	PE5	−0.066	**0.855**	−0.045	0.008	0.007
	PE6	0.049	**0.821**	−0.018	−0.014	0.011
. Intention to Adopt Chatbot for E-Commerce (INT)	INT1	−0.078	−0.065	**0.870**	−0.014	0.002
	INT2	−0.011	0.011	**0.834**	0.081	−0.005
	INT3	0.043	0.001	**0.860**	0.016	−0.140
	INT4	0.01	0.078	**0.736**	−0.068	0.040
Chatbot Interactivity (CBI)	CBI1	0.011	−0.012	−0.034	**0.809**	0.025
	CBI2	−0.022	0.013	−0.076	**0.839**	0.038
	CBI3	0.044	−0.011	0.025	**0.827**	−0.012
Perceived Humanness (PH)	PH1	−0.033	−0.022	0.034	0.044	**0.847**
	PH2	0.014	−0.036	−0.033	−0.047	**0.873**
	PH3	−0.043	0.033	0.001	0.081	**0.864**
	PH4	0.045	0.078	0.092	0.088	**0.786**

Table 3 Results of measurement analyses

Constructs	Items	Cronbach's α	Composite Reliability	AVE
Chatbot Interactivity	3	0.863	0.865	0.682
Perceived Humanness	4	0.907	0.908	0.711
Trust toward AI Chatbot	6	0.903	0.904	0.602
Perceived Enjoyment	6	0.915	0.915	0.652
Intention to Adopt Chatbot for E-Commerce	4	0.894	0.896	0.683

AVE Average Variance Extracted

correlation with the intention to adopt chatbot ($r = .36$, $p < .001$).

Figure 2 shows a graphical representation of the moderating effect. The simple slope test reveals that the impact of trust toward AI chatbot on intention to adopt chatbot for e-commerce is strongest at a high level (1 standard deviation above the mean) of perceived enjoyment compared to the low level (1 standard deviation below the mean) of perceived enjoyment. Therefore, H6 is supported, and the results suggest that perceived enjoyment plays a significant role in moderating the relationship between trust toward AI chatbots and intention to adopt chatbots for e-commerce.

Test mediation and moderated mediation effects

Table 5 presents the direct effects, moderation, and mediation hypotheses tests. The direct effects indicate that chatbot interactivity has a positive effect on trust toward AI chatbot with a β of 0.33 ($p < .001$), and perceived humanness also positively affects trust toward AI chatbot with a β of 0. 31 ($p < .001$). Further, trust toward AI chatbots has a significant impact on the intention to adopt chatbots for e-commerce with the β = 0. 53 ($p < .001$). In the moderation analysis, perceived enjoyment has a positive relationship with intention to adopt Chatbot with a β of 0.35 ($p < .001$), and the interaction term trust toward AI chatbot*perceived enjoyment further affects intention to adopt chatbot for e-commerce with a β of 0.28 ($p < .001$). The mediation analysis shows that the intention to adopt a chatbot is mediated by trust toward AI chatbot where β for chatbot interactivity is 0.16 ($p < .001$), and perceived humanness has a direct effect on the intention to adopt chatbot through trust toward AI chatbot with a β of 0. 14 ($p < .001$), with 95% confidence intervals for these indirect effects ranging from 0. 07 to 0.26 and

Table 4 Descriptive statistics, alpha values, and correlation matrix

Constructs	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Age	-	-	-									
2. Gender	-	-	0.01	-								
3. Education	-	-	−0.08	−0.03	-							
4. Job Nature	-	-	−0.06	0.02	0.05	-						
5. Use Frequency	-	-	0.05	−0.03	0.01	0.01	-					
6. Chatbot Interactivity	3.57	0.96	−0.10	−0.12	−0.01	−0.04	−0.04	**(0.83)**				
7. Perceived Humanness	3.66	0.90	−0.07	−0.04	−0.03	0.07	0.03	0.49***	**(0.84)**			
8. Trust toward AI Chatbot	3.60	0.84	−0.11	−0.03	−0.06	−0.08	−0.01	0.43***	0.42***	**(0.78)**		
9. Perceived Enjoyment	3.59	0.84	−0.03	−0.10	0.03	−0.06	−0.05	0.29***	0.25***	0.20**	**(0.81)**	
10. INT	3.82	0.99	−0.06	−0.08	−0.01	0.01	0.01	0.42***	0.52***	0.48***	0.36***	**(0.83)**

INT = Intention to Adopt Chatbot for E-Commerce; $n = 343$. Values of the square root of inter-construct correlation of AVEs are shown in parentheses; ** $p < .01$, *** $p < .001$

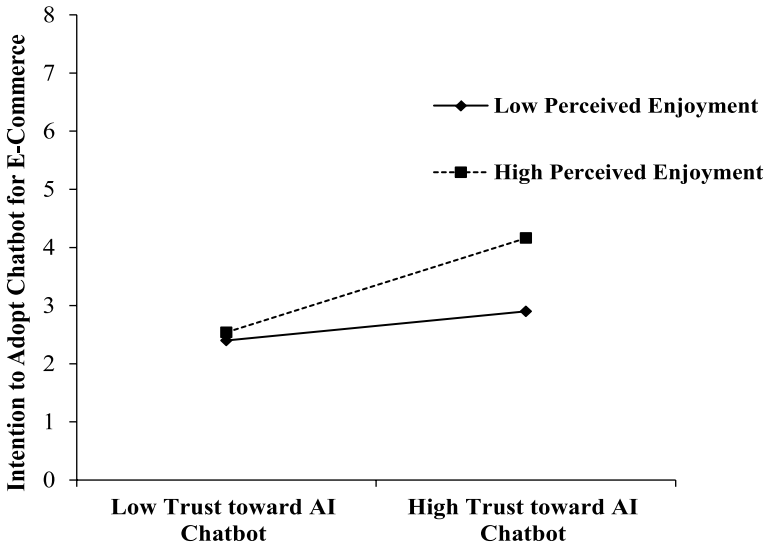

Fig. 2 moderating effects of perceived enjoyment on the link between trust toward AI Chatbot and intention to adopt Chatbot for E-commerce

Table 5 Results for direct moderation, and mediation related hypotheses

	β			Supported
H1: Chatbot Interactivity–> Trust toward AI Chatbot (AIT)	0.33***			Yes
H2: Perceived Humanness –> AIT	0.31***			Yes
H3: AIT–> Intention to Adopt Chatbot for E-Commerce (INT)	0.53***			Yes
Moderation analysis				
Perceived Enjoyment –> INT	0.35***			Yes
H6: AIT***Perceived Enjoyment –> INT	0.28***			Yes
Mediation analysis				
	β	**LL**	**UL**	
H4: Chatbot Interactivity–> AIT –> INT	0.16***	0.07	0.26	Yes
H5: Perceived Humanness –> AIT–> INT	0.14***	0.06	0.24	Yes

LL = lower level of the 95% confidence interval; UL = upper level of the 95% confidence interval; * $p < .05$; ** $p < .01$; *** $p < .001$

0.06 to 0.24, respectively. All hypotheses tested are supported at the 0.001 level of significance.

Discussion

The findings of this study explain how interactivity, humanness, and perceived enjoyment have an impact on consumer trust in and the use of AI chatbots in the context of e-commerce. All the results provided strong support for the hypotheses presented, thus pointing to the relativeness of these factors in the influence of consumer perceptions and consequent behaviors. H1 stating that there is a relationship between patterns of interactivity and the level of consumer trust found support in the literature showing that interactivity positively affects users' engagement and satisfaction. Araujo [6] underlines the fact that interactivity increases the amount of control perceived by users and their perceived competence, and as a result, it helps increase the level of trust. This is supported by our research which also validates the assertion that interactive as well as dynamic conversational interfaces enhance consumers' trust in chatbots. Likewise, this study confirms H2 which means human-like characteristics have a positive impact on consumer trust toward AI chatbots. Self-generated natural language processing, the ability to display empathy, and be ability to respond to users in a way that is coherent towards holding constructive conversations; all have an impact on the user perception of the chatbot as being credible [12]. There is evidence that as postulated above anthropomorphic interfaces have a stress and improve the user experience and trust. Based on a study done by Adam et al. [1], they state widely the concepts involving perceived credibility that could be utilized to enhance the chatbots' design intending to mimic human qualities, and they include first-person language, emotional expressions, and conversational tones. The findings support the study by stressing the importance of human-like characteristics as a way of gaining consumers' trust in AI systems for use in e-commerce applications.

Moreover, using a sample of 343 participants, this study tests the mediating role of trust toward AI for the interactivity-induced increase in the intention to adopt AI chatbots for e-commerce (H4) and the mediating role for perceived humanness (H5). The results show that there is a significant mediation of consumer trust toward AI in the intention to adopt chatbots. Prior literature is also in line with the notion that trust facilitates the acceptance of technology especially in the area of AI and automated systems [20, 42]. To the extent that trust was identified as a mediating variable, constructive perceptions of interactivity and humanness are particularly important in increasing the propensity of e-commerce sites to adopt AI chatbots. Besides, the current study introduced perceived enjoyment as a moderator in the relationship between trust toward chatbots and intention to adopt chatbots for e-commerce (H6). Perceived enjoyment therefore relates to the satisfaction that the user gets from a technology that has a bearing on the interest and the behavioral motivation of the users. The results of the current study indicate that the influence of users' trust on their intentions of using the chatbot will be more potent if they enjoy interacting with the chatbot. This moderating role of perceived enjoyment is supported by [70], who therefore states that perceived enjoyment has a direct effect on users' behavioral intentions to use new technology especially those involving direct control.

Other studies on human-computer interaction also shed light on the angle of fun and enjoyment experience on the call for trust on the overall intention to adopt. This literature is in line with the study as it posits that perceived enjoyment acts as the moderator in the relationship between trust toward chatbots and consumers' intention to use AI chatbots in e-commerce. Finally, this study examines the moderated mediation of perceived enjoyment on the indirect impact of interactivity, and humanness on the adoption intention of AI chatbot for e-commerce through trust (H7 & H8). The findings provide concrete evidence to the proposed hypothesis that perceived enjoyment provides a direct mediation of the relationship between trust toward chatbot and adoption intention and also that perceived enjoyment can act as a moderator of the mediating role of trust. This moderated mediation effect thus attests to the fact that perceived enjoyment is a critical variable when it comes to the adoption process of AI chatbots. Another research shows that some fundamentals of technology lead to acceptance and that enjoyment is one of them carrying more importance where the value is the user experience [70]. For example, Hasan et al. [23] have shown that perceived enjoyment increases the positive link that perceived usefulness has with the intention. Therefore, our research builds on these findings by further showing that enjoyment also moderates the effectiveness of trust in influencing adoption intention, thereby underlining its importance in enriching the chatbot experience.

Theoretical implications

This study offers four major theoretical implications grounded in ECT: First, this study enhances the implication of ECT by showing that interactivity and humanness in AI chatbot elicited a positive impact on the user expectation resulting in a higher level of trust towards the chatbot. The study indicates that where the AI chatbot can perform up to or even surpass users' expectations concerning their interactivity and human-like behaviors, the users develop higher levels

of trust in the chatbot. This trust also has a significant effect on their attitude and thus their perceived intention to use the chatbot for e-commerce. This is in line with ECT which proposed that the level of user satisfaction, and therefore the behavioral intentions, are determined by the level of confirmation/disconfirmation of the initial expectations [9, 14].

Second, the results on perceived enjoyment as the moderating factor have added to the theoretical knowledge of how affective reactions come into play with cognitive appraisals in the domain of ECT. In particular, if the users' interactions with the AI chatbot are perceived as fun, then the positive correlation between trust and the willingness to adopt chatbot grows stronger. This implies that perceived enjoyment plays an enlarging role, where it boosts and verifies the positive perceived attitudes towards the use of the chatbot which consequently results in an improved intention to use the chatbot among the users. This extends ECT to embrace organizational pleasures because consideration of affective dimensions of technology utilization helps advance models of technology acceptance [7, 15].

Third, this study proposed that the human element in AI chatbots is a critical factor in trust and adoption intentions that should be incorporated as important factors in the expectation-confirmation model. People's perception of humanness in chatbots most probably enhances their expectations of the chatbot and their ability and willingness to engage in conversation with it. Where such expectations are met, then trust is created leading to a higher probability of adoption of a product. Expanding this theoretical construct opens up ECT to encompass the human-like features of an AI that can help confirm the expectations and trigger adoption behaviors, among other things [11, 58].

Finally, this study supports and takes a firm stand for trust as a core mediator in the ECT framework particularly within the context of e-commerce chatbot adoption. Thus, there is evidence that user trust lies at the center of the process connecting interactivity and humanness on one hand, and the intention to adopt the chatbot on the other hand. Such awareness calls for e-commerce platforms to optimize the creation of trust with users because trust is a confirmed determinant of expectation thus the users' decision to continue using AI chatbots [22]. These theoretical implications are very enlightening to capture the nature of trust and adoption in the case of AI chatbot interactions and enrich the understanding of the concept of ECT about its applications and further developments in the digital world.

Practical implications

This study offers several practical implications: First, this study identified that interactivity has the best impact on the trust towards the AI chatbot. It is recommended that e-commerce businesses focus on designing extremely effective interactive chatbots that can better engage the users. Using features like real-time responses, personal touches, and intuitive user experiences, companies can establish a more credible environment within which users can feel comfortable relying on AI chatbots when it comes to their purchasing needs.

Second, this study looks at the effect of humanness on the consumer's trust as an influential feature in the AI chatbot. There is a need for e-commerce providers to focus on making the chatbot contain some human-like characteristics like the ability of the bots to show empathy, natural language understanding, and the ability to anticipate what the user may require. Most of these enhancements can help users relate with the chatbot, and due to this, increases the trust of the user implying that they will be willing to use the chatbot for future purchases.

Third, this study reveals that perceived enjoyment mediates the link between trust and the attitude toward the chatbot; the more enjoyable the chatbot experience, the higher the effectiveness of the chatbot in influencing the intention of the users to adopt the chatbot. e-commerce platforms should focus on making the chatbot experience more entertaining and fun by adding games, stories, or attractive designs. Thus, adding fun to chatbot experiences can help businesses achieve greater consumer loyalty and better overall uptake.

Fourth, since this research is conducted specifically for the Chinese e-commerce market, firms should ensure that their chatbot initiatives are in line with local trends and ad cultures. Therefore, examples like linking the commonly used social networks, using culturally sensitive terminologies and icons, or accommodating the frequent consumer concerns towards privacy and security amongst Chinese consumers could assist in the creation of better trust and confidence. It is believed that comprehension of features in this market will help e-commerce providers create chatbots that are more appealing to users and therefore better reception.

Finally, increased perception of user experience and the level of confidence in AI chatbots encourage quick transition. E-commerce businesses should endeavor to appreciate more the utilization of chatbots than the business transaction roles and use them for good customer relationship management. If businesses keep optimizing the chatbot options and making it more interactive and human-like in its interactions, people will be more

trusting and loyal in the long run and will continue to engage with the business and have a higher lifetime value.

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Authors' contributions
YD: Conceptualization, Methodology, Resources, Supervision, Writing - Review & Editing, Project administration. MN: Conceptualization, Methodology, Formal analysis, Investigation, Data Curation, Writing - Original draft preparation, Visualization.

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Data availability
The data that support the findings of this study are available from SEM Hubei Engineering University, but restrictions apply to the availability of these data, which were used under licence for the current study and so are not publicly available. The data are, however, available from the authors upon reasonable request and with the permission of SEM Hubei Engineering University.

Declarations

Ethics approval and consent to participate
According to the Declaration of Helsinki, the research was approved by SEM Hubei Engineering University's Ethical Committee, and all respondents were required to provide written informed consent. Participation was voluntary, and participants were told of the study's goal. Privacy was maintained, and responses were submitted anonymously.

Consent for publication
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Competing interests
The authors declare no competing interests.

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