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The role of AI-powered chatbots on improving customer experience in e-commerce: a case study of pharmaceutical organisations in Shanghai

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Abstract: This research investigated the influence of AI chatbots on customer experience and satisfaction in Shanghai's e-commerce pharmacies. Using a quantitative survey research design, data was collected from a sample of 400 respondents, drawn from the internet-using population in Shanghai. The Chinese customers in Shanghai with prior experience using AI chatbots in e-commerce pharmacies. The sample size was determined by the Taro Yamane formula and participants were selected through simple random sampling. An online survey questionnaire with high reliability (Cronbach's alpha > 0.80) was used as the data collection instrument. Data analysis was performed using SPSS, including descriptive, inferential statistics, and structural equation modelling. The findings indicated that AI chatbots positively influenced customer experience, which in turn enhanced customer satisfaction through personalised and interactive experiences. These results also aligned with the customer relationship management theory, emphasising how AI chatbots can strengthen customer relationships by meeting real-time needs and fostering trust.

Keywords: customer experience; AI-powered chatbots; customer service engagement; customer relationship management; CRM; customer satisfaction.

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1 Introduction

1.1 Background of the study

Artificial intelligence (AI) is the exhibition of human-like behaviours or intelligence by any machine or computer. It is the field of computer science that specialises in the creation of intelligent machines that are developed with the ability to perform activities associated with individuals (Das et al., 2021). AI plays a vital role in the discovery of drugs, the delivery of drug formulation, polypharmacology, and hospital pharmacy. AI can potentially improve the pharmacy industry by delivering drugs as needed by the customers.

AI-driven chatbots like ChatGPT have had a transformative impact on pharmaceutical research. This AI model is known for its understanding of natural language and generation capabilities (Malkawi, 2024). It can even review vast volumes of scientific literature, generate concise summaries, and extract required information on drug delivery languages. AI-driven chatbots are crucial in understanding their role in improving customer experience in online pharmacies.

The value of the online pharmacy market was US$109.74 billion in 2023 and is anticipated to reach US$286.26 billion by the year 2029, with a rising CAGR of 17.33% (Globe News Wire, 2024). Online pharmacies are continuously evolving with new technologies that help simplify their activities, such as inventory tracking, auto communication with customers, and online prescription management. There is a need for continuous technology improvement by online pharmacies, so the use of AI can help them improve their operations.

1.2 Problem statement

In the healthcare system, e-commerce pharmacies have emerged in Shanghai. Customers face issues like a lack of transparency and sufficient information related to drug usage and medical facilities in e-commerce pharmacies (Miller et al., 2021). This leads to the waste of public health resources, negatively impacting the care system for patients. Customers also face many difficulties, like dealing with multifaceted product information, the sale of prescription-only medicines (POMs) without a prescription, along with the sale of false medicines that are detrimental to people. Shi et al. (2025) stated that there are problems like unsuccessful phone appointments, invalid online registrations, extended waiting times, and insufficient online quotas that show the gap between the healthcare needs of over 25 million citizens and system capacity. Repeated registration shows that the patients get frustrated when they need to register again, leading to extra

costs in Shanghai. There is an increasing need for AI chatbots to augment customer service and allow customers to get medical services. Qi et al. (2025) stated that there have been reports of privacy and ethical and privacy, limited acceptance by users, inconsistent accuracy, technical complexities, lack of accountability, trust-oriented issues, and ineffective infrastructure. This ensures the need for using AI chatbots in healthcare for preventing these problems. Nadarzynski et al. (2019) commented that AI chatbots can aid online pharmacies in managing demand for healthcare services, improve doctor-patient communication and relations and access healthcare services. This ensures the need for AI chatbots to augment customer experience in online pharmacies. To address these challenges, AI chatbots offer potential solutions for improved services and service engagement for customer satisfaction.

There is a scarce number of studies analysing the role of AI-powered chatbots in e-commerce pharmacy. Even though ChatGPT has entered various domains, its role in enhancing efficiency in drug delivery has yet to be examined (Malkawi, 2024). The present research is novel in explaining the importance of AI-powered chatbots in e-commerce in Shanghai pharmaceutical organisations. Primarily, there are no studies about the effects of AI chatbots on Shanghai online pharmacies. Albogami et al. (2024) stated that Learning Language models (LLMs) have remained untested in real-world cases in law, business or healthcare, and their effectiveness and safety in the real world are not known. Future research is required to investigate the user experience and acceptance of healthcare patients and professionals, delivering critical insights about the practical combination of AI chatbots in healthcare aspects and their effects on the user journey. Andrikyan et al. (2025) also focused on AI chatbots to provide the right answers to frequently asked questions regarding the treatment of drugs, but the study did not consider the practical experiences of customers and medical laypersons while interacting with chatbots. This shows that the previous studies cannot contribute to the influence of AI-powered chatbots on enhancing customer experience in Shanghai pharmacies. The research contributes to the study by stating the importance of AI-powered chatbots on customer experiences regarding e-commerce in Shanghai pharmaceutical organisations. It can help in understanding the importance of customer service, along with customer service engagement, to improve customer satisfaction through AI-powered chatbots. The research addresses the gap by understanding the particular impact of AI chatbots on Shanghai's e-commerce pharmacies. It devises solutions to mitigate the issues of a lack of sufficient information and customer dissatisfaction by applying AI-powered chatbots. The research is novel in understanding the ways chatbots can improve customer service, along with satisfaction in Shanghai online pharmacies. It can help customers understand the benefits of using AI chatbots to access the right information, and healthcare providers understand the benefits of AI chatbots in serving their customers.

1.3 Research aims and objectives

The research aims to find the role of AI-powered chatbots in augmenting customer experience in Shanghai e-commerce pharmaceutical companies. It aims to understand the importance of customer experience along with customer service engagement on customer satisfaction. The aim will be accomplished through the objectives below:

- To evaluate the specific impact of AI-powered chatbots on customer experience in online pharmacies in Shanghai- the first objective is addressed by understanding

whether the use of AI chatbots in e-commerce pharmacies improves customer experience, and whether improved customer experience due to AI chatbots increases customer satisfaction.

- To assess the effectiveness and efficiency of AI-powered chatbots on the effectiveness and speed of customer support in online pharmacies in Shanghai- the second objective by addressing whether AI-powered chatbots significantly boost the efficiency of customer service engagements, and whether improved customer service engagement due to AI chatbots increases customer satisfaction.

2 Literature review

2.1 Influence of AI chatbots in e-commerce pharmacies on customer experience

Natural Language Processing (NLP) is the AI aspect that helps in the process of getting meaning from natural language or human input. It aids in analysing text, allowing machines to identify human language. The feature of human language that allows communication with computers is of great advantage (Abdulla et al., 2022). The issues involved are related to the collocation of words instead of not understanding the meaning of words and their expressions. Firms utilise chatbots or robotic virtual agents to support through interfaces of desktop. Most firms are utilising virtual chatbots due to their continuous presence during the week for 24 hours. This helps in easy interaction between people and computers, so conversational applications on converted devices can be replaced by chatbots in the future, implying the need for research. Rule-based, also called generative AI-driven programs, ensure text-oriented interactions with users, give information, answer queries, or assist with activities (Zohuri and Rahmani, 2023). Generative AI chatbots can be adapted to changing situations while responding effectively to unanticipated user inputs, as opposed to rule-based chatbots. They learn from the interactions and augment their responses continuously. This has made the topic interesting to conduct research on. Ni et al. (2024) stated that Generative AI can help firms to diagnose customer issues and deliver strategies to overcome e-commerce problems in China. Gen AI can help in performance gains for faster service delivery. This is because Gen AI can respond swiftly to customer inquiries, leading to a decline in the time to provide services. Limited research regarding AI chatbots on e-commerce pharmacies in Shanghai is the reason for this research.

AI chatbots are crucial in e-commerce pharmacies to augment the customer experience. According to do Nascimento et al. (2023), chatbots can manage customer interactions at any moment with the aim of continuous improvement in the quality of responses and ensuring low costs. Chatbot mitigates long waiting times for chat, e-mail, web-based customer support and phone as they are simultaneously available to many users. This can be attributed to the business process performance through ambidextrous innovation enabled through information systems strategy (Yoshikuni, 2024). Adoption of an information system can enhance business performance for customer satisfaction. do Nascimento et al. (2023) give evidence of Pfizer leading the market with the launch of three chatbots globally to resolve customer queries, showing the strengths. However, it is limited to public laboratories and the pharmaceutical industry in Brazil, and the findings do not focus on the mediating role of customer experience on customer satisfaction. The

findings may not apply to e-commerce pharmacies found in Shanghai, China. Iyelolu et al. (2024) stated that AI-enabled chatbots can ensure improved customer relationship management (CRM) through improvements in retention and satisfaction rates, thereby improving the overall experience. CRM is crucial in understanding customer interactions by tracking customer interactions at various touchpoints, thereby improving the overall customer experience, but is limited to the literature review and case studies, so no primary data can be found, which is used in this research. On the contrary, Haleem et al. (2024) argued that chatbots cannot comprehend the emotional condition of the customers, which can be crucial in understanding and analysing situations. A human agent can be better suited to manage situations when the customers are irritated or irate. The inability of chatbots to comprehend and understand linguistic nuances like sarcasm or irony might create misunderstandings. The dependence of chatbots on pre-programmed replies is the major issue. A combination of human personnel and AI chatbots for improved customer service shows the importance of a combination of AI and human skills. However, it is limited to the use of ChatGPT for patient and customer service management, but it does not explore the influence of chatbots on online pharmacies. Even though chatbots have these limitations of failure to understand human emotions and their mental irritation, Mpinganjira et al. (2024) contributed to the fact that experiential value contributes to the intention of shoppers when fashion e-retail continuously uses chatbot services in online fashion shopping. It helps in understanding the shopper's intentions and expectations under the influence of e-retail chatbots, which are its strengths, but is limited to the survey conducted on the youths ranging from 18 to 29, while ignoring the other age groups. The findings are also limited to South African online fashion retail and do not focus on the independent role of AI chatbots on customer experience. The main findings of the literature studies are that chatbots can improve customer interactions and services, but there needs to be research regarding the influence of AI-powered chatbots on customer service engagement. The relationship between chatbots and customer experience needs to be further explored and tested in e-commerce pharmacies in Shanghai. Therefore, the following hypothesis is proposed.

H1 The Use of AI chatbots in e-commerce pharmacies improves customer experience.

2.2 Influence of AI-powered chatbots on customer service engagement

AI-powered chatbots can influence customer service engagement. Jiang et al. (2022) stated that AI-powered chatbot-enabled dialogue plays an important role in communication, resulting in consumer engagement. Increasing AI-powered services like conversational chatbots play a vital role in dialogic communication in organisations having digital interactions with customers. It helps in providing prompt feedback to the comments of the customers, ensuring changes as per their feedback, and addressing the needs of the customers, which are its main strengths. This ensures treating the customers as real communication partners while respecting their opinions or perspectives, avoiding dominating communication and creating an understanding dialogue, indicating the predictors of customer satisfaction with the chatbot services of the organisation. However, it is limited to US organisations that are rooted in the local culture, and does not focus on the independent role of AI chatbots on the dependent role of customer service engagement. Alvarez and Jordan (2024) further stated that innovation is important for social leaders, business owners and managers for effective strategies related to the

development of an innovation system. Innovation systems can ensure higher performance. The use of AI can be attributed to the information system to ensure innovation for higher performance. Contradictorily, Khan and Iqbal (2020) argued that it is very challenging to initiate and construct AI-oriented, smart, innovative solutions that are customer-friendly and cost-effective. AI is highly misunderstood and confused by both decision-makers and consumers who do not have an effective understanding of its concepts. In discussions with respondents, service providers find it very difficult to assess in what situations and when a customer prefers human interaction and demands AI-oriented services like Chatbots or Virtual Office Assistants, but this is limited to previous studies and does not explore the mediating role of customer experience and customer service engagement. Nevertheless, the study is useful in understanding the issues that organisations can face in adopting AI chatbots. Customers demand more personalised AI engagement across all channels so that they can get seamless, quick and pleasant experiences, which are its strengths (Anozie et al., 2024). The findings cannot be generalised to other sectors, like e-commerce pharmacies in Shanghai, and are limited to case study research. Despite this, the demand for AI among customers is evident as they seek more enriching and seamless experiences. Therefore, literature studies are crucial in understanding the importance of AI-powered chatbots in delivering cost-effective, customer-friendly communication so that customers can make the right decisions. Influence on customer service engagement would help in understanding the benefits of AI chatbots. However, these studies could not provide data and information about the independent role of AI chatbots on the dependent role of customer service engagement. This research contributes to exploring and understanding the relationships in Shanghai e-commerce pharmacies. Therefore, the following hypothesis is proposed.

H2 AI-powered chatbots significantly boost the efficiency of customer service engagements.

2.3 Influence of customer experience due to AI chatbots on customer satisfaction

AI chatbots can influence customer experience by making customers aware of the latest events, products or promotions. COVID-19 has influenced businesses to adopt fast, contactless, remote online customer communication and service. These businesses have focused on automating customer service and routine activities using chatbots to answer customer questions 24/7, deliver instant information, check and monitor the status or accept a service inquiry, which are their strengths (Stoilova, 2021). This ensures the AI chatbot can easily automate communication to engage more with the customers and attract new markets to augment revenue. However, it lacks primary data; rather, it focuses on three case studies, with no focus on the mediating role of customer experience between AI chatbots and customer satisfaction. Adoption of AI chatbots can be attributed to business model innovation (BMI) for strategic and sustainable innovations. BMI is crucial to drive the information system for higher business performance (Schaller and Vatananan-Thesenvitz, 2024). This ensures that BMI is crucial to improve firm performance by changing the status quo and adopting new business models. On the contrary, Misischia et al. (2020) argued that chatbots may fail to meet the expectations of the users regarding the language skills of chatbots, which could result in negative emotions like frustration of not being understood properly. The absence of

communication aspects by humans, like gestures and voice, can make communication issues more acute. The lack of sector-specific information shows that the findings are generalised, with no information on the mediating role of customer experience, the independent role of AI chatbots and the dependent role of customer satisfaction. Nevertheless, chatbots can trigger various emotions among users. The willingness of users to interact depends on the feelings of the users and the attitudes of chatbots. Continuous learning about the capabilities of AI chatbots enables them to adapt to customer preferences and needs, thereby improving their effectiveness (Inavolu, 2024). However, it does not state the relationship between customer experience, AI chatbots and customer satisfaction. It can be said that the previous studies fail to provide real-life data and information about AI chatbots, customer experience and customer satisfaction in e-commerce pharmacies. However, literature review analysis shows that improved customer experiences through AI chatbots can improve customer satisfaction. However, the gap is that no studies have contributed to understanding the mediating role of customer experience between AI-powered chatbots and customer satisfaction in Shanghai online pharmacies. The relationship between the variables in Shanghai e-commerce pharmacies is yet to be explored through primary data, thereby proposing the next hypothesis.

H3 Improved customer experience due to AI chatbots increases customer satisfaction.

2.4 Influence of customer service engagement due to AI chatbots on customer satisfaction

Customer service is an important aspect of AI chatbots, which impacts customer satisfaction. Bhattaru et al. (2024) proposed the model of customer service 2.0, which specifies the importance of AI-based chatbots for online shopping support. The findings specified that chatbots equipped with emotional intelligence algorithms result in a 20% increase in customer satisfaction compared to standardised chatbots, which are their strengths. Reportedly, customers feel more valued and understood in interacting with the AI-displayed emotional responsiveness, but it does not produce sector-specific real-life data and information about AI chatbots in the e-commerce pharmacy industry. Nevertheless, customers express greater satisfaction when they get consistent services through AI. Businesses can invest in AI models that can respond to and recognise a range of different emotions to augment customer relationships. Chhajer et al. (2024) stated that four change enablers are positive emotions, enhancing job engagement, building individual capacities and high-quality connections. The use of AI chatbots signifies high-quality emotions and connections with customers. However, Al-Oraini (2025) argued that despite the growing adoption of chatbots, there is a lack of comprehensive analysis of dynamics that influence chatbot interactions to augment satisfaction. The significance of AI chatbots in increasing customer satisfaction requires in-depth research to understand the ways AI can improve customer service engagement. The strengths are that social-based communication, perceptions of warmth and competence, trust, along subjective norms significantly enhance customer satisfaction with chatbots, but are limited to Saudi Arabia, with no information about the relationship based on the mediating role of customer service engagement on AI chatbots and customer satisfaction. Nicolescu and Tudorache (2022) stated that chatbot-related, context-related and customer-related factors influence customer experience. Chatbots can influence customer

attitudes, feelings and perceptions so that they can love the brand. These chatbots can increasingly help organisations resolve problems and make effective decisions, thereby improving customer service and leading to better customer satisfaction, which are their strengths. However, it is limited to literature studies with a lack of sector-specific information, which shows that findings may not apply to current research due to regional and cultural differences. Iyelolu et al. (2024) stated that the adoption of AI technologies can deliver effective customer services by anticipating customer needs. Integration of AI into CRM can help organisations for long-term sustainability and scalability, which are its strengths, but is limited to a systematic literature review, where the existing studies are used to find the influence of customer experience with AI chatbots for customer service, which may not help in understanding the current situation of adopting AI chatbots to improve customer satisfaction. It can be said that the literature review analysis shows that AI chatbots can increase customer service engagement to augment customer satisfaction. The literature studies could not explain mediating role of customer service engagement between chatbots and customer satisfaction. There needs to be further research on chatbots, customer service engagement and customer satisfaction in Shanghai online pharmacies. Therefore, the following hypothesis is proposed.

H4 Improved customer service engagement due to AI chatbots increases customer satisfaction.

2.5 CRM theory

CRM theory primarily denotes the ability of organisations to serve customers effectively and retain them in the long run. It is the organisational approach that focuses on effectively applying, organising and gathering through technological solutions to build valuable relationships with customers (Khneyzer et al., 2024). AI is the ultimate limit in developing an efficient and unique CRM. AI tools help organisations conduct data analysis, recognise patterns for higher customer satisfaction, and improve customer experience. This helps organisations ensure better service quality and personalised services. Firms should implement AI technologies, specifically in CRM, operations and marketing. They can augment customer loyalty, optimise decision-making processes, and ensure data-oriented strategies (Saleem et al., 2024). This rate of adoption can be accompanied by effective employee training to overcome technical issues and ethical aspects in AI execution. AI chatbots can improve customer acquisition by acquiring new customers and retaining them through predictive analysis (Hossain et al., 2024). AI can help in customer loyalty by personalising marketing to recommend the right services and products. AI can improve CRM to improve loyalty, customer retention, along with customer satisfaction. Iyelolu et al. (2024) stated that AI-driven CRM solutions are crucial to facilitating customer engagement by ensuring that businesses can analyse and manage data and customer interactions. CRM has become indispensable for organisations to drive business growth, enhance long-term satisfaction and facilitate long-term sustainability. CRM improves customer engagement by resolving queries and giving them real-time information. Engaged customers can become more loyal to the brand while making repeat purchases and recommending the business by word-of-mouth (Iyelolu et al., 2024). CRM can improve customer satisfaction by providing enterprises with the ability to deliver effective and personalised customer service. Customers can get engaged with the chatbots when they find them user-friendly and effective. This implies

that CRM is important in understanding the influence of AI-powered chatbots in augmenting the experiences and engagement of the customers, which can lead to higher customer satisfaction. However, Miraz et al. (2024) argued that CRM is affected by ineffective user evaluations regarding the practicality, functionality and usability of various technologies. Higher levels of dissatisfaction and negative experiences of users due to AI chatbots significantly affect CRM. Nevertheless, the ability of chatbots to deliver improved CRM processes is related to their effectiveness. This implies that effective chatbots can enable organisations to improve customer relationships by managing them effectively and resolving their queries in real time.

2.6 Literature gap

The research has identified certain gaps in the literature studies. A lack of existing studies about the influence of AI-powered chatbots on customer service engagement, customer experience and customer satisfaction concerning e-commerce pharmacies is the primary reason for conducting the research. Existing studies by Khan and Iqbal (2020) and Jiang et al. (2022) focused on the influence of AI-powered chatbots on customer experience, where chatbots can improve customer experiences through real-time data and information. Jiang et al. (2022) stated that customer satisfaction with the use of chatbots is positively associated with social media engagement to augment chatbot services. The responsiveness and the conversational aspect in tone in chatbot communication are positively associated with customer satisfaction related to chatbot services. However, it does not include the relationship between chatbots and customer service engagement and customer experience to increase customer satisfaction. Khan and Iqbal (2020) stated that AI customer service can optimise customer experience, but it lacks any primary data and does not include the aspect of customer satisfaction as the role of the dependent variable. The research mitigates the gap by focusing on the importance of AI chatbots on customer experience, customer service engagement and customer satisfaction in Shanghai online pharmacies. Previous studies cannot explain, investigate and explore the mediating roles of customer experience and customer service engagement between AI chatbots, along with customer satisfaction. This research mitigates the gap by exploring and explaining the specific impact of AI-powered chatbots on customer experience effectiveness and efficiency of AI-powered chatbots, of the efficacy and speed of customer support in online pharmacies in Shanghai.

2.7 Conceptual framework

The framework shows that AI chatbots are the independent variables, customer experience and customer service engagement are the mediating variables, and customer satisfaction is the dependent variable. Customer experience is a changing, holistic, indirect or direct interaction between a consumer and a company involving thoughts, feelings, actions, relations, and activities (Sidaoui et al., 2020). Customer engagement is the multidimensional aspect of buying behaviour (customer financial contributions for firm value and customer satisfaction and loyalty), knowledge (customer active engagement or suggestions), and referrals (customer involvement in brand promotion for monetary incentives or benefits) (Michel et al., 2023). Customer satisfaction is the perception and expectation of the customers regarding the services or goods that they receive (Singh et al., 2023). Based on the framework, it can be said that the AI chatbots

in e-commerce pharmacy are the independent variable, customer experience and customer service management are the mediating variables, and customer satisfaction is the dependent variable. CRM theory can be used to link the variables, where AI chatbots can help in improving customer experience through operational processes, systems and practices. AI in CRM helps in collecting data, identifying trends, suggesting the best course of action, forecasting potential results and automating the customer satisfaction engagement to improve customer satisfaction (Khneyzer et al., 2024). CRM theory shows that the use of AI chatbots can help pharmacy firms develop a relationship between seller and buyer through online interactions. CRM theory can explain the mediating roles of customer experience and customer service engagement in improving customer satisfaction, as AI chatbots can meet the real-time needs of customers and engage them for a better experience. Thus, the following hypotheses are formed.

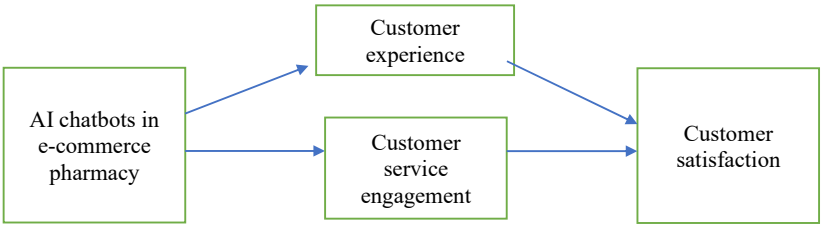
Hypothesis 1 The Use of AI chatbots in e-commerce pharmacies improves customer experience.

Hypothesis 2 AI-powered chatbots significantly boost the efficiency of customer service engagements.

Hypothesis 3 Improved customer experience due to AI chatbots increases customer satisfaction.

Hypothesis 4 Improved customer service engagement due to AI chatbots increases customer satisfaction.

Figure 1 Conceptual framework (see online version for colours)



Source: Author's own construction

3 Methodology

The primary research method was used in this research to collect raw data and information about customer experiences in online pharmacies in Shanghai. The rationale for conducting this primary research is that it helps to deliver up-to-date, relevant and accurate information (Mitchell and Rich, 2020). This primary research helped to understand the emerging trends of AI-powered chatbots in enriching customer experience and satisfaction in e-commerce pharmacies in Shanghai. It helped in collecting raw data about the importance of AI-powered chatbots for online pharmacies that struggle to deliver unique customer experiences. However, the primary research would have the problem of potential bias, which was overcome in this research by giving respondents equal chances of participating in the research. A quantitative survey was used to understand customer satisfaction in e-commerce pharmaceutical companies in Shanghai.

The rationale for using a quantitative method is to produce objective and generalisable data by using statistical measures to test the proposed hypotheses (Ghanad, 2023). This approach allows for a systematic investigation of customer preferences and choices regarding AI chatbots, providing numerical evidence for their impact on customer experience and satisfaction in Shanghai's e-commerce pharmacies. It helped in understanding the consumer preferences and choices of AI chatbots for enhanced customer experience and customer service engagement to improve customer satisfaction. Quantitative research helped in investigating the situation, forming the hypothesis and using deductive reasoning to predict the data in case of a true hypothesis, after collecting the data and analysing it to reject or confirm the hypothesis. The survey was used to collect data through a closed-ended questionnaire. The rationale for using the survey is that it helps in gathering information and data using relevant questions from a sample of people to understand the whole population (Ghanad, 2023). The survey helped in understanding customer satisfaction with AI-powered chatbots as online pharmacies use chatbots to resolve customer queries and give real-time solutions. However, qualitative interviews were not used since getting expert interviews could be time-consuming, and there was an accessibility issue. The total sample size was 400 customers based on the Taro Yamane formula. The TYF is based on sample size, population size, error, and level of precision, whereas the Krejcie & Morgan formula is based on population size, sample size, sample size's acceptable error, and reliability level (Uakarn et al., 2021). The rationale for using this formula is that it is simple, easy to use, and effective in dealing with large populations compared to other formulas. However, Oluigbo et al. (2024) argued that TYF has limitations, like biased results, and it may not represent the true results of the heterogeneity of data. It can have lower accuracy when compared to stratified sampling. To overcome the limitations, the sample was selected rigorously and ensured that the sample fit the stated criteria to derive the right research outcomes. Based on Taro Yamane's formula, the following sample size was derived.

Formula	n	=	N/
			$1+ (N(e^2))$
When	n	=	Sample size
	N	=	Target population size
	e	=	Allowable sampling error
Hence	n	=	23,894,400
			$1+ (23,894,400 (0.05)^2)$
		=	400 individuals

Convenience sampling was used to select the participants. The reason for using convenience sampling is that it helps in selecting the units of the sample due to convenience (Golzar et al., 2022). It is beneficial due to low effort, but its problem is systematic errors and sampling bias. It suffers from bias from self-selection and non-coverage in case the empirical literature uses non-probability convenience samples. The researchers may unable to employ self-selection since people decide whether they will fill up the survey or not. The bias and errors were mitigated in this research by controlling the representativeness of the sample. This sampling helped select the participants from the target population fit for this research. The customers were deemed to be fit for the research. The survey was conducted online through Qualtrics, and the

questionnaire was distributed through social media channels like WeChat and Mai Mai. The participants were contacted through community groups, acquaintances and social groups on WeChat and MaiMai. The inclusion criteria were that the respondents were customers of e-commerce pharmacies in Shanghai and were aware of chatbots. They could easily use smartphones and have a social media presence. The exclusion criteria were that old-aged persons, who could not use chatbots, did not have a presence on social media channels or used e-commerce pharmacies. The questionnaire comprised closed-ended questions through a five-point Likert Scale to understand the customer experience due to AI-powered chatbots. The measurement scale was developed to frame the questions as found in Appendix. The questionnaire was developed through pre-existing scales, and a pilot test was conducted with 25 respondents. Prior to the full-scale data collection, a pilot test was conducted with 25 respondents to evaluate the feasibility and reliability of the survey instrument. As shown in Table 1, the pilot test demonstrated strong internal consistency for all four key scales, with Cronbach's alpha values well above the acceptable threshold of 0.70. This result provided confidence that the questionnaire items were clear, consistent, and suitable for the main study. Given the success of the pilot in terms of reliability, full-scale data collection was subsequently carried out with a sample of 400 participants.

Table 1 Pilot test

	Cronbach's alpha
AI chatbots in e-commerce pharmacy	0.867
Customer experience	0.729
Customer satisfaction	0.861
Customer service engagement	0.849

Finally, SMART PLS was used to conduct the data analysis. Smart-PLS is suitable for latent variable modelling, which is essential for measuring abstract concepts like customer experience and engagement. This study also depends on customer experience and engagement. Path analysis helps examine direct and indirect effects, ensuring a clear understanding of causal links. Hence, Smart PLS and structural equation modelling (SEM) were chosen for this study. Through SEM, assessing measurement reliability, validity, and structural model paths through bootstrapping has been done. Model fit was evaluated using SRMR, d_ULS, d_G, Chi-square, and NFI, with control variables included to account for demographic influences. The questionnaire was developed by framing the research objectives, identifying key constructs and variables, and formulating the closed-ended questions. The close-ended questions comprise demographic questions and questions related to vhatbots, customer experience, customer service engagement, and customer satisfaction. The demographic questions, such as age, gender, AI usage, and usage of pharmaceutical AI chatbots, were primarily collected for sample profiling; however, they were also incorporated as control variables in the data analysis. By including them in the structural model, the study controlled for potential confounding effects, ensuring that the core relationships observed were not biased by demographic or prior usage factors. These control variables were included in the structural model during PLS-SEM analysis to isolate their influence from the main predictors. By adding them as independent paths to customer satisfaction, their effects were statistically accounted for without interfering with the relationships among core variables. The researcher followed

the ethical guidelines in conducting the research and gathering data from the survey respondents. The participation was purely voluntary, and anyone could withdraw from the research if they wanted. No one was coerced or forced to participate in the research. The research's potential selection and response biases were overcome by choosing a large sample and conducting anonymous surveys. Standardised data collection processes helped in overcoming confirmation bias.

4 Findings and discussion

4.1 Findings

4.1.1 Descriptive statistics

The sample consists of 55.3% males and 44.8% females. The largest age group is 29–39 years (35.8%), followed by 40–50 years (22.3%) and 51+ years (21.8%). AI chatbot usage is highest among users with over a year of experience (32.3%), while 41.5% have used chatbots in Shanghai pharmaceutical companies for over a year. This indicates sufficient experience among the sample. It also shows that 41.5% of the participants have specific experience using chatbots from Shanghai Pharmaceutical Companies. This means the chosen participant sample has significant experience with pharmaceutical-related chatbots. The data can be used for reliability analysis as it achieves its desired relevance thresholds. However, the data has certain limitations since the sample size could have been increased, but due to time and budget limitations, the small sample size was chosen for generalisability.

Table 2 Descriptive statistics

Category	*Frequency*	*Percent*	*Valid percent*	*Cumulative percent*
Gender				
Male	221	55.3	55.3	55.3
Female	179	44.8	44.8	100.0
Age				
18–28 years	81	20.3	20.3	20.3
29–39 years	143	35.8	35.8	56.0
40–50 years	89	22.3	22.3	78.3
51 or more years	87	21.8	21.8	100.0
AI chatbots usage				
0–3 months	68	17.0	17.0	17.0
3–6 months	83	20.8	20.8	37.8
6–9 months	58	14.5	14.5	52.3
9–12 months	62	15.5	15.5	67.8
1 or more years	129	32.3	32.3	100.0

Table 2 Descriptive statistics (continued)

Category	*Frequency*	*Percent*	*Valid percent*	*Cumulative percent*
Usage of Chatbots of Shanghai pharmaceutical companies				
0–3 months	34	8.5	8.5	8.5
3–6 months	44	11.0	11.0	19.5
6–9 months	75	18.8	18.8	38.3
9–12 months	81	20.3	20.3	58.5
1 or more years	166	41.5	41.5	100.0

4.1.2 Reliability

Table 3 suggests the reliability of the chosen questionnaire items. AI chatbots in e-commerce pharmacies, customer experience, customer satisfaction, and customer service engagement exhibit strong reliability (Cronbach's alpha > 0.80) and good convergent validity (AVE > 0.5) (Hajjar, 2018). Therefore, chosen constructs have significant reliability for inferential statistical analysis.

Table 3 Reliability

	Cronbach's alpha	*Composite reliability (rho_a)*	*Composite reliability (rho_c)*	*Average variance extracted (AVE)*
AI chatbots in e-commerce pharmacy	0.866	0.875	0.909	0.716
Customer experience	0.720	0.739	0.826	0.545
Customer satisfaction	0.860	0.880	0.905	0.705
Customer service engagement	0.847	0.861	0.898	0.688

4.1.3 Discriminant validity

HTMT values below 0.85(sometimes 0.90) indicate acceptable discriminant validity (Cheung et al., 2024). Table 4 shows that AI chatbots in e-commerce pharmacy and customer satisfaction (0.771) are closely related but remain distinct. Customer experience shows low correlations (≤0.440), suggesting differentiation. Constructs exhibit good discriminant validity; therefore, a model can be built based on this.

Table 4 Discriminant validity

	AI chatbots in e-commerce pharmacy	*Customer experience*	*Customer satisfaction*	*Customer service engagement*
AI chatbots in e-commerce pharmacy				
Customer experience	0.480			
Customer satisfaction	0.771	0.706		
Customer service engagement	0.444	0.869	0.633	

4.1.4 Direct effects

Table 5 suggests a direct relationship between AI chatbots in e-commerce pharmacies and customer experience and customer service engagement. The positive and significant relationship ($p < 0.05$) confirms that AI chatbots enhance customer experience (H1). The effect size is also positive, suggesting AI chatbots do increase customer experience ($\beta = 0.386$, $p = 0.000$). Similarly, a strong positive effect of 0.386 means that for every unit increase in AI chatbot effectiveness, customer experience increases by approximately 0.386 times the increase in standard deviation units, reflecting a moderately strong and practically meaningful impact. Overall, the effect size is positive. Therefore, an increase in one factor will be followed by another factor. Similarly, the direct relation between AI chatbots and customer service engagement suggests that it also has a directly proportional positive association ($\beta = 0.382$, $p = 0.000$). In comparison, the strongest effect is observed in the relationship between AI chatbots and customer experience. A beta value of 0.382 means a unit standard deviation change in the positive side of the AI chatbots will lead towards a 0.386 standard deviation of increase in customer service engagement. This means using AI chatbots has the most impact on customer experience. Although AI chatbots strongly drive customer service engagement, their impact is also quite similar to customer experience. Therefore, the findings confirm that AI chatbots are crucial in enhancing both customer experience and customer service engagement in e-commerce pharmacies.

Table 5 Direct effects

	Original sample (O)	*Sample mean (M)*	*Standard deviation (STDEV)*	*T statistics (|O/STDEV|)*	*P values*
AI chatbots in e-commerce pharmacy -> Customer experience	0.386	0.388	0.069	5.627	0.000
AI chatbots in e-commerce pharmacy -> Customer service engagement	0.382	0.382	0.072	5.321	0.000

4.1.5 Indirect effects

The indirect effects further reveal that customer experience plays a stronger mediating role in enhancing customer satisfaction than customer service engagement ($\beta = 0.139$, $p = 0.003$). While AI chatbots increase satisfaction, the enhancement is due to experience improvement. This implies that a standard deviation improvement in customer experience (caused by AI chatbot interaction) translates into a 0.139 standard deviation improvement in customer satisfaction. This means that while AI chatbots directly enhance customer experience, the improved experience drives higher satisfaction. Not only does this mark statistical significance, but it also suggests a practical importance, indicating that how users feel as they engage with AI (ease, usefulness, personalisation) is a significant determinant of overall satisfaction with the e-commerce pharmacy. Similarly, AI chatbots in e-commerce pharmacies are mediated by Customer service engagement when affecting Customer satisfaction ($\beta = 0.117$, $p = 0.014$). Here, the effect size is 0.117, which implies

that a one standard deviation change in customer service engagement brought about by chatbot AI leads to a change of 0.117 standard deviations in customer satisfaction. This means the higher the AI chatbots' influence on customer experience engagement, the better the satisfaction. The more customers engage with these AI chatbots, the more responsive and helpful they perceive the platform to be, leading to increased satisfaction. In both of these cases, H3 and H4 accepted that customer experience and customer service engagement play a major intermediary role in enhancing customer satisfaction. Therefore, AI chatbots in pharmacies increase customer experience, which results in higher customer satisfaction.

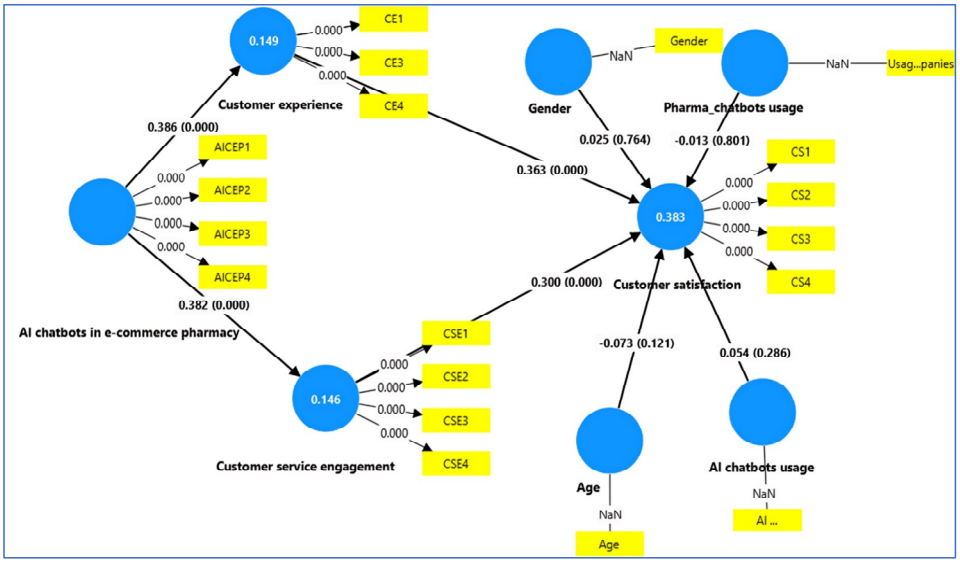
Table 6 Indirect effects

	Original sample (O)	*Sample mean (M)*	*Standard deviation (STDEV)*	*T statistics (|O/STDEV|)*	*P values*
AI chatbots in e-commerce pharmacy -> Customer experience –> Customer satisfaction	0.139	0.143	0.047	2.976	0.003
AI chatbots in e-commerce pharmacy -> Customer service engagement -> Customer satisfaction	0.117	0.120	0.048	2.463	0.014

4.1.6 Model

Figure 2 suggests that AI chatbots in E-Commerce Pharmacies are the main influencing factor, Customer Experience and Customer Service Engagement are intermediaries, and Customer Satisfaction is the outcome. Although the model includes gender, age, and AI chatbot usage as control variables to ensure the accuracy of the primary model (Figure 2). Statistical results show that none of these control variables had a significant impact on customer satisfaction. This confirms that the main effects observed are not confounded by demographic or usage-based differences. The R-squared values indicate the explanatory power of AI chatbots on each dependent variable. AI chatbots explain 14.9% of the changes that occurred in customer experience ($R^2 = 0.149$). Similarly, customer service engagement ($R^2 = 0.146$) shows a 14.6% variance, implying that AI chatbots influence engagement. Now, AI chatbots, customer experience, and customer service engagement combined explain 37.6% changes in customer satisfaction. Hence, all three factors have a significant impact on increasing satisfaction. AI chatbots and engagement significantly impact satisfaction. This structural model explains the interdependence among AI chatbots in e-commerce pharmacies, customer satisfaction, customer service, and customer engagement. Contextually, the SRMR value of 0.072 indicates an acceptable fit, suggesting low residuals between observed and predicted correlations. However, the NFI value of 0.711 indicates a moderate model fit. Hence, model fit is acceptable based on SRMR, despite moderate support from NFI.

Figure 2 Final structural model (see online version for colours)



4.2 Discussion

4.2.1 The use of AI chatbots in e-commerce pharmacies improves customer experience

The hypothesis testing indicates that AI chatbots are positively related to customer experience, showing that AI chatbots enhance customer experience and customer service engagement. This is because AI chatbots give customers enjoyable experiences, showing a positive relationship between AI chatbots and customer experience (H1). The strength of the relationship is denoted by 38.6%, showing a positive and strong effect. AI chatbots can increasingly help in improving customer experience and customer service engagement, as improving customer experience can motivate customers to engage in the services. They will be motivated to use AI chatbots. The findings align with the study of Haugeland et al. (2022), which stated that chatbot conversation, which is personal and humanlike, can contribute positively to the user experience. This is similar to the findings of the literature review that state the importance of customer interactions with chatbots (do Nascimento et al., 2023; Mpinganjira et al., 2024). Sidaoui et al. (2020) stated that chatbots can be explored by their ability to engage customers through storytelling. AI-equipped chatbots can easily extract customer experience through data and information. The similarities between current findings and previous findings are that AI chatbots can improve customer experience. This indicates that online pharmacies can deploy chatbots to improve their customer experience. However, the difference is that the previous studies do not provide detailed information about the independent role of AI chatbots on the dependent role of customer experience, as in Das et al. (2021), which only focused on the importance of AI in Shanghai pharmacies.

4.2.2 AI-powered chatbots significantly boost the efficiency of customer service engagements

The findings are crucial in understanding the importance of chatbots for customer service engagement, as the second hypothesis is also accepted (H2). The β value of 0.382 shows that the strength of the relationship is 38.2% between AI chatbots and customer experience. This shows a strong, positive relationship, implying that AI chatbots can effectively increase customer experience. This is consistent with the findings of existing studies. Sidaoui et al. (2020) stated that the AI-oriented chatbot interview approach consists of important characteristics, engagement and immersion, aligning with the current findings. Providing chatbots with a positive persona and demonstrating empathetic feelings during the interview experience can ensure positive customer engagement. The findings of this research are crucial in understanding the importance of customer service engagement, as AI chatbots can address the specific needs of customers during service interactions. AI chatbots generally provide a more engaging and interactive experience than any other service method. This is consistent with the literature review that AI-oriented chatbot services like conversational chatbots can help in digital interaction to understand customer needs and preferences (Jiang et al., 2022). Chatbots can learn continuously, and with the help of already stored expressions, they can give the right answers to the customers. This is related to the findings of the study. The customers get engaged in online interactions with AI chatbots as they feel that their personalised needs are met. This demonstrates that AI chatbots are essential for delivering effective customer experiences. Customer service engagement acts as the mediating variable to deliver improved customer satisfaction through AI chatbots. The similarities between the previous findings and the current findings are that they show that AI chatbots can improve the efficiency of customer service engagements. However, the previous studies could not explore the significant, positive relationship between AI chatbots and customer service engagements in e-commerce pharmacies in Shanghai.

4.2.3 Improved customer experience due to AI chatbots increases customer satisfaction

The research findings are crucial in understanding the strong positive association between AI chatbots and customer experience, supporting H3. The indirect relationship is denoted by $\beta = 0.139$, which shows that the 13.9% strength of the indirect relationship between improved customer experience, AI chatbots and customer satisfaction. When customers have a positive experience regarding AI chatbots, they derive higher satisfaction. As customer experience benefits positively from chatbot implementation, there is a stronger impact on customer service implementation. As found in the study of Haugeland et al. (2022), user experience is impacted by the conversation types and interaction style of customer service chatbots. The concepts of social presence and anthropomorphism ensure free text interaction that gives the users a sense of a chatbot that is socially oriented and human-like. AI chatbots render positive interactive experiences to the users so that they can use them freely and effectively. The findings contribute to the research by stating the positive relationship between AI chatbots, customer experience and customer service engagement. Customer experience also shows a stronger mediating role in enhancing customer satisfaction than customer service engagement. This is because AI chatbots augment experience as they drive customer engagement, leading to better customer

satisfaction. The current research is different to the previous findings in understanding the mediating role of customer experience between AI chatbots and customer satisfaction in Shanghai online pharmacies. AI chatbots are the new technology phenomenon, and their increasing penetration in online pharmacies can help in delivering a new customer experience.

4.2.4 Improved customer service engagement due to AI chatbots increases customer satisfaction

Acceptance of hypothesis H4 shows that increasing chatbots in online pharmacies can improve customer experience, leading to better customer satisfaction. The β value is 0.117, showing an 11.7% strength of relationship between customer service engagement, AI chatbots and customer satisfaction. This shows that higher customer service engagement through AI chatbots can help in improving customer satisfaction. These findings are similar to the literature review, which contributes to improved loyalty, higher customer satisfaction and increased customer engagement. Stoilova (2021) further added that the advantage of using chatbots during the pandemic has augmented the importance of considering customer service engagement and experience through chatbots. Kumar et al. (2023) supported the fact that online chatbots have become essential tools for organisations and businesses to support customers and improve overall experience and user engagement. This is because chatbots can deliver personal interactions, resolve various user queries and augment customer engagement, making them an essential part of online customer service strategies. AI chatbot assistance influences users to use online pharmacies in Shanghai. Customer experience is a more potent mediator than customer service engagement in this context since customers seek improved experiences through AI chatbots. Humans may be unable to provide customer service as they may be unavailable or fail to give customer service at the required time, so AI chatbots can improve customer experience with real-time support and information. The practical implications of these mediating effects are that Shanghai online pharmacies can adopt and use AI chatbots to improve customer experiences and attract more customers. The current research is different from the previous findings in ensuring that customer service engagement mediates the role of AI chatbots and customer satisfaction. Customer service engagement can be improved through AI chatbots to ensure customer satisfaction in Shanghai.

The theoretical analysis of CRM theory states the importance of enhancing customer relationships through chatbots. CRM strategies are implemented in organisations to serve customers effectively in the long run. AI systems in CRM are effective in collecting data, identifying trends, suggesting the best course of action, anticipating potential outcomes and automating the customer engagement process (Khneyzer et al., 2024). The theoretical implications of the findings support the CRM theory by analysing the importance of customer relationships through AI chatbots. Customers are satisfied when their queries are solved and they get effective services to get their required drugs and medicines. This is in line with the findings that show that chatbots can augment customer relationships in Shanghai online pharmacies. It can be said that the online e-commerce pharmacies can use AI chatbots for favourable CRM. People using AI chatbots are crucial to ensure easy and positive interactions. User experiences can be greatly improved when AI chatbots are incorporated into CRM strategies. Miraz et al. (2024) confirmed that there is a positive correlation between the intention of the customers to use an AI chatbot to augment CRM

and the degree of trust participation and user acceptance of the technology. Nicolescu and Tudorache (2022) further anticipated an increase in the adoption of AI-oriented virtual agents that can work with CRM activities and allow for CRM automation. Customer service requires positive customer experiences, which can be rendered through customer service chatbots. It can be said that CRM is very important for e-commerce pharmacies to adopt AI chatbots so that they can render effective customer experiences and customer service engagement, thereby increasing customer satisfaction. The practical significance of the study is that online pharmacies in Shanghai can adopt and implement AI chatbots for a better customer experience. Customer service engagement can be improved when they gain the benefits of AI chatbots. The online pharmacies can also constantly update AI chatbots for a better customer experience. Online pharmacies can also secure and store customer data effectively to give them drugs, and healthcare services according to customer requirements, leading to improved customer satisfaction.

5 Conclusions

It can be said that AI-powered chatbots can improve customer experience in Shanghai pharmaceutical organisations. The findings and discussion practically contribute to the research by influencing e-commerce pharmacies in Shanghai to adopt AI chatbots. They show that AI chatbots can improve customer experience, leading to better customer satisfaction. Customer experience and customer service engagement mediate between chatbots and customer satisfaction. The unique contribution of the research is that it helps in understanding the importance of AI chatbots in improving customer satisfaction and experience. AI chatbots can influence online pharmacies to engage customers actively in purchasing medical products according to their requirements. Adoption of AI chatbots can enable online pharmacies to remind customers to purchase medicines and seek medical advice according to their purchasing history, even suggesting medical care.

5.1 Managerial implications

The research can influence managers, owners and employees to use chatbots for understanding customer needs and preferences and analysing the trends in the pharmaceutical industry. The managers can deploy AI chatbots to ensure that the customers get real-time solutions to the challenges and issues of getting healthcare services. The managers can even train employees to understand the benefits and loopholes of adopting AI and deliver solutions to improve customer experiences. Customers can give feedback about their experiences of using AI chatbots. Employees can report to the managers in case they find any kind of discrepancies in AI chatbots. Employees can even convince customers to use AI chatbots for better customer experience, engagement and satisfaction.

5.2 Theoretical implications

The research also contributes to theoretical understanding by analysing the importance of CRM theories in improving customer relationships and understanding their needs and preferences. The use of the theory is crucial to understanding the ways AI chatbots can enable companies to understand the emotional aspects of customers and suggest the right

medical solutions. The research shows that CRM is very important for online pharmacies in Shanghai to engage customers and improve their experience. CRM can enable pharmacies to increase the use of chatbots and upgrade them as per emerging trends. The integration of CRM theory with AI-oriented chatbots can lead to a strong theoretical foundation for analysing their role in enriching customer experiences. Chatbots are important in the pharmaceutical industry due to the complexities in the industry, with the need for personalised interactions and medical information. The CRM theory can enable online pharmacies to enhance customer relationships and engagement processes. This can enable the pharmacies to utilise customer data effectively and improve personalised interactions. It can be recommended that Shanghai e-commerce pharmacies should adopt AI chatbots through their apps to resolve customer queries 24*7, recommend the right products and services, and support customer purchases for the right products and services (Kim et al., 2020). The chatbots can help e-commerce pharmacies to improve interaction with customers to increase their engagement. This can help it minimise errors and improve customer experience.

5.3 Research limitations

A key limitation of this study is the reliance on a single quantitative method due to time and budget constraints, which limited the ability to conduct in-depth qualitative interviews. A mixed-methods approach could have provided richer insights into the emotional aspects and detailed experiences of customers, thereby enhancing the overall validity and depth of the research findings. The use of mixed-method strategy could have helped in improving research validity since it could help in overcoming limitations of using one method. The research is limited to surveys only, which can limit the scope of this research. The interviews from the experts could have helped in understanding the importance of AI chatbots in the Shanghai e-commerce pharmacies to augment customer satisfaction. Limited sample size is another limitation. The research is also limited to the region of Shanghai, so it may not analyse the industry trends in other regions of China. The findings of the research can be applied to the e-commerce pharmacies in Shanghai, China, thereby ignoring the industry insights in other developed regions.

5.4 Future research

The research paves the future scope by enabling future researchers to research the importance of AI chatbots in developed regions through a longitudinal study. Future researchers can easily explore the use of chatbots in other industries like retail, hospitality, construction, manufacturing or any other industry in developing regions like China through interviews. Future researchers can conduct research on the topic by surveying a large sample size. They can also explore the importance of chatbots in improving customer engagement and satisfaction in the industries through secondary data. A longitudinal study can be conducted on the use of chatbots to improve customer loyalty and ensure customer retention. The research paves the future scope to conduct surveys on employees to understand the feasibility and practicality of AI chatbots on organisational performance.

Declarations

All authors declare that they have no conflicts of interest.

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Appendix

Survey questionnaire

Variable		*Scale*				
Independent variable 1: use of AI Chatbots in e-commerce pharmacies						
1	AI chatbots are frequently available when I visit online pharmacies.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
2	I find the use of AI chatbots in online pharmacies beneficial for resolving my queries.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
3	The AI chatbots provide timely responses to my questions.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
4	AI chatbots enhance the convenience of purchasing medication online.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Independent variable 2: efficiency of AI chatbots in customer service						
5	AI-powered chatbots respond to my inquiries more efficiently than human agents.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
6	The AI chatbots effectively resolve my customer service issues without needing further assistance.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
7	AI chatbots reduce the waiting time for customer service in online pharmacies.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
8	I am satisfied with the speed at which AI chatbots address my concerns.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Mediating variable 1: customer experience						
9	The use of AI chatbots makes my shopping experience in online pharmacies more enjoyable.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
10	AI chatbots have improved the overall convenience of my interactions with online pharmacies.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
11	I am more likely to use an online pharmacy if it has an AI chatbot for assistance.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Survey questionnaire (continued)

Variable		*Scale*				
Mediating variable 1: customer experience						
12	The quality of customer experience has improved since AI chatbots were introduced.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Mediating variable 2: customer service engagement						
13	AI chatbots engage me effectively by addressing my specific needs during service interactions.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
14	The interaction with AI chatbots feels personalized to my needs.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
15	I am more engaged with online pharmacy services when interacting with AI chatbots.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
16	AI chatbots provide a more interactive and engaging experience than other customer service methods.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Dependent variable: customer satisfaction						
17	I am satisfied with the customer service provided by AI chatbots in online pharmacies.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
18	The use of AI chatbots has improved my overall satisfaction with online pharmacy services.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
19	I would recommend online pharmacies with AI chatbots to others based on my satisfaction.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
20	The improved experience due to AI chatbots has increased my overall satisfaction with the pharmacy.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree