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Revolutionizing food ordering: predicting the dynamics of chatbot adoption in a tech-driven era

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ABSTRACT

In today's technology-driven world, businesses have recognized the crucial role of real-time customer interaction. Many companies have enthusiastically adopted self-service technologies (SSTs) such as chatbots to fulfill these needs effectively. Our study examines the intention behind utilizing chatbots for food ordering. The proposed model was tested with the PLS-SEM technique on 296 respondents who had experience using a chatbot for food ordering. Given that chatbots are currently in the early stages of adoption, the present study focuses on several key factors directly relevant to the context of AI-based services, such as inconvenience, technological anxiety, anthropomorphism, automation, perceived innovativeness, and perceived intelligence. We seek to explain technology usage using the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technology Acceptance Model (TAM). The study's findings indicate a positive relationship between anthropomorphism, perceived intelligence, and negative association of inconvenience with the intention to adopt. In addition, the intention to adopt significantly predicted the subsequent actual usage. Our study will enrich the existing knowledge landscape and guide future endeavors in AI-driven customer interactions and engagement strategies, leading to a better understanding, fulfilling their needs, and impacting how society perceives and interacts with AI technologies.

Introduction

In today's fast-paced world, the demand for real-time information and seamless interaction with companies has become an undeniable expectation of modern consumers, necessitating businesses to adapt and prioritize responsive and interactive communication strategies (Lee et al., 2023). Information and interaction have recently been considered a competitive

advantage and are becoming prerequisites. Many companies have and proactively invest in the technologies and strategies to meet this growing prerequisite, ensuring their relevance and success in meeting consumer demands, specifically on self-service technologies (SSTs) such as chatbots (Bonfanti et al., 2023; Robinson et al., 2024). It is a software application that converses via auditory or textual methods and other advanced conversational modes (pictorial, hologram, etc. Dinh & Park, 2023). At the beginning of their evolution, chatbots were designed as response platforms (Pillai & Sivathanu, 2020) or recommendation systems in the form of apps or website-based ordering services (Robinson et al., 2024). Today, chatbots have progressed into advanced AI-driven conversational applications that can understand different programmed languages, personalization, and integration. They are equipped with advanced technologies such as machine learning, sentiment analysis, and predictive analytics. Omarov et al. (2023) chatbots are currently used in many industries for customer support, virtual assistance, lead generation, and they are even programmed for mental health counseling, exhibiting their usefulness and increasing usage in modern digital interactions.

Today's artificial intelligence (AI) based chatbots are much more sophisticated due to machine learning and intelligent software algorithms (Hsu et al., 2023; Hussain, Ting, et al., 2024). Modern chatbots are designed to perform in a way that a consumer gets the impression of communicating with an actual person. The idea is to support daily operations and customer support, providing an efficient source of information or virtual assistance while ensuring a pleasant experience. According to Savanur et al. (2021), AI is the replication of human intelligence by machines or systems, enabling them to learn from past experiences, support daily operations, and assist customers without requiring the presence of human involvement.

The escalating growth and the increasing ubiquity of chatbot technology have sparked significant research interest, establishing it as an indispensable tool poised to become an integral part of our daily lives (Bilgihan & Ricci, 2024). Given their interactive nature, chatbots have been extensively used for various purposes across different sectors, facilitated by a shift in the communication landscape (Annaraud & Berezina, 2020). Previous research has researched the interaction style of chatbot (Chattaraman et al., 2019; De Cicco et al., 2021), the functioning and application of chatbots (Savanur et al., 2021), users' perceptions of chatbots (Araujo, 2018), etc. However, there is a dearth of research on the factors that explain why consumers use this technology (Melián-González et al., 2021; Pillai & Sivathanu, 2020). Understanding those factors is essential for marketing practitioners since it enables them to leverage chatbot technology for consumer experience and engagement (Pillai & Sivathanu, 2020) and to reduce the barriers to using chatbots (Hussain, Mirza, et al., 2024). It is also important for developers and

marketers of such software products to optimize their features to provide a more efficient and satisfying shopping experience.

Young generations grew up surrounded by technology and perceived it to be compatible with their lifestyle patterns (Aslam et al., 2017). Technology, along with the evolution of AI, has seamlessly blended into people's lives. AI can handle many service tasks effectively and provide support around the clock, ensuring prompt and convenient support whenever needed. AI-based technologies have gained widespread adoption across various industries, including the food ordering and delivery sector. The utilization of this technology has demonstrated its efficacy in increasing productivity levels within the industry, fostering stronger customer relationships, and expanding market reach (Rohden & Zeferino, 2022). Furthermore, the certainty of real-time information and interaction becomes even more paramount in food ordering. With the critical link to food and the imperative of time efficiency, seamless and immediate communication is paramount to ensure customer satisfaction and operational effectiveness (Mirza et al., 2021). According to Yeo et al. (2017), the time-saving factor in food delivery increases the service value. While one person can only give information and take orders from a small number of customers, a chatbot can interact with many customers at the same time, even if they are connecting from different locations. Since hungry customers are not famous for their patience, fast and error-free ordering can lead to fewer customer complaints, buying withdrawals, and stronger loyalty toward the food service provider.

Nevertheless, it is important to note that the integration of chatbots within the food service delivery sector is currently at an early stage, with limited availability of comprehensive market research findings. The research into the proliferation of chatbots within the food service delivery industry and their consequential effects on the customer's experience remains an area that has yet to be extensively studied (De Cicco et al., 2021). Additionally, the determinants influencing the acceptance and utilization of chatbots in food orders have yet to be thoroughly examined.

In today's technology-driven world, businesses have recognized the crucial role of real-time customer interaction. Many companies have enthusiastically adopted SSTs such as chatbots to fulfill these needs effectively. Despite the ubiquitousness of these advanced SSTs in the contemporary market, the underlying reasons fueling consumer engagement remain unexplored. Our study aims to examine the intention behind utilizing chatbots. We hope to reach a comprehensive understanding of their implications and facilitate informed decision-making in AI-based service implementation. Given that chatbots are currently in the early stages of adoption, the present study focuses on several key factors directly relevant to the context of AI-based services, such as inconvenience, technological anxiety, anthropomorphism, automation, perceived innovativeness, and perceived intelligence. We seek to explain

technology usage using the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technology Acceptance Model (TAM).

The present study made a noteworthy contribution to the existing body of knowledge in the field of food delivery by conducting an empirical investigation to authenticate the impact of various factors on the association between study variables and the inclination to embrace chatbots. The framework presented herein is intended for scholars keen on exploring the implementation of AI chatbots and robotics in the food industry to scrutinize consumer preferences and trends. Our study will contribute significantly to the fields of customer relationship management and digital marketing. By examining factors such as inconvenience, technological anxiety, anthropomorphism, automation, perceived innovativeness, and perceived intelligence, our study delves deep into user perceptions and attitudes toward AI-based chatbots. The projected understanding is crucial for businesses aiming to enhance customer experiences and for businesses to create user-centric, trustworthy, and engaging interactions. The findings will also lead to the creation of more intuitive, user-friendly, and efficient chatbots, advancing the technological landscape of AI-driven customer interactions.

Furthermore, chatbots can play a significant role in customer engagement strategies. By aligning chatbot interactions with user perceptions, businesses can create engaging and interactive experiences through the symbiotic relationship between businesses, customers, and AI-driven technologies. Our study will enrich the existing knowledge landscape and guide future endeavors in AI-driven customer interactions and engagement strategies, leading to a better understanding and fulfillment of their needs and impacting how society perceives and interacts with AI technologies.

Theoretical background and hypotheses development

Various theories and models have been developed in technology acceptance to examine users' cognitive processes and behaviors when encountering and adopting new technologies. These frameworks aim to understand how individuals perceive and accept novel technological innovations and how they subsequently utilize them – potential consequences and effects of users' continued use of these technologies. The selection of technology and its subsequent use can be influenced by various factors, including but not limited to ease of use, complexity, and social influence. Studies on technological acceptance have widely considered TAM and UTAUT and their extended versions for identifying the user's behavioral intention. However, these theories are highly context-based (Lowe et al., 2019) and incapable of capturing novel technologies' acceptance (McLean & Osei-Frimpong, 2019). Compared to previous company-controlled service technologies, AI-based technology is more personal, connected, and accessible (Gummerus et al., 2019). Several
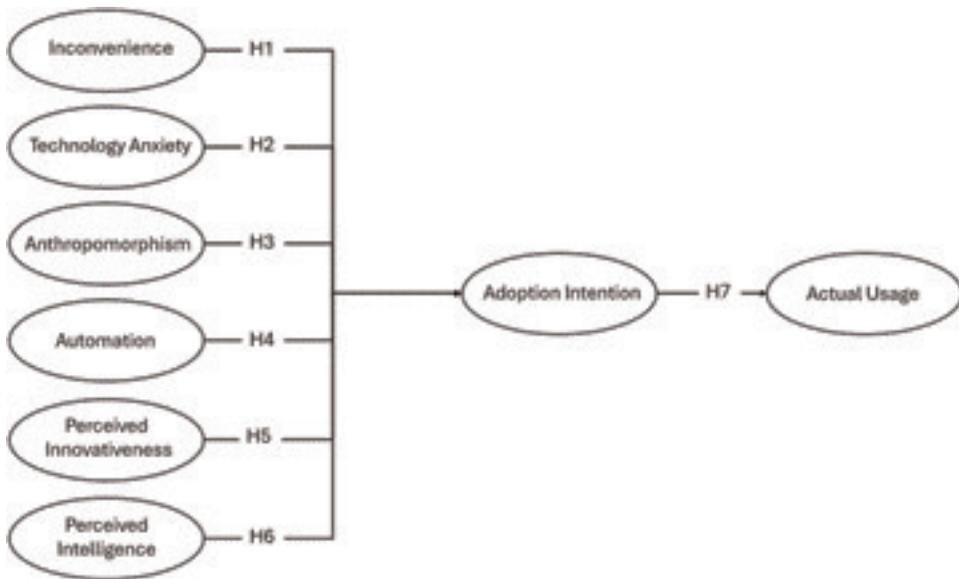
Figure 1. Conceptual model.

studies have incorporated the TAM in their research, such as Al-Qaysi et al. (2020) investigation of social media's impact on vacation destination selection, Unal and Uzun (2021) study on university student behavioral attention, and Chen et al. (2023) exploration of web-based self-service technology in the hospitality sector.

The UTAUT has emerged as a comprehensive and sophisticated framework for understanding technology acceptance. This is primarily attributed to incorporating the most pertinent constructs from earlier theories and models. In a study conducted by Venkatesh et al. (2003), they investigated the following eight conceptual frameworks that have been developed to understand and explain technology acceptance: The theory of Reasoned Activity (TRA), the Theory of Planned Behavior (TPB), TAM, Combined Forms of TAM and TPB (C-TAM-TPB), PC Usage Model (MPCU), Innovation Diffusion Theory (IDT), Motivational Model (MM), and Social Cognitive Theory (SCT). These theories have been widely utilized in technology acceptance research. Consequently, the UTAUT was proposed to combine and use the distinctive attributes of the abovementioned theories and models.

On the other hand, multiple studies have also used the UTAUT model in the healthcare system and the acceptance and use of ICT in tourism (Ali et al., 2022). The studies on AI also highlighted other constructs, such as automation, perceived innovativeness, and inconvenience. Considering the literature, our study conceptualizes the research model (see Figure 1) that assumes that inconvenience, automation, and technological anxiety negatively affect the adoption of Chabot, and personal innovativeness, anthropomorphism, and

perceived intelligence positively impact the adoption intention of a chatbot. Also, adoption intention positively affects the actual usage of chatbots. Given the novelty of chatbots in the services industry, this research incorporates TAM and the UTAUT to enhance our understanding of how food delivery service providers can effectively adopt chatbots for food ordering purposes.

Inconvenience and adoption intention

In the context of technology, convenience encompasses the notion of simplicity and ease of use offered by a particular technology. It captures the ability of the technology to streamline tasks, simplify processes, and provide users with a seamless and effortless experience (Aslam et al., 2019; Zeba et al., 2024). In contrast, inconvenience refers to the difficulty in using the technology (Melián-González et al., 2021).

In chatbots, simplicity is often touted as a key advantage. However, certain features pose challenges, particularly when expressing individual thoughts (Melián-González et al., 2021). Users must express their thoughts and viewpoints that the chatbot can comprehend, and hence, additional time and effort compared to human-to-human communication. Moreover, when customers know they are interacting with a machine, they may feel compelled to express their ideas and thoughts (Melián-González et al., 2021). Research indicates that individuals use positive emotions when engaging with human counterparts, unlike their interactions with chatbots (Hill et al., 2015). These findings highlight the unique challenges and nuances of communication within the chatbot landscape, shedding light on the potential disparities between human-to-human and human-to-chatbot interactions. This implies that people will try to change their conversational style while talking with a chatbot. These changes can slow down human-chatbot interactions, which have been shown to impact client satisfaction with SSTs (Collier & Kimes, 2013). Furthermore, just like with many other SSTs, customers may prefer to interact with human-(Walker & Johnson, 2006) as they feel that interacting with chatbots is inconvenient compared to traditional modes of communication. Hence, based on this, we propose that:

H1: Inconvenience negatively affects the intention to adopt chatbots.

Technological anxiety and adoption intention

The degree to which a consumer experiences dread or concern while using technology is referred to as technological anxiety (Meuter et al., 2005; Pillai et al., 2023), which produces trepidation and fear of using new technology (Igbaria & Parasuraman, 1989; Venkatesh, 2000). It is one of the key variables

identified as a crucial psychological antecedent of technology adoption that reduces the desire to use technology and brings confusion (Meuter et al., 2005). Literature has discussed that technology anxiety leads to avoiding technology and becomes a major barrier (Lam et al., 2008; Mani & Chouk, 2018). Hence, it negatively affects technology adoption (Evanschitzky et al., 2015). Thus, we hypothesize that:

H2:   Technology anxiety negatively affects the intention to adopt chatbots.

Anthropomorphism and adoption intention

Anthropomorphism concerns human qualities and behavior with non-human objects such as chatbots and robots (Bartneck et al., 2008; Pillai & Sivathanu, 2020). When a human interacts with a non-human entity, the person examines the behavior and characteristics of the non-human entity to see if there is a perceived likeness (Wiese & Weis, 2020). With the rise of technologies and smart devices, virtual assistants, and intelligent systems, it is no surprise that individuals are increasingly engaging with non-human entities that exhibit anthropomorphic qualities (Pfeuffer et al., 2019). The emerging AI becomes an indispensable part of people's daily lives, necessitating their acceptance. The element of surprise surrounding AI has dissipated as it has become a familiar presence in our daily lives (Hong, 2021). Uncanny valley theory postulates that people are more optimistic about things/products with anthropomorphic qualities (Gutuleac et al., 2024; Mori et al., 2012). When engaging with people, a key element of chatbots is that they try to appear human-like (Kuhail et al., 2025; Melián-González et al., 2021; Sayed & Abutaleb, 2025). The amount to which machines make customers feel like interacting with another human might boost their engagement and pleasure (Huang & Rust, 2021; Ruijten et al., 2019). Studies have identified that anthropomorphism positively affects the intention to use chatbots (Melián-González et al., 2021; Pillai & Sivathanu, 2020; Sheehan, 2018). Hence, we propose that:

H3:   Anthropomorphism positively affects the intention to adopt chatbots.

Automation and adoption intention

Automation refers to domestic tasks and chores, including controlling lighting, heating systems, and ventilation. This automation technology allows individuals to experience enhanced comfort, convenience, security, and energy efficiency (Pillai et al., 2020; Yang et al., 2018). The adoption of automation in chatbot food ordering has recently experienced a surge,

primarily attributed to the improved affordability and ease of use of technological advancements. The factors influencing the behavioral intention to adopt robotics and automation include perceived usefulness, perceived ease of use, perceived compatibility, perceived risk, and perceived cost (Aldossari & Zin, 2019). A study by Alboqami (2023) investigates the factors that influence consumers' adoption of chatbots using TAM. Adopting automation is influenced by various factors, including perceived usefulness, ease of use, compatibility, risk, and cost.

Additionally, the adoption of automation has been studied in various contexts, including robotics and autonomous vehicles. There is limited literature on automation negatively affecting the intention to adopt chatbots. However, the studies reviewed suggest that the adoption of chatbots is influenced by various factors, such as consumers' attitudes, beliefs, and perceptions. Thus, we hypothesize that:

H4: Automation negatively affects the intention to adopt chatbots.

Perceived innovativeness and adoption intention

Innovativeness measures how open individuals are to new ideas compared to other members of their social group system (Johannessen et al., 2001). In other words, the willingness of an individual to try out any new information technology (Acikgoz et al., 2023). Although we live in the information technology era, consumers' use of technology varies (Camilleri, 2024). As a result, some consumers choose to employ new technology, while others reject it or delay its adoption (Laukkanen et al., 2008). Studies have shown that individuals' intention to use technology for online shopping was favorably associated with their innovativeness (Kwarteng et al., 2023). Based on this, it can be assumed that consumer innovativeness is positively linked to the use of technology. Therefore, we hypothesize that:

H5: Perceived innovativeness positively affects the intention to adopt chatbots.

Perceived intelligence and adoption intention

Previous literature has explored the perception of intelligence associated with the speech, voice, and appearance of various entities, including robots. Experimental studies have shown that individuals attribute intelligence to these factors (Duffy, 2003; Mirnig et al., 2017; Pillai & Sivathanu, 2020). A chatbot's or robot's perceived intelligence relies on

its competence, efficiency, use, and ability to provide valuable outcomes (Moussawi & Koufaris, 2019; Yu, 2020) or how a chatbot provides solutions to clients within limited interaction (Bartneck et al., 2008). Intelligent robots are thought to be more alive, and robots that provide personalized information and interact with people have been found to have higher adoption (Rosenthal von der Pütten et al., 2017; Stadler et al., 2014). Perceived intelligence is one of the forerunners of adoption intention in hotel service robots (Tussyadiah & Park, 2018) and intelligent personal agents (Moussawi & Koufaris, 2019). In the tourism context, chatbots help deliver real-time travel booking solutions by resolving issues with travel planning and scheduling, and hence, they positively affect adoption intention (Pillai & Sivathanu, 2020). Therefore, we propose that:

H6: Perceived intelligence positively affects the intention to adopt chatbots.

Adoption intention and actual usage

The perceived likelihood of an individual engaging in a particular behavior is measured by adoption intention (Fishbein & Ajzen, 1975). Behavioral intention aims to understand and anticipate how consumers react to new technologies (Davis, 1989; Fishbein & Ajzen, 1975; Martins et al., 2014; Venkatesh et al., 2003). Actual usage refers to the assistance technology provides in achieving goals through technology (Burton-Jones & Grange, 2013). The studies on consumer acceptance of new technologies confirm the link between adoption intention and actual consumer behavior (Hoque & Sorwar, 2017; Wei et al., 2021). The influence of adoption intention on the actual usage of tourist technology is supported by existing studies (Ghanem et al., 2017; Gupta et al., 2018). The adoption and usage of chatbots in various domains are driven by their ability to streamline customers' requirements and deliver the required service, fostering improved customer engagement and loyalty (Wamba-Taguimdje et al., 2020). Given that a chatbot is a relatively new and innovative technology, its adoption and usage rates remain uncertain. Hence, we postulate that:

H7: Adoption intention positively affects the adoption and actual usage of chatbots.

Methodology

Data collection

Our study collected data from Pakistan, focusing on people who regularly use online food delivery apps and websites. According to a recent report, the annual revenue generated by this industry in Pakistan was approximately US $1,991 million in 2024, with an expected growth of US$3,372 million by 2029 (Statista, 2024).

The link to the self-administered questionnaire was posted from personal accounts on different social-media food content-related groups on Facebook (e.g., *Pakistan Food Forum, Voice of Customer*). To enhance generalizability, this method helps to approach a wider audience with different socio-demographic backgrounds and from different geographic regions of the country. Also, to reach the right audience, we selected only those groups that have at least five thousand members and actively shared daily food-ordering experiences and related topics on these forums. A screening question was asked to identify the targeted respondents: have you used a chatbot while ordering food online within the last month? They can only proceed to the next page if they select yes. Otherwise, they automatically exit with a thank you note. A total of 323 complete responses were received, and after removing some biased surveys (e.g., straight-line answers), 296 responses were retained for final analysis.

Measures

All the measurement items were adapted from existing literature for better reliability and validity. We used scale for the inconvenience, perceived innovativeness, anthropomorphism, and automation developed by Melián-González et al. (2021). Whereas, items for technology anxiety were borrowed from Meng et al. (2022), perceived intelligence from Balakrishnan et al. (2022), adoption intention from Kaushik and Rahman (2015), and actual usage from Zhou et al. (2010). The scale items used in this study are summarized in Table 2.

Results

Demographics

The demographic details of all 296 respondents are given in Table 1. The majority of respondents were female (55%), whereas 45% were male. Slightly more than half of the sample is comprised of the young population, with 46% being aged between (21–25 years), 23% (15–20 years) and 17.5% (26–30 years).

Table 1. Respondent profile (*n* = 296).

Characteristics	Distribution		Percentage (%)
Gender			
	Male	134	45.3
	Female	162	54.7
Age			
	15–20	68	22.9
	21–25	136	45.9
	26–30	52	17.5
	31–35	29	9.7
	36 and above	11	3.7
Frequency			
	Daily	86	29.1
	A few times a week	106	35.8
	Once a week	76	25.7
	Monthly	28	9.5
Monthly spending (Pkr*)			
	<500	37	12.5
	501–1000	91	30.7
	1001–1500	65	21.9
	1501–2000	61	20.6
	>2000	42	14.2

*Pakistani Rupee.

Regarding engagement with online food ordering activities, around 30% of the sample engaged daily, 36% a few times a week, and 26% once a week.

Measurement model

We tested the construct reliability using composite reliability (CR) and Cronbach alpha (values above 0.70). Convergent validity is established by the values of average variance extracted (AVE) and outer loadings, which should meet the cutoff values of > 0.5 and > 0.7, respectively (Hair et al., 2016). Table 2 reports the values of CR, AVE, and outer loadings.

To assess discriminant validity, we employed the Heterotrait-Monotrait (HTMT) ratio of the correlation criterion (Henseler et al., 2015). According to the recommended threshold, HTMT values should be less than 0.85 to confirm adequate discriminant validity. As presented in Table 3, all HTMT values fall below the threshold, indicating that discriminant validity has been established in our measurement model (Hair et al., 2017). This result confirms that the constructs in the model are sufficiently distinct.

Structural model

For hypotheses testing, bootstrapping was performed using 5000 subsamples. The outcomes of a path analysis are presented in Table 4, which revealed that perceived intelligence predominantly affects adoption intention ($\beta = 0.393$, $p < 0.05$), followed by automation ($\beta = 0.192$, $p < 0.05$) and anthropomorphism ($\beta = 0.200$, $p < 0.05$). Furthermore, the results revealed that inconvenience negatively affects adoption intention ($\beta = -0.119$, $p < 0.05$). In contrast,

Table 2. Assessment results of the measurement model.

Items	Loadings	Adapted Sources
Inconvenience (INC), CR = 0.847, AVE = 0.624		
INC1: Using chatbots is inefficient since chatbots frequently do not understand what I am expressing.	0.745	Melián-González et al., (2021)
INC2: expressing an idea to a chatbot is more complicated than doing so to a human.	0.817	
INC3: Using chatbots is impractical since typing is required.	0.712	
INC4: Using chatbots is uncomfortable since I must express my ideas in a way that is understandable to the chatbot.	0.877	
Technology Anxiety (TAX) CR = 0.913, AVE = 0.621		
TAX1: Using chatbot services would make me feel very nervous	0.824	Meng et al., (2022)
TAX2: Using chatbot services may make me feel worried	0.755	
TAX3: Using chatbot services may make me feel uncomfortable	0.801	
TAX4: Using chatbot services may make me feel uneasy and confused	0.775	
Anthropomorphism (ANT), CR = 0.753, AVE = 0.565		
ANT1: The conversation with a chatbot must resemble one with a human being.	0.718	Melián-González et al., (2021)
ANT2: Conversations with chatbots should be natural.	0.730	
ANT3: Chatbots should seem as if they understand the person with whom they are interacting	0.811	
ANT4: Conversation with a chatbot should not be artificial	0.743	
Perceived Innovativeness (IIN), CR = 0.710, AVE = 0.632		
INN1: I find new tools that are easy to use.	0.819	Melián-González et al., (2021)
INN2: I am a person with technological skills, I like to be up to date with the latest things.	0.740	
INN3: I am always seeking new ways and new tools.	0.824	
Automation (AUT), CR = 0.791, AVE = 0.679		
AUT1: I think that chatbots are going to replace workers.	0.898	Melián-González et al., (2021)
AUT2: Jobs currently performed by human beings will be performed by chatbots.	0.712	
AUT3: Firms will use more chatbots and fewer workers.	0.851	
Perceived Intelligence (INT), CR = 0.822, AVE = 0.574		
INT1: Chatbots are competent in providing services.	0.706	Balakrishnan et al., (2022)
INT2: Chatbots are knowledgeable during service interactions.	0.799	
INT3: Chatbot exhibits responsibility during service interactions.	0.770	
INT4: Chatbots have intelligent functions that are concerned with services.	0.709	
INT5: Chatbots are sensible during service replies.	0.800	
Adoption Intention (ADI), CR = 0.765 AVE = 0.675		
ADI1: I intend to use chatbot technology in the future.	0.840	Kaushik & Rahman, (2015)
ADI2: I plan to use chatbot technology in the future.	0.738	
ADI3: The likelihood that I would recommend the chatbot technology to a friend is high.	0.881	
Actual Usage (ACU), CR = 0.846, AVE = 0.765		
ACU1: I often use chatbot technology for food ordering.	0.885	Zhou et al., (2010)
ACU2: I frequently interact with chatbots to get restaurant recommendations.	0.860	
ACU3: I frequently utilize chatbots to track my food delivery status.	0.878	

technology anxiety and perceived innovativeness do not have any impact on adoption intention ($\beta = 0.007$, $p > 0.05$) and ($\beta = 0.027$, $p > 0.05$), respectively. Adoption intention was a significant determinant for actual usage, having $\beta = 0.597$ and $p < 0.05$.

Discussion and conclusion

With the proliferation of the internet and the emergence of virtual assistance services, chatbots are becoming an integral component of almost every

Table 3. Discriminant validity (HTMT criterion).

	ADI	ANT	ACU	AUT	INC	INN	INT	TAX
Adoption Intention								
Anthropomorphism	0.654							
Actual Usage	0.745	0.476						
Automation	0.609	0.594	0.413					
Inconvenience	0.295	0.266	0.204	0.109				
Perceived Innovativeness	0.542	0.562	0.410	0.479	0.225			
Perceived Intelligence	0.754	0.551	0.769	0.551	0.197	0.675		
Technology Anxiety	0.170	0.147	0.099	0.093	0.598	0.233	0.190	

Table 4. Hypotheses testing.

	Hypotheses Path	Path Coefficient	t-Statistics	p-Values	Decision
H1	Inconvenience -> Adoption Intention	−0.119	2.094	0.018	**Supported**
H2	Technology anxiety -> Adoption Intention	0.007	0.144	0.443	Not Supported
H3	Anthropomorphism -> Adoption Intention	0.200	2.237	0.013	**Supported**
H4	Automation -> Adoption Intention	0.192	3.024	0.001	Not Supported
H5	Perceived innovativeness -> Adoption Intention	0.027	0.457	0.324	Not Supported
H6	Perceived intelligence -> Adoption Intention	0.393	5.788	0.001	**Supported**
H7	Adoption Intention -> Actual Usage	0.597	14.37	0.001	**Supported**

industry and people. Industry and academic professionals, especially from online food services providers, continuously explore whether- and- how such Al-enabled chatbots can be integrated into the online system and improve customer food ordering experiences. By integrating TAM and UTAUT, our study proposes a comprehensive model that illustrates the influence of factors from TAM and UTAUT's theoretical perspectives toward adoption intention and actual usage of such technologies in online food ordering.

Aligned with prior studies Melián-González et al. (2021), significant and negative results regarding inconveniences and adaptation intention were revealed (H1). Chatbots can answer straightforward questions or perform basic tasks but often struggle with complex, multilayered, or uncommon situations. This is also highlighted in the previous literature, which stated that people feel more positive and associated when communicating with humans than virtual agents or chatbots (Hill et al., 2015).

Consistent with prior studies, our results demonstrated that anthropomorphism positively affects the intention to utilize chatbots for food ordering (H3). For instance, Melián-González et al. (2021) found that anthropomorphism positively influenced the intention to use chatbots in travel and tourism. Similarly, Pillai and Sivathanu (2020) reported a positive relationship between anthropomorphism and chatbot adoption intention in the hospitality sector. In the context of food ordering, the positive impact of anthropomorphism on adoption intention suggests that users appreciate chatbots that can simulate human-like interactions. This preference may be particularly relevant in the

food service industry, where customers often value personal touch and custo-mization. Our study reveals that the choice to use chatbots in food ordering is strongly influenced by perceived intelligence (H6). This means that customers will be more prone to interact with chatbots if they find that the chatbot is relatively competent, knowledgeable, and sensible; thus, they will adopt chat-bots as helpful assistants when ordering food. It is also established in previous research that a chatbot's perceived intelligence has a positive influence on adoption intention, which is in line with previous research on hotel service (Tussyadiah & Park, 2018) and travel booking (Pillai et al., 2023).

Contrary to expectations, results further revealed that automation positively influences the intention to use chatbots when ordering food, which is incon-sistent with our proposed hypothesis (H4). This might be because earlier generations often feared technology because of human psychology, societal structures, and cultural beliefs. However, with the advances of such self-service technologies, people's beliefs completely changed and now they enjoy a more seamless user experience while ordering food through chatbots. Furthermore, technology anxiety and perceived innovativeness are insignificant to adoption intention. This suggests that technology anxiety (H2) and perceived innova-tiveness (H5) may not be decisive factors in determining their willingness to adopt and utilize a chatbot. This also indicates that the attitude (especially of the young generation) toward technology has changed somewhat in recent years. People are becoming increasingly familiar with different technologies; as a result, technological anxiety and perceived innovativeness could become less critical in deciding to use a specific technology.

Finally, study findings strongly support the hypothesis that adoption inten-tion positively affects the adoption and actual usage of chatbots H7. Consistent with several previous studies e.g., Ghanem et al. (2017) found that adoption intention positively influenced the actual usage of e-tourism technologies in Egyptian tourism companies. Similarly, Gupta et al. (2018) reported a positive relationship between adoption intention and actual usage of smartphone apps in the tourism context.

Theoretical contributions

The markets for AI services are experiencing a surge in developer and service provider participation. The acceptance of AI services as a novel service form needs further exploration. Our study examined how customers interact, feel, and behave when using chatbots to place online food orders. As chatbots become increasingly important in many sectors, understanding customer responses to this technology is pivotal for businesses aiming to tailor their services effectively. The study's framework is intended for scholars interested in exploring the implementation of AI chatbots and robotics in the food industry to scrutinize consumer preferences and trends. The findings equip

businesses with actionable intuitions to enhance their AI-driven services and pave the way for more innovative, user-friendly, and customer-centric chatbot applications. Our study aligns with the broader objective of advancing technology in ways that support and enhance human experiences. The study's findings will contribute significantly to the fields of customer relationship management and digital marketing. By examining factors such as inconvenience, technological anxiety, anthropomorphism, automation, perceived innovativeness, and perceived intelligence, the study delves deep into user perceptions and attitudes toward AI-based chatbots. Projected understanding is crucial for businesses aiming to enhance customer experiences and create user-centric, trustworthy, and engaging interactions.

Our study also leads to the creation of more intuitive, user-friendly, and efficient chatbots, advancing the technological landscape of AI-driven customer interactions. Furthermore, chatbots can play a significant role in customer engagement strategies. By aligning chatbot interactions with user perceptions, businesses can create engaging and interactive experiences through the symbiotic relationship between businesses, customers, and AI-driven technologies. Our study enriches the existing knowledge landscape and guides future endeavors in AI-driven customer interactions and engagement strategies, leading to a better understanding and fulfillment of their needs and impacting how society perceives and interacts with AI technologies. Our study provides evidence from various studies that support the importance of factors such as anthropomorphism, perceived intelligence, and perceived usefulness in predicting users' adoption and actual usage of chatbots in the food industry.

From a theoretical standpoint, this study advances the application of the TAM theory by focusing on the adoption of SSTs. This research endeavor aims to enhance our comprehension of the elaborate dynamics between SSTs, such as chatbots, and the food service sector. Specifically, it examines the implications of the TAM on customers' food ordering encounters within this industry. This study examines anthropomorphism and automation in the TAM framework to understand better why food service workers use AI-driven solutions. These findings can be used beyond food ordering to design more user-friendly and practical AI agents in hospitality and other sectors, enabling informed technology-based solution development and implementation (Rese et al., 2020; Romero-Charneco et al., 2025). This way, the study strengthens the theoretical underpinnings of technology adoption while directly impacting practical applications and user experiences in the evolving landscape of AI and food services.

Our study also employs the UTAUT model in a novel way to explain the adoption of information technologies. It is important to note that the inconveniences associated with using a specific technology have not been previously considered in SSTs literature (Blut et al., 2016). Furthermore, the correlation between automation and chatbot intentions is positive, suggesting that

consumers value technology's advantages over potential drawbacks. Therefore, compared to what some data (Wike & Stokes, 2018) and research (McClure, 2018; Melián-González et al., 2021) suggest, there may be less fear of automation than it seems.

Additionally, our research adds to the knowledge of chatbot design by building on earlier studies like Ciechanowski et al. (2019) study. Although these authors demonstrated that consumers are more at ease and prefer simple chatbots, we also stress the importance of considering a hedonic viewpoint. A hedonic viewpoint is crucial in cultivating positive user experiences, increasing engagement and retention, differentiating in a competitive market, shaping positive brand perceptions, and fostering long-term user adoption (Zeba et al., 2024). It aligns with the evolving expectations of those users who seek functionality and emotionally satisfying interactions with AI technologies.

Managerial & practical implications

This research provides critical insights for practitioners and managers on chatbots for food ordering. From a managerial standpoint, the implications of our study are clear-cut: The present study aims to investigate the determinants that impact the decision-making process of businesses regarding the implementation of chatbots. Specifically, the research focuses on the adoption of chatbots in the food service delivery industry, which is currently in its nascent stage. The findings of this study provide valuable insights for practitioners and managers operating in this sector, enabling them to make informed decisions. The developers and marketers of food delivery services who utilize chatbots for food ordering ought to ensure that the chatbots are intuitive, user-friendly, and practical for users to adopt. In addition, managers can incentivize users to adopt chatbot technology by emphasizing its potential to offer personalized experiences and recommendations, save time, and provide convenience to alleviate inconvenience. When developing chatbots for food ordering, it is imperative to ensure that the chatbots offer a user interface that is simple and easy to use (Hsiao & Chen, 2022) to minimize any perceived inconvenience and facilitate the adoption of the technology.

Secondly, the predominance of younger respondents aligns well with the current trends in technological adoption, particularly in the context of food-ordering apps and chatbots. This age group, often referred to as digital natives, tends to be more comfortable with and receptive to new technologies. So, service providers can make such AI-enabled chatbot technologies more attractive for them by providing more interactive experiences, for example, chatbots can be programmed to mimic non-verbal behaviors of conversational agents (e.g. smiling, head nodding, posing; Maar et al., 2023). Likewise, marketing messages for chatbot services should emphasize the benefits of social comfort

(e.g., you can have a friend by your side with a chatbot) akin to the younger generation's social needs (Dinh & Park, 2023; Kholkina et al., 2025).

Thirdly, chatbots can collect and scrutinize customer information to provide tailored recommendations. Managers can leverage this functionality to augment both the intention and the actual usage of chatbots. Managers should solicit user feedback to improve chatbot design and functioning. For the tourism sector, where perceived intelligence is a major motivator for adopting chatbots, trust must be established by providing genuine service through chatbots (Iancu & Iancu, 2022). Chatbot developers must ensure their chatbots possess anthropomorphic characteristics to elicit a sense of realism, vitality, and human-like qualities among consumers. Implementing multilingual capabilities in chatbots is a straightforward undertaking for designers and developers, resulting in a more hospitable user experience for their clientele. Ensuring that chatbots do not cause technological anxiety among users is a crucial responsibility of practitioners. Designers must develop chatbots with a user-friendly interface to alleviate clients' apprehensions regarding novel technologies. Furthermore, consistently monitoring and responding to user feedback can increase the chances that the chatbot conforms to customer-perceived innovativeness and intelligence, resulting in a gradual intention to adopt.

Limitation & future research

Although this study revealed some interesting insights about using chatbots in online food ordering, some limitations still need to be acknowledged. First, the study did not consider the potential influence of cultural differences. Conducting comparative research between a developed and developing nation would be a valuable contribution to the current scholarly discourse. Future research could benefit from comparative studies that examine chatbot adoption in diverse cultural settings, which would provide insights into how cultural norms and values (e.g., online privacy issues) influence user interactions with AI technologies. Second, the study did not consider differences in income levels and ages of consumers. It was found that younger consumers, those with a higher body mass index (e.g., those more likely to be influenced by deals on high-calorie and discounted items), and those with higher education interacted with chatbots more frequently (Arli et al., 2024). Third, it is important to note that all the data collected in this study was obtained using self-reported scales, which can introduce measurement errors (Hussain et al., 2023). Technology advancements are inevitably transforming the world of food ordering, which will result in a higher level of immersion and personalization. With the increased use of voice and Neuro-Linguistic Programming technologies, food ordering experiences are becoming more convenient and

efficient (Chakraborty et al., 2024). Fourth, although recent studies high-lighted the importance of AI-based chatbots and other tools, the adoption and acceptance of such technologies are not well understood both by academia and industry. A possible explanation might be the lack of a reliable and valid scale to measure the user's motivation to adopt such technologies. Therefore, further studies can develop a psychometrically valid scale of chatbot adoption intention by following Churchill (1979) guidelines.

Lastly, as we can see from the demographic, around two-thirds of respondents consisted of younger respondents (around 70% aged 15–25 years). This age skew may limit the generalizability of our findings across different age groups and potentially overlook the perspectives of older consumers who might have different attitudes toward chatbot technology. Future research should aim to include a more balanced representation of age groups, particularly focusing on older consumers, to understand generational differences in chatbot adoption.

Conclusion

This study aims to uncover the importance of different antecedents associated with the adoption intention of chatbots while ordering food online. The proposed model was tested with the PLS-SEM technique on 296 respondents who had experience using a chatbot for food ordering. The study's findings indicate that anthropomorphism and perceived intelligence are positively correlated while inconvenience is negatively associated with adoption intentions. As a result of our study, the existing knowledge landscape will be enhanced and future endeavors in AI-driven customer interactions and engagement strategies will be guided, resulting in a better understanding and fulfilling their needs.

Disclosure statement

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