# Optimising Customer Service Delivery and Response Time through AI-Enhanced Chatbots in Facilities Management-A Mixed-Methods Research

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## ABSTRACT

The present study aimed to assess the effect of AI-enhanced chatbots that optimize customer service delivery and response times on facility management. It utilised the Technology Acceptance Model (TAM) and Social Response Theory (SRT) for this purpose. The research adopted a mixed-methods methodology aimed to explore the multiple perspectives of 10 facility managers and facility service providers affiliated with facilities management departments in the UAE, Qatar and Saudi Arabia regarding the benefits and challenges of AI-enhanced chatbots. This research used correlation analysis and regression to examine the relationships between variables. Correlation analysis, using SPSS 24.0, showed strong positive correlations between five AI-enhanced chatbot factors: Perceived Usefulness (PU), Perceived Ease of Use (PEoU), Behavioural Intention to Use (BIoU), Responsiveness (RP), and User Satisfaction (US) (Pearson Correlation Coefficient>0.7). Regression analysis indicated a significant impact of all these variables on facilities management (p<0.05). The study found that AI-enhanced chatbots in facilities management improve communication, responsiveness, and operational efficiency. They automate workflows, handle manual tasks, predict failures, and respond to customer queries. However, challenges include technical issues, limited human-human interaction, system quality and security, and user adoption. Chatbots deliver productivity gains and are used for automated reporting, identifying hazards, conducting briefings, managing meetings, providing training, supporting teamwork, ensuring well-being, and enhancing customer service.

## INTRODUCTION

Text-based conversational systems or conversational Artificial Intelligence (AI) referred to commonly as chatbots are the designed software systems for human interaction using natural language processing (NLP) (Gnewuch *et al.*, 2022; Lin, 2023). Chatbots are categorised based on two objectives including task oriented and non-task oriented; task-oriented chatbots are those compatible highly with the information retrieval requirement for effective decision making. Thereby, chatbots have gained widespread attention in various industries like finance, e-commerce and healthcare due to growing demand for convenient and efficient customer service (Gnewuch *et al.*, 2022). Notwithstanding, using live chat interfaces to communicate with customers in e-commerce settings improves real-time customer service to obtain information for product details or assistance in solving technical problems. Chatbots have thus enhanced the two-way communication significantly affecting customer satisfaction, trust, word-of-mouth (WOM) intentions and repurchase (Adam *et al.*, 2021). Over 100,000 chatbots have already been created as of 2017 on Facebook Messenger only for customer service delivery through instant messaging apps and social media (Meyer-Waarden *et al.*, 2020).

Facilities management or facility management has been called multiple things, including asset management, business infrastructure management and invisible service for building. It has evolved by merging as a business support service and building maintenance management business (Atkin & Bildsten, 2017). Interoperability capabilities of Building Information Modeling (BIM) are effective in the application of facility management, construction and building maintenance stages referring to technology-based solutions for improving inter-organisational productivity and collaboration (Ghaffarianhoseini *et al.*, 2017). A chatbot is developed as a friendly user interface to improve the user experience and efficiency in facility management, integrating BIM, NLP and ontological techniques to generate immediate responses (Lin, 2023). A delayed response time negatively impacts usage intentions and the social presence of users, affecting customer service in facility management (Gnewuch *et al.*, 2022).

Nonetheless, it is worth noting here that a key challenge faced in designing conversational user interfaces is to make sure that the conversations feel human-like and natural. Thus, to increase perceived humanness, chatbots may use response delays; however, this can affect user satisfaction, especially in situations where fast response times are expected, i.e., customer service. Service delivery and system response time are correlated, being critical factors for productivity and user satisfaction among chatbots. For example, when the response time is slow in customer service live chats, it creates negative website quality perceptions among users (Gnewuch *et al.*, 2018). Additionally, the chatbot provides improved functionality in real-time scenarios, emphasising its usefulness within

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an organisation dealing with relevant challenges, including complex business domains, cost factors and limited responsiveness, etc. (Majumder & Mondal, 2021).

Although previous research has widely discussed AI-enhanced chatbots in various fields, implementing them in facilities management for optimising service delivery and response time has been discussed rarely. It has been noted that chatbots in facility information delivery solution promises three benefits, including handling large amounts of complex data, containing tedious information and having high mobility, reducing time to solve users' query with intuitive user interfaces (Chen & Tsai, 2021). However, with a great many benefits, there might be a few challenges associated with AI-enhanced chatbots as well. Therefore, the current research opted for a mixed-methods approach to examine the impact of AI-enhanced chatbots optimising customer service delivery and response time on facility management using the Technology Acceptance Model (TAM) and Social Response Theory (SRT). It is also aimed at exploring the in-depth perspectives of personnel linked with the facilities management department in the UAE, Qatar and Saudi Arabia on the benefits and challenges of AI-enhanced chatbots optimising customer service delivery and response time.

## LITERATURE REVIEW
### AI-Enhanced Chatbots

The first chatbot 'ELIZA' was developed in the 1960s; however, broader organisational interest was not gained until the 2010s. On Facebook alone, 300,000 chatbots were developed at the beginning of 2016, having common applications in e-commerce, customer service, workplace employee support and healthcare (Gnewuch et al., 2022). It is estimated that conversational agents can reduce the costs of current global business to around $1.3 trillion by solving 265 billion queries of customers per year by reducing their response times, freeing up the human workload for different work and dealing with the 80% of routine questions (Adam et al., 2021). Siri was developed in 2010 by Apple, which makes conversations and resolves inquiries using voice commands through messengers integrating with video, audio, and image files. Later, in 2011, a Watson names chatbot was developed by IBM and Google Now was developed in 2012 by Google. Cortana, the Microsoft-designed personal assistant and Alexa, a human-automation chatbot, were designed in 2014. Notably, Chatbots are categorised into various categories; knowledge domain, service provided, response generation method, human-aid, communication channel and permissions (Adamopoulou & Moussiades, 2020).

Siri and Alexa are task-based dialog agents which are known for creating short conversations, including making phone calls, describing routes, etc. However, conversational AI-based chatbots are non-task-oriented dialog systems used in customer service for various purposes. These are focused on imitating conversations like humans focused on certain tasks. Xioaice is developed

as a non-task-oriented agent by Microsoft Pecking, which is like a friend (Akhtar et al., 2019). Additionally, OntBot was developed using NLP to ease user interactions, providing support that can process e-commerce queries. Ask Diana is a chatbot known for providing information relevant to disaster-related information delivery in facilities management (Chen & Tsai, 2021). Besides, some of the Facebook Messenger-based chatbots that generate a response to users by interacting with them include DBpedia, SOGO, Arts-bot, SHIHbot, CISEC, E-Commerce Website Chatbot, Nombot, and CALMsystem (Maroengsit et al., 2019).

### AI-Enhanced Chatbots in Facilities Management

AI components, including "pattern recognition" and "machine learning," integrate a potential value in the AI-enhanced alternative workflow for humans. The continuous advances of smart digital tools are effectively operating in improving customer services and solving problems (Burry, 2022). Furthermore, the access to AI-enhanced chatbots anywhere and anytime with the integration of cloud-BIM and augmented reality (AR) offers extreme assistance for facilitating decision-making. It provides support to facility managers contributing towards customer service (Su et al., 2021). Similar to humans, chatbots offer customer service, integrating relationship management with consumers. These include relational-oriented behaviours and functional-oriented behaviours assisting consumers in buying decisions. Despite the fact that chatbot has no emotions, which is considered its dark side, it has attained multiple benefits in faster service delivery, satisfying immediate customer needs. Leveraging the fact that computers are social actors, traits of chatbots are considered trustworthy, reducing the spread of negative WOM (Su et al., 2021).

AI chatbots are used in organisations to help staff members access business information and documents online, offer translation services, gather data from various sources, and format gathered data to adhere to organisational guidelines. By facilitating easy access to, discovery of, and management of work resources, AI chatbots are said to enhance employees' experiences (Gkinko & Elbanna, 2023). In addition to being used increasingly often in working settings to help employees, AI chatbot systems are utilised to support customers in a range of industrial sectors (including healthcare, banking, retail, and education). AI chatbots have shifted from emphasising the perspective of employees to that of either designers or customers (Gkinko & Elbanna, 2023). The validity of compliance and persuasion strategies in technology-based self-service contexts is being debated as chatbots replace human customer care representatives. Conversational Agents provide 24-hour electronic channels for consumers, offering quick, easy, and affordable communication. However, the nature and caliber of these exchanges vary significantly. For example, consumers use more profanity and speak for longer periods, which could affect their cooperation in

response to chatbot suggestions and requests. Therefore, understanding the differences between humans and chatbots is crucial for effective customer service (Adam *et al.*, 2021).

## AI in Customer Service Delivery and Response Time in Facilities Management

According to Gkinko and Elbanna (2023), a major challenge of balancing service quality and service efficacy is faced by customer service providers. Therefore, the potential benefits of chatbots are considered significant for customer self-service, including reduced costs, time efficiency and enhanced customer experience. It impacts improving provider-customer encounters and service quality by being a cost-saving as well as time-saving approach (Gkinko & Elbanna, 2023).

Using AI-based chatbots is all about easing human life by knowing information or news to make recommendations, suggestions, shopping services, etc. AI-based communication agents support facility management in a wide range of services that improve customer service, including providing customer support, scheduling meetings, giving financial assistance, suggesting policies, advising insurance policies, offering administration-based services, etc. (Nirala *et al.*, 2022). Big data simplifies the role of CRM staff by providing them with advanced insights into client behaviour patterns, enabling them to manage each customer effectively. This data also allows for better engagement across channels, enabling manufacturers to assess customer reactions to new products on social networks and media. This allows them to pinpoint the optimal CRM approach for each client, ultimately resulting in cost-effectiveness for all CRM actions (Anshari *et al.*, 2019).

Facility/asset owners and operators have accumulated enormous amounts of data over the years but frequently lack the tools to utilise them fully. Humans have a very limited ability to interpret the given data, which is where AI comes into play since it can provide top management with well-reasoned, well-supported advice on which to base a decision. It is crucial to understand that intermediate managers, which include facility and asset managers, might be disregarded in this situation since mission-critical choices are made much more quickly than normally (Atkin & Bildsten, 2017). In the research by Chen & Tsai (2021), to implement the created information distribution strategy, a chatbot based on LINE, an instant messaging service with the greatest market share in Taiwan, was prototyped. The LINE chatbot offers customers two primary interfaces via which they can get or utilise rules to query the facility management data.

The efficiency is maximum, and speed is almost twice as quick when the participant chooses an item from the chatbot's clickable menu to get information. Additionally, a user's performance was the same while utilising the chatbot and the facility management platform to input natural language to get information.

## Theorisation of Constructs and Hypothesis Development
### Technology Acceptance Model (TAM)

The utilisation of emerging technologies, such as AI and service robots, and their acceptability by users are predicted using TAM. The service robot acceptance model (sRAM), which incorporates relational and social-emotional components, adjusts and improves the TAM. TAM attempts to study how external factors affect a person's internal beliefs, attitudes, and intentions by drawing on the Theory of Reasoned Action. TAM analyses two crucial factors-the Perceived Usefulness (PU) and the Perceived Ease of Use (PEoU)-to study the behaviours associated with technology adoption (Meyer-Waarden *et al.*, 2020). These two aspects are related to the motivational factors which create an influence on behavioural intentions and user satisfaction. PU reflects upon the beliefs of users about their experiences of using technology, whereas PEoU is based on the perceived system quality of chatbot for the user with limited response time and easy availability of chatbot systems. The motive is to provide reliable information for user support needs, increasing levels of trust and satisfaction (Nguyen *et al.*, 2021).

PU is known as the degree to which it is believed that a particular system would improve an individual's job performance. PEoU refers to a person who perceives that using a specific system would be free of effort. Therefore, AI-enhanced chatbots are perceived as easy to use by users for acquiring quick knowledge and system-wide optimal solutions free from human fatigue and error. Chatbots enhance service delivery within four dimensions, including reliability, empathy, responsiveness and tangibles. It is the distinction that increases the intention to reuse the chatbot (Meyer-Waarden *et al.*, 2020). TAM allows for meeting the requirements of social influence, complexity and ease of use, which affects the user's choice of technology selection (Humairoh & Susilo, 2023).

### Social Response Theory (SRT)

A set of social cues are posited from computers in social response theory (SRT), such as using natural language, interacting with others, triggering mindless responses from humans, and playing social roles irrespective of whether the cues are rudimentary or not. Thereby, it is noteworthy here that a chatbot's response time may trigger social responses that are shaped by the social expectations of users. The persuasiveness of the chatbot's messages is influenced by response time (Gnewuch *et al.*, 2018). In digital contexts, anthropomorphism is the attribution of human-like behaviours, characteristics and emotions to non-human agents (Adam *et al.*, 2021). Chatbots mainly interact with customers through messaging-based interfaces in a real-time dialogue via dynamic and physical representations. However, some believe that due to the immediate response of chatbots, they may appear as non-human, so a little delay in dynamic responses may

increase social presence, user satisfaction and perceived humanness (Gnewuch *et al.*, 2022). It creates an impact on the behavioural intention to use in customer service delivery and dynamic response times (Adam *et al.*, 2021). Based on the theoretical foundation of TAM and SRT, the following hypotheses have been formulated to test the effectiveness of AI-enhanced chatbots on facilities management. Figure 1 depicts the conceptual framework of the research in which the variables on the left-hand side are independent, i.e., factors of AI-enhanced chatbots optimising customer delivery service and response time tested to examine their impact on facilities management.

H1: The impact of the perceived usefulness of AI-enhanced chatbots optimising customer service delivery and response time is significant on the dependent variable, i.e., facilities management.

H2: The impact of perceived ease-of-use of AI-enhanced chatbots optimising customer service delivery and response time is significant on facilities management.

H3: The impact of behavioural intention to use AI-enhanced chatbots optimising customer service delivery and response time is significant on facilities management.

H4: The impact of responsiveness of AI-enhanced chatbots optimising customer service delivery and response time is significant on facilities management.

H5: The impact of user satisfaction of AI-enhanced chatbots optimising customer service delivery and response time is significant on facilities management.
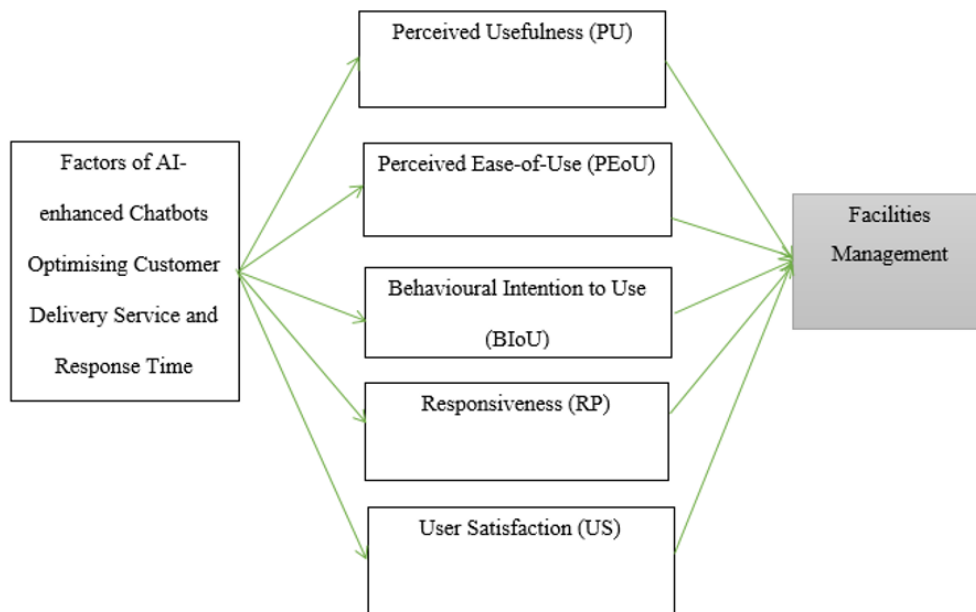


**Figure 1:** Conceptual Framework
*Source: Author*

## METHODOLOGY
### Research Design
A mixed-method approach comprising quantitative data collection through surveys and qualitative interviews was employed in the current research. A pragmatic philosophical approach was opted to support the subjective findings with objective conclusions gathering both qualitative and quantitative data. The purpose of the research was to examine the perceptions of facility service providers who have implemented chatbots to explore their significance in customer service delivery and response time in facilities management. Using mixed methods, the research offers empirical and theoretical insights into the practical implementation of chatbots in this industry and gauges their effectiveness.

### Data Collection
The researcher gathered qualitative and quantitative data, both through primary sources. The quantitative data was collected by distributing a close-ended survey questionnaire among the target population. The items

of the questionnaire were adapted from the theorisation of constructs using TAM and SRT and relevant existing literature. Perceived usefulness, perceived ease-of-use, behavioural intention to use, responsiveness and user satisfaction were the selected five constructs with three items each. Each item was examined based on a five-point Likert scale ranging from 0 to 4, in which 0 refers to strongly agree, whereas 4 refers to strongly disagree. The interview questions were centred on specific research objectives to identify the key benefits and challenges of using AI-enhanced chatbots optimising service delivery and response time in facilities management. However, the survey and interview questions were both modified to fit the current and recent research, following the instructions of some experts in facility management to ensure comprehensiveness, consistency and readability. Also, convergent validity (AVE) and reliability of items were tested.

### Sampling
The targeted population of the current research was

the personnel working in facilities management. The targeted population was approached to fill out survey questionnaires through LinkedIn and other social media platforms. Therefore, these respondents were sampled through a random sampling approach, and 270 respondents who finished the complete survey have experience working with AI-enhanced chatbots for improved service delivery and response time in facilities management. Furthermore, 9 respondents for interviews were sampled using purposive sampling as they were the experts in their field. Interview respondents were the facility managers and facility service providers who have implemented chatbots within the Middle East. For both interviews and surveys, equal respondents, i.e., (90 each for surveys and 3 each for interviews) were approached from UAE, Qatar, and Saudi Arabia, as these could be approached easily by bearing limited costs.

**Analysing Sample's Profile**
Figures 2,3,4 and 5 below depict the demographics of the targeted respondents.

The majority of the respondents were aged between 30 and 39 years, i.e., 69.3%, whereas 37, i.e., 13.7% respondents were aged between 20 and 29, 26, i.e., 9.6% were within the age group of 40-49 years and only 20, i.e., 7.4% respondents were aged 50 years and above as shown in Figure 2.

Figure 3 shows the gender demographics, such that 158 (58.5%) were male, whereas 102 (37.8%) were females who participated in this research. 10 (3.7%) respondents preferred not to mention their gender.

Figure 4 below depicts the designation of respondents. It shows that 106 (39.3%) of respondents were Facility Service Providers, followed by 95 (35.2%) by Facility Managers. 53 (19.6%) were End Users, and 9 (2.6%)
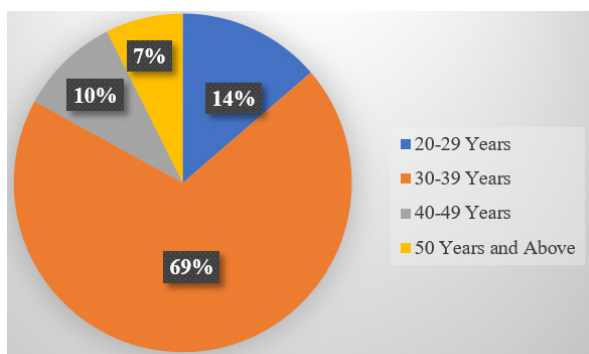


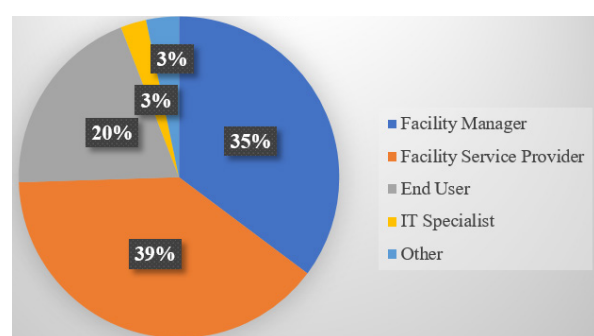**Figure 2:** Age Demographics
*Source: Author*



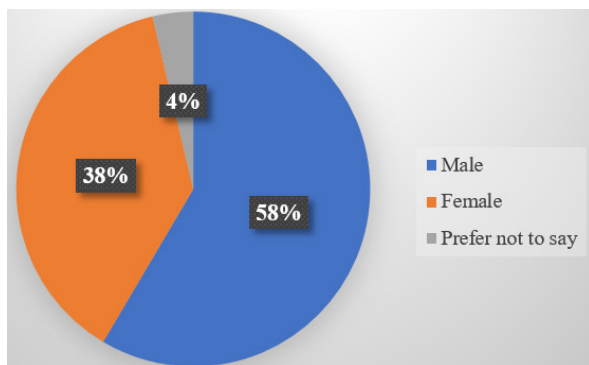**Figure 4:** Job Designation of Respondents
*Source: Author*



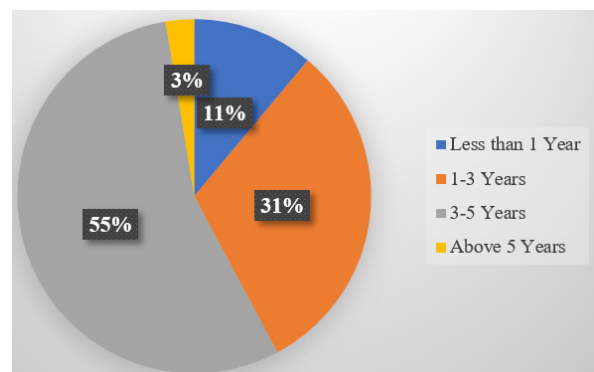**Figure 3:** Gender Demographics
*Source: Author*



**Figure 5:** Job Experience of Respondents
*Source: Author*

were IT Specialists. The remaining 7 (3.3%) were Other respondents, suggesting that these categories cover most respondents.

**Data Analysis**
SPSS 24.0 was used for carrying out numerical analysis. Using this statistical tool, reliability and convergent validity were tested, and correlation, regression and exploratory factor analysis were performed to test the association of independent and dependent variables of the research. Besides, thematic analysis was conducted to analyse the interview responses following the stages

of coding transcripts, identifying keywords, formulating themes and analysing them.

**RESULTS**
**Quantitative Analysis**
This section of the research contains results for the survey questionnaires examined using SPSS.

**Reliability Analysis**
The reliability of a scale was tested in this research to assess the internal consistency of the variables. In reliability analysis, the value of Cronbach's alpha is

obtained, and values are tested to range between 0 and 1, with 0.7 being the lowest accepted value (Hajjar, 2018). As shown in Table 1 below, the value of Cronbach's alpha for each construct is obtained greater than 0.9, showing high internal consistency of all the statements, showing that these constructs are measuring a similar concept underlying AI-based chatbots in facilities management.

**Table 1:** Cronbach's Reliability Test

| Dimension Name | Number of Statements | Cronbach's Alpha (ą) (Standardised) N=270 |
|---|---|---|
| Perceived Usefulness (PU) | 3 | 0.931 |
| Perceived Ease of Use (PEoU) | 3 | 0.960 |
| Behavioural Intention to Use (BIoU) | 3 | 0.963 |
| Responsiveness (RP) | 3 | 0.971 |
| User Satisfaction (US) | 3 | 0.989 |

*Source: Author*

**Convergent Validity and Exploratory Factor Analysis**
The measurement model must meet three key conditions to achieve convergent validity: the factor loadings of all the variables must be higher than 0.5, the Average Variance Extracted (AVE) must be greater than 0.5, and the composite reliability for each construct must be higher than 0.7 (Nguyen *et al.*, 2021).

The criterion followed in this research is Fornell and Larcker's method, which was used to analyse the AVE values for each construct shown in Table 2 below. The current measurement model confirmed validity as it met

*al*l three conditions for all the latent constructs since the AVE value for all constructs, including PU, PEoU, BIoU, RP and US, is greater than 0.5, lying within the range of 0.7 and 0.9.

Factor loadings were examined using the Kaiser-Meyer-Olkin (KMO) method. As shown in Table 2 below, all the values of the factor loadings are greater than 0.5; therefore, all variables are acceptable, fit and unidimensional in the current research. Explained Variance (%) depicts that the factors capture a large data portion in Variance of data if percentages are higher, as shown in Table 2 below.

**Table 2:** Exploratory Factor Analysis

| Dimension Name | Items | Factor Loadings | Kaiser- Meyer-Olkin (KMO) Values | Explained Variance (%) | Mean (Std. Deviation) | AVE |
|---|---|---|---|---|---|---|
| **Perceived Usefulness (PU)** | | | | | | |
| AI-enhanced chatbots increase the effectiveness and quality of facility management services. | PU1 | 0.925 | 0.732 | 88.077% | 11.26 (0.912) | 0.849 |
| AI-enhanced chatbots can speed up the response time to service requests in facilities management. | PU2 | 0.866 | | | 10.98 (0.971) | |
| AI-enhanced chatbots can assist in automating the facilities management process, making it more efficient and beneficial. | PU3 | 0.851 | | | 11.35 (0.899) | |
| **Perceived Ease of Use (PEoU)** | | | | | | |
| I find AI-enhanced chatbots in facilities management easy to use. | PEoU1 | 0.940 | 0.770 | 92.747% | 11.27 (0.971) | 0.832 |
| I often use AI-enhanced chatbots to navigate and communicate when making service requests or queries about facilities management. | PEoU2 | 0.906 | | | 10.97 (0.952) | |
| AI-enhanced chatbots make facility management service's access and requests easier. | PEoU3 | 0.937 | | | 11.26 (0.912) | |
| **Behavioural Intention to Use (BIoU)** | | | | | | |

| Statement | Code | | | | | |
|---|---|---|---|---|---|---|
| In the future, I intend to use AI-enhanced chatbots for facility management service requests and queries. | BIoU1 | 0.955 | 0.749 | 93.113% | 10.93 (0.963) | 0.871 |
| AI-enhanced chatbots are equally appropriate in these new technology-based self-service situations and are designed to convince consumers to comply with or adapt to a specific request. | BIoU2 | 0.946 | | | 10.98 (0.971) | |
| I will use AI-enhanced chatbots because they create the impression of intelligence in a non-human technology agent and make conversations feel more natural in a customer service setting. | BIoU3 | 0.892 | | | 11.26 (0.912) | |
| **Responsiveness (RP)** | | | | | | |
| When employing AI-enhanced chatbots for facility management services, I frequently get a response or solution immediately. | RP1 | 0.941 | 0.756 | 91.714% | 11.27 (0.971) | 0.825 |
| In contrast to their rule-based predecessors' somewhat static replies, AI-enhanced chatbots are adaptable and demonstrate empathy when responding to the user's input in facilities management. | RP2 | 0.884 | | | 10.97 (0.952) | |
| Users' perceptions of humanness and social presence are strengthened by AI-enhanced chatbots' responsiveness, which also increases their satisfaction with the chatbot engagement. | RP3 | 0.927 | | | 11.27 (0.971) | |
| **User Satisfaction (US)** | | | | | | |
| Real-time AI-enhanced chatbots have made customer support a two-way conversation, which has a significant effect on customer satisfaction, repurchase intentions, and trust. | US1 | 0.912 | 0.536 | 67.946% | 10.93 (0.963) | 0.707 |
| The response time of an AI-enhanced chatbot is an important factor that affects user satisfaction and other aspects of perceived system quality. | US2 | 0.893 | | | 10.98 (0.971) | |
| Customers are more satisfied interacting with support chatbots that give dynamically delayed replies than those that send near-instant responses. | US3 | 0.233 | | | 10.98 (0.971) | |

*Source: Author*

### Correlation Analysis

Correlation analysis is used test the relationship between multiple variables of the research. When two variables are tested to be correlated their covariance is divided by the standard deviations known as Pearson Correlation Coefficient 'r' (Kafle, 2019). The value of 'r' lie between +1 and -1 such that values greater than 0.7 depict strong correlation. As shown in the Table 3 below, all the five

**Table 3:** Correlations

|  | Perceived Usefulness (PU) | Perceived Ease of Use (PEOU) | Behavioural Intention to Use (BIoU) | Responsiveness (RP) | User Satisfaction (US) | Facilities Management (FM) |
|---|---|---|---|---|---|---|
| Perceived Usefulness (PU) | 1 |  |  |  |  |  |
| Perceived Ease of Use (PEOU) | .971** | 1 |  |  |  |  |
| Behavioural Intention to Use (BIoU) | .970 | .981 | 1 |  |  |  |
| Responsiveness (RP) | .945 | .961** | .991** | 1 |  |  |
| User Satisfaction (US) | .939** | .985** | .945** | .931 | 1 |  |
| Facilities Management (FM) | .979** | .978** | .991** | .989 | .952** | 1 |

*** Pearson Correlation is significant at p< 0.05 (2-tailed); N=270.*
*Source: Author*

factors of AI-enhanced chatbots optimising service delivery and response time including PU (0.979**), PEoU (0.978**), BIoU (0.991**), RP (0.989) and UP (0.952**) are strongly correlated with facilities management since the values are greater than 0.7.

**Regression Analysis**
The relationship tested between two or more independent and dependent variables of interest is evaluated using regression. The sig value or p-value is tested to determine the impact of independent variables on the dependent variable, which should be less than the threshold value of 0.05 (Kafle, 2019). As shown in Table 4 below, the sig values of all the independent variables of the research are 0.000, which depicts that the impact of all the five factors of AI-enhanced chatbots optimising service delivery and response time, including PU, PEoU, BIoU, RP, UP is significant on facilities management.

**Table 4:** Table of Coefficients using Regression

|  | Unstandardised Coefficients | | Standardised Coefficients | t | Sig. |
|---|---|---|---|---|---|
|  | B | Std. Error | Beta |  |  |
| (Constant) | .000 | .001 |  | -.121 | .904 |
| Perceived Usefulness (PU) | .575 | .004 | .558 | 160.069 | .000 |
| Perceived Ease of Use (PEOU) | 1.041 | .019 | 1.062 | 54.758 | .000 |
| Behavioural Intention to Use (BIoU) | -1.610 | .022 | -1.633 | -74.050 | .000 |
| Responsiveness (RP) | 1.426 | .012 | 1.490 | 122.925 | .000 |
| User Satisfaction (US) | -.433 | .010 | -.462 | -44.863 | .000 |

*Source: Author*

**Thematic Analysis**
Chatbots are increasingly becoming significant for opening important gateways to digital information and services within the domain of facilities management (Lin, 2023). Thematic analysis was conducted to identify the key benefits, challenges and applications of AI-enhanced chatbots in facilities management from the in-depth perspectives and views of personnel working first-hand with them. These are the conversational agents which are used to gather insights on interactive customer service and collaborative work support systems. However, the challenges of implementation and maintenance might be crucial at the initial stage (Følstad *et al.*, 2021). Chatbot's impact on facility management has not been discussed widely. Therefore, a few questions were asked from the interviewees of the current research to gather their diverse opinions.

**Benefits**
In your opinion, what are the key benefits of AI-enhanced chatbots in facilities management?

**Participant 1 Stated That**
"We deploy chatbots to make communication easy with the facilities management system. The benefit is that we are shifting towards messages from audio calls, which

are preferred by users very often as response times are limited."

**Participant 3 Stated That**
"We all know that AI is the game changer in responsiveness being more user-friendly. I think in service delivery, chatbots are making significant improvements in terms of handling daily inquiries and routine tasks, making our team stay focused on the complex ones. So, I believe that the key benefit of AI-based chatbots in building management systems is streamlining of operations appreciated by clients in reduced response times."

**Participant 7 Stated That**
"The best thing we have done using AI-enhanced chatbots is to cut resources in the era of Smart Facilities Management when we are working on smart buildings and cities. In my experience, the fully automated workflows managed by chatbots excel some manual tasks which save resources in service delivery like predicting and maintaining failures, responding to customer queries and minimising downtime."

**Challenges**
How do you think AI-enhanced chatbots pose challenges in facilities management?

**Participant 1 Stated That**
"AI-based chatbots have many benefits, but technical issues and limited human-human interaction pose few challenges since sometimes consumers expect and we also need chatbots to mimic human behaviour."

**Participant 2 Stated That**
"A natural conversation's design can increase user satisfaction; therefore, poor system quality might pose a challenge with respect to the security and reliability of chatbot systems. It is a major concern for us to implement compliance and robust security measures to secure the sensitive information of clients and our facilities provided."

**Participant 4 Stated That**
"Sometimes employees and clients both feel resistant to using chatbots for the requirements of customer service delivery due to lack of training on chatbots reliability and user adoption. The key is to know about what are aspects of facility management where chatbots are considered an authentic and reliable source."

**Practical Applications**
What is the practical implementation of AI-enhanced chatbots in facilities management?

**Participant 2 Stated That**
"Implementing a chatbot for facilities management is a viable and cost-effective source, increasing user preference towards messaging due to the sophistication of NLP. The chatbot's software implementation means there are no significant equipment expenditures or installation expenses. It does not require long to notice productivity gains for building management and convenience gains for building users."

**Participant 4 Stated That**
"We employ a chatbot-assisted facility management technology to automatically produce daily reports for building contractors by collecting conversations between subcontractors on instant messaging platforms. Also, it helps with facility management, identifying hazards, briefings, meetings, training, teamwork, well-being, and customer service."

**DISCUSSION**
This study focused mainly on the integration of TAM and SRT to shed light on the use of chatbots optimising service delivery and response time in facilities management. Several key findings derived from the analysis are discussed as follows.

First, the relationship between PU of chatbots optimising service delivery and response time and facilities management is supported (H1: The impact of the perceived usefulness (PU) of AI-enhanced chatbots optimising customer service delivery and response time is significant on the dependent variable, i.e., facilities management). TAM has been advanced in analysing how new technologies are perceived and received for the outcomes of ease of use, social influence and complexity (Humairoh & Susilo, 2023; Tawafak *et al.*, 2023). Consequently, each time a user facilitates automated conversations using a chatbot, the parameters of user satisfaction are increased after getting well-timed, correct and relevant data. It directly influences the perceived usefulness of chatbots in facilities management (Humairoh & Susilo, 2023; Le, 2023). Supporting the stated fact, another research claimed that chatbots are easy to use (PEoU) due to the use of NLP technology, which is becoming useful (PU) for both companies and customers as they are perceived to deploy human resources in other tasks within the business and save time (Lubbe & Ngoma, 2021; Selamat & Windasari, 2021). Efficient use of technology such as chatbot strengthen overall customer experience decreases the number of complaints, and encourages repurchase intention (Chen *et al.*, 2021; Lubbe & Ngoma, 2021). Nonetheless, existing literature studies also highlighted that PU and PEoU are associated with perceived enjoyment, perceived risk, price consciousness, compatibility, and personal innovativeness (Kasilingam, 2020). Similarly, the research supported the relationship between PEoU of chatbots optimising service delivery and response time and facilities management is supported (H2: The impact of the perceived ease-of-use (PEoU) of AI-enhanced chatbots optimising customer service delivery and response time is significant on the dependent variable, i.e., facilities management).
Second, the advantages of chatbots are various

associated with ease of use, such as cost-effectiveness, availability, customer interaction, personal assistance and automation. Nevertheless, reduced flexibility can be a challenge for a few users, which influences their BIoU. However, the current research opposes the stated fact since it is supported (H3: The impact of behavioural intention to use AI-enhanced chatbots optimising customer service delivery and response time is significant on facilities management). It is justified by Su *et al.* (2021) that chatbots, like humans, provide customer service by integrating relationship management and functional behaviours. Despite lacking emotions, they offer faster service delivery, satisfy immediate needs, and reduce negative word-of-mouth (Um *et al.*, 2020). Consequently, Adam *et al.* (2021) analysed that AI-enhanced chatbots create an impact on the BIoU in customer service delivery and dynamic response times. Conversely, it was examined in the thematic analysis of the current research that technical issues and limited human-human interaction may affect BIoU since sometimes consumers expect chatbots to mimic human behaviour.

In customer service delivery, user satisfaction is critical because if service requests fail to meet a satisfactory response, it can cause crucial damage. Therefore, a chatbot is included for better responsiveness and fulfil customer satisfaction for service delivery, optimising response time for users (Hwang *et al.*, 2019). Similarly, the results of another past research examined that responsiveness and anthropomorphism directly influence customer engagement, service quality and customer satisfaction mediated by AI empathy and psychological safety whereas moderated by AI usability (Hui *et al.*, 2023). Consequently, the current research supported (H4: The impact of responsiveness of AI-enhanced chatbots optimising customer service delivery and response time is significant on facilities management and H5: The impact of user satisfaction of AI-enhanced chatbots optimising customer service delivery and response time is significant on facilities management). Meyer-Waarden *et al.* (2020) analysed that chatbots improve service delivery in four dimensions: reliability, empathy, responsiveness, and tangibles, increasing the intention to reuse them. Considerably, the thematic analysis also showed that the majority of the interviewees agreed that AI-based chatbots in building management systems are streamlining operations appreciated by clients in reduced response times. In an online setting, businesses must be courteous when serving their customers and should provide them with an appropriate response. The operational efficiency of chatbot systems may be greatly enhanced by their responsiveness, affecting user satisfaction (Yun & Park, 2022).

Nonetheless, consumers desire customised communication despite the fact that it offers several alternatives for mobility and response. Their motto is "minimum time, best service." Despite its many advantages, consumers and decision-makers who are unfamiliar with AI's principles are greatly confused and misinterpreted (Khan & Iqbal, 2020). Similarly, interviewees in the current research claimed that implementing compliance and robust security measures is crucial for protecting client information and facilities, and understanding the aspects of facility management where chatbots are considered authentic and reliable is essential.

## LIMITATIONS
The findings of the current research are limited to facilities management, which might vary in any other context or industry. There will be a limited generalisability of results to all industries of TAM and SRT since, with rapid technological developments, the actual behaviour may change. The research limited data collection from respondents within a few countries of the Middle East due to limited financial and time constraints. However, despite some of these limitations, the research will be effective for the departments of facilities management to use AI-enhanced chatbots for improving customer experiences and optimising service delivery and response time. Service quality will be a critical driver for enhancing customer satisfaction and trust for the facility managers when using chatbots for task management. However, researchers explore the role of user training and education in the efficient adoption of chatbots dealing with the ethical concerns of privacy and data security. The study suggests future research with longitudinal studies, cross-industry research, qualitative research, controlled experiments, and ethical considerations.

## CONCLUSION
AI-based communication agents enhance customer service in facility management by providing support, scheduling meetings, financial assistance, policy suggestions, and administration-based services. Delayed response time negatively impacts usage intentions and user social presence, affecting facility management. The study highlights the benefits of AI-enhanced chatbots in facilities management, including improved communication, reduced response times, and automation of routine tasks. These chatbots also contribute to resource savings and predictive maintenance. However, implementation challenges include technical issues, human-like interaction, and concerns about system quality, security, and reliability. The research emphasizes practical applications, such as hazard identification, meetings, teamwork, and customer service. The study supports the integration of theoretical models and practical applications, finding a positive relationship between perceived usefulness, ease of use, behavioural intention, responsiveness, and user satisfaction.

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