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## Chapter 6. The Use of Artificial Intelligence-Based Chatbots to Promote the Sustainability of South African Small and Medium Enterprises in the Digital Era

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### Abstract

The advancement of artificial intelligence (AI) applications, such as AI chatbots, enables small and medium enterprises (SMEs) to enhance competitiveness, operational performance, and digital marketing capabilities. However, utilisation among SMEs in developing countries remains limited. Addressing this gap, the study applies technology-organization-environment (TOE), technology acceptance model (TAM), and diffusion of innovation (DOI) frameworks to identify factors influencing AI chatbot utilisation among SMEs in South Africa. A quantitative method was employed: a self-administered questionnaire was distributed to 300 SMEs, and data were analyzed using SEM. Results showed relative advantage, compatibility, top management support, organisational readiness, ethical AI regulation, perceived usefulness, and ease of use were highly significant; whilst security is less significant. The study makes a contribution by developing a model that explains factors influencing AI chatbot utilisation among SMEs.

**Keywords:** artificial intelligence chatbots, diffusion of innovations, small and medium enterprises, technology-organisation-environment, technology acceptance model.

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### **Introduction**

The digital era has created both opportunities and challenges for organisations around the world (George, 2024; Marganaha, 2024). Artificial intelligence (AI) is at the centre of this change (Wang, Lin & Shao, 2023; Badghish & Soomro, 2024; Hamida, 2025). One important example of AI is AI chatbots (Kedi, Ejimuda, Idemudia & Ijomah, 2024). Organisations use chatbots to provide personalised services, automate tasks, and communicate with customers (Wang, Lin & Shao, 2023). According to a report by Grand View Research (2025), the global chatbot market was USD 7.76 billion in 2024 and is expected to grow to USD 27.29 billion by 2030. A report published by Gartner (2023) predicts that by 2026, more than 80% of organisations will use AI through apps or programming models (Rana, Pillai, Sivathanu & Malik, 2024). This fast growth of AI chatbots offers small and medium enterprises (SMEs) the chance to improve their operations and provide better customer service.

### ***Identified Gaps and the Purpose of the Study***

AI is vital for organisational performance and survival (Muzuva, Zhou & Zondo, 2024; Wang et al., 2023). Research has examined AI adoption factors and implementation in countries such as Germany, China, United kingdom, and Malaysia (Ulrich & Frank, 2021; Liang & Hongtao, 2023; Mathagu, 2024; Roszelan & Shahron, 2025). Nevertheless, studies on AI chatbot use in SMEs, especially in developing countries like South Africa, remain limited (Shekgola & Modiba, 2025).

### ***Research Questions***

The present study addresses the following questions as follows:

- What are the factors influencing the utilisation of AI chatbots in SMEs?
- Does the utilisation of AI chatbots influence the performance of SMEs?

### **Literature Review**

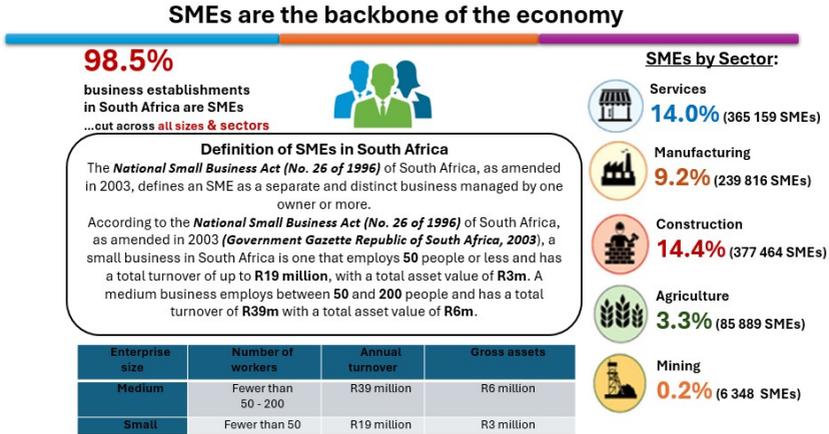
#### ***Small and Medium Enterprises (SMEs) in South Africa***

The National Small Business Act (NSB) No. 26 of 1996, amended in 2003, defines SMEs as organisations with 50 to 200 employees, an annual turnover of up to R39 million, and gross assets of up to R6 million (Madzimure, Mafini & Dhurup, 2020). Figure 6.1 illustrates this definition of SMEs.

#### ***The Importance of SMEs to the South African Economy***

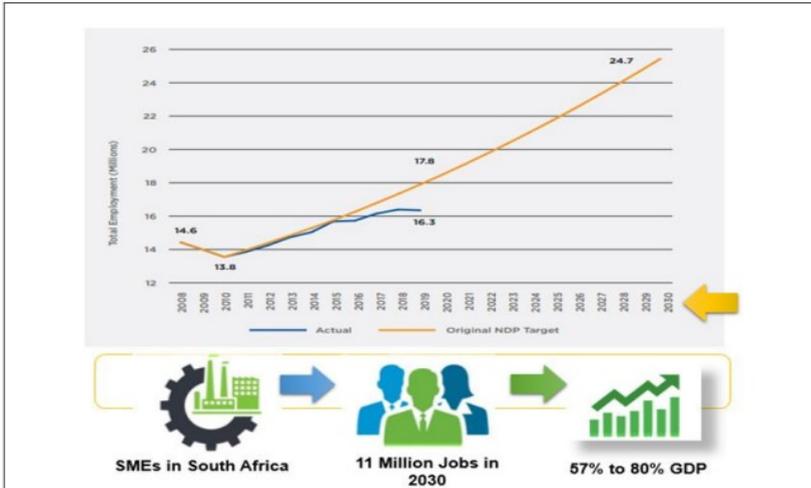
SMEs are key drivers of economic growth, playing a vital role in reducing poverty, and creating jobs (Bvuma & Marnewick, 2020). They make up about 98.5% of businesses, contribute 39% 57% to the gross domestic product (GDP), and provide 60% of employment (Mhlongo & Daya, 2023). SMEs are crucial for achieving the National Development Plan (NDP) targets of higher GDP and job creation by 2030 (Matekenya & Moyo, 2022). Despite their importance, SMEs in South Africa face numerous challenges. Figure 6.2 illustrates employment targets aligned with NDP goals.

**Figure 6.1**  
*Definition of SMEs in South Africa (Adapted)*



*Note.* Adapted from “Adoption of fourth industrial revolution 4.0 among Malaysian small and medium enterprises (SMEs)”, by A. Shahzad et al., 2023, *Humanities and Social Sciences Communications*, 10, Article 693, p. 4 (<https://doi.org/10.1057/s41599-023-02076-0>). Copyright 2023 by Springer.

**Figure 6.2**  
*South Africa’s Employment Targets*



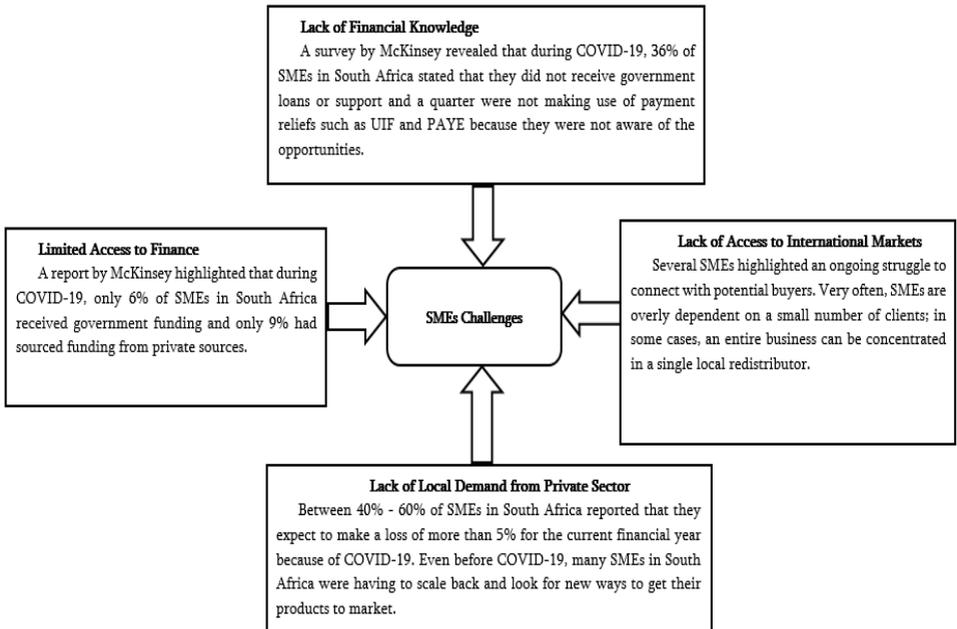
*Note.* From “Economic progress towards the national development plan’s vision 2030”, by National Planning Commission, 2020 (<https://www.nationalplanningcommission.org.za>). Copyright 2020 by NPC.

**Challenges Faced by SMEs in South Africa**

Many scholars have explored challenges faced by SMEs globally and in South Africa. For instance, Achieng and Malatji (2022) conducted a scoping review on digital transformation in sub-Saharan African SMEs, highlighting limited financial support and insufficient digital skills. Similarly, Etim and Daramola (2020) note that South African SMEs face lack of access to global markets, limited finance, and low ICT awareness. Figure 6.3 illustrates key challenges affecting SMEs in South Africa.

**Figure 6.3**

*SMEs Challenges in South Africa (Adapted)*



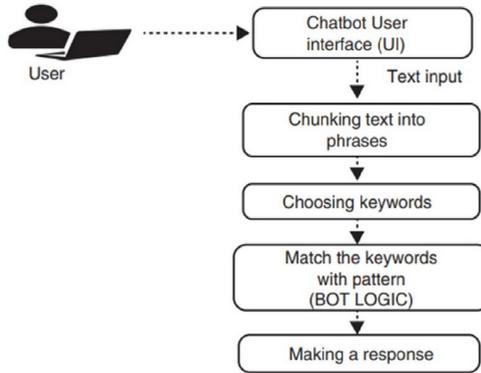
*Note.* Adapted from “Digital transformation of small and medium enterprises in sub-Saharan Africa: A scoping review”, by M. S. Achieng & M. Malatji, 2022, *The Journal for Transdisciplinary Research in Southern Africa*, 18(1) (<https://doi.org/10.4102/td.v18i1.1257>). Copyright 2022 by AOSIS (Pty) Ltd.

**The Importance of Using AI chatbots in SMEs**

In the era of digital transformation, AI has emerged as a pivotal marketing tool for organizations of all sizes, especially for SMEs (Laki & Miklosik, 2025). The word “bot” in “Chatbots” is short for “robot”, implying that chatbots are computer programs or systems designed to simulate human conversation (Alboqami, 2023). Figure 6.4 shows how chatbots operate.

Figure 6.4

How Chatbots Operate



Note. From “SMEs’ adoption of artificial intelligence-chatbots for marketing communication: A conceptual framework for an emerging economy”, by S. S. M. Mokhtar & M. G. Salimon, 2022, *Marketing Communications and Brand Development in Emerging Markets: Volume II*. ([https://doi.org/10.1007/978-3-030-95581-6\\_2](https://doi.org/10.1007/978-3-030-95581-6_2)). Copyright 2022 by the Author(s), under exclusive license to Springer Nature Switzerland AG.

A chatbot is an AI-powered tool that interacts with customers to understand their needs (Melynk & Pypenko, 2023). Sharma, Singh, Islam, and Dhir (2024) note that AI chatbots can revolutionize SMEs by boosting competitiveness, operational performance, and digital marketing.

Similarly, Laki and Miklosik (2025) argue that AI chatbots help SMEs automate tasks, optimize marketing strategies, and cut operational costs. Supporting this, Kedi et al. (2024) observe that AI chatbots also assist SMEs in sharing information with customers and employees.

### Conceptual Framework and Hypotheses Development

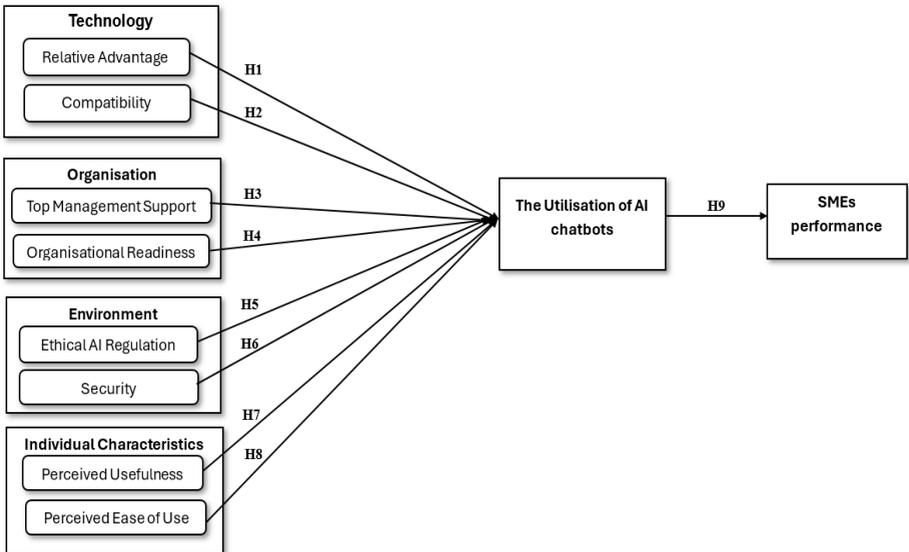
The present study employs the technology-organisation-environment (TOE) framework, technology acceptance model (TAM), and diffusion of innovation (DOI) theory to explain SMEs’ use of AI chatbots.

TOE, introduced by Depietro, Wiarda, and Fleischer in 1990, explains why organisations adopt new technologies through technology, organisation, and environment and has been applied on AI adoption (Badghish & Soomro, 2024; Almashawreh, Talukder, Charath & Khan, 2024).

DOI initially introduced by Rogers in 2003, explains adoption via relative advantage, compatibility, trialability, complexity, and observability (Badghish & Soomro, 2024; Sanchez, Calderon & Herrera, 2025). TAM introduced by Davis in

1989, examines user behaviour through perceived ease of use and usefulness and has been applied on AI adoption (Erraoui & Amine, 2024). Figure 6.5 shows AI chatbots utilisation is influenced by technological, organisational, environmental, and individual characteristics.

**Figure 6.5**  
*Conceptual Framework*



*Technology*

The utilisation of AI chatbots is influenced by technological factors such as relative advantage and compatibility. Relative advantage refers to the perceived superiority of a new technology over existing ones (Rogers, 2003) and has been shown to positively influence technology adoption (Bhardwaj, Garg & Gajpal, 2021). Compatibility with existing organisational systems and processes further increases adoption among SMEs (Badghish & Soomro, 2024). Based on these claims, we propose the following hypotheses:

H1: Relative advantage influences the utilisation of AI chatbots.

H2: Compatibility influences the utilisation of AI chatbots.

*Organisation*

AI chatbot adoption is influenced by organisational factors, notably top management support, which is senior leaders’ backing of technology use (Mathagu, 2024) and increases implementation success (Siradhana and Arora, 2024). Organisational readiness to adopt new technology, requires SMEs to have

sufficient financial, technological, and skilled human resources (Badghish & Soomro, 2024). Consequently, the following hypotheses are proposed:

H3: Top management support influences the utilisation of AI chatbots.

H4: Organisational readiness influences the utilisation of AI chatbots.

### *Environment*

The use of AI chatbots is influenced by technological factors, particularly ethical AI regulation (Omonov & Ahn, 2025). Ethical AI regulation refers to laws and frameworks that ensure AI use aligns with ethical principles (Cajueiro & Celestino, 2025). Ethical principles support transparency, fairness, accountability, and effective operation of AI chatbots, supported by strong security measures (Omonov & Ahn, 2025). Consequently, the following hypotheses are formulated:

H5: Ethical AI regulation influences the utilisation of AI chatbots.

H6: Security influences the utilisation of AI chatbots.

### *Individual Characteristics*

Individual traits, especially perceived usefulness and ease of use, affect AI chatbot use. Perceived usefulness is how much a user thinks a technology improves performance, while ease of use is how much it reduces effort (Davis, 1989). These factors are related, as easier technologies are often seen as more useful (Bhardwaj et al., 2021). Users are more likely to adopt AI chatbots if they see them as helpful and effortless (Omonov & Ahn, 2025). Based on this, we propose the following hypotheses:

H7: Perceived usefulness of AI chatbots influences the utilisation of AI chatbots.

H8: Perceived ease of use influences the utilisation of AI chatbots.

### *The Utilisation of AI chatbots and SMEs performance*

Considering SMEs' resource constraints and limited technical capabilities, AI chatbot utilisation overcomes these limits and improves business processes (Sharma, Singh, Islam & Dhir, 2024). Similarly, a study by Omonov & Ahn (2025) found that AI chatbots enhance organisational performance. Therefore, the following hypothesis is formulated:

H9: The utilisation of AI chatbots influences SMEs performance.

## **Methodology**

### ***Research Design and Approach***

SMEs conducting business in Gauteng province, South Africa, were primarily targeted. The present study employed a quantitative approach to empirically test the hypotheses derived from the conceptual framework.

A cross-sectional survey was utilised, meaning data was gathered from respondents at a single point in time. The study aligns with the positivist paradigm, which posits that social phenomena can be examined objectively and that variable relationships can be measured and validated through statistical analysis (Saunders, Lewis & Thornhill, 2019).

**Data Collection and Analysis**

To collect data from SMEs, a closed-ended questionnaire was developed and physically distributed. According to Saunders et al. (2019), closed-ended questions are more specific and less prone to interpretation and verbosity than open-ended ones. Items were measured on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 4 = agree, 5 = strongly agree). Of 500 questionnaires distributed, 300 were returned. Data were analysed using SPSS version 28.

**Results**

As depicted in Table 6.1, the percentage of male respondents was 63.0% and 37.7% were female. Age wise, the study results show that 74.3% of respondents were from the 20 to 29 age group, 21.3% from the 30 to 39 group and 4.7% were 50 years and above. Furthermore, Table 6.1 illustrates that 56.7% of respondents have a BTech degree, 19.3% have a master’s degree, 15.3% have a diploma, and 2.0% have a PhD.

**Table 6.1**  
*Demographic Profile*

	<b>Variables</b>	<b>Frequency</b>	<b>Percentage</b>
Gender	Male	187	63.3
	Female	113	37.7
	Total	300	100.0
Age	20-29 years	222	74.3
	30-39 years	64	21.3
	50 years and above	14	4.7
	Total	300	100.0
Education	Matric	20	6.7
	Diploma	46	15.3
	B-tech	170	56.7
	Master’s	58	19.3
	PhD	6	2.0
	Total	300	100.0

**Assessment of Measurement Model**

The measurement model was examined using factor loadings (FL), composite reliability (CR), and average variance extracted (AVE) (Hiar, Ringle, Gudergan, Fischer, Nitzl & Menictas, 2019).

FL, CR, and AVE should exceed 0.7, 0.5, and 0.7, respectively. Table 6.2 shows all constructs meet these thresholds, confirming acceptable convergent validity.

**Table 6.2**  
*Loadings Reliability and Validity Statistics*

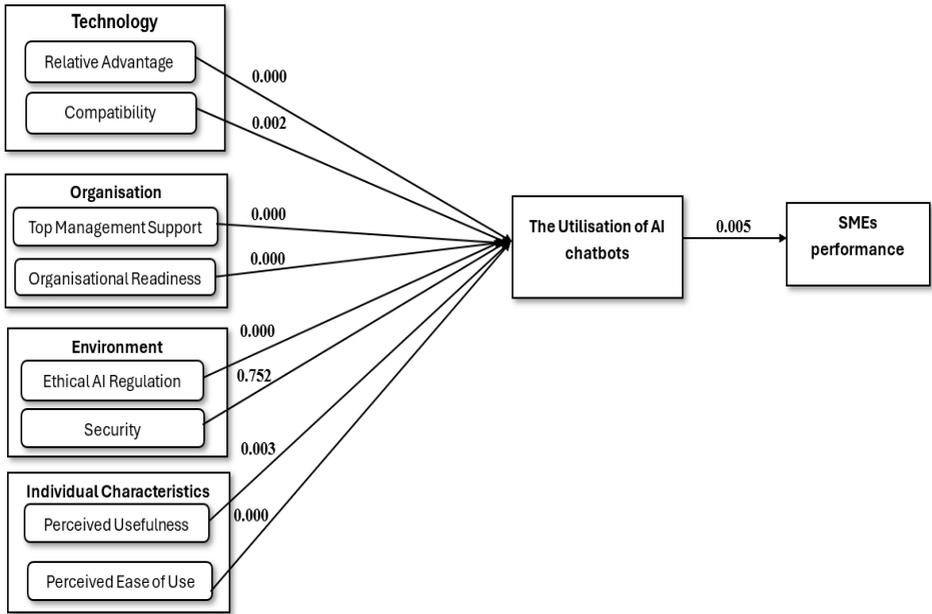
Construct	Item	Outer Loading	FL	CR	AVE
Relative Advantage (RA)	RA1	0.725	0.778	0.955	0.725
	RA2	0.826			
	RA3	0.950			
Compatibility (CP)	CP1	0.766	0.862	0.739	0.885
	CP2	0.856			
	CP3	0.925			
Top Management Support (TMS)	TMS1	0.715	0.970	0.778	0.988
	TMS2	0.886			
	TMS3	0.795			
Organisational Readiness	OR1	0.855	0.773	0.755	0.825
	OR2	0.856			
	OR3	0.775			
Ethical AI Regulation	EAR1	0.875	0.778	0.834	0.775
	EAR2	0.954			
	EAR3	0.774			
Security	SC1	0.854	0.765	0.856	0.905
	SC2	0.855			
	SC3	0.725			
Perceived Usefulness	PU1	0.792	0.752	0.772	0.925
	PU2	0.835			
	PU3	0.712			
Perceived Ease of Use	PEU1	0.885	0.916	0.854	0.755
	PEU2	0.793			
	PEU3	0.785			
Utilisation of AI chatbots	UAC1	0.775	0.778	0.849	0.753
	UAC2	0.819			

**Assessment of Structural Model**

In this section, the structural equation model (SEM) was used to test the hypotheses. Figure 6.6 presents the simplified structural model with hypothesized relationships among latent variables. Figure 6.6 shows that eight of the nine paths are significant.

As shown in Table 6.3, eight hypotheses including relative advantage (H1,  $p < 0.05$ ), compatibility (H2,  $p < 0.05$ ), top management support (H3,  $p < 0.05$ ), organisational readiness (H4,  $p < 0.05$ ), ethical AI regulation (H5,  $p < 0.05$ ), perceived usefulness (H7,  $p < 0.05$ ), perceived ease of use (H8,  $p < 0.05$ ) and AI chatbot utilisation (H9,  $p < 0.05$ ) are accepted, indicating these factors significantly affect utilisation. Security (H6,  $p > 0.05$ ) is rejected.

**Figure 6.6**  
*Structural Model*



**Table 6.3**  
*Hypotheses Testing*

Constructs	Std. Beta ( $\beta$ )	T-Values	p values	Results
<b>H1</b> Relative advantage→ utilisation of AI chatbots	0.178	0.245	0.000	Accepted
<b>H2</b> Compatibility→ utilisation of AI chatbots	0.142	0.344	0.002	Accepted
<b>H3</b> Top Management Support→ utilisation of AI chatbots	0.373	1.286	0.000	Accepted
<b>H4</b> Organisational Readiness→ utilisation of AI chatbots	0.442	0.142	0.000	Accepted
<b>H5</b> Ethical AI Regulation → utilisation of AI chatbots	0.347	1.772	0.000	Accepted
<b>H6</b> Security→ utilisation of AI chatbots	0.135	2.552	0.752	Rejected
<b>H7</b> Perceived Usefulness→ utilisation of AI chatbots	0.268	1.071	0.003	Accepted
<b>H8</b> Perceived Ease of Use→ utilisation of AI chatbots	0.112	4.357	0.000	Accepted
<b>H9</b> Utilisation of AI chatbots→ SMEs performance	0.274	0.173	0.005	Accepted

### **Discussion**

The present study aimed to find and explain the factors that affect the use of AI chatbots by SMEs in South Africa. For technological factors, relative advantage has a positive effect on AI chatbot use ( $p=0.000<0.05$ ; H1 accepted). This means the benefits of AI chatbots encourage SMEs, especially in South Africa, to use them (Siradhana & Arora, 2024; Badghish & Soomro, 2024).

Compatibility was also positive and significant ( $p=0.002<0.05$ ; H2 accepted), showing AI works well with existing SME systems and is easy to adopt (Omonov & Ahn, 2025).

For organisational factors, top management support was significant ( $p=0.000<0.05$ ; H3 accepted), showing companies adopt new technology when management supports it (Siradhana & Arora, 2024).

Organisational readiness was significant ( $p=0.000<0.05$ ; H4 accepted), meaning use is higher when resources and skills are available.

In terms of environmental factors, ethical AI regulation was significant ( $p=0.000<0.05$ ; H5 accepted), meaning SMEs follow rules.

Security was not significant ( $p=0.752>0.05$ ; H6 rejected), suggesting weak protections make SMEs less likely to use AI (Omonov & Ahn, 2025).

For individual characteristics, perceived usefulness ( $p=0.003<0.05$ ; H7 accepted) and perceived ease of use ( $p=0.000<0.05$ ; H8 accepted) positively affected use.

Finally, AI chatbots had a significant impact on SMEs' performance ( $p=0.005<0.05$ ; H9 accepted), in line with earlier studies (Badghish & Soomro, 2024).

### ***Theoretical and Practical Contribution***

The study makes a theoretical contribution by developing a model that integrates TOE, TAM, and DOI to explain AI chatbot utilisation and its impact on SME performance.

It also makes a practical contribution by helping SME managers understand limited AI chatbot use and assess factors influencing adoption, particularly in developing countries. The model addresses technological, organisational, and environmental factors and individual characteristics.

### **Conclusion**

The growth of AI has driven scholars to examine its impact on organisational performance using TOE, TAM, and DOI. This study proposes a model to explain factors influencing AI chatbot utilisation among SMEs in South Africa. The study results show that relative advantage, compatibility, top management support, organisational readiness, ethical AI regulation, perceived usefulness, and perceived ease of use significantly influence chatbot utilisation, while security is less significant. The study concludes that AI chatbots are essential for improving SME performance.

### Ethical Approval

The study obtained ethical clearance from the institution's Ethics Committee (Ref no. FCRE/ICT/2022/03/001 (1)).

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