Why do SMEs adopt artificial intelligence-based chatbots?

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ABSTRACT

Developments in artificial intelligence (AI) have led to the emergence of new technologies offering unique business opportunities. This study examines the factors influencing AI-based chatbot implementation by small and medium enterprises (SMEs). We grounded the study's conceptual model in the technology–organisation–environment (TOE) framework. Employing a quantitative research methodology, we collected data from 292 SME respondents via an online survey. We then utilised covariance-based structural equation modelling (CB-SEM) to analyse the data. The empirical results reveal that perceived employee capability, perceived availability of financial support, perceived top management support, perceived cost, perceived complexity and perceived relative advantage are positively associated with SMEs' AI-based chatbot adoption intention. This study thus contributes to the scarce literature on the adoption of AI-based chatbots for SMEs in developing small island countries. The findings provide meaningful insights to developers, marketers and SMEs to enhance firms' performance and competitiveness by increasing the adoption of AI-based chatbots.

Index Terms: Artificial intelligence; Chatbots; SMEs; TOE framework; Covariance-based structural equation modelling

I. INTRODUCTION

While the concept of 'virtual agents' dates back a few decades [1], recent advancements in artificial intelligence (AI) have enabled the development of truly capable and efficient chatbots [2]. A chatbot is a programmed computer that uses natural language text or voice to mimic dialogue between humans [3]. Chatbots can now mimic human conversation/language and provide a realistic experience to those engaging with such systems [4, 5]. Exhibiting double-

digit growth rates, the chatbot industry is projected to be a billion-dollar industry by 2025 [2]. Studies have shown that businesses investing in this technology provide customers with better service through personalisation while also enhancing customer experience and engagement [6–8].

A critical part of any economy, small and medium enterprises (SMEs) face significant challenges because of increased competition from small and large businesses [9, 10]. Nevertheless, the growth and development of SMEs cannot be ignored because these businesses create employment opportunities, contribute to economic growth and enhance social stability [11, 12]. Due to their limited financial and technical resources, however, SMEs must identify and pursue new opportunities to survive and remain competitive in the dynamic business environment [13, 14]. AI-based chatbots offer one such opportunity for firms to engage with and remain available to customer queries and requests around the clock. The use of chatbots has the potential to significantly benefit employees, reducing the time they spend providing customer support without requiring firms to incur additional costs. Prior studies have explored the adoption of AI-based chatbots in various contexts, including tourism [15], health [16], education [17] and retailing [18]. Scholars have also examined the motivations that drive the adoption of AI-based chatbots. These include factors such as communication accuracy and quality [19, 20], anthropomorphism, ease of use and trust [15], performance expectancy [21] and informativeness [22].

Most of the existing studies on AI-based chatbots have focused on better understanding various customer perspectives (e.g. Song et al. [19] and Chen et al. [18]). Meanwhile, fewer investigations have examined the factors that motivate businesses (especially SMEs) to adopt AI-based chatbots. Studying SMEs' chatbot adoption, Selamat and Windasari [23] found that chatbot elements of personalised recommendation, humanised conversation and responsiveness suit SME customers. Understanding SMEs' strategic decision-making process towards AI adoption and the factors associated with this process is essential for researchers and practitioners [24, 25]. This is particularly true because advancements in AI will profoundly alter the retailing industry [26, 27]. SMEs face greater knowledge and financial resource constraints than do large businesses [28]. This makes the adoption of chatbots a challenge for SMEs [29]. Most of the studies conducted on SMEs and AI have primarily focused on developed countries [30].

To investigate the adoption of AI chatbots by SMEs and address the above literature gaps, this study applies the technology–organisation–environment (TOE) framework. The TOE framework is relevant because it provides valuable insights into the factors that motivate and challenge businesses' technology adoption [31]. The TOE framework encompasses the technological, organisational and environmental perspectives. Prior studies have applied this framework to understand SMEs' adoption of technologies such as social commerce [31], business intelligence [32] and enterprise resource planning software [33]. With a strong theoretical base and the support of extensive empirical evidence, the TOE framework has been used by several technology adoption studies [34].

We formulate the following research questions (**RQs**) in response to the above literature gaps. **RQ1**: Do technological factors of cost, complexity and relative advantage influence SMEs' adoption of AI-based chatbots? **RQ2:** Do organisational factors of employee capability, financial resources and top management support influence SMEs' adoption of AI-based chatbots? **RQ3:** Do environmental factors of vendor support, customer pressure and competitive pressure influence SMEs' adoption of AI-based chatbots? By answering these questions, this study aims to ascertain the impact of TOE framework factors on SMEs' adoption of AI-based chatbots. We tested this study's TOE-based conceptual framework using covariance-based structural equation modelling (CB-SEM) with 292 SME respondents [31, 35].

Our findings make the following important contributions. First, the study contributes to the scarce literature regarding SMEs' AI adoption. Because existing studies on AI have primarily examined larger businesses [36], studies exploring the factors behind SMEs' adoption of AI chatbots have the potential to provide important empirical evidence. Second, prior studies on AI adoption have focused on large and developed countries [15, 18]. Country background and factors such as the legal environment, technological infrastructure, economy and culture impact firms' adoption of technologies [37–39]. This makes it necessary to study AI adoption in small and less developed countries. The current study addresses this literature gap by collecting data on SMEs' adoption of AI chatbots from Fiji, a developing small island country. Located in the South Pacific, Fiji consists of two main islands, Viti Levu and Vanua Levu. Its capital is Suva. SMEs contribute 18% of Fiji's gross domestic product (GDP) and employ approximately 60% of the country's labour force. Third, this study contributes to the TOE framework by examining SMEs' AI chatbot adoption. In doing so, it adds to the applicability and generalisability of the

theory while providing insights into the technological, organisational and environmental factors affecting SMEs' adoption of AI chatbots.

The remainder of the paper is organised as follows. Section 2 presents the literature review as well as this study's theoretical foundation and conceptual framework. Section 3 details the study's methodology. Section 4 presents the results. Finally, Section 5 contains the discussion, implications and directions for future studies.

II. LITERATURE REVIEW AND THEORETICAL FOUNDATION

A. Artificial intelligence-based chatbots

Chatbots can be divided into two categories: traditional (rule-based) chatbots and AI-based chatbots [2, 40]. The modern AI-based chatbots available today differ in several ways from traditional rule-based chatbots. Chatbots that are AI-driven utilise computing and AI to communicate with humans [41]. Such chatbots employ textual inputs to communicate with humans on a turn-by-turn basis [15]. The term AI-based chatbot (hereafter 'chatbot') is an interface powered by an AI-based back-end system [3]. This interface can be accessed via smartphones, computers and other devices [15]. Because they are capable of engaging in human-like conversation with customers, these systems can be useful for customer service, marketing and sales. Table 1 below highlights the differences between rule-based and AI-based chatbots.

Table 1. Differences between chatbots

Rule-based chatbots	**Conversational AI chatbots**
Keyword-driven	Understand a wide variety of ways in which a person can ask questions without being explicitly trained on every utterance
Act based on manually-crafted rules Difficult to train because every utterance (or phrase) needs to be explicitly trained (i.e. train bot explicitly for 'Where's my order?' and 'When is my order coming?')	Learn from real interactions Understand spelling mistakes and abbreviations.
Difficult to scale	Easy bootstrap training with historical data
To optimise the bot performance, companies must explicitly update rules	Reinforcement learning facilitates adjustments and retraining

	Has knowledge of the real-world context (i.e. can understand a country if given a city)

In differentiating between the two types of chatbots, Table 1 highlights the superior ability of AI-based chatbots to communicate with humans. This ability allows AI-based chatbots to be easily scaled and employed within a larger context.

Scholars have examined the factors driving customers' adoption of chatbots. A study by Song et al. [19] found that perceived risk and communication quality influenced the type of chatbot (human vs AI) customers adopted. In the context of luxury e-shopping, Chung et al. [20] found that chatbot communication competence, credibility and accuracy enhanced customer satisfaction. Additionally, customers' adoption of AI chatbots was influenced by anthropomorphism, perceived intelligence, trust and ease of use in the hospitality industry [15]. Another study by Melián-González et al. [21] found that anthropomorphism, social influence, predisposition towards self-service technology, hedonic, habit and expected performance influenced adoption. Orden-Mejía and Huertas [22] found that destination chatbots' interactivity, empathy and informativeness were associated with tourists' satisfaction.

AI-based chatbots have the potential to tailor product medication, enhance relationships with customers and improve brand awareness [42]. Patent analysis of chatbots revealed businesses' motivation to adopt the technology and thereby interact with customers, collect information from them to provide tailed solutions and draw inferences from the collected data [2]. Cheng and Jiang [43] found that customisation, entertainment, accessibility, information and interaction via chatbots influenced the quality of firms' communication with customers, leading to better responses and relationships between customers and the brand. Similarly, in the context of insurance industries, Riikkinen et al. [44] highlighted AI chatbots' potential to promote customer value creation by providing businesses with additional resources. Youn and Jin [45] found that AI chatbots can form virtual assistantships and friendships with customers to assist businesses in customer relationship management.

B. TOE framework

Rogers' [46] proposed diffusion of innovation (DOI) theory offers crucial insights into the diffusion of new technologies. The theory examines the technological progress from invention to adoption. Developed by Tornatzky et al. [47], the TOE framework is similar. Scholars have

utilised the TOE theory to explain businesses' decision-making behavior in terms of technology innovation. Despite the two theories' similarities in considering organisational and technological factors, the TOE framework adds to the DOI theory by including the 'environment'. This addition significantly increases the TOE model's ability to predict businesses' technology adoption decisions [48]. Researchers have widely utilised this framework to distinguish between technology non-adopters and adopters [31, 49, 50]. However, the theory has yet to be employed to examine factors motivating SMEs' adoption of AI-based chatbots. Additionally, the TOE framework has generally been tested in large businesses [31, 48, 51] and more developed countries [52–54]. This narrow focus justifies the use of the TOE model to understand SMEs' adoption of AI-based chatbots in a developing small island country.

The three contexts of the TOE framework are as follows. First, technological characteristics refer to the innovation attributes of information technology that affect a business's ability to adopt new technology [31]. Second, the organisational perspective relates to the organisational traits that affect a business's ability to adopt new technologies. Third, the environmental perspective consists of the business's dogmatic environment, the availability of technology service providers and the overall industry structure [55]. Innovation is positively related to the technology support infrastructure [31]. This study adopts the TOE framework to examine all three perspectives. From the technological perspective, it includes the constructs of complexity, cost and relative advantage. In the organisational context, it examines employee capability, financial resources and top management support. In the environmental context, it considers the factors of vendor support, customer pressure and competitive pressure.

C. Conceptual framework and hypotheses development

Technological factors

AI adoption offers businesses various advantages [56]. Relative advantage refers to the extent to which a business recognises an innovation as superior to its predecessor [57]. The benefits of adopting a new technology motivate businesses to adopt it [49]. According to To and Ngai [58], the relative advantages of technology adoption include social status, competitiveness and value. The perceived usefulness of social media motivates businesses to adopt it [59]. Research has confirmed that the perceived relative advantages of adopting a new technology are positively associated with businesses adopting that technology [60–62]. Khayer et al. [63] identified relative advantage as the crucial factor impacting SMEs' cloud computing adoption. Ahani et al. [64] reported similar results for SMEs' social customer relationship management

adoption intention. In the context of AI, the technology's relative advantage for businesses has proven a key factor affecting its adoption [65–67]. Based on the above studies, we expect that SMEs that perceive advantages in adopting AI chatbots will be more likely to adopt such chatbots. Therefore, we hypothesise as follows:

H1. *The perceived relative advantage of AI-based chatbots is positively associated with SMEs' AI chatbot implementation intention.*

If potential users of a new technology perceive its implementation to be challenging and complicated, they are less likely to adopt it. Studies have shown that a new technology's ease of use significantly affects its acceptance [68–70]. Sohn and Kwon [71] found that effort expectancy (i.e. ease of use) is a critical variable affecting the acceptance of AI-based products. Belanche et al. [72] also reported that ease of use is positively associated with customers' adoption of robo-advisors. Talukder et al. [73] made similar observations regarding the acceptance of wearable technology. Businesses' adoption of AI is hindered by the technology's perceived complexity [74, 75]. Likewise, SMEs that consider a technology to be complex will be less willing to adopt it [62, 76]. Therefore, if SMEs expect that the adoption of AI chatbots will be excessively complex, they will be less likely to adopt the technology. Therefore, we hypothesise as follows:

H2. *The perceived complexity of AI-based chatbots is negatively associated with SMEs' AI chatbot implementation intention.*

The adoption of AI entails various challenges [77, 78]. One challenge affecting the adoption of innovative technology is the associated cost [79]. Businesses' adoption of technologies requires exorbitant start-up costs, including the cost to purchase online packages and the associated software [78, 80]. Wong et al. [62] found that start-up costs also impact SMEs' decisions to adopt blockchain technology. Ghobakhloo and Ching's [81] study demonstrated that the cost factor is positively associated with SMEs' increased adoption of smart manufacturing technologies. Kala Kamdjoug et al. [82] reported similar results when examining factors affecting the IT adoption of Cameroon's women-managed small enterprises. The similarly expensive nature of AI adoption has affected businesses' adoption of this technology [66]. Based on the findings of the above studies, we expect perceived cost to reduce the likelihood of SMEs' AI-based chatbot adoption. Therefore, we hypothesise as follows:

H3. *The perceived cost of AI-based chatbots is negatively associated with SMEs' AI chatbot implementation intention.*

Organisational factors

Higher management support for adopting innovative technology is termed top management support [49]. It includes resource allocation, authority and strategic direction to aid adoption [83]. A business's decision to adopt new technology is positively associated with top management's motivation to adopt the technology [60]. Studies have confirmed the positive association of top management support with technology acceptance [84, 85]. Oliveira et al. [86] found top management support as a significant factor affecting software-as-a-service adoption. Swani [87] found similar results for businesses' adoption of mobile applications. Scholars have also confirmed the association between top management support and businesses' AI adoption [65, 88, 89] and for SMEs' adoption of technology [63, 90]. Based on the above studies, we expect that SMEs will be more likely to adopt AI chatbots when owner–managers offer support in terms of resources allocation. Therefore, we propose the following hypothesis:

H4. *Top management support is positively associated with SMEs' AI chatbot implementation intention.*

The availability of resources also profoundly impacts businesses' adoption of innovative technology. Resource availability refers to the availability of resources for businesses to use in adopting a technology [91]. Financing is required to implement new systems and manage the ongoing costs associated with running them [91]. Compared to SMEs, larger businesses enjoy a significant advantage in securing financial resources [92, 93]. Okundaye et al. [94] found that the availability of financial resources was a key factor impacting Nigerian SMEs' adoption of information communication technology (ICT). Chau et al. [95] reported similar results for Vietnamese SMEs' adoption of mobile commerce. SMEs' AI adoption is likewise hindered by the lack of availability of financial resources [96]. This implies that the unavailability of financial resources impacts SMEs' adoption of AI-based chatbots. Therefore, we hypothesise as follows:

H5. *The perceived availability of financial resources is positively associated with SMEs' AI chatbot implementation intention.*

Having qualified employees assist in the facilitation of ICT adoption is crucial for businesses [91]. Compared to larger businesses, SMEs often lack these human resources, which affects innovation [92, 93]. This issue, in turn, requires firms to bear the additional financial burden of hiring consultants [91]. Hsu et al. [48] found that the lack of employees' IT capabilities was positively associated with the SMEs' adoption of cloud computing. Similarly, Baker [97]

acknowledged the importance of employee capability in adopting new technology. Eze et al. [98] identified employee capability as a significant factor impacting the adoption of mobile marketing technology. Businesses' AI adoption is also influenced by their employees' knowledge and capabilities [99]. Research has confirmed this relationship in the context of SMEs' technology adoption [100]. This implies that having employees who are capable of implementing and maintaining AI-based chatbots is essential for SMEs to adopt the technology. Therefore, we propose the following hypothesis:

H6. *Perceived employee IT capability is positively associated with SMEs' AI chatbot implementation intention.*

Environmental factors

The amount of pressure a business faces from its competitors in the same industry is termed competitive pressure [49]. This implies the role of external pressure in motivating businesses to adopt new technology [101]. Early adopters of technology enjoy the first-mover advantage, which drives other competitors to follow suit and thereby maintain their competitiveness [102]. In a highly competitive business environment, firms attempt to imitate industry leaders' strategies and actions [103]. Scholars have found a positive association between competitive pressure and businesses' technology adoption [49, 101]. Xu et al. [104] confirmed these results for enterprise resource planning (ERP) adoption, while Jia et al. [105] reported similar findings for Enterprise 2.0 adoption. Research has also confirmed this association between competitive pressure and technology adoption in the context of AI [65, 66, 106]. Competitive pressure likewise motivates SMEs to adopt innovative technologies [62, 76, 107]. Based on the above findings, we expect SMEs to adopt AI chatbots when they observe their competitors using similar technologies. Therefore, we hypothesise as follows:

H7. *Competitive pressure is positively associated with SMEs' AI chatbot implementation intention.*

The customer–business relationship plays a crucial role in businesses' acceptance of innovative technology, like pressure from customers, commitment, encouragement and trust between the two parties [31]. Businesses attempt to fulfil their customers' expectations and needs by adopting technologies that enhance their interactions with them [108]. Fuelled by the belief that customers expect it, businesses are increasingly adopting innovative technologies [109, 110]. Studies have found a positive association between customer pressure and businesses' acceptance of innovative technology [50]. Lorente-Martínez et al. [111] reported that customers' attitudes impacted SMEs' acceptance of 'customer-facing in-store technologies'. In

another study by Abed [31], customer expectations influenced SMEs' social commerce adoption. Additionally, high customer expectations lead SMEs to adopt conventional chatbots [23]. Based on the above studies, we propose that SMEs whose customers expect them to adopt AI chatbots will be more likely adopt the technology. Therefore, we hypothesise as follows:

H8. *Customer pressure is positively associated with SMEs' AI chatbot implementation intention.*

Technology suppliers' actions and activities are positively associated with businesses' technology adoption [112]. Supplier support and training are important in driving innovation for businesses [91]. Such support decreases businesses' perception of risk and increases their desire to innovate [113]. Ahmadi et al. [114] identified vendor support as a key factor affecting hospital information system adoption in Malaysia. Sepasgozar [115] highlighted the importance of vendor support in I4.0 technology acceptance. Sharma and Sehrawat [116] also demonstrated the importance of vendor support in businesses' adoption of cloud computing. In the context of AI, vendor support has been shown to impact organisations' adoption of AI [65]. Vendor support is likewise critical for SMEs' adoption of innovative technology [76, 117, 118]. This implies that vendor support during the pre-adoption, adoption and post-adoption phases will be positively associated with SMEs' decision to adopt AI-based chatbots. Therefore, we hypothesise as follows:

H9. *Perceived availability of vendor support is positively associated with SMEs' AI chatbot implementation intention.*

Based on these nine hypotheses, which are grounded in the TOE framework, we developed a conceptual model that illustrates the relationships discussed above (Figure 1).

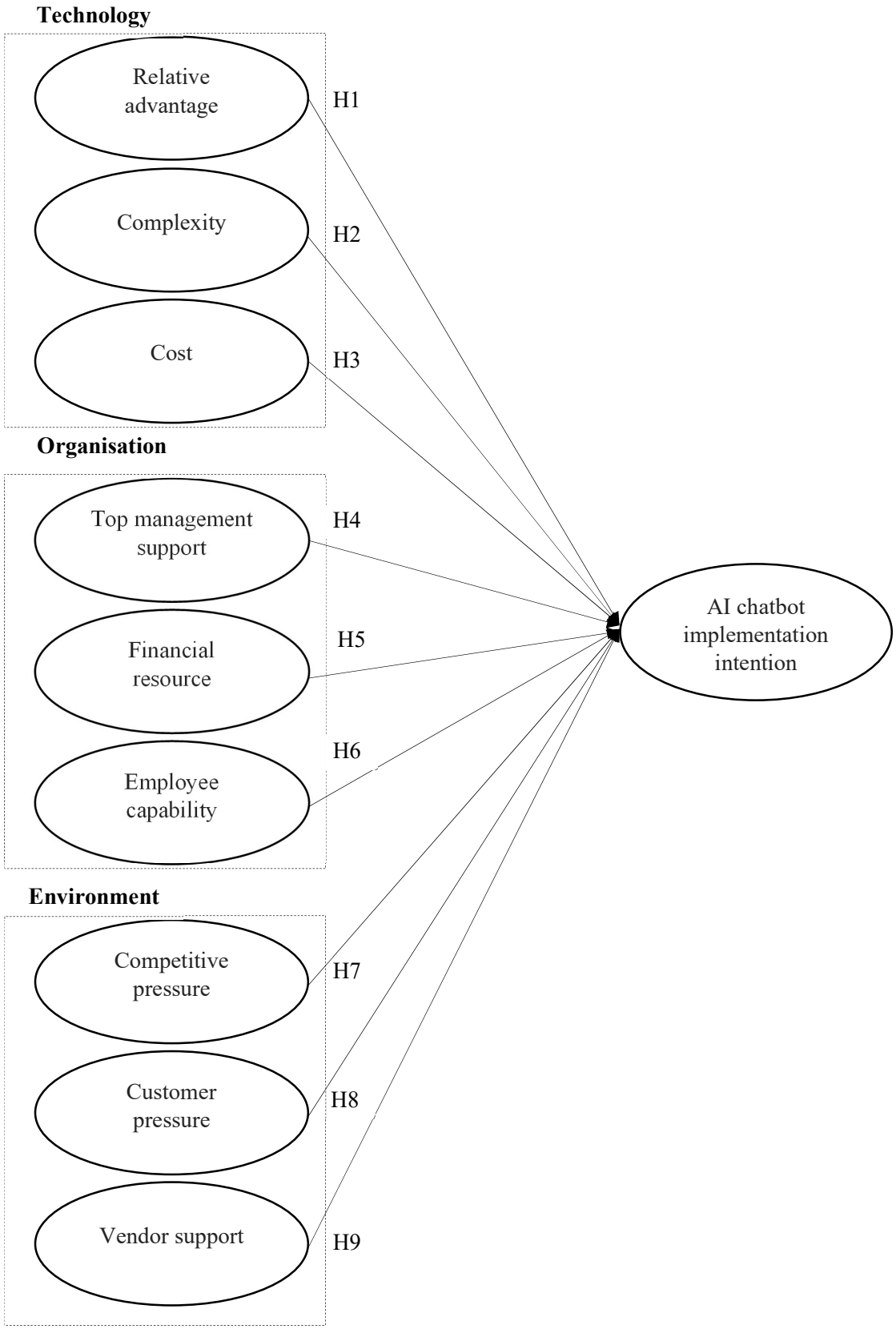

Figure 1. Research model of this study

III. METHODOLOGY

A. Participants and procedure

We created an online survey instrument using SurveyMonkey. This instrument collected cross-sectional responses from SMEs. The full survey data was collected on Facebook because it is the most used social networking site in Fiji [37]. We placed a sponsored advertisement on Facebook to target business (SMEs) pages in Fiji. The questionnaire began with screening questions to ensure that the respondents were SME owners. To further verify their ownership of SMEs, respondents were asked to supply their business registration number. Second, only those respondents who held managerial, director or CEO positions within the business were permitted to participate. To ensure that the respondents clearly knew what a chatbot was and the differences between rule-based and AI-based chatbots, they were encouraged to click on a link that provided detailed explanations and examples to distinguish between the two types of chatbots. Following this, they were asked to indicate (yes or no) if they understood what an AI-based chatbot was and how it differed from a rule-based chatbot. Only those respondents that understood this were permitted to participate in the survey.

B. Measures

This study adopted the definition of an SME outlined by the Reserve Bank of Fiji (RBF). This definition considers a business to be a small enterprise if it has between 6 and 20 staff members or revenue or total asset between $30,000 (Fijian dollars) and $100,000 (Fijian dollars), [119]. A business is considered a medium enterprise if it has between 21 and 50 employees and turnover or assets between $100,000 (Fijian dollars) and $500,000 (Fijian dollars) [119]. Sharma et al. [10] likewise employed this definition. To encourage participation, we offered respondents an entry to a lottery in which they could win prizes. The survey was active from 15 November to 15 December 2020.

The survey instrument utilised pre-validated items from prior studies. The appendix presents the detailed items used to formulate the survey instrument as well as their sources. We measured each of the items using a seven-point Likert scale due to this scale's high reliability in capturing responses [120]. The development of the survey instrument proceeded as follows. First, we confirmed the adapted scales' content validity via feedback from two professors in the field of marketing and one in the field of information systems. After making changes based on this feedback, we piloted the survey instrument with 15 post-graduate students at the

University of the South Pacific (USP). We made a few additional changes to the items to enhance readability following the pilot test.

C. Analysis

We received a total of 296 responses. We examined this data for missing responses, unengaged responses, normality distribution and multicollinearity issues. Four responses were removed because their Z-score values identified them as outliers. Skewness and kurtosis tests confirmed the normal distribution of the data by meeting the criteria suggested by Hair et al. [121]. Tolerance scores above 0.1 and variance inflation factor scores below 5 confirmed the absence of multicollinearity issues [122]. Following these tests, we subjected the remaining 292 responses to further analysis. Consistent with prior studies [123–125], we utilised structural equation modeling (SEM) due to its ability to analyse relationships between outcomes and their antecedents [10]. Variance-based SEM (VB-SEM) and covariance-based SEM (CB-SEM) are two types of SEM analysis that can be employed [126]. Considering the restrictions related to data is key to selecting the appropriate variant. VB-SEM is more lenient with sample size and data requirements. Meanwhile, CB-SEM is more appropriate when examining models that are theory based; however, it requires a larger sample size, conformance to multivariate assumptions and the absence of outliers. This study employed CB-SEM because the model is theory based [9].

IV. RESULTS

A. Common method bias (CMB)

Because this study collected data using a self-report instrument, CMB was a potential issue. While we attempted to avoid this issue by ensuring the respondents of their anonymity, we also employed Harman's single-factor assessment to confirm the issue's absence. The test revealed a variance of 30.21%, which is below the recommended 50% threshold [127]. This result confirmed that the data were not affected by CMB. Prior studies have likewise employed this method to examine CMB [128–130]

B. Measurement model

We also confirmed the instrument’s validity, with both Cronbach’s alpha and composite reliability (CR) tests returning values above 0.73 (the recommended cut-off is 0.70; Table 2) [131]. We examined convergent validity using the average variance extracted (AVE) values. The values of all constructs met the recommended criteria (>0.50; Table 3), thus validating

convergent validity. The square roots of the AVEs for all constructs exceeded their respective correlations (Table 2). This validated discriminant validity. A confirmatory factor analysis (CFA) revealed a good model fit [X^2/df = 2.832, *CFI* = 0.931; *GFI* = 0.929; *TLI* = 0.921; *RMSEA* = 0.030].

Table 2. Discriminant validity

	M	SD	α	CR	AVE	MSV	Max R (H)	PRA	PCM	PCT	TMS	PFS	PEC	PVS	PSV	PTP	CAI
PRA	3.67	0.93	0.77	0.78	0.79	0.08	0.86	**0.89**									
PCM	3.81	1.17	0.83	0.78	0.85	0.44	0.72	0.28*	**0.92**								
PCT	3.71	0.87	0.73	0.81	0.74	0.35	0.91	0.10***	0.38**	**0.86**							
TMS	3.67	0.91	0.93	0.93	0.77	0.54	0.94	0.23**	0.34*	0.27***	**0.88**						
PFS	3.56	0.82	0.94	0.94	0.8	0.54	0.94	0.18**	0.39*	0.31***	0.24***	**0.89**					
PEC	3.59	0.96	0.85	0.85	0.6	0.27	0.89	0.12***	0.26*	0.29***	0.39***	0.37***	**0.78**				
PVS	3.43	0.94	0.89	0.89	0.78	0.42	0.90	0.16*	0.31*	0.19**	0.49***	0.48***	0.52***	**0.88**			
PSV	3.45	0.95	0.84	0.73	0.85	0.32	0.70	0.14**	0.34*	0.24**	0.56***	0.60***	0.47***	0.40***	**0.92**		
PTP	3.41	0.83	0.89	0.89	0.74	0.37	0.92	0.20**	0.09*	0.05**	0.09*	0.12**	0.12**	0.08*	0.34***	**0.86**	
CAI	3.71	0.93	0.87	0.88	0.7	0.37	0.90	0.25**	0.09**	0.03	0.03*	0.11**	0.17*	0.07*	0.29***	0.41***	**0.84**

Note: M = Mean; SD = Standard deviation; α = Cronbach's alpha; AVE = Average variance extracted; CR = Composite reliability; MaxR(H) = Maximum Reliability; MSV = Maximum shared variance; PRA = Perceived relative advantage; PCM = Perceived complexity; PCT = Perceived cost; TMS = Top management support; PFS = Perceived availability of financial support; PEC = Perceived employee capability; PVS = Perceived vendor support; PCP = Perceived competitive pressure; PTP = Perceived customer pressure; CAI = Chatbot adoption intention. Significance of correlations: † $p < 0.100$; * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$.

Table 3: Measurement of study variables

Variable	Measurement items	Model and item indices	
		SL	SMC
Perceived relative advantage	PRA1	0.75	0.56
	PRA2	0.67	0.45
	PRA3	0.89	0.79
	PRA4	0.77	0.59
Perceived complexity	PCM1	0.87	0.75
	PCM2	0.8	0.65
	PCM3	0.77	0.59
	PCM4	0.83	0.69
Perceived cost	PCT1	0.94	0.88
	PCT2	0.73	0.53
	PCT3	0.8	0.65
	PCT4	0.81	0.65
Top management support	TMS1	0.89	0.79
	TMS2	0.93	0.87
	TMS3	0.9	0.81
	TMS4	0.79	0.62
Perceived availability of financial support	PFS1	0.87	0.76
	PFS2	0.87	0.76
	PFS3	0.92	0.85
	PSF4	0.91	0.84
Perceived employee capability	PEC1	0.78	0.61
	PEC2	0.88	0.77
	PEC3	0.87	0.76
	PEC4	0.81	0.66
Perceived vendor support	PVS1	0.8	0.64
	PVS2	0.87	0.76
	PVS3	0.8	0.64
	PVS4	0.83	0.68
Perceived competitive pressure	PCP1	0.82	0.66
	PCP2	0.75	0.56
	PCP3	0.86	0.74
Perceived customer pressure	PTP1	0.78	0.61
	PTP2	0.94	0.89
	PTP3	0.85	0.71
Chatbot adoption intention	CAI1	0.76	0.58
	CAI2	0.92	0.85
	CAI3	0.83	0.68

Note: SL = Standardised loadings; SMC = Squared multiple corelations.

C. Structural model

The structural model exhibited a good model fit [x^2/df = 2.915; *CFI* = 0.923; *GFI* = 0.915; *TLI* = 0.917; *RMSEA* = 0.029]. Following this confirmation, we examined the hypothesised relationships based on the empirical data.

Tests of the direct relationships produced the following results. Relative advantage (H1: β = 0.584, $p < 0.001$), complexity (H2: β = -0.618, $p < 0.001$), cost (H3: β = -0.357, $p < 0.001$), top management support (H4: β = 0.219, $p < 0.001$), financial resources (H5: β =0.263, $p < 0.01$) and employee capability (H6: β = 0.350, $p < 0.001$) were associated with SMEs' intention to adopt AI-based chatbots. The associations of perceived vendor support (H7), perceived competitive pressure (H8) and perceived customer pressure (H9) with intention to adopt were insignificant because their p-values exceeded 0.05. Therefore, we rejected H7, H8 and H9. The tests identified relative advantage as the strongest factor positively influencing AI-based chatbot adoption, followed by employee capability, financial resources and top management support. Complexity was the strongest negative factor, followed by cost. Examination of the R^2 value revealed that AI chatbot adoption intention was 79%, which indicates a strong predictive power. Refer to Figure 2 for illustration.

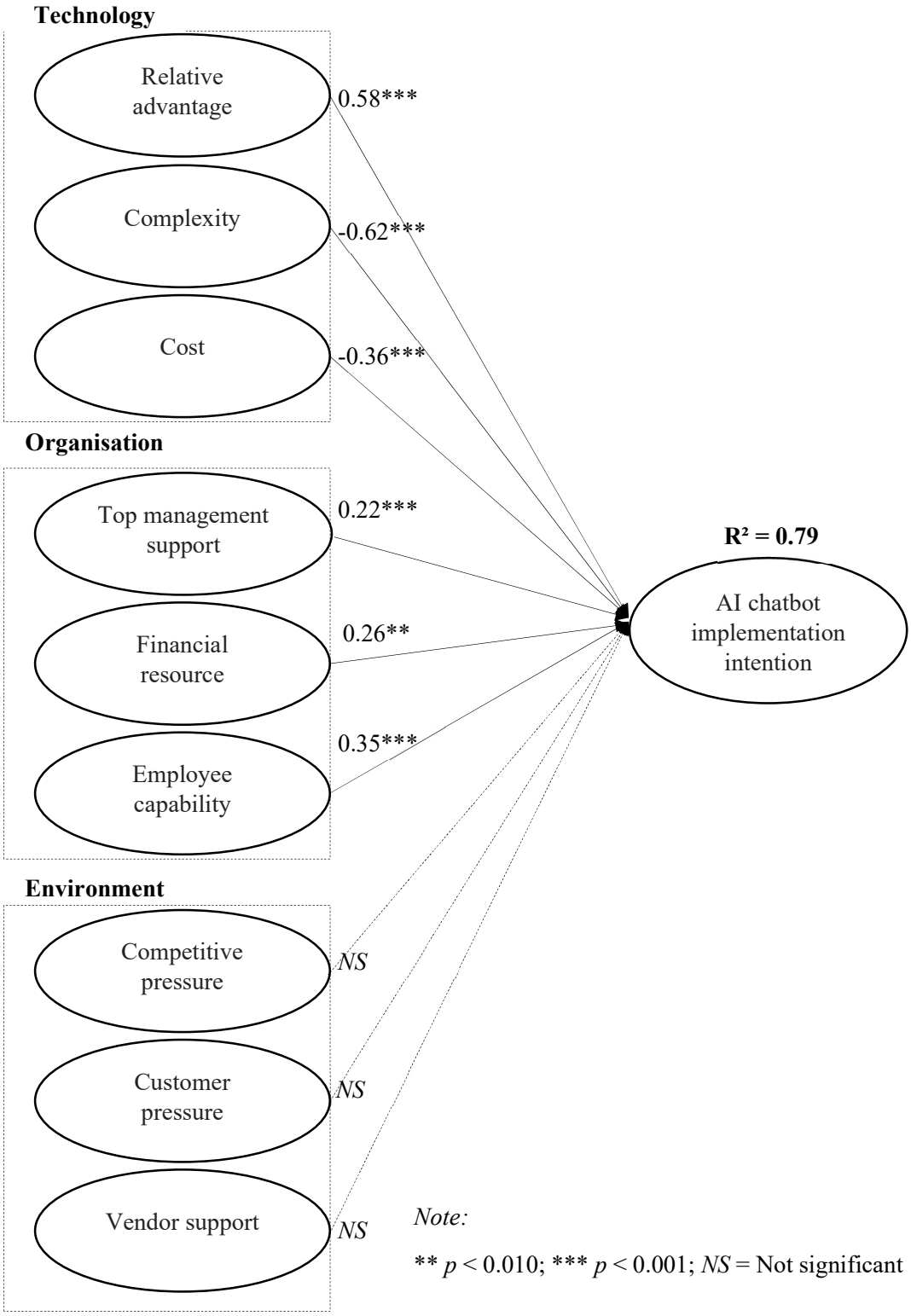

Figure 2. Results of hypotheses testing

V. DISCUSSIONS AND CONCLUSION

To examine SMEs' adoption of AI-based chatbots, this study proposed nine hypotheses based on the theoretical lens of the TOE model. The results from the statistical analysis confirmed

six (H1, H2, H3, H4, H5 and H6) of the nine hypotheses. H1, examining the positive association between perceived relative advantage and SMEs AI-based chatbot adoption intention, received support. Previous studies have confirmed similar findings regarding the importance of the perceived relative advantage of adopting new technology [60–62]. This result implies that SMEs that recognise the benefits and value of AI-based chatbots, such as convenience and real-time, 24/7 communication with customers without the need for employees, are more likely to adopt such systems. The reason behind this positive association may be that any business that realises the benefit of adopting a system will be more likely to adopt it.

H2, examining the negative association between perceived complexity and SMEs' AI-based chatbot adoption intention, also received support. This result is consistent with Belanche et al. [72], who found that ease of use was positively associated with customers' adoption of robo-advisors. Other researchers have reported similar findings highlighting the positive association between the ease of using a new technology and businesses' intention to adopt it [68–70]. This result implies that for SMEs to adopt AI-based chatbots, such chatbots must be easy to set up and use. Because AI-based chatbots are complex, businesses also consider the reputational, privacy and communication quality risks associated with them [19, 132]. Small businesses that lack internal IT capabilities are more likely to struggle to mitigate these risks. The reason for the negative association between perceived complexity and adoption intention may be that SEMs will be reluctant to adopt AI-based chatbots if they perceive the system to be complex and difficult to implement and use.

The study also supported H3, which examined the negative association between perceived cost and SMEs' intention to adopt AI-based chatbots. Wong et al. [62], Ghobakhloo and Ching [81] and Kala Kamdjoug et al. [82] reported similar findings regarding SMEs' adoption of new technology. In other words, because SMEs face more significant financial constraints than do larger businesses [92, 93], they will be less likely to adopt AI-based chatbots when they perceive the cost of implementing and maintaining such systems to be high. This cost includes the cost to update, troubleshoot or even hire external consultants as necessary to ensure the system's smooth running. A reason for this negative association may be the risk that the adoption of AI-based chatbots could fail by producing greater costs than benefits.

H4, examining the positive association between top management support and SMEs' decision to adopt AI-based chatbots, also received support. Previously, Swani [87] confirmed top management support as a crucial factor affecting a business's acceptance of mobile

applications. Other studies have likewise supported this relationship in the context of businesses' adoption of new technology [84, 85]. This result implies that owner–manager support in terms of allocating time and resources is key to SMEs' adoption of AI-based chatbots. A reason for this positive association may be that SMEs' small size positions their owner–managers as the key decision-makers. Thus, their support is critical for the adoption of AI-based chatbots.

The study also supported H5, which examined the positive association between the perceived availability of financial resources and SMEs' adoption of AI-based chatbots. Okundaye et al. [94] found similar results, with the availability of financial resources profoundly impacting Nigerian SMEs' ICT adoption. Chau et al. [95] and Mittal et al. [36], too, reported similar findings in relation to SMEs' technology adoption. This result suggests that financial resource availability is key to SMEs' adoption of innovative technologies, such as AI-based chatbots. Because SMEs face significant challenges in securing financing, the availability of finance is among the key factors driving their innovation adoption.

H6, examining the positive association between employees' perceived IT capabilities and SMEs' AI-based chatbot adoption intention, also received support. This result aligns with those of other studies, including Eze et al. [98], who identified employee capability as a significant factor impacting businesses' adoption of mobile marketing technology. This result implies that to successfully adopt AI-based chatbots, businesses must have employees who are highly skilled and sufficiently knowledgeable to set up and run such a system. Compared to larger businesses, SMEs often lack qualified human resources, which affects innovation [92, 93]. The reason for this positive association may be that if SME owner–managers believe their employees possess the technical experience to implement and use AI-based chatbots, the business will adopt such chatbots.

The study did not support H7, which examined the relationship between perceived availability of vendor support and SMEs' AI-based chatbot adoption intention. This result contradicts the findings of other scholars, such as Sharma and Sehrawat [116], who found vendor support to be critical in businesses' adoption of cloud computing. This finding was also inconsistent with Maduku et al. [91] and Ahmadi et al. [114] in terms of technology adoption. A plausible explanation may be that although SMEs consider vendor support to be important, such support is not sufficient for them to successfully adopt AI-based chatbots. This may be especially true because AI-based chatbots were developed with larger businesses in mind [15]. Additionally,

SMEs may be sceptical of relying too much on vendor support while lacking internal IT capabilities. This could increase their risk and make them vulnerable to losing AI capabilities in the future [132].

H8, examining the positive association between competitive pressure and SMEs' decision to adopt AI-based chatbots, also did not receive support in our study. Again, this result contradicts those of prior studies in the context of businesses' technology adoption [49, 101]. Xu et al. [104] and Jia et al. [105] confirmed that competitive pressure impacts ERP and Enterprise 2.0 adoption, respectively. Our contradictory result may be because most SMEs have not adopted AI-based chatbots in Fiji. Therefore, SMEs do not face pressure to follow their competitors in adopting this technology. This result also highlights the advantages of early adoption of AI-based chatbots as a way for small businesses to gain a competitive edge [133].

Finally, the study did not support H9, which examined the positive association between customer pressure and SMEs' AI-based chatbot adoption intention. This finding, once again, contradicts those of prior studies. Nam et al. [50], Lorente-Martínez et al. [111] and Abed [31] found customer pressure to be positively associated with SMEs' adoption of innovative technologies. A plausible explanation for our contradictory finding may be that AI-based chatbots are not yet a commonly used technology. Therefore, customers have yet to realise their benefits. This, in turn, could explain the lack of customer pressure on SMEs to adopt the technology. Additionally, customers have been shown to hold higher trust in conventional agents and perceive them to be more attractive and offer better communication experiences than chatbots [134]. The lack of customer pressure may thus be the result of their preference for conventional agents. This implies that businesses must consider customers' emotions and preferences before adopting innovations, such as chatbots.

A. Conclusion

In the area of business communication, chatbots have been a benchmark since the dawn of commerce. However, their effectiveness was initially limited by the absence of the 'human element'. Recent developments in artificial intelligence and I4.0 [135–137] have transformed the capabilities of chatbots and thus their potential as effective tools for businesses. Interestingly, the data we collected from 292 SME respondents confirm both organisational and technology-related factors in the TOE framework. However, we found all factors relating to the environment (customer pressure, competitive pressure and perceived availability of vendor support) to be insignificant. The implications of this study help to expand the scarce

literature on SMEs and AI. This is crucial because AI-based chatbots have the potential to fundamentally enhance SMEs' competitiveness.

B. Theoretical implications

This study contributes theoretically to the literature as follows. First, the literature relating to the applicability of AI in SMEs is scarce [96, 138]. Much of the literature relating to the implementation of AI relates to large businesses [36]. Nevertheless, opportunities exist for SMEs to adopt innovative technologies created for larger businesses [9]. This study contributes to addressing this literature gap by examining the factors driving SMEs to adopt AI-based chatbots. Additionally, studies have focused on the customer perspective, with limited literature available on the business perspective [2, 18, 19]. This study's contribution is critical because SMEs significantly impact social stability and economic development [10, 125, 139].

Second, studies on AI adoption have primarily been conducted in large and developed countries, such as the US [18] and India [15]. However, little empirical evidence exists for smaller developing nations. Song et al. [19] highlighted that businesses from different cultures and country backgrounds may vary in their adoption of AI-based chatbots. Factors such as the legal environment, technological infrastructure, economy and culture profoundly influence businesses' adoption of innovative technologies [37–39]. Therefore, this study contributes by providing empirical evidence of the factors driving SMEs' adoption of AI-based chatbots in a developing small island country (i.e. Fiji).

Third, this study contributes to the TOE framework by providing empirical evidence regarding the technological, organisational and environmental factors influencing SMEs' adoption of AI-based chatbots. The findings indicate that in small developing countries, such as Fiji, environmental factors of competitive pressure, customer pressure and vendor support are insignificant in driving SMEs' to adopt AI-based chatbots. Meanwhile, technological and organisation factors drive adoption. Thus, the study contributes by highlighting differences in the factors affecting AI-based adoption based on the size of the business and country.

C. Practical implications

This study's findings offer critical practical insights for SME owners, AI-based chatbot developers and marketers in promoting the adoption of such systems.

Because the perceived relative advantage of AI-based chatbots is positively associated with SMEs' AI-based chatbot adoption decisions, developers and marketers must highlight the

benefits of harnessing AI and I4.0 technologies to improve businesses' operations and enable SMEs to gain a competitive advantage. AI developers and marketers should thus communicate the potential of AI-based chatbots to increase the efficiency of SMEs' communication with their customers without having to dedicate employees to the task. This would result in long-term cost savings and provide SMEs with a competitive edge by ensuring their round-the-clock availability to customers and enhancing their ability to provide reliable information and real-time solutions to problems. Additionally, developers and marketers should acknowledge the differences between SMEs and large businesses in terms of the former's limited budgets and resources. In sum, AI-based chatbots should be marketed to SMEs so that such businesses can recognise their value and feel confident in addressing any obstacles to their implementation.

Because complexity is negatively associated with SMEs' decision to adopt AI-based chatbots, developers must ensure that such chatbots are easy for businesses to implement and use. Although they have thus far primarily developed I4.0 technologies with larger businesses in mind, developers must recognise the limited resources available to SMEs in terms of technical experiences and IT infrastructure. Moving forward, developers should create AI-based chatbots that are easy for SMEs to install, use and maintain. Developers and marketers should communicate the user-friendly nature of such systems to encourage SME adoption.

Our study confirms a negative association between perceived cost and SMEs' decision to adopt AI-based chatbots. Thus, cost is a critical factor for developers to consider when designing such systems. SMEs have limited financial resources, which leaves them unable to spend large amounts of money on AI-based chatbots. Therefore, developers should devise strategies that minimise the cost of implementing and running AI-based chatbots. For instance, running AI systems, such as chatbots, requires significant processing power, which would likely be too expensive for SMEs. To reduce these massive financial obligations, developers can offer SMEs cloud computing solutions.

Our study also highlights the importance of top management support in SMEs' decision to adopt AI-based chatbots. Often, a single owner–manager of an SME directs the business's decision-making, resource allocation, clarification of business direction and staff involvement. Therefore, this individual must become aware of developments in AI and other novel technological opportunities available to businesses [140, 141]. Developers and marketers should focus on encouraging SME owner–managers to adopt AI-based chatbots. They might,

for example, conduct workshops and training to provide the owner–managers of such businesses with information regarding the benefits of such technologies.

Our results also indicate that the perceived availability of financial resources positively influences SMEs' decision to adopt AI-based chatbots. Indeed, SMEs' expansion and development are primarily affected by their inability to secure financing. Therefore, developers must ensure that such businesses can secure the financing necessary to adopt AI-based chatbots. To this end, they might set up subscription plans whereby businesses pay monthly or yearly subscriptions rather than requiring them to make a high initial investment. Governmental organisations should also work alongside financial institutions to ensure financing options are available to support innovation in SMEs.

Finally, because perceived employee IT capability is positively associated with SMEs' adoption of AI-based chatbots, additional effort must be devoted to enhancing the skills and expertise of employees in such businesses. Owner–managers must have confidence in their employees' abilities and, in many cases, in their own abilities to implement and use AI-based chatbots. Developers and vendors must, therefore, provide training and workshops for the employees of organisations that have adopted such systems. These can be conducted using self-paced learning tools to limit any disruptions to work.

D. Limitations and future work

Although this research conformed to all sound research guidance, we must acknowledge its limitations. First, we collected data from managers, directors and CEOs using a sponsored advertisement on Facebook. The current restrictions on movement resulting from the COVID-19 pandemic made this method most appropriate [142]. However, it is unlikely that all SMEs are present on social networking sites. Therefore, future studies should obtain a list of all active SMEs in the country of interest and conduct random sampling to increase the results' generalisability. Second, we collected data from a single country. It would be interesting to conduct cross-national studies to examine SMEs' chatbot adoption in other country contexts. These efforts would allow exploration of the influence of country-specific factors, such as economic environment, legal environment, technological infrastructure and culture [125]. Third, this study examined customer intention to adopt AI-based chatbots. However, behavioural intention does not always lead to actual behaviour. Therefore, future studies should incorporate actual behaviour into the model to generate valuable insights. Finally, future

studies can explore AI-based chatbot adoption among larger businesses to better understand adoption behaviour related to this technology.

Despite the above limitations, this study makes considerable contributions to the literature on AI, technology acceptance and SMEs. Our empirical results from data collected from 292 respondents confirm the positive associations of perceived employee capability, perceived availability of financial support, top management support, perceived cost, perceived complexity and perceived relative advantage with SMEs' AI-based chatbot adoption intention. The R^2 value (79%) confirms the high predictability of the model. Thus, the study addresses the literature gaps pertaining to SMEs' AI adoption and provides novel insights for SMEs as well as AI chatbot developers and markets.

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APPENDIX

Appendix A: Measurement items

Perceived relative advantage [143, 144]
The AI-based chatbot would enable our business to communicate our products/services in a better way.
The AI-based chatbot would enable our business to communicate with our customers effectively.
We would be able to reach our customers in a timely manner with an AI-based chatbot.
The AI-based chatbot would assist us in developing better relationships with our customers.
Perceived complexity [143, 144]
The use of an AI-based chatbot would require much mental effort.
The use of an AI-based chatbot would be frustrating.
The AI-based chatbot would be too complex for our communication activities.
The skills needed to use an AI-based chatbot would be too complex for employees of our business.
Perceived cost [91, 143]
The costs involved in the adoption of AI-based chatbots would be far greater than the expected benefits.
The cost of maintaining an AI-based chatbot would be very high for our business.
The cost involved in providing support systems for AI-based chatbots would be too high.
The amount of money invested in training employees to use AI-based chatbots would be very high.
Top management support [143, 145]
Top management would provide the resources necessary for the adoption of AI-based chatbots.
Top management would provide the necessary support for the adoption of an AI-based chatbot.
Top management would support the use of an AI-based chatbot.
Top managers would be enthusiastic about adopting an AI-based chatbot.
Perceived availability of financial support [146, 147]
Our business would have the financial resources for adopting an AI-based chatbot.
Our marketing budgets would be significant enough to support the adoption of AI-based chatbots.
It would be easy to obtain financial support for AI-based chatbot adoption from local banks and/or other financial institutions.
Our business would take AI-based chatbots more seriously because of the adequate financial support we receive from local banks.
Perceived employee capability [91, 148]
Our employees would be capable of learning new AI-based chatbot-related technology easily.
Our employees would be capable of using an AI-based chatbot to solve our marketing problems easily.
Our employees would be capable of using an AI-based chatbot to interact with our customers.
Our employees would be capable of providing new ideas on AI-based chatbots used for our business.

Perceived vendor support [144, 149]
Vendors actively market the use of AI-based chatbots.
There would be adequate technical support for AI-based chatbots provided by vendors.
Training for AI-based chatbots would be adequately provided by vendors and other training service providers.
Mobile marketing vendors are encouraging our business to adopt AI-based chatbots by providing us with free training sessions.
Perceived competitive pressure [144, 147]
Our choice to adopt an AI-based chatbot would be strongly influenced by what competitors in the industry are doing.
Our business is under pressure from competitors to adopt an AI-based chatbot.
Our business would adopt an AI-based chatbot in response to what competitors are doing.
Perceived customer pressure [150, 151]
Many of our customers would expect our business to adopt an AI-based chatbot.
Our relationship with our major customers would suffer if we did not adopt an AI-based chatbot.
Our customers consider would consider us to be forward-thinking by adopting an AI-based chatbot.
Chatbot adoption intention [91]
Our business intends to use AI-based chatbot.
Our business intends to start using AI-based chatbots regularly in the future.
Our business would highly recommend AI-based chatbot for other businesses to adopt.