

# Why do retail customers adopt artificial intelligence (AI)-based autonomous decision-making systems?

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## ABSTRACT

Advancements in artificial intelligence (AI) have led to the development of autonomous decision-making processes, allowing customers to delegate decisions and tasks. Such technologies have the potential to alter the retailing landscape. Grounded in the unified theory of acceptance and use of technology (UTAUT) and Hofstede's cultural theory, this study investigates customers' adoption of AI-based autonomous decision-making processes by analysing 454 customer responses using covariance-based structural equation modelling. The results reveal that effort expectancy, performance expectancy, facilitating conditions and social influence are positively associated with customers' adoption of autonomous decision-making processes. Collectivism strengthened the positive association of social influence with customer attitude, while uncertainty avoidance dampened the associations of performance expectancy, effort expectancy and social influence with attitude. The findings provide useful implications for system developers and managers while providing future researchers with directions to further explore autonomous decision-making processes.

**Keywords:** Artificial intelligence; autonomous decision-making; UTAUT model; Hofstede's cultural dimensions; covariance-based structural equation modelling

## I. INTRODUCTION

Advancements in technology have led to artificial intelligence (AI)-based autonomous systems (hereafter, autonomous systems), which have enhanced the speed, reliability and

efficiency of tasks previously executed by humans [1]. Such systems are among a plethora of technological advancements, including mobile apps, big data and blockchain [2-4], which ease human lives through increased efficiency and effectiveness in daily-life tasks. Recently, autonomous systems have brought significant changes to the retail industry for both businesses and customers [5]. We conceptualise an autonomous decision-making process in the context of retailing as a system that can perform shopping processes, such as decision-making and purchase, which customers delegate to them [5]. Such a system processes data collected from customers to decide the type, quantity and purchase timing issues [5]. Currently, autonomous systems in retail are found in functions such as customer service [6], delivery [7] and payment systems [5]. These systems are among the most innovative technologies that have revolutionised customers' shopping processes [8].

The human decision-making element of shopping has been greatly reduced due to the arrival of an AI-based autonomous decision-making process. This has led to some customers being dissatisfied with decisions [9], feeling the depletion of self-regulatory resources [10] and being reluctant to forgo their decision-making authority [11], while others feel less burdened by the cognitive effort required in such decisions [11]. Due to the disruptive effect of this technology on the retailing environment, empirical evidence regarding the factors affecting customers' adoption of autonomous decision-making processes is required [5]. While scholars have examined AI integration in retailing [12-14] and marketing [15], studies on artificial autonomy remain limited [16]. To our knowledge, prior studies have not empirically examined the drivers of customer adoption of autonomous decision-making processes and systems [5]. This is a critical knowledge gap because customers' adoption of a particular technology often determines its success and relevance for organisations [4, 17]. The adoption of new technologies can be affected by factors such as discomfort, insecurity and environmental uncertainty [18, 19].

To investigate the adoption of autonomous decision-making processes and contribute to the state-of-the-art knowledge in the field, this study adopts the unified theory of acceptance and use of technology (UTAUT) model. The use of the UTAUT model is appropriate because this theory has been applied to investigate technology adoption in retailing [20]. Additionally, this study adds attitude to the UTAUT theory. Of the 16 models and theories of information systems relating to technology adoption Dwivedi, et al. [21] examined, only five included attitude. The UTAUT model also does not include the individual characteristics factors of attitude. Theories such as the theory of planned behaviour [22] and the theory of reasoned

action [23] have highlighted the importance of attitude in influencing behavioural intention, and this has been shown to increase predictive power [21]. Therefore, this study extends the UTAUT model by adding attitude. Furthermore, individual culture also impacts the adoption—and predicts the later usage of—innovative technology [25]. Shavitt and Barnes [26] observed that cultural factors impacted the adoption of AI-based autonomous shopping systems. Cultural factors can influence social-relational, appearance-based and agency-based criteria that influence the adoption of robotic technology [27]. Considering the important role of cultural connotations, this study grounds the proposed research framework in Hofstede's cultural dimensions to examine the drivers of customer adoption of an autonomous decision-making process in the retailing context.

On the basis of the above literature gaps, this study formulates the following research questions (**RQs**): **RQ1**. What are the factors that influence customer attitude towards of autonomous decision-making processes? **RQ2**. Do cultural factors of collectivism and uncertainty avoidance positively moderate the relationship between effort expectancy, performance expectancy, facilitating conditions and social influence on attitude towards autonomous buying decisions? **RQ3**. Does attitude towards autonomous buying decisions influence autonomous shopping adoption decisions? We collected data from 454 retail customers and analysed it using covariance-based structural equation modelling (CB-SEM).

This study's novelty derives from four main aspects. First, it contributes to the limited literature and empirical evidence on the factors influencing the adoption of autonomous decision-making processes [5]. Additionally, by integrating the UTAUT model with cultural factors (i.e. collectivism and espoused uncertainty avoidance), the study generates key insights into variations in the adoption of autonomous decision-making processes across cultures. This also extends the generalisability of the theory to the novel context of autonomous decision-making processes. With the majority of studies on artificial intelligence conducted in developed countries, such as Korea [28], the USA [29], India [14, 30], China [31-35] and Taiwan [36], insights from small developing countries remain limited. Therefore, this study contributes by providing empirical insights from a developing country on the factors influencing AI adoption via autonomous decision-making processes. In doing so, the study offers comprehensive insights for both developers and customers relating to the adoption of autonomous decision-making processes in retailing. The subsequent section of the paper discusses the theoretical background, hypotheses and conceptual model for this study. Thereafter, we present the research methodology, data analysis, discussion and conclusions.

## II. LITERATURE REVIEW AND THEORETICAL FOUNDATION

### *A. Unified theory of acceptance and use of technology (UTAUT)*

One of the most prominent adoption theories in information systems [37-39], the UTAUT model has been used to investigate the adoption of AI in the fields of education [40], product adoption [41], customer relationship management [42], disaster relief operations [43] and retailing [44], among others. Venkatesh, et al. [45] first proposed the theory by combining eight information systems adoption theories into a unified framework to investigate the motivations driving individuals to adopt information systems. Since then, it has become one of the most utilised information systems adoption models [24, 46, 47]. According to the theory, the dependent variable of behavioural intention is influenced by four independent variables: effort expectancy, performance expectancy, facilitating conditions and social influence [45]. Actual behaviour is motivated by facilitating conditions and behavioural intention [45]. Four moderators (i.e. experience, the voluntariness of use, gender and age) are also components of the UTAUT model [45].

### *B. Hofstede's cultural dimensions*

Culture has multiple definitions due to its multifaceted nature. Simply put, though, culture includes the perceptions, values, beliefs and customs that a society shares [48]. The field of cultural theory has seen contributions from various influential individuals, including Arendt [49], Leidner and Kayworth [50] and Karl Marx, among others. Similarities exist in culture based on locations and markets, which, in turn, influence individuals' preferences [51]. Studies have confirmed that cultural values influence individuals' adoption of innovative technologies [24]—perhaps because such values help individuals to face uncertainty [52]. Because some cultures are less receptive to new ideas than are others, cultural differences across countries and individuals influence the adoption of technology [46]. These differences are likely to influence attitude towards investing in innovation [53]. The cultural-based development (CBD) model combines psychological and cultural factors as well as uncertainty to understand innovation adoption [54, 55]. The CBD model asserts that information plays a critical role in technology adoption and that culture significantly influences the exchange of information [51]. A recent study conducted in 11 countries found that the diffusion of robo-advisory financial services differs based on the cultural boundedness of choice in retail banking [51]. Other studies have investigated the role of culture in the adoption of e-learning [56, 57],

social media [58], home energy technology [59], internet banking [59] and digital contact tracing [59], among other forms of technology.

Hofstede [48] proposed a commonly used theory to investigate the information systems domain. The theory outlines five national cultural dimensions: time orientation (TO), power distance (PD), masculinity–femininity (MF), uncertainty avoidance (UA) and individualism/collectivism (COL). Studies have highlighted the importance of considering culture when investigating technology adoption [60, 61]. Culture influences individuals' attitudes and cognition as well as their uncertainty acceptance and innovativeness [57]. It also influences individuals' perceptions of various technologies [57]. Thus, it is critical to incorporate cultural factors in understanding the adoption of autonomous decision-making processes.

Of the five cultural dimensions, this study adopts UA and IDV. UA refers to the extent to which an individual considers ambiguous and new situations threatening [48]. IDV refers to an individual's derivation of identity from the inner-self rather than from the individual's association with a group [48]. UA and IDV are the two most frequently applied dimensions in technology adoption research [62]. Studies such as Tam and Oliveira [63] and Sharma, et al. [24] have applied the two dimensions of culture to understand technology adoption behaviour. We also limit our study to these two dimensions because it is unreasonable for a single study to adopt all five dimensions of culture [64, 65]. Noting Hofstede [66] recommendation against the use of cultural values at a country level to understand an individual's behaviour, this study employs the customer's espoused cultural values, which refer to the degree to which a person embraces national cultural values [67].

### **III. CONCEPTUAL FRAMEWORK AND HYPOTHESES DEVELOPMENT**

#### *A. Hypotheses grounded in the unified theory of acceptance and use of technology*

Figure 1 illustrates the conceptual framework based on the below-proposed hypotheses. The exogenous variables of the UTAUT model—effort expectancy, performance expectancy, facilitating conditions and social influence—impact customers' attitudes towards the autonomous decision-making process. Hofstede's cultural values of collectivism and uncertainty avoidance moderate these relationships. Finally, we propose that attitude towards the autonomous decision-making process is positively associated with autonomous decision-

making process adoption intention. The subsequent paragraphs present our arguments for each tested association.

Attitude refers to an evaluation of a person's behaviour [68]. Research has shown that performance expectancy is positively associated with a person's attitude [69, 70]. Performance expectancy refers to the benefits and utilities—such as productivity and convenience—customers derive through technology [45]. This definition implies that customers are more likely to accept a particular technology if the technology reduces effort and saves time [71-73]. Ameen, et al. [6] found that customers' adoption of AI-enabled services was positively influenced by the perception that it increases customer convenience. Another study conducted by Hu, et al. [16] showed that users preferred AI-enabled artificial autonomy—i.e. autonomy in action, thought and sensing—due to its convenience. With performance expectancy conceptualised in terms of technology's potential to save effort and time and increase convenience [24], existing studies have highlighted that AI enhances performance expectancy [74]. Moriuchi [75] found that performance expectancy enhanced customers' user experience in the context of AI. Consistent with prior research, we also propose that customers are more likely to adopt autonomous decision-making processes that provide them with benefits. We thus hypothesise as follows:

***H1:** Performance expectancy is positively associated with attitude towards autonomous decision-making processes.*

Customers are attracted to technology that requires little effort and is easy to use [71]. Information systems research has shown that ease of use (termed as such by Davis, et al. [76]), or effort expectancy (termed as such by Venkatesh, et al. [45]), is a crucial factor influencing technology adoption [77]. Prior research has revealed effort expectancy's significant and positive impact on tourists' attitudes towards the use of AI in service delivery [78, 79] and AI-based robotic devices [80]. In another study, Moriuchi [75] found effort expectancy to have the strongest positive effect on users' experience of AI. Following previous studies, we expect that customers will be more likely to adopt an autonomous decision-making process that requires little effort. Therefore, we hypothesise as follows:

***H2:** Effort expectancy is positively associated with attitude towards autonomous decision-making processes.*

Social influence refers to the impact of other people (from reference groups, such as one's social circle) on a person's attitudes and behaviour [45]. Gursoy, et al. [79] found that

social influence is one of the major factors positively affecting customers' acceptance of AI in service delivery. Similarly, Lin, et al. [80] confirmed the key role of social influence in increasing customers' AI-based robotic devices acceptance in the tourism industry. Research has shown that social influence also positively influences customers' willingness to adopt robo-advisers [81]. These studies imply that the likelihood of customers adopting an autonomous decision-making process will increase when their reference group members influence them to do so. Therefore, we propose the following hypothesis:

***H3: Social influence is positively associated with attitude towards autonomous decision-making processes.***

According to Venkatesh, et al. [45], the availability of support services and technical infrastructure influences the adoption of innovative technology. We consider these aspects, which the extant research has identified as key factors affecting technology adoption [82, 83] to be facilitating conditions. Lu, et al. [84] found that facilitating conditions positively affect customers' adoption of a service robot. Similarly, Kapser and Abdelrahman [85] and Kaye, et al. [86] found the same association to be significant in the context of autonomous delivery and vehicles, respectively. Facilitating conditions also significantly and positively influence the adoption of self-service parcel delivery services [82]. Thus, we anticipate that customers will be more likely to adopt autonomous decision-making processes when adequate technical infrastructure and support services are available. We propose the following hypothesis:

***H4: Facilitating conditions are positively associated with attitude towards autonomous decision-making processes.***

#### *B. Hypotheses grounded in Hofstede's cultural theory*

Collectivism refers to the degree to which a person prefers to be identified by their family in exchange for loyalty [87]. Cultures high in individualism tend to be more innovative [88]. According to Abbasi, et al. [89] and Zhang, et al. [90], highly individualistic cultures emphasise technology's usefulness when deciding to adopt it. Zhao et al. [91] found that cultures high in individualism were more influenced by the usefulness of e-learning adoption. Therefore, individuals in collectivist cultures are less likely to be influenced by the benefits of the autonomous decision-making process. This study thus proposes the following hypothesis:

***H5a: The relationship between performance expectancy and attitude towards autonomous buying decisions is weaker in highly collectivist cultures.***

Research has shown that collectivist cultures are less innovative than are individualistic cultures [88]. Ease of use is a key characteristic of technology that influences adoption in cultures high in individualism [89, 90]. Thus, we expect that individuals in collectivist cultures will be less affected by the autonomous decision-making process's ease of use. We hypothesise as follows:

***H5b: The relationship between effort expectancy and attitude towards autonomous decision-making processes is weaker in highly collectivist cultures.***

Lu, et al. [92] found that because collectivism induces individuals to give greater consideration to others' opinions when making decisions [93], social circles are more influential in individuals' mobile shopping decision-making in collectivist cultures. Studies by Srite [60] and Huang et al. [57] found a stronger relationship between subjective norms and behavioural intention in collectivist cultures. Social influence was also found to more strongly impact customers' decision-making regarding food purchases in collectivist cultures [94]. Thus, we expect that individuals in collectivist cultures will be more prone to influence from individuals close to them when deciding to adopt an autonomous decision-making process, and we hypothesise as follows:

***H5c: The relationship between social influence and attitude towards autonomous decision-making processes is stronger in highly collectivist cultures.***

A study by Yip et al. [95] found that students in Hong Kong (a collectivist culture) were less concerned about facilitating conditions than were students in Japan (an individualistic culture). Smith and Reynolds [96] found that individuals in individualistic cultures were more concerned about support services when using new technology. However, Sharma et al. [24] found individualism insignificant in moderating the relationship between facilitating conditions and behavioural intentions. These studies offer an inconsistent understanding of the impact of collectivism on individuals' attitudes and their perceptions of facilitating conditions, which is a scarcely studied association in prior research. We expect that individuals in collectivist cultures will be less influenced by the autonomous decision-making process's technical infrastructure and support services. Thus, we hypothesise as follows:

***H5d: The relationship between facilitating conditions and attitude towards autonomous buying decisions is weaker in highly collectivist cultures.***



Uncertainty avoidance refers to the degree to which an individual feels uncomfortable when faced with an ambiguous situation [97]. Understood as an individual's assessment of risk, UA is a cultural factor that causes the most significant disparities in new technology adoption [98]. Individuals high in UA value security more than do those who are low in UA [99]. Research has shown that cultures high in UA attempt to gain security and reduce risk perception by focussing on performance expectancy when faced with an unknown product or service [100-102]. Thus, we propose that individuals in high UA cultures will be more significantly influenced by the benefits of the autonomous decision-making process. We propose the following hypothesis:

***H6a:*** *The relationship between performance expectancy and attitude towards autonomous decision-making processes is stronger in high uncertainty avoidance cultures.*

Research suggests that individuals in high UA cultures focus on ease of use when faced with an unknown product or service [100-102]. Sun, et al. [103] found a positive association between UA and ease of use in the context of hotel technology adoption. Individuals in cultures with high levels of UA also give greater consideration to the effort required to learn a new technology [90]. We expect the ease of use of the autonomous decision-making process would enhance adoption. Therefore, we hypothesise as follows:

***H6b:*** *The relationship between effort expectancy and attitude towards autonomous decision-making processes is stronger in high uncertainty avoidance cultures.*

Individuals' concerns about uncertain situations are affected by others' feedback, comments and opinions [90]. Lai et al. [104] found that uncertainty avoidance strengthens the positive association between social influence and behavioural intention to use technology in classrooms. Referent groups members can motivate individuals by offering evidence that encourages them to adopt new technology [90, 105]. We agree with these findings and expect that individuals from high uncertainty avoidance cultures will be more prone to influence from their reference group members when deciding whether to adopt the autonomous decision-making process. Therefore, we hypothesise as follows:

***H6c:*** *The relationship between social influence and attitude towards autonomous decision-making processes is stronger in high uncertainty avoidance cultures.*

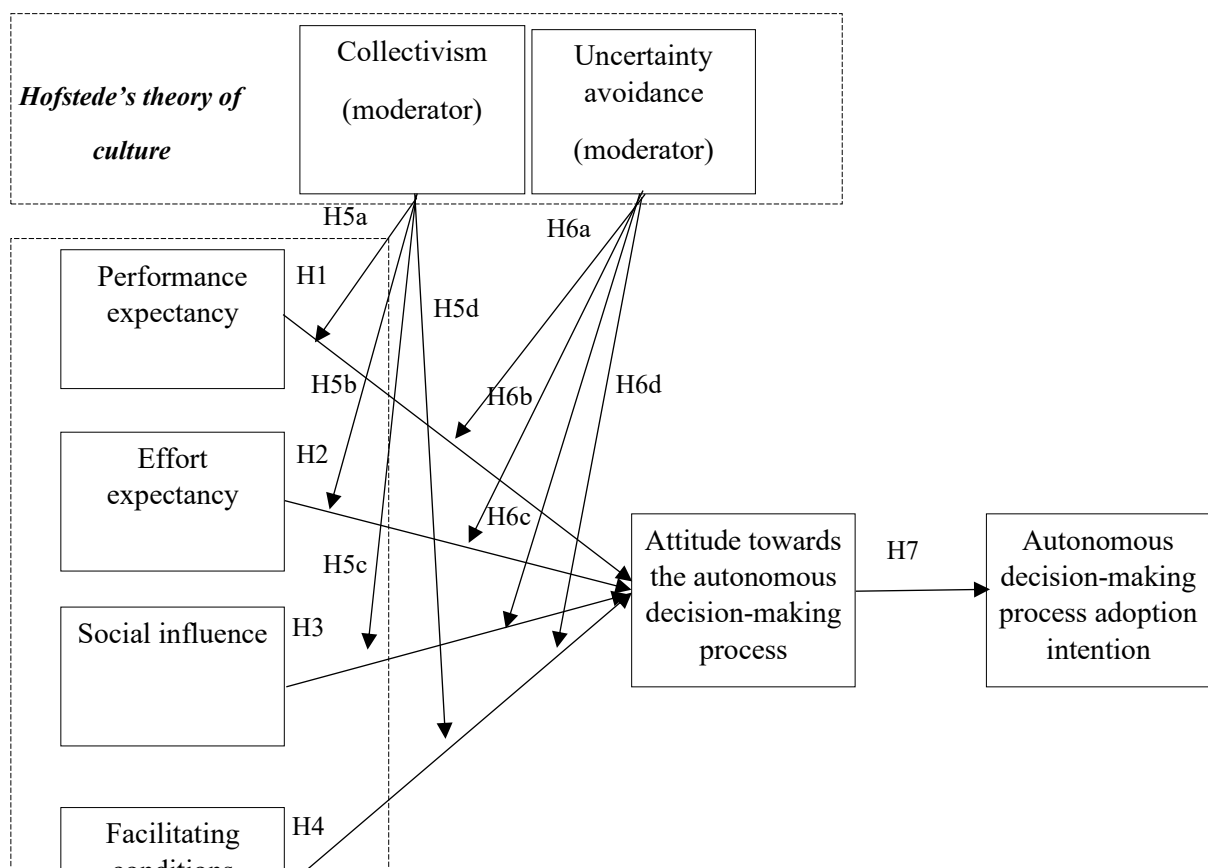
Customers who have access to more support resources are more likely to exhibit a positive attitude towards autonomous shopping, especially in high UA cultures [24]. However,

prior research offers contrasting evidence for this proposition. On the one hand, Im et al. [106] found that culture did not influence facilitating conditions, while on the other hand, Qi Dong [107] found that individuals from high UA cultures required more facilitating conditions to decrease their concerns about new technology adoption. Sharma, et al. [24] found similar results, confirming that the relationship between facilitating conditions and behavioural intention is stronger in high UA cultures. Despite the conflicting results, we are inclined to believe that technical infrastructure and support services (as facilitating conditions) will assure customers of possible service quality and reduce the risks they perceive to be associated with adopting an autonomous decision-making process. Therefore, we hypothesise as follows:

**H6d:** *The relationship between facilitating conditions and attitude towards autonomous decision-making processes is stronger in high uncertainty avoidance cultures.*

Researchers have explored the influence of attitude on behavioural intentions [108-110]. Further, research has revealed a significant role for attitude in eliciting positive adoption intentions among customers. For example, Sharma et al. [111] found attitude to be a key factor in customers' adoption of digital contract tracing applications. Similarly, Ek Styvén and Mariani [112] found attitude to positively impact individuals' behavioural intentions to purchase second-hand clothes. Based on the prior research, we expect that attitude will positively influence autonomous buying decisions and thus propose the following hypothesis:

**H7:** *Attitude towards autonomous decision-making processes is positively associated with customers' intention to adopt these processes.*



**Figure 1:** Conceptual framework

## **IV. RESEARCH METHODOLOGY**

### *A. Procedure and participants*

This study adopted a cross-sectional design by utilising an online survey on SurveyMonkey (a popular survey development website) to collect responses. Ten University of the South Pacific (USP) students participated in the pilot study. Because these students are also retail customers, their use in the pilot test was appropriate. After completing the pilot test, we slightly altered the phrasing of some of the questionnaire items to improve their readability and understandability. Noting the application of a similar methodology in prior studies [46, 113, 114], we then circulated the questionnaire by placing a sponsored advertisement on Facebook. According to Sharma, et al. [115], Facebook ranks as the most commonly used social networking site in Fiji. Data collection was conducted for four weeks in November 2020. To prevent any missing data, we made all questions related to the construct compulsory on SurveyMonkey. The data collection process strictly adhered to the ethical guidelines outlined by USP.

### *B. Measures and analysis*

While we employed pre-validated scales to measure the study's variables, we also made appropriate changes to the scales' phrasings to ensure that they aligned with the present study's context. The study employed a seven-point Likert scale due to its high reliability in capturing data from respondents [116]. Appendix A presents the scales as well as details about their sources. We utilised the Statistical Package for the Social Sciences (SPSS 25.0) and AMOS (25.0) to analyse the collected data. This process involved examining the measurement model using confirmatory factor analysis. Subsequently, we employed covariance-based structural

equation modelling (CB-SEM) to test the proposed hypotheses in the conceptual framework (see Figure 1). This approach is consistent with prior studies on consumer behaviour [117].

We examined the data for missing and unengaged responses, kurtosis, skewness and multicollinearity. This examination led us to exclude 13 responses identified as outliers based on Z-scores. We performed the data analysis with the remaining 454 responses. The data were normally distributed because the kurtosis and skewness values met those suggested by Hair, et al. [118]. Tests showed that the variance inflation factors were below 5 and the tolerance values were greater than 0.1. These results confirmed that the data were not affected by multicollinearity issues. The majority of the respondents were female (55.07 per cent), between the ages of 26 to 30 (33.26 per cent) and earning an income less than \$15,000 (24.01 per cent). Appendix B provides a detailed demographic profile of the respondents.

## **V. RESULTS**

### *A. Common method bias*

Consistent with prior research on information systems [119] and consumer behaviour [120], we tested for common method bias (CMB) in SPSS using Harman's single-factor test. The results revealed a variance of 31.25 per cent, which is well below the 50 per cent limit recommended by Podsakoff et al. [121]. The results thus confirmed that CMB did not influence the study's findings.

### *B. Measurement model*

Consistent with Fornell and Larcker's [122] recommendation, the composite reliability and Cronbach alpha values exceeded 0.70 (see Table 1). Table 2 confirms that each of the items' factor loadings also exceeded 0.70 and thus conformed to Hair, et al. [118] guidelines. We employed the average variance extracted (AVE) to confirm convergent validity. All values exceeded 0.50 while falling below their corresponding composite reliability values (see Table 1). Because the inter-construct correlation values were less than the square root of the AVE values of the respective variables, discriminant validity was validated [122]. Confirmatory factor analysis revealed a good model fit [ $\chi^2/df = 2.717$ ,  $CFI = 0.911$ ;  $GFI = 0.903$ ;  $TLI = 0.901$ ;  $RMSEA = 0.031$ ]. These model fit values were within the threshold recommended by Hair et al. [123]. Thus, the results confirm the model as a good predictor of autonomous shopping intention.

**Table 1:** Discriminant validity

	CR	$\alpha$	AVE	MSV	MaxR(H)	PFE	EFE	SIF	FLC	COL	UTA	ATT	ASI
<b>PFE</b>	0.91	0.84	0.71	0.24	0.84	<b>0.84</b>							
<b>EFE</b>	0.91	0.87	0.71	0.39	0.86	0.71***	<b>0.84</b>						
<b>SIF</b>	0.91	0.82	0.77	0.42	0.92	0.60***	0.63***	<b>0.88</b>					
<b>FLC</b>	0.86	0.89	0.70	0.47	0.87	0.57***	0.68***	0.71***	<b>0.82</b>				
<b>COL</b>	0.86	0.86	0.50	0.15	0.87	0.35***	0.34***	0.38***	0.29***	<b>0.71</b>			
<b>UTA</b>	0.92	0.92	0.71	0.14	0.95	0.37***	0.37***	0.25***	0.13*	0.20***	<b>0.84</b>		
<b>ATT</b>	0.93	0.88	0.74	0.54	0.94	0.70***	0.69***	0.59***	0.70***	0.34***	0.27***	<b>0.86</b>	
<b>ASI</b>	0.92	0.91	0.75	0.54	0.93	0.51***	0.58***	0.51***	0.63***	0.24***	0.26***	0.74***	<b>0.87</b>

*Note:* The boldfaced diagonal elements denote the square root of the variance shared between the variables and their measures. Off-diagonal elements are the correlations between variables. \*\*\*  $p < 0.001$ . PFE = Performance expectancy; EFE = Effort expectancy; SIF = Social influence; FLC = Facilitating condition; COL = Collectivism; UTA = Uncertainty avoidance; ATT = Attitude; ASI = Autonomous shopping intention; CR = Composite reliability; MSV = Maximum shared variance; MaxR(H) = Maximum reliability; AVE = Average variance extracted;  $\alpha$  = Cronbach alpha. Significance of correlations: \*  $p < 0.050$ ; \*\*  $p < 0.010$ ; \*\*\*  $p < 0.001$ .

**Table 2:** Measurement of study variables

Variable	Measurement items	Model and item indices	
		SL	SMC
Collectivism	COL1	0.65	0.43
	COL2	0.65	0.42
	COL3	0.79	0.62
	COL4	0.80	0.65
	COL5	0.65	0.42
	COL6	0.69	0.47
Uncertainty avoidance	UA1	0.70	0.49
	UA2	0.94	0.88
	UA3	0.92	0.85
	UA4	0.80	0.65
	UA5	0.83	0.69
Performance expectancy	PFE1	0.90	0.81
	PFE2	0.86	0.74
	PFE3	0.83	0.68
	PFE4	0.78	0.61
Effort expectancy	EFE1	0.79	0.63
	EFE2	0.84	0.70
	EFE3	0.88	0.77
	EFE4	0.85	0.72
Social influence	SIF1	0.86	0.73
	SIF2	0.91	0.83
	SIF3	0.86	0.74
Facilitating condition	FLC1	0.75	0.56
	FLC2	0.83	0.69
	FLC3	0.88	0.78
Attitude	ATT1	0.81	0.66
	ATT2	0.85	0.73
	ATT3	0.90	0.82
	ATT4	0.93	0.86
	ATT5	0.79	0.63
Autonomous shopping intention	ASI1	0.88	0.78
	ASI2	0.93	0.86
	ASI3	0.84	0.71
	ASI4	0.80	0.64

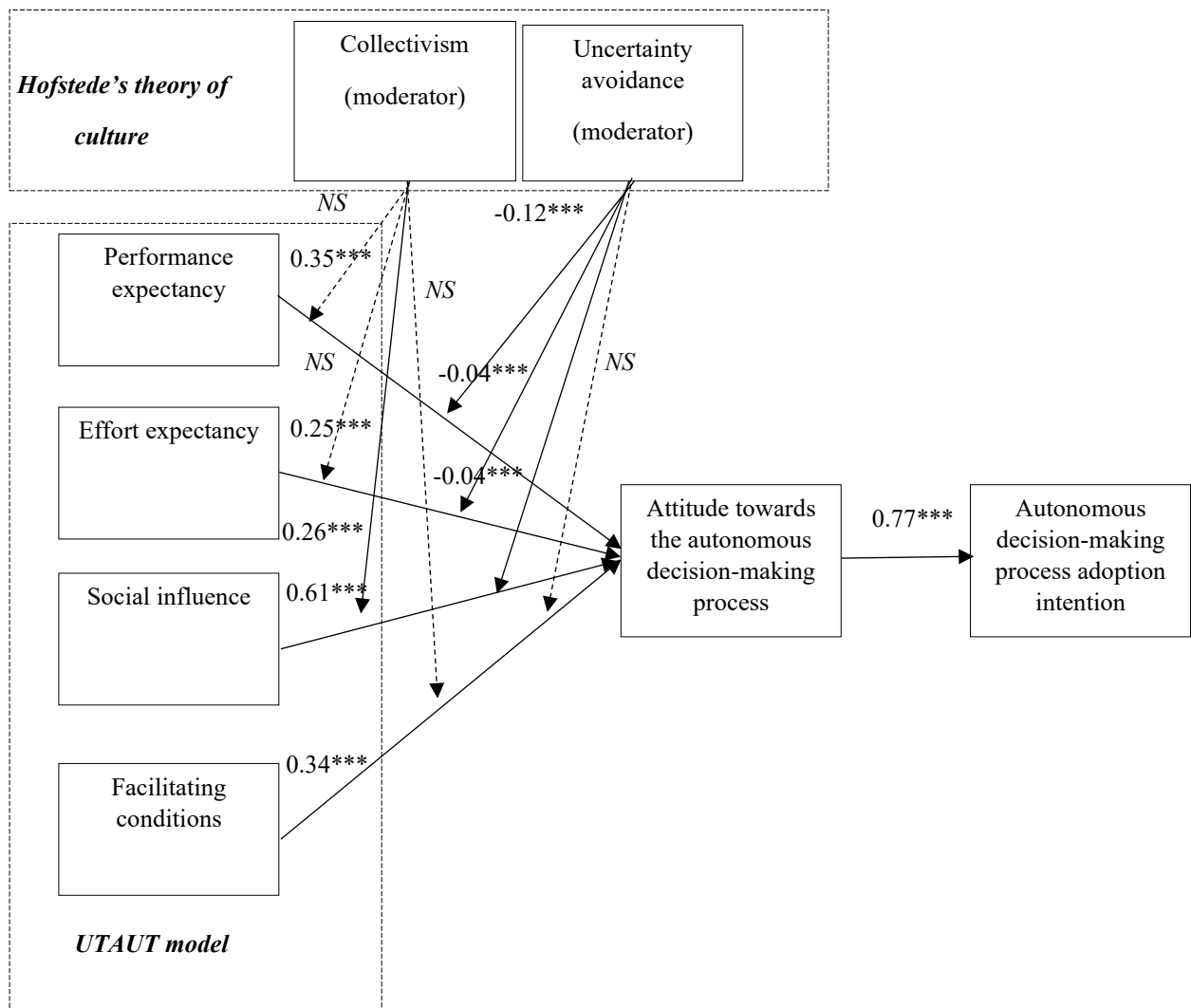
Note: SL = Standardised loadings; SME = Squared multiple correlations; see Appendix for details on items

### C. Structural model

A good model fit was also found for the structural model of this study [ $\chi^2/df = 2.31$ ,  $CFI = 0.90$ ;  $GFI = 0.90$ ;  $TLI = 0.90$ ;  $RMSEA = 0.03$ ]. Following this result, the hypotheses formulated at the start of the study were examined.

First, we tested the direct relationships (H1, H2, H3, H4 and H7). PFE ( $\beta = 0.35, p < 0.001$ ), EFE ( $\beta = 0.25, p < 0.001$ ), SIF ( $\beta = 0.61, p < 0.001$ ) and FLC ( $\beta = 0.34, p < 0.001$ ) positively influenced ATT while ATT ( $\beta = 0.77, p < 0.001$ ) positively influenced ASI. Therefore, H1, H2, H3, H4 and H7 received support (see Figure 2). The  $R^2$  value (explanatory power) for attitude was 56 per cent, while the  $R^2$  value for autonomous shopping adoption intention was 45 per cent. Both values exceeded the minimum value of 40 per cent recommended by Straub et al. [124]. Because this study incorporated attitude as an additional variable in the baseline UTAUT model, we next examined the model's predictive power without attitude. In the absence of attitude, autonomous shopping adoption intention exhibited a predictive power of 41 per cent, thereby confirming attitude as a valuable addition to the research model.

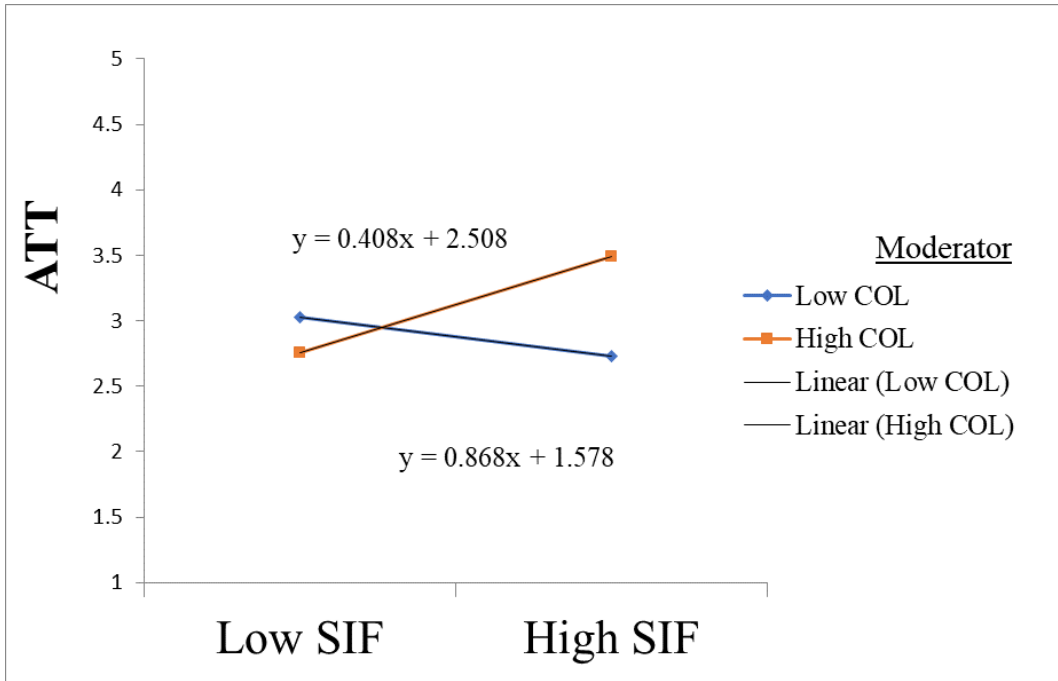
Second, we tested the moderating influences of COL and UA on the relationships between the UTAUT variables (PFE, EFE, SIF, FLC) and ASI. This included the interaction effects of PFE x COL, EFE x COL, SIF x COL, FLC x COL, PFE x UA, EFE x UA, SIF x UA, FLC x UA. While COL strengthened the positive relationship between SIF and ATT (H5c supported; see Figure 3), UA dampened the positive relationship between PFE and ATT (H6a supported; see Figure 4). In addition, UA dampened the positive relationship between EFE and ATT (H6b supported; see Figure 5) as well as the positive relationship between SIF and ATT (H6c supported; see Figure 6).



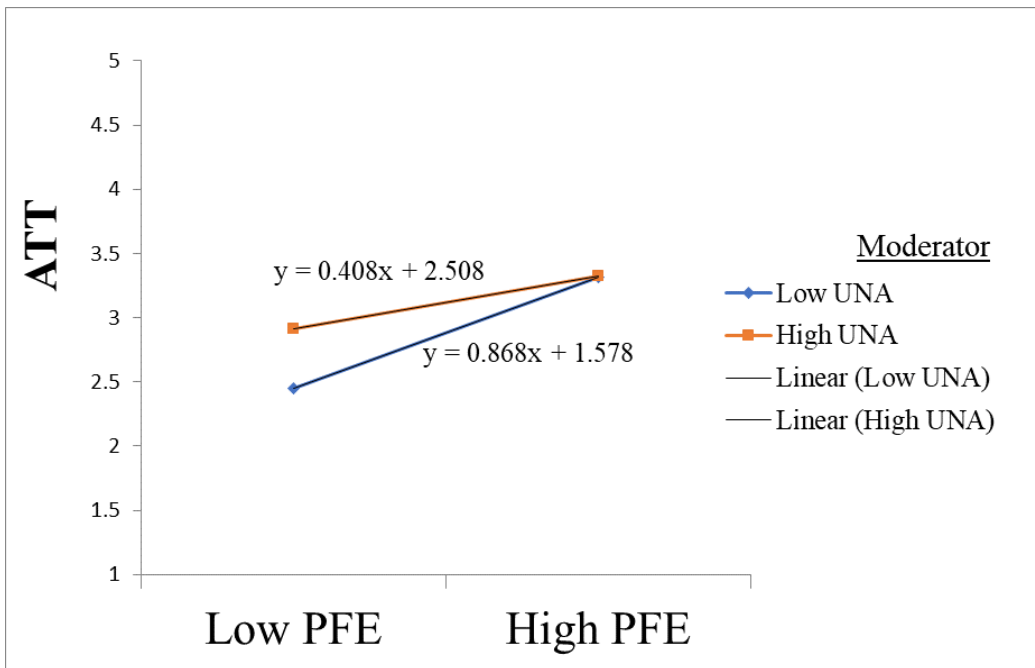
Note: NS = Not significant

**Figure 2:** Results of hypotheses testing

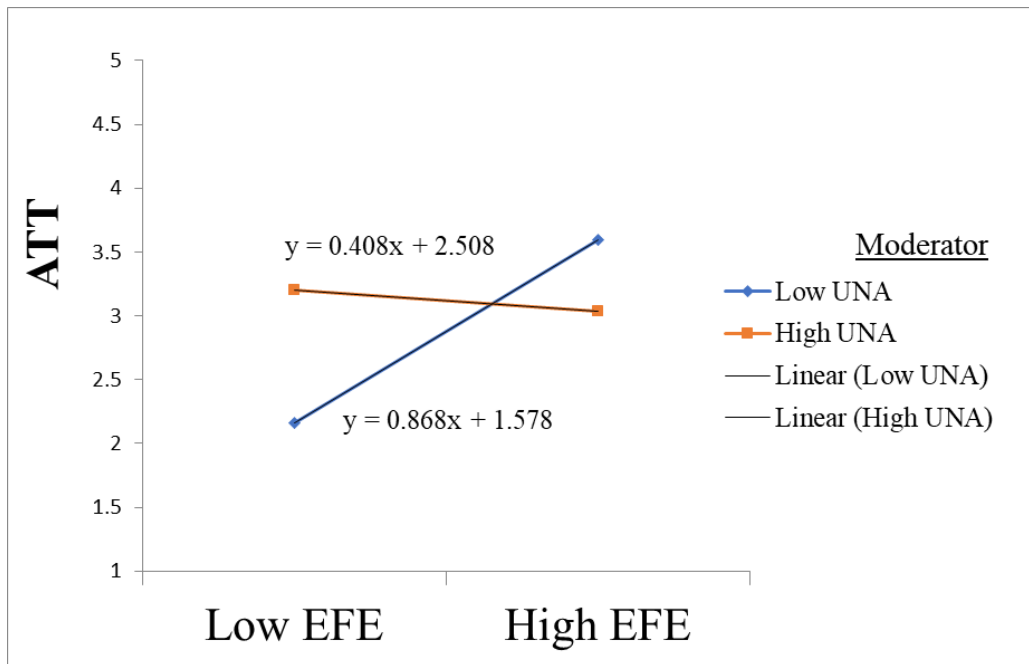




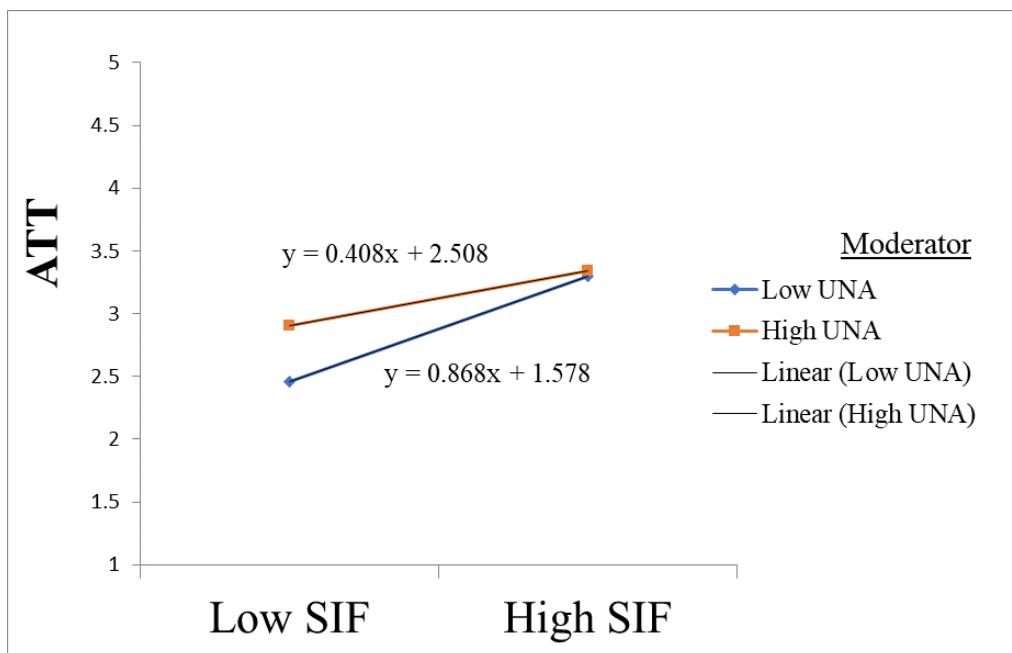
**Figure 3:** COL strengthens the positive association between SIF and ATT



**Figure 4:** UA dampens the positive association between PFE and ATT



**Figure 5:** UA dampens the positive association between EFE and ATT



**Figure 6:** UNA dampens the positive association between SIF and ATT

## VI. DISCUSSION

This study proposed direct and moderating hypotheses to examine customers' adoption of the autonomous decision-making process. Statistical analysis provided support for all five direct associations (H1, H2, H3, H4 and H7). H1 examined the proposed positive relationship

between performance expectancy and attitude towards autonomous decision-making process adoption. Although no prior studies have been conducted in the context of the autonomous decision-making process, our findings were consistent with those of Ameen et al. [6], Hu et al. [16] and Moriuchi [75] in the context of AI adoption. This result implies that customers in Fiji develop positive attitudes towards the autonomous decision-making process when that process reduces their effort and time spent shopping. The reason behind this association could be that the autonomous decision-making process provides shoppers with increased convenience and productivity, which causes them to develop more favourable attitudes towards the AI system.

H2 examined the hypothesised positive relationship between effort expectancy and attitude towards autonomous shopping adoption. The study's data analysis provided statistical support for this relationship, which is consistent with the work of Lin, et al. [80] and Moriuchi [75] in the context of AI adoption. This result suggests that customers in Fiji believe that the benefits of the autonomous decision-making process exceed the effort required to use it, which results in customers having a positive attitude towards the process's adoption. A possible reason behind this association could be that customers perceive the autonomous decision-making process to require little effort to set up and to be easy to use.

H3 examined the hypothesised positive relationship between social influence and attitude towards autonomous decision-making adoption. Results from prior studies have supported this relationship. For example, Gursoy et al. [79] identified social influence as a significant factor affecting customer acceptance of AI. Lin, et al. [80] found similar results in the adoption of AI-based robotic devices in the tourism industry. The current study's results imply that members of Fiji customers' referent groups play a key role in influencing those customers' attitudes towards the autonomous decision-making process. This association may be traced to the positive reviews of AI-based systems by current users who are part of the customers' referent groups; such positive reviews are likely to promote more positive attitudes towards the autonomous decision-making process.

H4 explored the proposed positive relationship between facilitating conditions and attitudes towards autonomous shopping adoption. Lu et al. [84] found consistent results in the context of service robot adoption while Kaye et al. [86] found similar results in the context of autonomous vehicle adoption. Further, facilitating conditions were also found to be a key factor in the adoption of self-service parcel delivery [82]. The current study's results imply that facilitating conditions, such as the availability of support services and technical infrastructure,

influence Fiji customers' attitudes towards autonomous shopping adoption. The reason behind this association could be that customers note the availability of adequate support services for the autonomous decision-making process, which results in more favourable attitudes towards the system.

This study also examined the moderating impact of cultural variables (i.e. collectivism and uncertainty avoidance). Of the four moderating hypotheses (H5a, H5b, H5C and H5d) examined with collectivism as a moderator, only one was significant (H5c). H5c anticipated that the proposed relationship between social influence and attitude towards the autonomous decision-making process would be stronger in highly collectivist cultures. This result was consistent with the work of Srite [60] and Huang et al. [57]. The findings imply that Fiji customers who are high in the collectivism dimension of culture are more influenced by members of their referent groups when it comes to attitudes towards the autonomous decision-making process. The explanation for this could be rooted in Shiu, et al. [93] observation that individuals in highly collectivist cultures give greater consideration to others' opinions when making decisions. On the other hand, H5a, H5b, and H5d did not receive statistical support in our analysis. This finding implies that the moderating variable of collectivism does not influence the relationships of performance expectancy, effort expectancy and facilitating conditions with the autonomous decision-making process adoption. The reason for this insignificance could be that culture does not require moderation in the relationship between these constructs.

Among the relationships with UA as a moderator (H6a, H6b, H6c and H6d), only one (H6d) was not supported. H6a, which predicted that the positive association between performance expectancy and attitude towards autonomous shopping intentions would be stronger in high UA cultures, received support in this study. This result implies that Fiji customers high in UA focus more on the benefits of adopting autonomous shopping—perhaps because cultures high in UA emphasise performance expectancy when faced with an unknown product or service [100-102]. This is consistent with results from studies conducted in other contexts. H6b, which anticipated that the positive association between effort expectancy and attitude towards autonomous shopping intentions would be stronger in cultures high in UA, also received support in this study. Sun, et al. [103] likewise found a positive link between UA and ease of use in the context of hotel technology adoption. This result implies that Fiji customers high in UA are more concerned about the effort required to adopt an autonomous

decision-making process—perhaps because individuals in high UA cultures are likely to focus on the effort required to learn new technology [90].

This study also supported H6c, which predicted that the positive association between social influence and attitudes towards autonomous shopping intentions would be stronger in cultures high in UA. Lai et al. [104] likewise found that UA strengthens the positive relationship between social influence and technology usage intentions in classrooms. This result implies that members of Fiji customers' referent groups provide evidence that encourages them to develop more favourable attitudes towards the autonomous decision-making process [90, 105]—perhaps because the reviews from referent group members who are current users are likely to decrease uncertainty for more sceptical customers.

This study did not support H6d, however, which proposed that the positive association between facilitating conditions and attitudes towards the autonomous decision-making process would be stronger in high UA cultures. This finding contradicts the findings of prior studies by Qi Dong [107] and Sharma, et al. [24], who examined a similar relationship. The results imply that the positive association between facilitating conditions and attitudes towards the autonomous decision-making process is not stronger for customers who are high in UA. This could be because culture does not influence the relationship between facilitating conditions and attitudes towards the autonomous decision-making process.

Finally, H7 examined the proposed positive association of attitude on behavioural intentions. Analysis of the data confirmed a positive association between the two constructs. These results, which align with similar findings by Ek Styvén and Mariani [112] and Abadi et al. [108] in the context of the AI system, imply that Fiji customers with a positive attitude—based on evaluations and perceived outcomes—towards the autonomous decision-making process are more likely to adopt such a system. A possible reason for this association could be that customers believe the positive outcomes outweigh the negative outcomes when assessing the autonomous decision-making process, which increases their adoption intentions.

#### *A. Theoretical implications*

This study provides four key theoretical contributions. First, this is one of the earliest empirical studies on factors influencing the adoption of autonomous decision-making processes. As such, it addresses gaps in the literature and answers the call for research by De Bellis and Johar [5]. This study's contributions to the literature increase developers and customers' understanding of autonomous technologies.

Second, information systems research has shown that an individual's culture plays a crucial role in the adoption of technology [24]. Factors that impact adoption intentions in one culture may differ from the factors that affect adoption intentions in another culture [63]. This study empirically confirms that specific cultural factors (i.e. espoused collectivism and espoused uncertainty avoidance) influence customers' decisions to adopt an autonomous decision-making process.

Third, many of the studies conducted on AI adoption have focused on large countries, such as China [31-35], India [14, 30], the USA [29] and South Korea [28]. This study is among the first to provide empirical evidence of AI adoption in developing countries. This is a valuable contribution to the literature because differences in the economic, political, legal and technological infrastructure can profoundly impact customer behaviour [125].

Fourth, this study showcases the suitability of core psychology and consumer behaviour theories, such as the UTAUT and Hofstede's theory of culture, for studying the adoption of continually emerging disruptive technologies. While our study supports the generalisability of the theory to a novel context, we implore future scholars to consider further expanding the model to introduce new moderating variables, which have been found to promote consumers' use of technological platforms. For example, fear of missing out (FOMO) is one possible variable that may motivate consumers to utilise autonomous decision-making processes [126, 127]. In other words, if people notice their reference group members using such services, they will be more likely to seek the same experience.

### *B. Practical implications*

This study offers five key implications for systems developers and managers seeking to increase customers' adoption of autonomous decision-making processes. Because performance expectancy is positively associated with attitude towards autonomous decision-making processes, developers must work to improve the functional benefits of AI systems—for example, by reducing the search cost, increasing the efficiency of decision-making and making better decisions overall [5]. Furthermore, developers must recognise that customers have different lifestyles and personalities. For example, some customers have diabetes [4]. The autonomous decision-making process should understand these unique customer needs and enable such customers to purchase foods that are low in sugar. Developers can run and test the autonomous decision-making process with a training dataset to ensure that the system is able to account for customers' special needs when making purchases for them. Additionally,

marketers must ensure that customers receive information relating to the benefits and usage of autonomous decision-making processes. For example, marketers would do well to promote the benefits of the autonomous decision-making process for double-income households whose members are likely to have less time to engage in personal or real-time shopping [4]..

Second, the positive association between effort expectancy and attitude towards autonomous decision-making processes highlights the need for such systems to be easy for customers to use. Modern customers are often unable to allocate a significant amount of time to learning to use new autonomous decision-making processes [128]. Therefore, AI systems developers should ensure that such systems can learn and adapt to customers' needs and expectations without requiring much effort from the customers themselves. An autonomous decision-making process must be easy to set up, and it must work in harmony with other customer-owned electronic devices. Developers should also ensure that the system can enhance the autonomous decision-making process experience by utilising data captured from customers' smartphones and other smart home devices, such as Alexa, rather than requiring customers to enter this information manually when setting up the AI system.

Third, this study confirms social influence's positive association with attitude towards autonomous decision-making processes. This result underscores the need for developers to market autonomous decision-making processes by highlighting the benefits of AI for existing system users. Social networking sites can also generate positive word-of-mouth by enabling users to share their experiences with the system. In addition, marketing campaigns must enlist authority figures, peers and family members in sharing positive opinions about the autonomous decision-making process on social media platforms or advertisements.

Fourth, the positive association between facilitating conditions and attitude towards decision-making process highlights the need for adequate support services for autonomous decision-making processes. With AI adoption still in its early stages, customers are likely to have concerns about the system [129]. Therefore, marketers must execute campaigns to educate customers about AI and provide promotional offers. Additionally, retailers should make informative websites, live chats and email support services available to increase customers' intentions to adopt the autonomous decision-making process.

Finally, this study reveals the key role of culture in customers' adoption of autonomous decision-making processes. This result highlights the need for AI developers to consider customers' cultures when designing such systems. For example, developers and retail marketers

in countries with high levels of individualism should emphasise the usefulness, ease of use and support services available for the autonomous decision-making process. Meanwhile, developers and marketers in collectivist countries should highlight positive word-of-mouth and current users' recommendations. Retailers can encourage these dynamics by offering promotional discounts to current users who successfully sign-up new users through invites or enter into co-branding campaigns to generate greater word-of-mouth and attract more customers. As this study's findings indicate, UA also affects customers' adoption intentions as well as the emphasis they give to various factors. Therefore, AI developers must understand individuals' cultural values to implement tailor-made strategies based on customers' dominant culture and thereby increase adoption of autonomous decision-making processes.

## **VII. CONCLUSION AND DIRECTIONS FOR FUTURE RESEARCH**

Seeking to answer the three proposed research questions, this study explored customers' adoption of the AI-based autonomous decision-making process. Using CB-SEM, the study confirmed that all four UTAUT variables (i.e. effort expectancy, performance expectancy, facilitating conditions and social influence) were positively associated with adoption intention. Uncertainty avoidance dampened the positive association of performance expectancy, effort expectancy and social influence with attitude, while collectivism strengthened the association between social influence and customer attitude. Pioneering the empirical investigation of factors influencing customers' attitudes towards and adoption of autonomous decision-making processes in a developing country, we offer a foundational study for future scholars interested in further advancing this area of enquiry. Although we adopted a robust methodology design, however, the study is subject to certain limitations and provides valuable future research directions.

First, we collected data for this study via Facebook. Although other studies have employed this method [130, 131], future studies can explore other data collection methodologies. For example, *Prolific Academic* could be used as a data collection platform; in fact, it is already quite popular in consumer behaviour studies for technology adoption [132, 133]. Second, this study's model employed a well-established theory to examine customers' attitudes towards autonomous shopping systems. However, the addition of other factors can improve the model's predictive power. For instance, examining the product characteristics of the autonomous shopping system on customers' attitudes towards adoption. It would be



interesting to investigate how various product characteristics (e.g. packaging colour, ease of disposal) and categories (e.g. cosmetics, apparel or consumer goods) influence customers' attitudes and adoption intentions. In addition, exploring the impact of customers' personality characteristics, such as self-efficacy and locus of control, on autonomous shopping intentions, may yield other valuable findings. Third, this study explored customers' intentions to adopt an autonomous decision-making process. However, studies have shown that intentions do not always lead to actual behaviour [4, 134]. Therefore, future work can incorporate actual behaviour into the model by objectively studying actual transactions and purchase behaviours.

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## APPENDIX A

### *Survey instrument items*

<b>Construct and source</b>	<b>Items</b>
Collectivism (adopted from Yoo, et al. [135])	<p>Individuals should sacrifice self-interest for the group.</p> <p>Individuals should stick with the group even through difficulties.</p> <p>Group welfare is more important than individual rewards.</p> <p>Group success is more important than individual success.</p> <p>Individuals should only pursue their goals after considering the welfare of the group.</p> <p>Group loyalty should be encouraged even if individual goals suffer.</p>
Uncertainty avoidance (adopted from Yoo, et al. [135])	<p>It is important to have instructions spelt out in detail so that I always know what I'm expected to do.</p> <p>It is important to closely follow instructions and procedures.</p> <p>Rules and regulations are important because they inform me of what is expected of me.</p> <p>Standardised work procedures are helpful.</p> <p>Instructions for operations are important.</p>
Performance expectancy (adopted from Venkatesh, et al. [45])	<p>I would find using the autonomous decision-making process useful in the purchasing process.</p> <p>An autonomous decision-making process would increase my chances of achieving things that are important to me.</p> <p>Purchasing using an autonomous decision-making process would help me accomplish things more quickly.</p> <p>I would be able to save time when purchasing using an autonomous decision-making process.</p>
Effort expectancy (adopted from Venkatesh, et al. [45])	<p>Learning how to use the autonomous decision-making process would be easy for me.</p> <p>My interaction with the autonomous decision-making process would be clear and understandable.</p> <p>I would find purchasing using an autonomous decision-making process easy.</p> <p>It would be easy for me to become skilful using an autonomous decision-making process.</p>
Social influence (adopted from Venkatesh, et al. [45])	<p>People who are important to me think that I should purchase using an autonomous decision-making process.</p> <p>People who influence my behaviour think that I should purchase using an autonomous decision-making process.</p> <p>People whose opinions I value prefer that I purchase using an autonomous decision-making process.</p>
Facilitating condition (adopted from Venkatesh, et al. [45])	<p>I have the resources necessary to purchase using an autonomous decision-making process.</p>

	<p>I have the knowledge necessary to purchase using an autonomous decision-making process.</p> <p>I feel comfortable with purchasing using an autonomous decision-making process.</p>
<p>Attitude (adopted from Ajzen and Fishbein [23])</p>	<p>Shopping through the use of an autonomous decision-making process is a good idea.</p> <p>Shopping through the use of an autonomous decision-making process is a wise idea.</p> <p>I like the idea of shopping through the use of an autonomous decision-making process.</p> <p>Shopping through the use of an autonomous decision-making process would be pleasant.</p> <p>Shopping through the use of an autonomous decision-making process is appealing.</p>
<p>Autonomous shopping intention (adopted from Venkatesh, et al. [45])</p>	<p>I intend to use autonomous decision-making processes in the future.</p> <p>I predict that I will use an autonomous decision-making process in the future.</p> <p>I plan to use the autonomous decision-making process in the near future.</p> <p>I will always try to use an autonomous decision-making process.</p>



## APPENDIX B

### *Demographic profile*

	N	%
<b>Gender</b>		
Male	250	55.07
Female	191	42.07
Do not wish to include	13	2.86
<b>Age</b>		
18–25 years	108	23.79
26–30 years	151	33.26
31–40 years	113	24.89
41–50 years	68	14.98
50 years and above	2	0.44
Do not wish to include	12	2.64
<b>Income (FJD)</b>		
I do not earn an income	53	11.67
Under \$15,000	109	24.01
\$15,000–\$29,999	93	20.49
\$30,000–\$44,999	74	16.3
\$45,000–\$59,999	43	9.47
\$60,000–\$74,999	41	9.03
\$75,000–\$89,999	39	8.59
\$90,000 +	2	0.44

*Note:* FJD = Fijian dollars