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Sector Diversity among IT Professionals in the Timing of Blockchain Adoption: an Attitudinal Perspective

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Blockchain technology has the potential to reshape the conventional ways of processes and transactions on digital platforms. Much of the attention surrounding blockchain is mainly focused on the technical and organizational aspects. Comparatively, little effort has been targeted towards understanding the attitudinal issues in blockchain adoption. This study aims to explore the role of attitudinal forms behind the intended timing of IT professionals' blockchain adoption, with an emphasis on the differences between the public and private sectors. A survey method was used where the data was collected from 208 IT professionals from public and private sector establishments in order to investigate how the different attitudes of the participants as well as the differences in their work sectors affect their intention to adopt blockchain. The data collected was analysed with ordinal logistic regression and the results indicate that the participants' affective, normative and pessimistic attitudes have a significant effect on the timing of blockchain adoption, and that these effects show differences among the IT professionals from the public and private sector. The findings are believed to provide valuable information to researchers and strategists in forecasting the future evolution of the blockchain technology in terms of individual utilization. The results also will provide feedback to managers of different sectors in making decisions regarding blockchain adoption, developers of blockchain services, as well as individuals who are interested in using blockchain.

Keywords: *Blockchain; Attitude; Sector; Early Adoption; Late Adoption; Intention*.

Introduction

Blockchain has attracted massive interest as a remarkably innovative technology with the potential to reshape the foundations of finance, manufacturing, government, and healthcare along with other sectors – even comparable to the impact of the Internet when first launched a few decades ago. Introduced in 2008 by Satoshi Nakamoto (Woodside, Augustine, & Giberson, 2017), blockchain, also called distributed ledger technology, is defined as a digitized, decentralized public ledger consisting of linked blocks of information secured through cryptography on a peer-to-peer network (Attaran & Gunasekaran, 2019). The growing interest in blockchain technologies is mostly due to the inherent attributes, namely anonymity, immutability and transparency, which provide various benefits to individuals as well as organizations (Clohessy, Acton, & Rogers, 2019). The anonymity feature allows users who are only identified with public keys to perform any transaction with no interventions from third parties such as the government or banks. In addition, due to the immutability feature, the blockchain is protected against any tampering or modifications to the data since any change in one block would directly alter all subsequent blocks in the chain (Attaran & Gunasekaran, 2019). Finally, in public blockchains, all transactions within a network can be viewed by all users, thus resulting in a completely transparent system.

According to the 2021 report by Grand View Research (2021), the global market size on blockchain technology was valued at $3.67 billion in 2020, expected to increase at an annual growth rate of 82.4 % until 2028. Moreover, the report by Statista (Liu, 2019) forecasts that by 2023, the worldwide blockchain technology revenues are expected to reach $23.3 billion. Many creative and innovative blockchain solutions have been presented in different sectors. For example, in the banking industry, blockchains can transform the underlying technology used for payment clearing and financial services (Guo & Liang, 2016). In manufacturing, distributed ledgers can be effectively used in supply chain management to track information about products and shipping (Min, 2019), and also in IOT systems for identifying and communicating with devices (Attaran & Gunasekaran, 2019). For governmental activities, blockchain can be utilized in voting systems, record-keeping and smart contracts (Clohessy *et al.,* 2019). Moreover, in healthcare, blockchain can be employed for health record management, data-sharing between smart devices and sensors, as well as data analytics (McGhin, Choo, Liu, & He, 2019).

The factors and strategies behind the adoption of blockchain have been examined in various studies. Clohessy et al. (2019) have identified technological, organizational and environmental considerations which affect blockchain adoption by organizations using the innovation theory.

Moreover, Woodside et al. (2017) presented a managerial overview and a list of strategies for blockchain adoption and identified the progress of blockchain technology on the diffusion of innovation curve. Parino et al. (2018) have analyzed the socio-economic factors affecting the adoption of Bitcoin blockchain by country. In addition, Angelis and Silva (2019) examined the relationship between the use of blockchain and the underlying value drivers in terms of organizational strategies. Most of the available literature on blockchain adoption involves the technical and organizational aspects, leaving out attitudinal factors affecting individuals' adoption of blockchain. Yet, blockchain technology is being widely recognized and used by individuals as well – in which respect, professionals' adoption of blockchain can influence organizational strategies and intentions to incorporate blockchain into their operations in public and private sectors. There has been some research on consumers' perspectives on the adoption of digital innovations (Claudy, Garcia, & O'Driscoll, 2015; Jahanmir & Cavadas, 2018; Waarts, Van Everdingen, & Van Hillegersberg, 2002), but the studies examining the individuals' attitude towards blockchain adoption from different perspectives are scarce and has not matured yet (Clohessy et al., 2019). On the other hand, the adoption timing (see for example Banyte and Salickaite, 2008a; Jahanmir and Cavadas, 2018; Waarts *et al.,* 2002) and sector differences (see for example Esteve and Ysa, 2011; Kay and Goldspink, 2015) have been identified to be crucial for especially retaining individual and organizational competitive advantages (Gupta et al., 2004). Although these factors have been studied in either adoption of digital innovations (see for example Banyte and Salickaite, 2008a; Jahanmir and Cavadas, 2018) or adoption of information technologies context (see for example Shirazi *et al.,* 2011; Taherdoost, 2018) there is a lack of focus on blockchain technology.

The aim of this study is to examine how different attitude forms affect the intention to use blockchain technology by focusing on the differences between public and private sectors. Moreover, the intended timing of the adoption will be analysed as per selected from the adopter categories of the diffusion of innovation theory. How individuals working in private and public sectors with affective, continuous, normative and pessimistic attitudes behave regarding their intention to adopt blockchain has not been studied in previous research which is the main contribution of this study. The research sample was formed from IT professionals considering that blockchain is a new technology and IT professionals are believed to possess higher awareness compared to other groups of professionals. Additionally, IT professionals play a dominating role in the acceptance and success of new digital technologies in establishments since they are normally held responsible for all the stages from installation to application (Cronan, Leonard, & Kreie, 2005; Mishra, Akman, & Mishra, 2014). The results of the analysis are believed to have substantial value in forecasting the future evolution of blockchain technology for individuals' utilization and developing effective organizational adoption strategies. The findings are expected to provide important feedback to managers in different sectors who approve policies and make decisions regarding blockchain adoption, developers of blockchain services, and individuals who are inclined to join the blockchain world.

The remainder of the manuscript is organized as follows. Section 2 introduces the research methodology followed by the description of the research instrument and data in Section 3. Section 4 provides the descriptive and test results for the different attitudes investigated. Section 5 presents a discussion of the findings followed by Section 6 which concludes the article and suggests future research.

Research Methodology

Theoretical Model

People's adaptation to a technologically changing world is critical for achieving their objectives and gaining competitive advantages in society both from individual and professional perspectives. Obviously, such developments are not without their challenges. Especially, the life cycles of digital developments are becoming shorter and their integration within societies is expected to accelerate (Jahanmir & Cavadas, 2018; Shirazi *et al.,* 2011). This makes individuals' adoption timing to new digital technologies crucial as a means to increase competetiveness (Banyte & Salickaite, 2008). On the other hand, the level of professional advantages and benefits is perceived to be proportional to the adoption timing of digital innovations (Waarts et al., 2002) since digital innovations have a dominating role in today's world (Jahanmir & Cavadas, 2018). Although there exists a comprehensive body of literature on the diffusion and adoption of digital innovations, the individuals' attitudes regarding the timing of their adoption have not received much attention (Jahanmir & Cavadas, 2018). Henceforth, research with a special reference to the adoption timing of digital developments will be a meaningful contribution to the literature and industry (Jahanmir & Cavadas, 2018; Pal, Vanijja, & Papasratorn, 2015; Waarts *et al.,* 2002). Therefore, the behavioral intention regarding blockchain adoption timing is included in the present study as the dependent variable. To this end, the adoption timing is adapted from Waarts et al., (2002) and Dearing (2009) and taken in three categories as early adoption, late adoption and no adoption (Figure 1).

The existence of differences between the public and private sectors is not new and has been emphasized in organization theory (Esteve & Ysa, 2011). Generally, available analyses show that professionals' preferences are influenced by the establishments' value systems, which are primarily related to the establishment's sector (Van Der Wal, De Graaf, & Lasthuizen, 2008). In technology, the adoption of new digital technologies has become critical for organizations (Bonina & Cordella, 2010) and that professionals' attitudes towards their usage are not reported to be the same for public and private sectors (Gupta et al., 2004; Lau, 2003). These differences may be attributed to the motivational and contextual differences between public and private sectors (Kay & Goldspink, 2015), which may be taken as an indication of the need for deeper insight for developing appropriate strategies regarding the usage of new digital technologies in establishments. However, the assessment of the nature and

implications of professionals' behaviors and sectoral differences regarding the adoption of IT innovations remain under-investigated (Bonina & Cordella, 2010). This also applies to blockchain adoption since it is presented as one of the primary crucial developments in the digital world in recent years (Bonina & Cordella, 2010). Therefore, the present research is also designed to focus on the nature of sectoral differences in IT professionals' intentions as regards to the timing of blockchain adoption (Figure 1).

The attitude is an individual attribute and defined as the probability that a person will show a favorable or unfavorable feeling toward a given technology. Understanding individuals' attitudes is crucial for recognition, and acceptance of new technology since it will provide an insight to assess the way of future adoption behavior (Taherdoost, 2018). In their original articles, Venkatesh et al. (2003) and Davis et al. (1989) refer to the attitude against information technology as the level of user's desirability, reporting it as a predictor of the likelihood of adoption. Based on their original proposal, attitude is used in many of the information technology (IT) acceptance research as a predictor of behavioral intention and a mediator for adoption. Blockchain technology is undeniably a new concept for individuals and enterprises, with the potential to introduce revolutionary changes into transactions of commercial, government, academic, and non-profit nature. Its strategic assessment is crucial for the diffusion of this technology and needs to be analyzed from different angles (Carson, Romanelli, Walsh, & Zhumaev, 2018). This means, understanding individuals' different attitudinal forms may shed valuable light and bring new dimensions into blockchain adoption so that potential stakeholders may extract feasible solutions for their own benefit. Therefore, attitudinal forms are included as the independent variables in the analyses (Figure 1).

In many studies, attitude has been considered to be multidimensional and including different forms related to individuals' feelings varying from negative to positive. The magnitude and nature of the direct and indirect influence of different attitude forms differ for each individual's behavioral intention (Kamble, Gunasekaran, & Arha, 2019; Taherdoost, 2018; Yang & Yoo, 2004). Shirazi et al. (2011) introduced affectiveness, continuance, normativeness and pessimism to be important attitudinal forms affecting adoption intention. Their findings were also supported by Meyer et al. (2002), who reported the profound impact of affectiveness, continuance and normativeness, proposing that the prevalence of change may lead researchers to examine the impact of changing conditions - which also applies to technological change. Based on the studies by Shirazi et al. (2011) and Meyer et al. (2002), our research presents attitude in four forms as affective, continuous, normative and pessimistic. It is believed that blockchain is a new field of application, and, for this reason, probably involves hesitance, indecisiveness, lack of knowledge and lack of awareness by individuals and establishments. With this in perspective, the present study can have many implications for strategists and decision-makers to provide an in-depth understanding of the underlying reasons related to various forms of IT professionals' attitudinal perceptions regarding blockchain adoption (Figure 1).

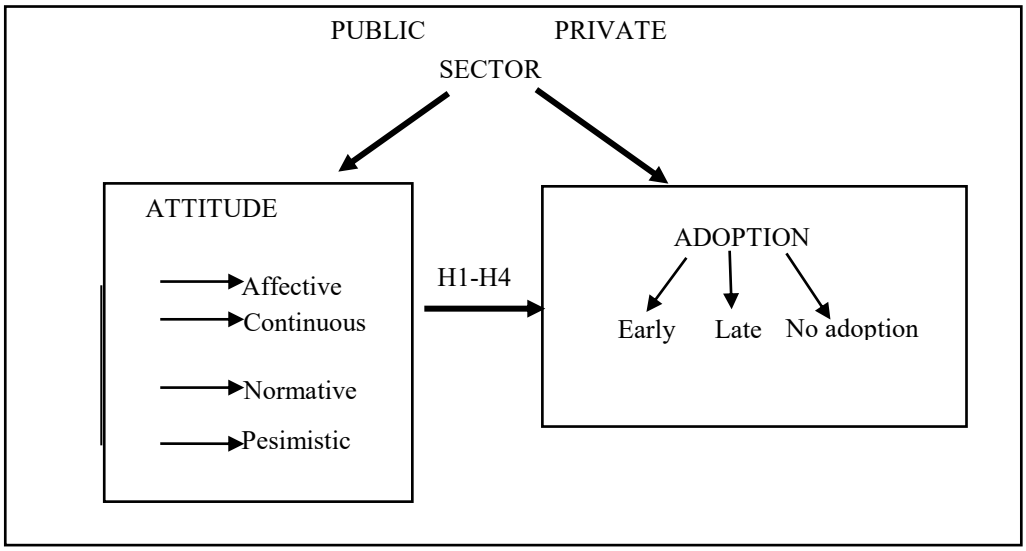

Figure 1. Blockchain Research Model

Hypotheses

Affective attitude refers to how much a person is in favor of adopting a given technology (Yang & Yoo, 2004). It measures the degree of emotional attraction toward the object (Bagozzi & Burnkrant, 1979, 1985) and has been identified as one of the major attitudinal forms by Petty et al. (1997). Affective attitude is extensively used in acceptance research for new technologies. Huang (2017) used the technology acceptance model and the theory of interpersonal behavior to predict the continued use of information systems by separating attitude into its components. He reported that the affective form of attitude has an important potential as a predictor of intention and, as such, analyses should include it as well. Kim and Crowston (2011) present affective attitude to be critical in predicting adoption behavior for cyber technologies including blockchain. This is because affective attitude is

an intrinsic factor and relates to satisfaction, which is crucial for explaining intention to use a technology (Kim & Crowston, 2011). According to their view, affective attitude needs to be considered in studying information technology adoption since the evidence confirms the positive relationship between affective reaction and satisfaction. Therefore, the analysis of the influence of affective attitude on blockchain adoption intention has value, leading to the following hypothesis:

H1: The influence of affective attitude on the intended timing of blockchain adoption is significantly different for public and private sector professionals.

Continuous attitude is obviously critical for IT adoption since retaining existing users of a new technology produces less complication compared to new users considering the factors such as the resources needed for creating new accounts and initiating new customers. Therefore, it is known in IT acceptance research and individual continuance attitude studies that the acceptance of new IT is vital for its widespread usage in different fields (Bhattacherjee, 2001). The available studies have either used different contexts or different theoretical perspectives (Li, Yang, & Guo, 2019; Limayem & Cheung, 2008; Yuan, Liu, Yao, & Liu, 2016). Many confirm that continuance is important for the success of the adoption of a new IT. The discussions also emphasize the relevance of continuance in IT. While previous attempts have extensively investigated the acceptance of IT, very little research has concentrated on the relationship between continuance attitude and intention (Ifinedo, 2018; Li et al., 2019) with no focus on the blockchain context. Therefore, we propose the following hypothesis.

H2: The influence of continuous attitude on the intended timing of blockchain adoption is significantly different for public and private sector professionals.

The normative attitude addresses perceived obligation towards the adoption of new technology (Khalip, 2016), and investigating normative components has proven to help elicit the normative forms of technical and social practices (Van Burken & De Vries, 2012). The role of normative variables has been studied in the literature in general, and these variables are reported to be emerging as significant independent predictors of intention (White, Smith, Terry, Greenslade, & McKimmie, 2009). White et al. (2009) declared the normative form of attitude to be among the essential sources of influence on behavior, emphasizing the necessity for continuous exploration of normative factors in this sense. In his article, Swierstra (2015) argued the consequences of neglecting technology's impact on societies and explained how new technologies arise as a source of argument for individuals' normative standards. Shirazi et al. (2011) conducted a survey in a public organization to assess the employees' readiness to implement Knowledge Management (KM) initiatives using normative attitude and observed normative attitude to have the highest correlation. In their recent study, along with other conventional factors of their conceptual models, Kamble et al. (2019) explored and statistically verified the effect of user normative attitude for the adoption of blockchain technology in the Indian context. Nevertheless, the normative attitude literature is very limited and far from saturation in acceptance research (Khalip, 2016). This view is also valid for the blockchain context, leading to the following hypothesis.

H3: The influence of normative attitude on the intended timing of blockchain adoption is significantly different for public and private sector professionals.

The concept of pessimism against technologies is not new and has the potential to influence an individual's choices (Follet, 2016). Techno-pessimism has been studied in the literature from different perspectives (Hwang & Satchell, 2013) to understand an individual's pessimistic attitude especially arising from prospective risks and ambiguities sourced by new IT (Eichberger & Guerdjikova, 2013). It is argued in Selwyn (2011) that acceptance research generally takes into account the pessimistic attitude to be relatively more rational and effective since the holder of this attitude does not expect much. According to Selwyn (2011), the investigation of pessimism is crucial to provide an understanding of how and why new IT's can be used by individuals to better adapt themselves to a technologically changing world (Eichberger & Guerdjikova, 2013). This may be used as the motivation for research on the relationships between attitudinal pessimism and individuals' behavior regarding the process of adoption of new IT's. Blockchain is a new technology, having the potential to redefine the conventional ways of transactions, thus helping to postulate the following hypothesis (Eichberger & Guerdjikova, 2013).

H4: The influence of pessimistic attitude on the intended timing of blockchain adoption is significantly different for public and private sector professionals.

Research Instrument and Data

In this study, the research sample was formed from IT professionals since blockchain is a new technology and IT professionals are observed to have a higher awareness of this concept than any other groups of professionals (Cronan *et al.,* 2005; Mishra *et al.,* 2014). According to Mishra et al. (2014) and Cronan et al. (2005), acceptance research should address IT professionals to explain the organizational and individual adoption of new digital technologies since this group of professionals are responsible for the developments and implementations at especially initial stages. Eventually, the data obtained from a sample of this nature may be more reliable and illustrative (Jin, Drozdenko, & Bassett, 2007; Mishra et al., 2014). Accordingly, a survey was conducted on a sample of 208 IT professionals. The research instrument contains 12 research questions. The initial version of this instrument was tested and revised based on suggestions from a group of IT experts and academicians. The attitudinal questions corresponding to the independent variables were grouped under 4 constructs (Table 1). The data was collected from leading public and private establishments and during the 2nd National BlockChain workshop using judgement sampling. One of the questions addresses the level of blockchain awareness among the respondents, and 28 of

whom were discarded from the analyses due to reported lack of awareness. A five-point Likert Scale (5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree) was used for independent variables. The question for adoption timing was adopted from Waarts et al. (2002) and Dearing (2009) and respondents' perceptions of early, late or no adoption were determined relative to professionals in their close environments. The details of the research variables are given in Table I.

The ordinal logistic regression analysis was used to test the relationships between the dependent and independent variables with a special emphasis on sectoral diversity. The analyses were based on the following model:

$$Y=a_{i0}+a_{i1}x_i+a_{i2}s+a_{i3}x_i*s, i<=4 (1=affective, 2=continuous, 3=normative, 4=pessimistic).$$

This model includes the intention for the timing of adoption as the dependent variable (Y); the attitude form (x_i), sector (s; private=0, public=1) and their interaction component (x_i*s). The interaction term in the model tests the existence of sectoral diversity. Additionally, the existence, direction and magnitude of the effect of attitude form (x_i) and sector (s) against the professionals' blockchain adoption intention are also predicted by the model.

The overall Cronbach's alpha was used to test the internal reliability, which is shown to be adequate 0.93. Table 1 shows item loadings for attitudinal constructs. The construct reliabilities change from 0.901 to 0.922, demonstrating that the four constructs in the tests exhibit high reliability and, for this reason, measure the same concept (Tavakol & Dennick, 2011). Additionally, item loads were found to be higher than 0.70, which can be used as an indication of construct validity (Workman, 2014). The content validity was confirmed by adapting and modifying the research items from the previous studies according to the purpose of this study. Appropriate refinements were made, along with a pilot study, during the selection of items.

Table 1

List of Variables, Constructs and Corresponding Items

Categories	Construct/ variable name	Item	Item Loadings	Construct Reliabilities
Sector	S	Private (0)/Public (1)	-	-
Adoption Attitude Dimension	Affective	It is important to use blockchain.	.851	.916
		Blockchain is closely related to my professional and organizational activities.	.851	
	Continuous	It is difficult to continue using other systems after experiencing blockchain.	.860	.913
		It will be a necessity to use blockchain in the future from professional and organizational perspectives.	.860	
	Normative	Blockchain is a new paradigm that must be followed closely.	.844	.901
		The exceedingly fast developing IT today requires constant adaptation.	.844	
	Pessimistic	Blockchain is not necessary.	.938	.922
		Blockchain is not useful.	.938	
Intention for Adoption Timing	AI	Early adoption relative to professionals in immediate surroundings (1)/ Late adoption relative to professionals in immediate surroundings (2)/ No adoption (3)	-	-

Results

Descriptive Results

The descriptive results are summarized in Table 2. The percentage of the respondent professionals from the private sector (63.9 %) is higher than that of the public sector (36.1 %). Of the private sector IT professionals, 72.8% have graduated from IT programs; whereas, respondents with other engineering or science degrees constitute 18.4%. These percentages are 71.9 %, and 15.6 % for the public sector IT professionals, respectively. This means that education shows similar dispersions for the private and public sector IT professionals in the survey. The percentage of recruitment of IT graduates is the highest for medium-scale establishments in both the private (37.2 %) and public (45.7%) sectors. The figures for the second-highest are small-scale in private (32.5 %) and large-scale in public (36.9 %) sector institutions. It is interesting to note that 11.1 % of the respondents reported no intention for blockchain adoption. This may be explained by the fact that most of these professionals are non-IT graduates (92.2 %) and are likely to be considered as laggards since they work in either routine daily operations or standard software development tasks in their establishments. They are not considered to be in the group of pioneers who adopt innovative digital technologies. On the other hand, non-adopters are also likely to show indecisive attitude against new information technologies, which comprise significant high risks. Most of the IT professionals from the private sector (53.3 %) report their tendency for early adoption, while non-adopters are as low as 8.5 % in this group. These percentages for the public sector are 40 % and 8 %, respectively. The chi-square test results show significance for the distribution of public and private sector IT professionals against the adoption timing intention (Chi-Square = 5.962; DF = 2; P-Value = 0.051).

Test Results

The test results for the path significance of each hypothesized association in the research model and the results for bilateral relations between dependent and remaining independent factors are presented in Table 2.

Affective Attitude

First of all, based on a one-to-one comparison of the third row in Table 3, the p-value for the interaction component of the regression model (Eq. 1) shows significance (coeff. = 0.275; p-value = 0.007) for alpha<.01. This means that there is sufficient evidence to conclude that the influence of affective attitude on IT professionals' adoption timing intentions shows a significant diversity between the public and private sector respondents. Therefore, H1 is accepted. On the other hand, the last value on the first row of Table 3 shows a significance for the affective attitude (coeff. = -0.259; p-value = 0.009) at alpha<.01 significance level. This means that the affective attitude has a negative effect on the likelihood of moving from early to late adoption. The negative coefficient of affective attitude shows that the stronger the perceived affective attitude, the earlier IT professionals intend to adopt blockchain. To be in parallel with the interaction term, the test result for the sector (coeff. =-1.460; p-value =0.007) also shows sufficient evidence to conclude that the sector has an influence on the intentions for IT professionals' adoption timing and that the negative coefficient for this predictor can be interpreted as private-sector IT professionals showing stronger affective attitude towards the intention for earlier blockchain adoption. This probably shows that the recognition of the value of blockchain is higher among IT professionals from the private-sector.

Table 2

Descriptive Results

Variable-description	N	Percen.	Mean	SD	Correlations		
					Sector	Scale of estab.	Edu. field of resp.
Sector	180	100.0	1.361	0.232	-	-	-
1=private	115	63.9					
2=public	65	36.1					
Scale of establishment	180	100.0	2.089	0.783	0.019	-	-
1=Small	47	26.1					
2=Medium	68	37.8					
3=Large	63	35.0					
Unknown	2	1.1					
Education field of respondent	180	100.0	1.383	0.671	0.199	0.076	-
1=IT	130	72.2					
2=Other engineering or science	31	17.2					
3=Others	19	10.6					
Individual adoption timing	180	100.0	1.620	0.685	0.471	0.050	0.003
1=Early	90	50.0					
2=Late	66	36.7					
3=No adoption	20	11.1					
Unknown	4	2.2					

For the adoption timing, the goodness of fit test results indicate that the model for the affective attitude is significant since Pearson (p-value=0.349) and Deviance (p-value=0.120) p-values are both greater than the selected significance level (alpha<.01). The correlation was measured to be 0.029 (Variance Inflation Factor (VIF) = 1.02) between the predictor variables affective attitude and sector. This does not support the existence of collinearity and linear association between two explanatory variables. Therefore, independent variables are capable of predicting the dependent variable.

Continuous Attitude

For the model of continuance attitude **(Eq. 2)**, the p-value (coeff=0.143; p-value= 0.207) in row 6 in Table 3 does not support the existence of any difference between public and private sector establishments as to the impact of continuous attitude towards adoption timing intention. Therefore, H2 is not accepted. This means that there is no difference between the two sectors' IT professionals for early or late blockchain adoption intentions in this category. Additionally, p-values on rows 4 and 5 do not support the influence of continuance attitude (coeff.= -0.135, p-value=0.2249) and the sector (coeff=-0.460, p-value= 0.498) on adoption intention. However, their negative coefficients can be taken as an indication of the notion that being a private sector IT professional and having a stronger continuous attitude are indicators of earlier blockchain adoption intentions. The goodness of fit test supports significant model fit to data since Pearson (p-value=0.181) and Deviance (p-value=0.196) p-values are both greater than the selected significance level (alpha <.01). The correlation and VIF values between independent variables were found to be 0.045 and 1.047, respectively. This can be used as an indication of a lack of collinearity, which shows the linear independence of predictor variables. In other words, the explaratory variables can independently predict the dependent variable.

Normative Attitude

The inspection of the p-value for the interaction component of Equation 3 in Table 3 shows significance

(coeff. = 0.237; p-value = 0.037) at alpha<.05 significance level. This can be used to conclude that the public and private sector IT professionals' normative attitude has a significantly different effect regarding their intentions for blockchain adoption timing. Therefore, H3 is accepted. On the other hand, as shown on the seventh and eight rows in Table 3, IT professionals' normative attitude (coeff. = -0.244; p-value =0.031) and sector (coeff. = -1.699; p-value= 0.084) are two significant predictors for their blockchain adoption timing intention at alpha <.05 and alpha< 0.1 significance levels, respectively. This means that both the normative attitude and sector influence the adoption timing, but the effect of the professionals' sector is almost 8 times stronger than that of the normative attitude in this class. Their negative coefficients (Table 3), can be used as evidence that the IT professionals' stronger normative attitude and working in a private sector establishment are indicators of the intention for earlier blockchain adoption. According to the goodness of fit test results, since p-values for Pearson (p=0.154) and Deviance (p=0.73) tests are greater than the selected significance level (alpha<.01), there is no sufficient evidence to claim that the model does not adequately represent the data. Finally, the correlation (0.035) and VIF (1.036) values for the independent variables in this category do not indicate the existence of collinearity. This can also be used as a lack of linear dependence between two explanatory variables so that they can independently predict the dependent variable.

Pessimistic Attitude

Based on the goodness of fit test results, p-values for Pearson (0.439) and Deviance (0.362) tests are both greater than the selected significance level (alpha<.01), indicating that there is no lack of fit to data for the model. The p-value in the last row of Table 3 shows that the interaction component of Equation 4 (coeff.=0.363; p-value=0.001) is significant at alpha<.01 significance level. This can be used as evidence of the fact that there is a difference between public and private sector IT professionals' pessimistic attitudes in terms of their adoption timing intentions for blockchain. Therefore, H4 is accepted. On the other hand, the p-values on the seventh and eight rows in Table 3 indicate significant effects for pessimistic attitude (coeff. = 0.357; p-value=0.001) and sector (coeff.= 2.264, p-value= 0.006) at alpha <.01 significance level. The estimated coefficients exhibit the effect of the sector to be more than 6 times stronger. The positive coefficients (Table 3), show that the stronger perceived pessimistic attitude and working in a public sector establishment are two indicators of intention for later blockchain adoption. This may be taken as an indication that the public sector professionals' awareness is lower concerning the benefits of blockchain. The correlation and VIF values were measured as 0.048 and 1.05, respectively. This can be used as an evidence of a lack of collinearity. This also means that the explanatory variables are capable of predicting the dependent variable independently.

Table 3

Test Results for Sector Diversity

Dependent variable	Regression Equations	Predictors	Hyp.	Predictions	
				Coeff.	p-val.
Intention Adoption (early, late, no adoption)	Equation 1: Affective attitude	affective attitude		-0.259	0.009*
		Sector		-1,460	0.004*
		Interaction component	H1	0.275	0.007*
	Equation 2: Continuous attitude	continuous attitude		-0.135	0.224
		Sector		-0.460	0.498
		Interaction component	H2	0.143	0.207
	Equation 3: Normative attitude	normative attitude		-0.244	0.031**
		Sector		-1.699	0.084***
		Interaction component	H3	0.237	0.037**
	Equation 4: Pessimistic attitude	pessimistic attitude		0.357	0.001*
		Sector		2.264	0.006*
		Interaction component	H4	0.363	0.001*

(*), (**) and (***) indicate statistical significance at .01, .05 and .10 significance levels, respectively.

Discussion

The results of the study indicate that the participants with affective attitude towards blockchain are more likely to adopt the technology at an earlier time. As such, the IT professionals who have a positive opinion of blockchain are expected to join the blockchain community before others. This might be attributable to the technical competence of the professionals, which should be considered in the efforts to understand and manage their behavior (Meyer *et al.,* 2002). A practical implication of our finding is that affective attitude is necessary to explain adoption behavior in using blockchain technology (Kim & Crowston, 2011). Our finding is in line with that by Huang (2017), who states that positive feelings are expected to boost the intention to utilize an information system. In parallel, Kim and Crowston (2011) define user satisfaction as the affective attitude towards a computer system and state that satisfaction affects the intention to continue using such systems. Our findings also show that the IT professionals working in the private sector are more likely to have an affective attitude towards blockchain adoption when compared to the public sector, resulting in an intention for early adoption. Similar to our findings,

Gatautis et al. (2015) assert that the public sector is slower in Information Communication Technology adoption when compared to the private sector. This difference can be due to a lack of competition, slow decision processes and a conscious sense of avoiding mistakes in the public sector. In comparison, private-sector workers employ more innovation-driven competitive strategies, and such establishments are more likely to benefit from fostering technical competence among their employees (Meyer *et al.,* 2002), in this way resulting in a more positive inclination towards adopting blockchain within an earlier timeframe. It may also be an indication that private sector professionals gain more technical satisfaction toward using new technologies in earlier stages.

The continuance attitude, which is also examined in this study, deals with the desire of a person to continue working in an organization or using a system due to the perceived economic or social consequences associated with leaving it (Shirazi *et al.,* 2011). The continuance attitude for the adoption of new technologies is critical since new users may cost as much as five times more than retaining existing ones (Bhattacherjee, 2001). Therefore, it serves as a strategic edge for professionals in the competitive environment present in the market. Unlike the results in other categories, no difference in the timing of blockchain adoption was found between the participants from the public or private sectors in this study. Considering the questions used for this attitude form (Table 1) and the demographic characteristics of the sample, this is not surprising. Most of the respondents from the public (71.9 %), and private (72.8 %) sector are IT graduates according to the survey. Naturally, irrespective of the sector differences, those with an IT education are not expected to experience difficulties in adopting and continuing to use blockchain technology. The nature of our sample may be the reason behind our conflicting results with others in the literature (Bonina & Cordella, 2010; Gupta *et al.,* 2004; Halvorsen, Hauknes, Miles, & Roste, 2005; Lau, 2003; Nel *et al.,* 2004; Rashid & Rashid, 2012). Nevertheless, there was a slight indication that private-sector employees with a stronger continuous attitude, intend to adopt blockchain within an earlier timeframe. This result may be due to employees in private institutions preferring smoother, faster and continuous decision-making processes because of working in for-profit organizations (Nutt, 2006). Those in the public sector, on the other hand, experience more turbulence, interruptions, recycles, and conflict (Nutt, 2006). Our finding may also indicate that participants who have become accustomed to the financial benefits generated by blockchain, would choose to continue using the technology.

The third category examined in this study is the normative attitude, which describes loyalty or feelings of obligation one feels towards an object, organization, etc. White et al. (2009) state that the normative component is effective in predicting intentions. Our findings also indicate that the participants with normative views aim for an earlier adoption of Blockchain. A plausible explanation for this result may be based on the notion that the normative attitude shows professionals' effort and willingness to adopt new technologies, including blockchain, in the future. This result is similar to the findings by Shirazi et al. (2011), who state that increased participation of users results in more positive attitudes and commitments towards using systems. Interestingly, in this category, the effect of the participants' sector is almost 8 times stronger than that of their attitude. As such, those with a normative attitude working in the private sector have strong intentions for earlier adoption of blockchain. Based on the content of the corresponding questions in the research instrument, our finding for normative attitude may be an indication of the higher perceived motivation of the private sector professionals towards the future (Husman & Lens, 1999). Higher motivation provides the normative professionals with an advantage over those without a developed IT interest (Ma *et al.,* 2017), which is vital for the survival of private sector establishments. Our result may also be due to private sector employees being more motivated by financial rewards and opportunities for career development when compared to the public sector personnel (Rashid & Rashid, 2012). Additionally, failure to utilize new technologies may be seen by the normative professionals in the private sector as the fault of the professional, who simply did not develop any significant competence (Ma *et al.,* 2017). Private sector professionals with normative attitudes are more oriented towards gaining IT competencies due to early exposure and force of will (Ma *et al.,* 2017).

The final type of attitude studied is the pessimistic attitude, which can be described as perceiving the object in question negatively (Shirazi *et al.,* 2011). Our findings reveal that the effect of the sector is significant in the timing of the blockchain adoption when the attitude is pessimistic. The participants working in the public sector with such an attitude show reluctance towards embracing the new technology, and intend to start using blockchain at a later time. As presented by Selwyn (2011), pessimists are aware of the limits, risks and conflicts involving a change and are willing to wait for them to be resolved so that they can decide accordingly. Moreover, pessimists are inclined to evaluate all the positive and negative information about a product before making final decisions (Eichberger & Guerdjikova, 2013). The public sector is reluctant towards embracing innovations as well because of an initial mistrust combined with a lack of awareness, and would rather wait and learn from the experiences of the private sector (Gatautis *et al.,* 2015). As such, a public sector professional with a pessimistic attitude is more uncertain about new technology such as blockchain, and, hence, is hesitant to utilize it before gathering more information and waiting for the favorable and unfavorable experiences of other users to provide clues.

Conclusion

This study aims to examine the attitudinal and sectoral differences that affect the intended timing of blockchain adoption adapted from the diffusion of innovation theory. The survey sample consists of IT professionals to guarantee blockchain awareness for the reliability of the results and their generalizability to other types of digital innovations. The results show that affective, normative and pessimistic

attitudes are significant predictors of the professionals' readiness to adopt blockchain technology. Understanding the attitudinal determinants of blockchain adoption timing may lead to the acceleration of the rate of blockchain adoption in establishments. Especially, by comprehending the determinants of early adoption, the profiles, expectations, needs and preferences of late and non-adopters may be addressed. As such, establishments may come up with better managerial decisions regarding the adoption of not only blockchain but also other digital innovations.

The analyses also show that public and private sector diversity is valid for different attitude forms. This means the attitudinal preferences related to technology adoption are primarily dependent upon the sector as the results indicate distinct value systems for public and private sector professionals. One of the main advantages of having an understanding of the differences between the IT professionals from public and private sectors in the blockchain adoption context is that it can facilitate the organizational strategies towards blockchain adoption. The authors hope that the results of the study will provide additional data in forecasting the utilization of blockchain in the near future, and offer insight for organizational plans towards blockchain adoption. Moreover, the findings are expected to present clues to decision-makers and strategists for an in-depth understanding of the reasons behind the different forms of perceptions of IT professionals regarding blockchain adoption.

This study has some limitations. It is important to note that future research should consider the actual usage of blockchain technology as a dependent variable since the actual usage could not be addressed in this study. Also, our study analyses attitudinal forms using a sample of IT professionals with an emphasis on sector diversity. There may be additional and unforeseen factors that affect such adoption, hence necessitating the inspection of socio-demographic attributes and factors such as security, privacy, trust, and others may as well be worth addressing in this context. Lastly, testing this concept within a broader scale, such as organizational adoption, can be another future initiative.

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