INDERSCIENCE PUBLISHERS
Linking academia, business and industry through research

International Journal of Management and Enterprise Development

ISSN online: 1741-8127 - ISSN print: 1468-4330
https://www.inderscience.com/ijmed

The mediation role of top management support in the adoption of cloud computing in Malaysian SMEs

Raymond Teh, Anusuiya Subramaniam, Jo Ann Ho, Norazlyn Kamal Basha

DOI: 10.1504/IJMED.2024.10063221

Article History:
Received: 25 October 2023
Last revised: 15 December 2023
Accepted: 02 January 2024
Published online: 03 May 2024

The mediation role of top management support in the adoption of cloud computing in Malaysian SMEs

Raymond Teh*

School of Graduate Studies,
Universiti Putra Malaysia,
43400 UPM Serdang, Selangor, Malaysia
Email: ray99mondtkl@gmail.com
*Corresponding author

Anusuiya Subramaniam, Jo Ann Ho and Norazlyn Kamal Basha

School of Business and Economics,
Universiti Putra Malaysia,
43400 UPM Serdang, Selangor, Malaysia
Email: anusuiya@upm.edu.my
Email: ann_hj@upm.edu.my
Email: norazlyn@upm.edu.my

Abstract: With only 3.63% of total IT spending on cloud computing and a growth rate of 13.13%, Malaysia's adoption of cloud computing is lower than others. The purpose of this study is to find out the mediation role of top management support together with the DOI's innovative characteristics and TOE's contexts on cloud computing adoption among Malaysian SMEs. This study was able to determine the relationships between IV and DV in a more accurate way and the findings are crucial to understanding how to drive a higher cloud computing adoption rate among Malaysian SMEs with top management support as the mediator, which eventually can drive better firm performance. An empirical cross-sectional research paper that was conducted on Malaysian SMEs with 352 participants was carried out with a quantitative online survey with a five-point Likert scale and systematic sampling technique to collect the primary data. It was concluded and proven that top management support has a significant mediating effect on cloud computing adoption and DOI's innovative characteristics and TOE's contexts have positive influences on the adoption of cloud computing.

Keywords: cloud computing; top management support; TOE; DOI; technology adoption.

Reference to this paper should be made as follows: Teh, R., Subramaniam, A., Ho, J.A. and Basha, N.K. (2024) 'The mediation role of top management support in the adoption of cloud computing in Malaysian SMEs', *Int. J. Management and Enterprise Development*, Vol. 23, No. 1, pp.73–96.

Biographical notes: Raymond Teh is a full-time employee of one of the leading global cloud computing hyperscaler providers, with more than 18 years of work experience in the IT industry. He is currently pursuing his PhD study at Universiti Putra Malaysia in Business and Economics after completing his

MBA at Anglia Ruskin University. He is a passionate Malaysian in the information technology industry and has been conducting research and study in such a field. He has also achieved MBOT professional technologies and PMP project management certifications, is a certified personal trainer, and has obtained a few IT technical certifications.

Anusuiya Subramaniam, a Senior Lecturer at the School of Business and Economics, Universiti Putra Malaysia (UPM), specialises in human resource development, work and organisational psychology, leadership, and management. As an editorial board member/Associate Editor for *BMC Health Services Research* and Associate Editor for the *Asian Journal of Case Research*, she contributes significantly to scholarly publications. Certified as a professional trainer by the Malaysian Institute of Management (MIM-CPT), she conducts workshops on global leadership, systematic research problem identification and writing, and quantitative data analysis using SPSS and SEM-AMOS software. With prior experience in leading industries, she seamlessly transitioned into academia.

Jo Ann Ho is a Professor at Universiti Putra Malaysia's School of Business and Economics. Her research interests are in business ethics and CSR. She has received grants from prestigious organisations, including the Sumitomo Foundation Grant Scheme, Malaysia Ministry of Higher Education and the Ministry of Science, Technology and Innovation. She is also an editorial board member in the *Journal of Hospitality & Tourism Research* and *Business Ethics*, the Environment and Responsibility. She played a key role in developing SIRIM Malaysia's 'General Principles for Sustainable Development', showcasing her dedication to sustainability.

Norazlyn Kamal Basha is a Senior Lecturer from the Department of Management and Marketing, the School of Economics and Business in Universiti Putra Malaysia. She obtained her PhD in Marketing from the University of Western Australia in 2016. In terms of research, she has interest in collaborating with colleagues and students alike in the areas of international marketing, services marketing, consumer behaviour, higher education, societal marketing, and the like. Special interests outside academia include animal welfare conservation, especially of the feline variety, long-distance running and Brazilian Jiu-jitsu.

1 Introduction

According to Gartner (2019), Malaysia has been identified as a resisting country on public cloud computing, spending only 3.63% of total IT spending on cloud computing. According to Twinbit (2020), Malaysia's public cloud growth rate is only 13.13%, which is not only much lower than the global rate but also lower than other ASEAN countries. Failing to adopt and leverage the benefits that cloud computing brings will cause low productivity, not being competitive, a lack of market information access, and a lack of integration with global and regional markets (SME Corp. Malaysia, 2021).

From an academic point of view, the low adoption rate of cloud computing in Malaysia is due to a lack of IT investment and understanding pertaining to the actions that are required to be taken for the adoption of cloud computing, and the inability of Malaysian companies to catch up with the technological learning curve of multinational

companies has widen the gap in competitiveness (Mansour et al., 2020). Several survey reports across the world reflect that SMEs have not seriously taken action to leverage digitalisation for their business operations (Lee et al., 2020). Several challenges and complexities restrict emerging countries' SMEs digitalisation due to resource scarcity (Lee et al., 2020). The adoption rate of cloud computing in SMEs is below expectations due to a lack of success stories and confidence, and SMEs prefer waiting for others to try it first (Razzaq and Mohammed, 2020).

In terms of SMEs challenges from an industry point of view, low levels of awareness and knowledge on technologies and financing among SMEs are playing an important role in business digital transformation (SME Corp. Malaysia, 2021). Secondly, a lack of digital talent and a gap in digital infrastructure are the roadblocks to business transformation (SME Corp. Malaysia, 2021). Thirdly, the slowness of digital transformation causes SMEs to be less productive and lack wider and quicker access to market information and resources, as well as integration into regional and global markets (SME Corp. Malaysia, 2021). Nevertheless, despite its enhancement and maturity, studies pertaining to the antecedents of cloud computing adoption, especially among SMEs' employees, are limited (Hassan et al., 2017; Ming et al., 2018; Teh and Subramaniam, 2023).

A great number of studies have identified that the adoption of cloud computing can significantly improve firm performance (Raut et al., 2018a; Priyadarshinee et al., 2017b; Teh, 2023) by increasing operational effectiveness and reducing operational costs (Sallehudin et al., 2018). The cloud computing market share has grown exponentially, from USD 5 billion in 2008 to USD 236 billion in 2020 (Statista, 2021), and the global cloud computing market size is expected to grow from USD 371.4 billion in 2020 to USD 832.1 billion by 2025 at a compound annual growth rate (CAGR) of 17.5% (Research and Markets, 2020). Considering the high growth rate of cloud computing, it is definitely worth spending effort and time to understand the factors that could influence and drive further cloud computing adoption, especially among Malaysian SMEs.

There are quite a number of contradicting results identified from previous studies related to cloud computing adoption, whereby the gap could be due to different sets of populations as well as different industries, segments, and countries which can be classified as evidence. For the theoretical gap, there are few limitations of the theories, such as diffusion of innovation (DOI), which does not consider an individual's resources or social support to adopt the innovation (BUMC, 2022), and the technology-organisation-environment (TOE) framework's assumption that the model will apply to large organisations where customers make certain of congruity and have fewer grievances than to SMEs (Bryan and Zuva, 2021). The study will integrate both models and theories to fill the gaps in each other's (Bryan and Zuva, 2021). In terms of the practical knowledge gap, most of the previous studies have been carried out within a theoretical framework with only a few variables, whereas in actual situations, organisations are not just looking from a technological point of view but involve many other aspects. The study is trying to fill the gap by including top management support as the mediator. Lastly, for the population gap, limited studies have been carried out on Malaysian SMEs, especially based on the latest empirical findings on cloud computing adoption-related studies (Hassan et al., 2017; Ming et al., 2018). The study is trying to address the gap for Malaysian SMEs by finding out the latest empirical findings about the influencing factors on cloud computing adoption.

2 Conceptual background

2.1 Definition of key concepts

There are five original characteristics of DOI theory (Clarke, 1999), which are relative advantage, compatibility, complexity, trialability, and observability. Relative advantage is the degree to which it is perceived to be better than what it supersedes, compatibility refers to consistency with existing values, past experiences, and needs; complexity refers to the difficulty of understanding and using it; trialability is the degree to which it can be experimented with on a limited basis; and observability is the visibility of its results (Clarke, 1999). Three out of five DOI constructs will be adopted in this study: complexity, relative advantage, and compatibility. TOE framework was described in terms of processes of technological innovation (Tornatzky et al., 1990), which describe the process of innovation from idea to adoption and implementation. The TOE framework is an organisation-level theory that explains three different contexts and their influence on adoption decisions: technological, organisational, and environmental contexts (Baker, 2012). In this study, DOI and TOE will be integrated in the theoretical framework as the independent variable to find out the mediating effect of top management support on cloud computing adoption.

Technological context is the most important area to touch on whenever exploring new technology adoption. In this study, a few technological improvements that were brought about by cloud computing are grouped under innovative characteristics such as relative advantages, compatibility, and complexity, whereby these constructs are part of the technological context. Cost effectiveness and security assurance are grouped under technological context' in this study. Cost reduction refers to the ability to control costs by continuously improving quality with budgeting (Shahzad et al., 2020), and the conclusion that such an initiative might compromise quality and cause multiple unforeseen disbursements. Privacy is one of the main concerns for those intending to migrate to cloud computing to ensure the data, especially sensitive data, is protected safely, while security is another main concern to ensure confidentiality and integrity to safeguard the system's security (Almaiah and Al-Khasawneh, 2020).

The environment context is another independent variable in this study, along with industry influence, competitive pressure, and regulatory compliance as sub-dimensions. In previous cloud computing studies, environmental elements were common, especially if the study was based on the TOE framework. Industry pressure from trading partners and competitors is another critical element in information system adoption, whereby industry pressure is defined as the level of cloud computing ability in the corporate's segment with its competitors (Chang, 2020). Competitive pressure is a crucial external force in the technology adoption study as it helps corporations gain advantages over their competitors (Shahzad et al., 2020). Regulatory compliance is when a corporation obeys the guidelines, laws, and specifications that pertain to its operations (Hiran and Henten, 2019), which is not limited to the industry but also both domestic and international.

Organisational context was included in quite a number of past studies on the adoption of cloud computing, especially those that applied the TOE framework. The sub-dimensions of this study are corporate culture, IT competency, and firm size. Culture refers to the pattern of beliefs, values, assumptions, and practices that have a direct influence on the adoption of new technology or innovation (Alenezi et al., 2017). IT readiness refers to the available IT experts and resources of the corporations, which will

indirectly impact the adoption of new technology or innovation (Alghamdi et al., 2018), while IT readiness in Al Ajmi et al. (2017) is defined as the degree of preparation of IT infrastructure and manpower in terms of the adoption of new technology. In the Senyo et al. (2016) study, firm size refers to the magnitude of a corporation in terms of staff, target market opportunity, and capital investment, while firm scope refers to the area of operation of the corporation.

Top management support in the Qasem et al. (2020) study refers to top management's altitude regarding the concerned technology, and the extended support given to the technology adoption and successful deployment of cloud computing depends on the capabilities of the top management to drive or influence it. Top management support is crucial, especially for SMEs that have a very simple structure, as most of the time the owners, CEOs, or executives have absolute decision-making authority (Khayer et al., 2020). The perceptions and actions of the corporate's executives on the usefulness of technological innovation by providing business values to the corporate are defined as top management support (Garcia-Sanchez et al., 2017; as cited in Hiran and Henten, 2019) to ensure long-term vision and resource commitment in the establishment and realisation of the corporate's goals. Management support in the Li (2020) study refers to the management's willingness to adopt the new technology via general impression, investment justification, action taking, and others.

2.2 Review of related theories and models

There are plenty of theories, frameworks, and models that have been used in the past for cloud computing adoption and related studies. The main underpinning theories in this study are DOI and TOE. The TOE framework was described in terms of processes of technological innovation (Tornatzky et al., 1990), which describe the process of innovation from idea to adoption and implementation. The TOE framework is an organisation-level theory that explains three different contexts and their influence on adoption decisions: technological, organisational, and environmental contexts (Baker, 2012). The constructs under TOE's technological context are technology, availability, and characteristics, while industry characteristics and market structure, technology support infrastructure, and government regulation are under the environmental context. The constructs under organisational context are formal and informal linking structures, communication processes, size, and slack. All the constructs are original elements of the TOE framework. The technological context established in this study has its origins in IDT or DOI theory (Rogers and Williams, 1983), which explains how, why, and at what rate new ideas and technology spread. The organisational context established in this study has its origins in the dynamic capabilities theory (Teece et al., 1997), which is the capability of an organisation to purposefully adapt its resource base, and stakeholder theory (Freeman, 2010), a theory of organisational management and business ethics that accounts for multiple constituencies impacted by business entities, while the environmental context established in this study has its origins in the Institutional theory (Meyer and Rowan, 1970s) to explain how organisations might navigate the rules and norms of the system in order to appear legitimate and survive (Hwang et al., 2016).

DOI theory seeks to explain how, why, and at what rate new ideas and technologies spread. It was developed by Everett Rogers and published in 1962, with the 5th edition published in 2003. Adopters of new ideas or technologies can be broken down into five phases: innovators, early adopters, the early majority, the late majority, and laggards. The

main characteristics of an innovation are relative advantage, compatibility, complexity, trialability, and observability (Clarke, 1999). The adoption of cloud computing study by Sabi et al. (2017) is one of the studies that uses DOI theory as its main theoretical framework, with relative advantages in terms of complexity, compatibility, trialability, observability, and demonstrable results. Al Ajmi et al. (2017) conducted a different study that integrated the DOI model and Fit-Viability model, where relative advantage, complexity, and compatibility were expected to have a significant influence on the fitness of cloud computing. Qasem et al. (2018) is similar to Al Ajmi et al. (2017) by integrating DOI and Fit-Viability but with additional TOE. The sub-dimensions under DOI and technological context are relative advantage, compatibility, complexity, and security assurance, whereby security assurance is not common as it is not part of the original DOI theory characteristics.

In the past, quite a number of studies have integrated TOE and DOI together to study and analyse cloud computing adoption in a better way. Mohammed et al. (2016) have integrated DOI characteristics into the technology context of the proposed model, which consists of relative advantage, compatibility, complexity, trialability, and security. Njenga et al. (2019) is another study that integrated TOE and DOI in the research model, whereby the innovative characteristics that are integrated into the technological context are relative advantage, complexity, and compatibility. Ali et al.'s (2018) study is quite similar to that previously discussed, whereas the conceptual research model is based on the TOE framework and DOI model but with an additional desire framework. In the study of Singh and Mansotra (2019), the research model is based on the TOE framework, whereby the technological context consists of relative advantage, compatibility, and complexity, which are part of the DOI model. Similar to Singh and Mansotra (2019), Al-Sharafi et al. (2017) are similar in that the technological context consists of relative advantage, complexity, compatibility, and additional perceived security and privacy, where relative advantage, compatibility, and complexity are a few of the ten most noteworthy elements of cloud computing adoption. According to Mokhtar et al.'s (2016) study, the technological context of the TOE framework is compatible with DOI theory's five characteristics, but in the study only three constructs were chosen and factored into the technological context, which are relative advantage, compatibility, and complexity. Alismaili et al. (2020) are another study that integrates both TOE and DOI, whereby the constructs are relative advantage, compatibility, trialability, and cost savings. Empirical studies have indicated that among these five innovative characteristics, only relative advantage, complexity, and compatibility are consistently related to the adoption or utilisation of a technology or innovation (Hwang et al., 2016). This is also supported by other studies like To and Ngai (2006), Tornatzky et al. (1990), and Al Ajmi et al. (2017) that find that these three characteristics have a consistent linkage with innovative behaviours across SME and enterprise segments. The concepts of trialability and observability tend to test an innovation; hence, these factors were not considered in the study (Singh and Mansotra, 2019).

One of the key differentiations of this study is integrating both the TOE framework and DOI theory by embedding the DOI's innovative characteristics within the TOE's technological context. The innovative characteristics that are embedded into TOE's technological context are relative advantage, compatibility, and complexity, along with the additional cost effectiveness and security assurance in the technological context, which are not part of the innovative characteristics but are under the availability and characteristics of the original TOE framework. Such integration is supported by previous

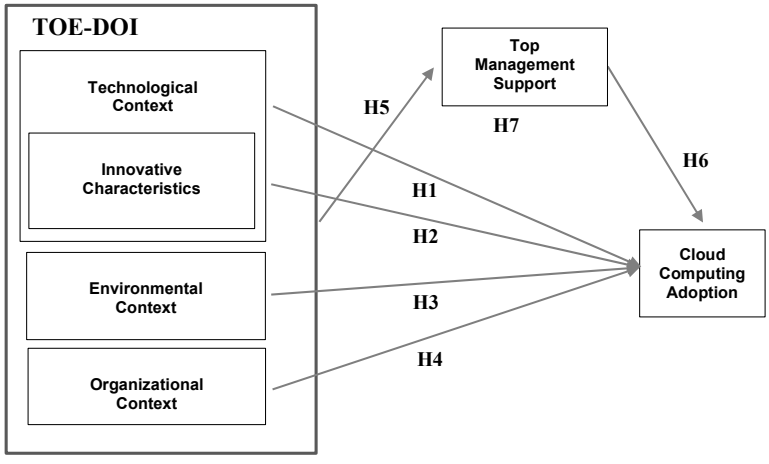
studies like Qasem et al. (2021) with relative advantage, compatibility, and complexity plus additional security under the original TOE's technological context, Almubarak (2017) with relative advantage, compatibility, and complexity, and Qasem et al. (2018) with relative advantage, compatibility, complexity, and security. Both studies of Qasem et al. (2018, 2021) are slightly different in that in the 2018 study version, the security was part of the DOI, but in the 2021 study version, the security has been removed from the DOI and parked under technological context, which is to align the original DOI's innovative characteristics as security is not one of the original characteristics under the DOI.

3 The research model

3.1 Theoretical framework

Figure 1 shows the theoretical framework for this study, which was adjusted to suit this research. The framework has four independent variables which are technological context, innovative characteristics, environmental context and organisational context, and cloud computing adoption as dependent variable. Additionally, the theoretical framework of this research study is used to investigate whether or not top management support as a mediator can mediate cloud computing adoption.

Figure 1 Proposed theoretical framework



3.2 Formulation of hypotheses

The study by Hiran and Henten (2019) shows that the hypothesis of how the technological context affects the plan to embark on cloud computing was supported. There is a connection between the technological context and the adoption of cloud computing in Singh and Mansotra's (2019) study. Technological factors are positively related to the challenges of executing a cloud computing model (Juma and Tjahyanto, 2019). The hypothesis that technological factors will be positively associated with the likelihood of cloud computing adoption is supported and was the strong driver in the

study of Alismaili et al. (2020). Innovative characteristics is subset under technological context as per study's theoretical framework which aligned with the TOE framework and previous studies such as Qasem et al. (2021) and Almubarak (2017). Thus, it could be hypothesised that:

H1 Technological context is positively and significantly related to cloud computing adoption.

In Arpaci's (2017) study, innovativeness is greatly related to perceived ease of use, while perceived ease of use is greatly related to attitudes towards using cloud computing-related services. Innovative characteristics with sub-dimensions of relative advantage, complexity, and compatibility have a positive relationship with cloud computing adoption in Malaysian IT companies (Mohammadi et al., 2017). Another study shows innovative characteristics with the sub-dimensions of relative advantage, complexity, and compatibility have a positive relationship with cloud computing adoption in higher education institutions (Qasem et al., 2020). In the Ali et al. (2020) study, innovative characteristics with a sub-dimension of complexity and compatibility have a positive relationship with cloud computing adoption in local government. Thus, it could be hypothesised that:

H2 Innovative characteristics are positively and significantly related to cloud computing adoption.

The study of Hiran and Henten (2019) shows that the hypothesis that environmental context affects the intention behind the adoption of cloud computing was supported. There is a connection between the environmental context and cloud computing adoption in Singh and Mansotra's (2019) study. Environmental elements have a positive impact on viability, while viability has a positive impact on the performance of cloud computing adoption (Yoo and Kim, 2019). Environmental elements are positively associated with the challenges in deploying cloud computing models (Juma and Tjahyanto, 2019). Thus, it could be hypothesised that:

H3 Environmental context is positively and significantly related to cloud computing adoption.

The study by Hiran and Henten (2019) shows that the hypothesis of how organisational context affects the plan to adopt cloud computing was supported. Organisational elements have a positive impact on viability, while viability has a positive impact on the performance of cloud computing adoption (Yoo and Kim, 2019). The hypothesis that a remarkable association exists between the organisational element and the adoption of cloud computing is supported in Cheng and Wakil (2019). Thus, it could be hypothesised that:

H4 Organisational context is positively and significantly related to cloud computing adoption.

Top management throughput functional orientation will be positively related to management innovation (Heyden et al., 2018). Top management commitment and contribution have been widely proven as one of the elements of success in innovation processes (Wiener, 2018). The findings of the Li (2020) study demonstrate that there is a significant connection between technology and management support. Furthermore, Al Shaar et al.'s (2015) study also revealed that technological context is related to top

management support. As per Li's (2020) study, environmental context such as stakeholder was found to be associated with management support. Environmental contexts like mimetic pressure and normative pressure lead to greater levels of top management involvement in technology adoption (Gopalakrishna et al., 2019). The Al Shaar et al. (2015) study shows that there is a significant connection between top management support and organisational context. In Hassan and Yazid's (2019) study, the proposed conceptual framework listed top management support as a mediating variable that will mediate the organisational context with technology effectiveness. Thus, it could be hypothesised that:

H5 TOE-DOI is positively and significantly related to top management support.

With regards to Khayer et al. (2020), top management support has been identified as being positively associated with the adoption of cloud computing. Khayer et al.'s (2020) study indicated that top management is important to accelerate the adoption of new technology or innovations like cloud computing. Furthermore, Ming et al.'s (2018) study did reveal that top management support is significantly associated with the adoption of cloud computing. Shee et al. (2018) found that top management support for cloud computing technology adoption positively mediates the relationship between cloud-enabled integration and firm performance. Thus, it could be hypothesised that:

H6 Top management support is positively and significantly related to cloud computing adoption.

Li's (2020) study is to investigate the roles of personal perception in technology adoption at the organisational level with a behavioural model versus a TOE framework, whereby the results proved that management support mediated the technological, environmental, and organisational contexts of technology adoption. According to Hwang et al. (2016), the heterogeneity of the top management team influences technological innovation. Another study listed top management support as a mediating variable to find out its mediating effect on the relation between organisational context and technological effectiveness, whereby the hypothesis was supported (Hassan and Yazid, 2019). In Ooi et al. (2018), it is suggested that top management can play a critical role in mediating the organisational context for technology adoption and innovation. Environmental context like the support of the government is positively correlated with top management support for the adoption of cloud computing (Wang et al., 2018). Thus, it could be hypothesised that:

H7 Top management support mediates the relationship between TOE-DOI and cloud computing adoption.

4 Research methodology

This study is targeting Malaysian SMEs, and the sampling frame will be based on three of the US-based technology vendors in Malaysia with about 5,500 unique SME organisations. The unit of analysis in this study will be the SME organisations, and the representatives could be individual contributors, managerial staff from varying departments such as the C-level and executives of the corporate, the IT division, and business users from sales, marketing, operations, and so on, who are directly or indirectly

utilising cloud computing or IT technology to execute and carry out their daily tasks. In this study, a systematic sampling technique, which is the probability sampling technique, was applied in order to generalise the results. With a 5% margin of error, a 95% confidence level, and a 40% response distribution, a minimum of 346 samples are required based on the target population of 5,500, whereby every third SME organisation was selected and invited to participate in the survey, considering the low response rate. A 5,500-sample frame is sufficient to meet 346 samples with a 20% response rate.

In this study, a single data collection technique was adopted, which is a mono method quantitative study with a web-based questionnaire survey. A Google Form was used in this study, and the instruments were written in English. This is a cross-sectional study where the data was collected at a particular time during a short period of time. For the question design, this study has adapted or adopted the questions that were developed by previous researchers in similar cloud computing adoption studies. The questionnaire survey in this study is split into seven sections, from Part A to Part I, as shown in Table 1. The questionnaire survey in this study was designed to follow a 5-point Likert scale from strongly disagree to strongly agree.

Before proceeding with mass data collection, pre-tests and pilots were conducted to ensure the validity and reliability of the questionnaires. During the pre-test, the instruments were reviewed by three academicians and five industry experts before questionnaire was finalised for official distribution and data collection. 30 pilot studies were conducted in this study to further fine-tune the questionnaires and ensure respondents were able to understand the questions. Unlike pre-tests, the results of pilot studies were emailed out, just like the actual survey. Both the data from the pre-test and pilot studies were excluded for data collection and analysis, whereas the actual data will be analysed by IBM SPSS and SmartPLS 4.

Table 1 Instruments

Section	*Description*	*No. of items*	*Sources*
A	Innovative characteristics	15	Mohammed et al. (2016), Ali et al. (2020)
B	Technological context	10	Qian et al. (2016), Qasem et al. (2020)
C	Environmental context	14	Jaradat et al. (2020), Qian et al. (2016), Ali et al. (2020)
D	Organisational context	15	Hussein Alghushami et al. (2020), Mohammed et al. (2016), Ali et al. (2020)
E	Top management support	8	Mohammed et al. (2016), Qian et al. (2016)
G	Cloud computing adoption	5	Wahsh and Dhillon (2015)
I	Demographic	5	Author

5 Research results

This chapter will focus on data analysis and its findings, whereby all the data analysis was processed and analysed with IBM SPSS ver. 28 and SmartPLS 4, with relevant data presented in table format as well as graphical output. Data screening, social

demographics, reliability, validity, normality, descriptive analysis, linearity, common method variance, multicollinearity, and correlation testing were analysed with IBM SPSS software. Confirmatory tetred analysis, internal consistency with composite reliability, convergent validity with factor loadings, average variance extracted (AVE), discriminant validity with Fornell-Larker criterion, as well as R-Square, F-Square, Q-Square, path coefficient for hypotheses, and mediation tests, were analysed with SmartPLS 4 software for both measurement and structural models.

5.1 Analysis

Prior to proceeding with the actual data collection, a reliability test was conducted on 30 pilot cases to ensure the quality of the reliability, and the results show that all the variables from these 30 cases have a Cronbach's alpha greater than 0.7. Next is the data cleaning and data analysis for the actual data collected. 352 people responded to the questionnaire survey, and among the 352 cases, 2 had missing data that were excluded, resulting in 350 final cases for data analysis in the following analysis.

Table 2 Social-demographic (Position)

		Frequency	*Percent*	*Valid %*	*Cumulative %*
Valid	C-level/executive	59	16.9	16.9	16.9
	Director/manager	191	54.6	54.6	71.4
	Individual contributor/contract	67	19.1	19.1	90.6
	Owner/founder/shareholder	33	9.4	9.4	100.0
	Total	350	100.0	100.0	

For the social demographic, certain profiles of the respondents were collected to better understand them. Among the social demographic profiles, some important data collected are age, education level, and position. It is clearly indicated that the respondents are experienced and senior, with more than 58% being greater than 41 years old with 15 years of working experience. In terms of education level, more than 80.5% of respondents have at least a bachelor's degree and above, which shows their knowledge and expertise level. In terms of position level, as shown in Table 2, more than 70% of respondents are experienced and hold senior positions in the particular organisation. All these are important indications to show the quality of the data collected from these experienced and senior respondents, as they are in a better position, are mature, and are able to articulate and provide quality feedback accordingly while representing their organisations.

After the social demographic analysis, next came descriptive statistics, whereby all the standard deviations of the variables are less than one, which seems to indicate that these variables are close to the mean. The skewness and kurtosis of the normality test are within acceptable values, and all the lines of the linearity test are diagonal normality and a normal distribution with small deviations as shown in Figure 2, which is acceptable.

In terms of the multicollinearity test, all the VIF values are between one and five as shown in Table 3, which is moderately correlated (Daoud, 2017), which is not an issue in this study as highly correlated variables could not accurately associate the variance of the dependent variable with other correct predictor variables. In terms of the correlation test, there are positive correlations among all these variables with a positive coefficient, and

the significant value is < 0.01, which is higher whereby positive correlation shows two variables tend to move in the same direction (Hauke and Kossowskim, 2011).

Figure 2 Linearity test

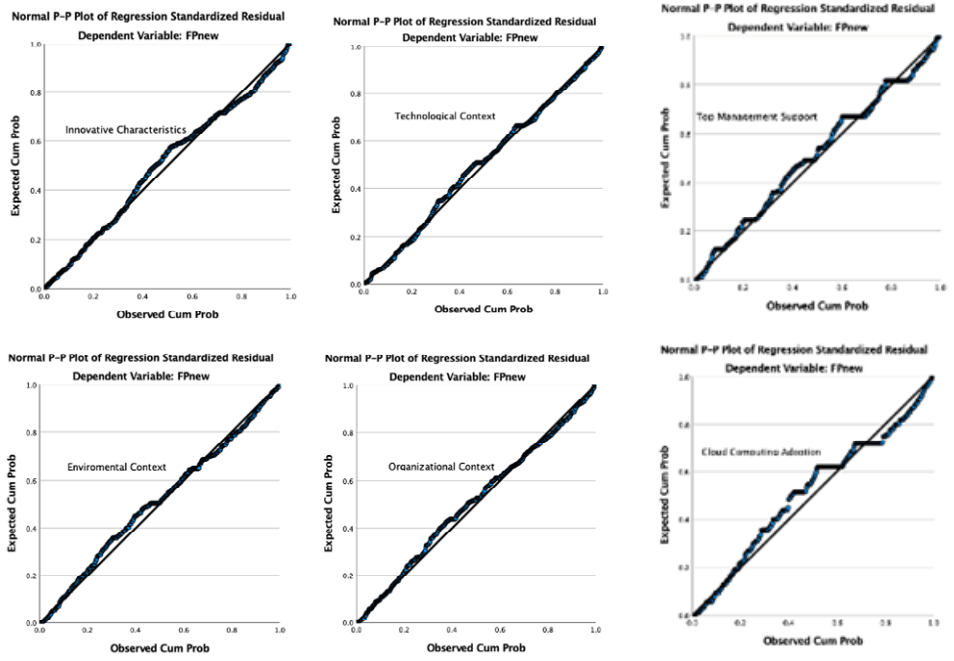


Table 3 Multicollinearity test

Model		*Un-std. coeff.*		*Std. coeff.*	*t*	*Sig.*	*Collinearity stat.*	
		B	*Std. ERR*	*Beta*			*TOL*	*VIF*
1	(Constant)	0.113	0.162		0.696	0.487		
	Innovative characteristics	0.113	0.045	0.123	2.486	0.013	0.469	2.134
	Technological context	0.114	0.047	0.126	2.438	0.015	0.432	2.313
	Environmental context	0.170	0.051	0.169	3.340	< 0.001	0.448	2.230
	Organisational context	0.099	0.048	0.095	2.064	0.040	0.540	1.851
	Top mgmt. support	0.129	0.047	0.131	2.713	0.007	0.490	2.042

Harman's single-factory test was conducted in this study with SmartPLS to test out the common method variance. The result, as shown in Table 4, is that the variance is 36.875%, which is less than 50%, and according to Tehseen et al. (2017), Common Method Variance is not an issue in the study. This is an important finding to ensure the

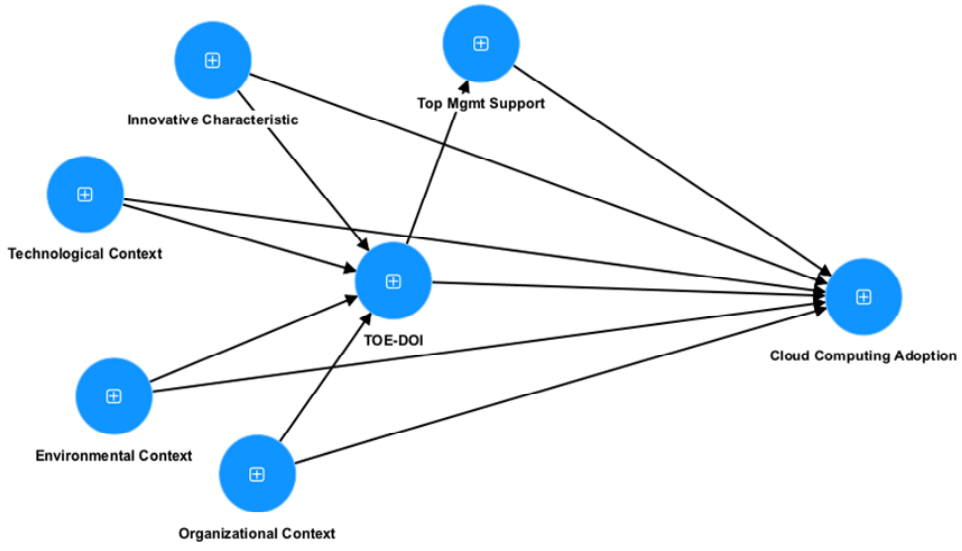
findings are not biased since the data from both independent and dependent variables were obtained from the same respondents with the same set of instrumentation.

Table 4 Common method variance

Component	*Initial Eigenvalues*			*Extraction sums of squared loadings*		
	Total	*% of var.*	*Cumulative %*	*Total*	*% of var.*	*Cumulative %*
1	24.706	36.875	36.875	24.706	36.875	36.875
2	4.275	6.380	43.255			
3	3.069	4.581	47.836			
4	2.420	3.613	51.449			
5	2.159	3.223	54.671			

All the tests done in the previous session were conducted with IBM SPSS, and the remaining tests in this following session were conducted with SmartPLS 4. SmartPLS analysis requires determining whether it is a formative or reflective measurement model prior to conducting the analysis and confirmatory tetred analysis in PLS (CTA-PLS) is used to distinguish it (Gudergan et al., 2008). Based on the results obtained, there was a 0-value straddle between CI low adjustment and up adjustment in each construct; hence, all these are reflective model assessments (Gudergan et al., 2008; Bollen and Ting, 1993). Figure 3 is the graphical diagram in SmartPLS 4.

Figure 3 Graphical Diagram in SmartPLS 4 (see online version for colours)



According to the composite reliability result in Table 5, all the composite reliability values are higher than 0.7, which shows adequate reliability of the instruments as one of the criteria for providing solid and credible research findings.

All the AVE values are greater than 0.5, which is above the recommended range after removing some questions, as shown in Table 6 (Bagozzi and Yi, 1988). Fornell and

Larcker criterion was used to test discriminant validity, as shown in Table 7, whereby all the values are within the acceptable range.

Table 5 Composite reliability

Variable	*Composite reliability*
Technological context	0.953
Innovative characteristics	0.937
Environmental context	0.933
Organisational context	0.889
Top management support	0.940
Cloud computing adoption	0.919

Table 6 Average variance extracted (AVE)

Variable	*Average variance extracted (AVE)*
Technological context	0.506
Innovative characteristics	0.515
Environmental context	0.505
Organisational context	0.509
Top management support	0.663
Cloud computing adoption	0.693

Table 7 Fornell-Larker criterion

	CCA	*EC*	*IC*	*OC*	*TOE-DOI*	*TC*	*TMS*
CCA	0.833						
EC	0.715	0.711					
IC	0.702	0.689	0.707				
OC	0.704	0.691	0.648	0.583			
TOE-DOI	0.804	0.896	0.902	0.821	0.599		
TC	0.743	0.748	0.962	0.661	0.944	0.68	
TMS	0.747	0.631	0.585	0.73	0.71	0.605	0.815

In Table 8, the R-Square values of top management support and cloud computing adoption are greater than 0.5, which is moderate enough that it can be explained by its exogenous variable or variables (Hair et al., 2013). The Q-Square values of top management support, and cloud computing adoption are greater than 0.35, which indicates strong predictive power. F-Square values of the technological context, innovative characteristics, environmental context, organisational context, and top management's support are smaller than 0.02, which has a small effect size (Cohen, 1998).

Table 8 R-Square test

	R-Square adjusted	*Q-Square*	*F-Square*
Top management support	0.580	0.381	0.188
Cloud computing adoption	0.705	0.484	0.653

Table 9 shows the results for hypotheses tested with the path-coefficient to determine the p-value. There are a total of seven hypotheses based on the theoretical framework in this study. A p-value is used in hypothesis testing to decide whether to reject the null hypothesis or not, and a p-value less than 0.05 or 5% means 95% of the conditions can be explained by the hypothesis. All the six hypotheses except H7 mediating hypothesis are supported based on the results obtained in this study and details will be discussed in the next session. Both TOE-DOI and other constructs (TC, IC, EC and OC) were tested separately due to higher and lower constructs in thetheoretical framework.

Table 9 Hypothesis testing

	β/Ori. sample	*Sample mean*	*Std. deviation*	*T statistics*	*P values*	*BI [2.5%; 97.5%]*	*Hypo-thesis*	*Outcome*
TC -> CCA	–0.828	–0.797	0.355	2.334	0.010	0.406–0.948	H1	Supported
IC -> CCA	–0.277	–0.268	0.149	1.855	0.032	–0.612–0.071	H2	Supported
EC -> CCA	–0.740	–0.713	0.318	2.328	0.010	0.056–0.250	H3	Supported
OC -> CCA	–0.498	–0.482	0.184	2.713	0.003	0.007–0.197	H4	Supported
TOE-DOI -> TMS	0.703	0.704	0.029	24.193	0.000	1.156–3.955	H5	Supported
TMS -> CCA	0.367	0.373	0.057	6.574	0.000	0.273–0.453	H6	Supported

Below is the summary of the supported hypotheses based on the findings, with the respective β, T and P values.

H1 Technological context is positively and significantly related to cloud computing adoption ($\beta = -0.828$, $t = 2.334$, $p = 0.010$).

H2 Innovative characteristics are positively and significantly related to cloud computing adoption ($\beta = -0.277$, $t = 1.855$, $p = 0.032$).

H3 Environmental context are positively and significantly related to cloud computing adoption ($\beta = -0.740$, $t = 2.328$, $p = 0.010$).

H4 Organisational context is positively and significantly related to cloud computing adoption ($\beta = -0.498$, $t = 2.713$, $p = 0.003$).

H5 TOE-DOI is positively and significantly related to top management support ($\beta = 0.703$, $t = 24.193$, $p = 0.000$).

H6 Top management support is positively and significantly related to cloud computing adoption ($\beta = 0.367$, $t = 6.574$, $p = 0.000$).

Tables 10 and 11 show the outcomes of the total effect, direct effect, and indirect effect of cloud computing adoption on independent variable of TOE-DOI. Bootstrapping procedure is used to normalise the products of a&b (a*B) (Preacher and Hayes, 2008).

Table 10 Total effect and direct effect tests

Total effect		*Direct effect*		*BI [2.5%;97.5%*	*Hypothesis*
Coefficient	*P value*	*]Coefficient*	*P value*		
2.876	0.001	2.612	0.002	0.180-0.336	H7: TOE-DOI -> TMS -> CCA

Table 11 Indirect effects test

	Indirect effects of DV on IV						
	Coefficient	*SD*	*T value*	*P value*	*BI [2.5%;97.5%]*	*Mediation*	
H7	0.264	0.042	6.224	0.000	0.180-0.336	Yes	Complementary partial mediation

Reporting mediation on H7: Top management support mediates the relationship between TOE-DOI and cloud computing adoption. The bootstrapping analysis showed that the indirect effect $\beta = 0.264$ was significant with a t-value of 6.224. Also, the 95% bootstrap confidence interval (CI) (Preacher and Hayes, 2008) does not straddle a 0 in between [LL = 0.185, UL = 0.351], which indicates that there is a mediation. Thus, we conclude that the mediation effect is statistically significant.

5.2 Discussion

Based on the H1 hypothesis, the technological context is positively and significantly related to cloud computing adoption, and this hypothesis is supported by the results of this study with $\beta = -0.828$, $t = 2.334$, $p = 0.010$. This result is aligned with previous studies by Singh and Mansotra (2019), Juma and Tjahyanto (2019), and Alismaili et al. (2020) that found that the technological context has a positive and significant impact on cloud computing adoption with benefits like efficiency, flexibility, and mobility (Singh and Mansotra, 2019). Based on the H2 hypothesis, innovative characteristics are positively and significantly related to cloud computing adoption, and this hypothesis is supported by the results of this study with $\beta = -0.277$, $t = 1.855$, $p = 0.032$. This result is aligned with previous studies by Priyadarshinee et al. (2017a), Raut et al. (2018b), and Ali et al. (2018) that found that innovative characteristics have a positive and significant impact on cloud computing adoption, with the sub-dimensions of relative advantage, complexity, and compatibility. This was explained as the basis for a firm's technical capability, which allows for business performance and streamlines business processes (Ravichandran et al., 2005; as cited in Priyadarshinee et al., 2017b).

Based on the H3 hypothesis, environmental context is positively and significantly related to cloud computing adoption, and this hypothesis is supported by the results of this study with $\beta = -0.740$, $t = 2.328$, $p = 0.010$. This result is aligned with previous studies by Singh and Mansotra (2019), Hiran and Henten (2019), and Yoo and Kim (2019). This was explained: firms will tend to implement changes like adopting cloud computing when facing tough competition or to support trading partners (Singh and Mansotra, 2019). Based on the H4 hypothesis, organisational context is positively and significantly related to cloud computing adoption, and this hypothesis is supported by the results of this study with $\beta = -0.498$, $t = 2.713$, $p = 0.003$. This result is aligned with previous studies by Cheng and Wakil (2019), Hiran and Henten (2019), and Yoo and Kim (2019), in which it was explained that organisational factors are crucial in the adoption of cloud computing and comprise indicators of size, adequacy of resources, and internal support (Cheng and Wakil, 2019).

Based on the H5 hypothesis, TOE-DOI is positively and significantly related to top management support, and this hypothesis is supported by the results of this study with $\beta = 0.703$, $t = 24.193$, $p = 0.000$. This result is aligned with previous studies by Al Shaar

et al.'s (2015), Li (2020), and Gopalakrishna et al. (2019). Top management throughput functional orientation will be positively related to management innovation (Heyden et al., 2018). Top management commitment and contribution have been widely proven as one of the elements of success in innovation processes (Wiener, 2018). Based on the H6 hypothesis, top management support is positively and significantly related to cloud computing adoption, and this hypothesis is supported by the results of this study with $\beta = 0.367$, $t = 6.574$, $p = 0.000$. This result is aligned with previous studies by Ming et al. (2018), Qian et al. (2016), and Shee et al. (2018), in which it was explained that top management is the owners or executives of the firm, and if they are convinced or understand the value and benefit that cloud computing could bring to the firm, then mostly cloud computing technology will be adopted, and vice versa (Ming et al., 2018).

Based on the H7 hypothesis, top management support mediates the relationship between TOE-DOI and cloud computing adoption. This hypothesis is supported by this study as it does not straddle a 0 in between LL and UL, hence there is a mediation, and this result is aligned with previous studies. The technical advantage as the sub-dimension of technology or innovative characteristics context was mediated by top management support for the adoption of cloud computing (Li et al., 2020), stakeholder as the sub-dimension of environmental context was mediated by top management support for the adoption of cloud computing (Li et al., 2020). organisational context mediated by top management support will achieve organisational success in managing risk effectively (Hassan and Yazid, 2019; Li et al., 2020).

6 Conclusions

The first theoretical implications of this study are the integration of DOI theory and TOE framework, whereby the results prove that the innovative characteristics under the DOI model and the technological context, environmental context, and organisational context under the TOE framework are playing important roles in the adoption of new technology such as cloud computing. Such results are supported by previous studies as well, and integrating both DOI theory and the TOE framework provides better comprehensive coverage (Teh et al., 2021; Bhuyan and Dash, 2018; Almubarak, 2017) and is able to explain the situation better. As it was discussed in the earlier chapter that there are few limitations to the theories, such as DOI, which doesn't consider an individual's resources or social support to adopt the innovation (BUMC, 2019), and the TOE framework's assumption that the model will apply to large organisations where customers make certain of congruities and have fewer grievances than to SMEs. This study integrated both models and theories to fill the gaps in each other's (Bryan and Zuva, 2021), and the findings of this study will enhance knowledge of the adoption of cloud computing or other technologies as well as future studies and investigations.

One of the significant theoretical implications and key differences of this study compared with previous studies is the top management support as the mediating variable. It is common to see top management support as one of the independent variables in previous studies, but it is rare to see it as the mediating variable, and it was discussed that top management support, together with other organisational, technological, and environmental factors, had a favourable impact on cloud computing adoption (Yigitbasioglu, 2015). Throughout this study, it is proven that top management support plays an important mediating role with TOE-DOI and cloud computing adoption.

TOE-DOI consists of innovative characteristics, technological, environmental, and organisational contexts which aligned with previous studies like Li's (2020). Although it is rare to see top management support as a mediating variable, there are a few similar studies with similar findings to support the finding of this study (Li et al., 2020; Hassan and Yazid, 2019). The findings in this study will add value and new knowledge to the mediating effect of top management support on the adoption of cloud computing or other technology, as well as to future studies and investigations.

The practical implications by leveraging the findings of this study, the significant variables that have a positive and significant influence on the adoption of cloud computing could be used as a reference by the government, relevant bodies like SME Corp. Malaysia, and cloud vendors to drive higher adoption of cloud computing among Malaysian SME organisations with the relevant strategies, framework, and program. The findings of this study also emphasise that getting top management support for the SME organisation is crucial to ensuring the adoption of cloud computing in the organisation. Other independent variables are important as well, but top management support is proven to mediate the adoption of cloud computing. With all the great programs and initiatives launched by the Malaysian government, like Malaysia digital and MyDigital, it is to drive digital adoption among aspiring SMEs and enable Malaysian businesses and the people in the global digital economy, where cloud computing is one of the important technologies and trends for organisations especially SMEs, to tap into to maximise the returns with the benefits brought by the technology itself.

Similar to other studies or research, this study has its own limitations. The first limitation of this study is the target population, which is just based on three invited cloud computing vendors' databases, and only 5,500 SME organisations are available after some data cleaning to remove non-SME organisations like the public sector and enterprises. Although this target population of 5,500 is the sampling frame in this study, the result could theoretically be generalised to present the entire Malaysian SME sector. However, 5,500 SMEs are pretty insignificant compared with the entire number of SMEs in Malaysia, as Malaysia has more than 900,000 SMEs, according to SME Corp. Malaysia. These 5,500 SMEs are mostly from Klang Valley, with a small portion from other locations like northern, southern, and east Malaysia. The second limitation of this study is that it is only focusing on the SME sector, so the results might not be able to represent other segments like enterprise and the public sector. It will be interesting to compare the findings across different segments and understand what the common factors are that could influence and drive the adoption of cloud computing across the segments and what the unique factors are that only work or do not work in certain segments. The sample did not differentiate the industry segmentation, size of the organisation, or years of establishment, as by driving into specific social demographics, the results might be different and could not drill down into specific industries and segments for better understanding and corresponding action items to drive better and more efficient adoption of cloud computing.

Future research or studies could expand to a wider target population by partnering with the government or government-linked agencies like SME Corp Malaysia to have the largest sampling frame to reach out to more Malaysian SMEs, so that the results of the survey will be even more solid and generalised to represent Malaysian SMEs, as the sampling frame in this study is limited to 5,500 organisations based on three cloud vendors' databases, and most of the organisations are based in Klang Valley, Malaysia. The future study could be carried out in different geographical areas, like northern,

southern, or east Malaysia, or across different countries, like ASEAN, to find out the similarities and differences and make the study more robust to have a greater view or drill down into specific geographical areas. Another recommendation based on this study is to carry out similar studies in different segments like enterprise, public sector, or even industry-focused segments like manufacturing, education, and healthcare to understand and analyse what are the common driving factors and what are the unique driving factors in terms of cloud computing adoption across these segments or industries, which could be referenced and used by relevant bodies to carry out specific programs or executions to drive the adoption of cloud computing more effectively.

References

Al Ajmi, Q., Arshah, R.A., Kamaludin, A., Sadiq, A.S. and Al-Sharafi, M.A. (2017) 'A conceptual model of e-learning based on cloud computing adoption in higher education institutions', *2017 International Conference on Electrical and Computing Technologies and Applications (ICECTA)*, pp.1–6, IEEE, DOI:10.1109/icecta.2017.8252013.

Al Shaar, E.M., Khattab, S.A., Alkaied, R.N. and Manna, A.Q. (2015) 'The effect of top management support on innovation: the mediating role of synergy between organizational structure and information technology', *International Review of Management and Business Research*, Vol. 4, No. 2, p.499.

Alenezi, H., Tarhini, A., Alalwan, A. and Al-Qirim, N. (2017) 'Factors affecting the adoption of e Government in Kuwait: a qualitative study', *Electronic Journal of e-Government*, Vol. 15, No. 2, pp.84–102.

Alghamdi, F., Sharma, D. and Sathye, M. (2018) 'Investigating the factors affecting the adoption of cloud computing in SMEs: a case study of Saudi Arabia', in *European, Mediterranean, and Middle Eastern Conference on Information Systems,* pp.158–176, Springer, Cham, doi.org/10.1007/978-3-030-11395-7_15

Ali, O., Shrestha, A., Osmanaj, V. and Muhammed, S. (2020) 'Cloud computing technology adoption: an evaluation of key factors in local governments', *Information Technology and People*, Vol. 34, No. 2, pp.666–703, doi.org/10.1108/ITP-03-2019-0119.

Ali, O., Soar, J. and Shrestha, A. (2018) 'Perceived potential for value creation from cloud computing: a study of the Australian regional government sector', *Behaviour and Information Technology*, pp.1–20, DOI:10.1080/0144929x.2018.1488991

Alismaili, S.Z., Li, M., Shen, J., Huang, P., He, Q. and Zhan, W. (2020) 'Organisational-level assessment of cloud computing adoption', *Journal of Global Information Management*, Vol. 28, No. 2, pp.73–89, DOI:10.4018/jgim.2020040104.

Almaiah, M.A. and Al-Khasawneh, A. (2020) 'Investigating the main determinants of mobile cloud computing adoption in university campus', *Education and Information Technologies*, Vol. 25, No. 4, pp.3087–3107, doi.org/10.1007/s10639-020-10120-8.

Almubarak, S.S. (2017) 'Factors influencing the adoption of cloud computing by Saudi university hospitals', *International Journal of Advanced Computer Science and Applications*, Vol. 8, No. 1, doi.org/10.14569/ijacsa.2017.080107.

Al-Sharafi, M.A., Arshah, R.A. and Abu-Shanab, E.A. (2017) 'Factors affecting the continuous use of cloud computing services from experts perspective', *TENCON 2017 – 2017 IEEE Region 10 Conference*, pp.986–991, IEEE, DOI:10.1109/tencon.2017.8228001.

Arpaci, I. (2017) 'Antecedents and consequences of cloud computing adoption in education to achieve knowledge management', *Computers in Human Behavior*, Vol. 70, pp.382–390, doi.org/10.1016/j.chb.2017.01.024.

Bagozzi, R.P. and Yi, Y. (1988) 'On the evaluation of structural equation models', *Journal of the Academy of Marketing Science*, Vol. 16, No. 1, pp.74–94, doi.org/10.1177/009207038801600107.

Baker, J. (2012) 'The technology–organization–environment framework', *Information Systems Theory*, pp.231–245, doi.org/10.1007/978-1-4419-6108-2_12.

Bhuyan, S. and Dash, M. (2018) 'Exploring cloud computing adoption in private hospitals in India: an investigation of DOI and TOE model', *Journal of Advanced Research in Dynamical and Control Systems*, Vol. 10, No. 8, pp.443–451.

Bollen, K.A. and Ting, K.F. (1993) 'Confirmatory tetrad analysis', *Sociological Methodology*, pp.147–175, doi.org/10.2307/271009.

Bryan, J.D. and Zuva, T. (2021) 'A review on TAM and TOE framework progression and how these models integrate', *Advances in Science, Technology and Engineering Systems Journal*, Vol. 6, No. 3, pp.137–145, doi.org/10.25046/aj060316.

BUMC (2019) *Diffusion of Innovation Theory* [online] https://sphweb.bumc.bu.edu/otlt/mph-modules/sb/behavioralchangetheories/behavioralchangetheories4.html (accessed 10 July 2022).

Chang, Y-W. (2020) 'What drives organizations to switch to cloud ERP systems? The impacts of enablers and inhibitors', *Journal of Enterprise Information Management*, Vol. 33, No. 3, pp.600–626, DOI:10.1108/jeim-06-2019-0148 .

Cheng, J.W. and Wakil, K. (2019) 'A model for evaluating the vital factors affecting cloud computing adoption: analysis of the services sector', *Kybernetes*, Vol. 49, No. 10, pp.2475–2492, doi.org/10.1108/K-06-2019-0434.

Clarke, R. (1999) *A Primer in Diffusion of Innovations Theory* [online] http://www.rogerclarke.com/SOS/InnDiff.html (accessed 12 September 2021).

Cohen, J. (1988) *Statistical Power Analysis for the Behavioral Sciences,* Routledge, Abingdon. England.

Daoud, J.I. (2017) 'Multicollinearity and regression analysis', in *Journal of Physics: Conference Series*, December, Vol. 949, No. 1, p.12009, IOP Publishing, doi.org/10.1088/1742-6596/949/1/012009.

Freeman, R.E. (2010) *Strategic Management: A Stakeholder Approach*, Cambridge university Press, doi.org/10.1017/cbo9781139192675.

Gartner (2019) *Cloud Adoption: Where Does Your Country Rank*? [online] https://www.gartner.com/smarterwithgartner/cloud-adoption-where-does-your-country-rank (accessed 10 July 2022).

Gopalakrishna-Remani, V., Jones, R.P. and Camp, K.M. (2019) 'Levels of EMR adoption in US hospitals: an empirical examination of absorptive capacity, institutional pressures, top management beliefs, and participation', *Information Systems Frontiers*, Vol. 21, No. 6, pp.1325–1344, doi.org/10.1007/s10796-018-9836-9.

Gudergan, S.P., Ringle, C.M., Wende, S. and Will, A. (2008) 'Confirmatory tetrad analysis in PLS path modeling', *Journal of Business Research*, Vol. 61, No. 12, pp.1238–1249, doi.org/10.1016/j.jbusres.2008.01.012.

Hair Jr, J.F., Hult, G.T.M., Ringle, C.M. and Sarstedt, M. (2013) 'A primer on partial least squares structural equation modeling (PLS-SEM)', *Sage Publications,* doi.org/10.54055/ejtr.v6i2.134.

Hassan, H., Nasir, M.H.M., Khairudin, N. and Adon, I. (2017) 'Factors influencing cloud computing adoption in small and medium enterprises', *Journal of Information and Communication Technology*, Vol. 16, No. 1, pp.21–41, doi.org/10.32890/jict2017.16.1.8216.

Hassan, M.F. and Yazid, A.S. (2019) 'The mediating effect of top management support on the relationship between organizational culture and enterprise risk management effectiveness among Malaysian public listed companies: a conceptual framework', *Research Journal of Finance and Accounting*, Vol. 10, No. 2, pp.103–111, doi.org/10.7176/rjfa/10-2-11.

Hauke, J. and Kossowski, T. (2011) 'Comparison of values of Pearson's and Spearman's correlation coefficients on the same sets of data', *Quaestiones Geographicae*, Vol. 30, No. 2, pp.87–93, doi.org/10.2478/v10117-011-0021-1.

Heyden, M.L., Sidhu, J.S. and Volberda, H.W. (2018) 'The conjoint influence of top and middle management characteristics on management innovation', *Journal of Management*, Vol. 44, No. 4, pp.1505–1529, doi.org/10.1177/0149206315614373.

Hiran, K.K. and Henten, A. (2019) 'An integrated TOE–DoI framework for cloud computing adoption in the higher education sector: case study of Sub-Saharan Africa, Ethiopia', *International Journal of System Assurance Engineering and Management*, Vol. 11, pp.441–449, doi:10.1007/s13198-019-00872-z.

Hussein Alghushami, A., Zakaria, N.H. and Mat Aji, Z. (2020) 'Factors influencing cloud computing adoption in higher education institutions of least developed countries: evidence from Republic of Yemen', *Applied Sciences*, Vol. 10, No. 22, p.8098, doi.org/10.3390/app10228098.

Hwang, B.N., Huang, C.Y. and Wu, C.H. (2016) 'A TOE approach to establish a green supply chain adoption decision model in the semiconductor industry', *Sustainability*, Vol. 8, No. 2, p.168, doi.org/10.3390/su8020168.

Jaradat, M.I.R.M., Ababneh, H.T., Faqih, K.M. and Nusairat, N.M. (2020) 'Exploring cloud computing adoption in higher educational environment: an extension of the UTAUT model with trust', *International Journal of Advanced Science and Technology*, Vol. 29, No. 5, pp.8282–8306.

Juma, M.K. and Gopalakrishna yanto, A. (2019) 'Challenges of cloud computing adoption model for higher education level in Zanzibar (the Case Study of SUZA and ZU)', *Procedia Computer Science*, Vol. 161, pp.1046–1054, doi.org/10.1016/j.procs.2019.11.215.

Khayer, A., Talukder, M.S., Bao, Y. and Hossain, M.N. (2020) 'Cloud computing adoption and its impact on SMEs' performance for cloud supported operations: a dual-stage analytical approach', *Technology in Society*, Vol. 60, p.101225, doi.org/10.1016/j.techsoc.2019.101225.

Lee, Y.Y., Falahat, M. and Sia, B.K. (2020) 'Drivers of digital adoption: a multiple case analysis among low and high-tech industries in Malaysia', *Asia-Pacific Journal of Business Administration*, Vol. 13, No. 1, pp.80–97, doi.org/10.1108/apjba-05-2019-0093.

Li, J.C. (2020) 'Roles of individual perception in technology adoption at organization level: behavioral model versus TOE framework', *Journal of System and Management Sciences*, Vol. 10, No. 3, pp.97–118, doi.org/10.33168/jsms.2020.0308.

Mansour, R.M., Rana, M.E. and Al-Maatouk, Q. (2020) 'A theoretical framework for implementation of cloud computing in malaysian hospitality industry', *International Journal*, Vol. 9, No. 2, doi.org/10.30534/ijatcse/2020/223922020.

Meyer, J.W. and Rowan, B. (1977) 'Institutionalized organizations: formal structure as myth and ceremony', *American Journal of Sociology*, Vol. 83, No. 2, pp.340–363, doi.org/10.1086/226550.

Ming, C.F., Chin, K.O., Alfred, R., Tan T.G. and Anthony, P. (2018) 'The determinant factors affecting cloud computing adoption by small and medium enterprises (SMEs) in Sabah, Malaysia', *Journal of Telecommunication, Electronic and Computer Engineering (JTEC)*, Vol. 10, Nos. 3–2, pp.83–88.

Mohammadi, A., Saeedikondori, A. and Ali, and Bin, N.A. (2017) 'Factors influencing cloud computing adoption in Malaysian information technology companies', *Journal of ICT*, Vol. 1, No. 1, pp.21–41.

Mohammed, F., Ibrahim, O. and Ithnin, N. (2016) 'Factors influencing cloud computing adoption for e-government implementation in developing countries: Instrument development', *Journal of Systems and Information Technology*, Vol. 18, No. 3, pp.297–327, doi.org/10.1108/jsit-01-2016-0001.

Mokhtar, S.A., Al-Sharafi, A., Ali, S.H.S. and Al-Othmani, A.Z. (2016) 'Identifying the determinants of cloud computing adoption in higher education institutions', in *2016 International Conference on Information and Communication Technology (ICICTM)*, pp.115–119, DOI:10.1109/icictm.2016.7890787.

Njenga, K., Garg, L., Bhardwaj, A.K., Prakash, V. and Bawa, S. (2019) 'The cloud computing adoption in higher learning institutions in Kenya: Hindering factors and recommendations for the way forward', *Telematics and Informatics*, Vol. 38, pp.225–246, doi.org/10.1016/j.tele.018.10.007.

Ooi, K.B., Lee, V.H., Tan, G.W.H., Hew, T.S. and Hew, J.J. (2018) 'Cloud computing in manufacturing: the next industrial revolution in Malaysia?', *Expert Systems with Applications*, Vol. 93, pp.376–394, doi.org/10.1016/j.eswa.2017.10.009.

Preacher, K.J. and Hayes, A.F. (2008) 'Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models', *Behavior Research Methods*, Vol. 40, No. 3, pp.879–891, doi.org/10.3758/brm.40.3.879.

Priyadarshinee, P., Raut, R.D., Jha, M.K. and Gardas, B.B. (2017a) 'Understanding and predicting the determinants of cloud computing adoption: a two staged hybrid SEM - neural networks approach', *Computers in Human Behavior*, Vol. 76, pp.341–362, doi.org/10.1016/j.chb.2017.07.027.

Priyadarshinee, P., Raut, R.D., Jha, M.K. and Kamble, S.S. (2017b) 'A cloud computing adoption in Indian SMEs: scale development and validation approach', *Journal of High Technology Management Research,* Vol. 28, No. 2, pp.221–245, doi.org/10.1016/j.hitech.2017.10.010.

Qasem, Y.A., Abdullah, R., Atan, R. and Jusoh, Y.Y. (2018) 'Mapping and analyzing process of cloud-based education as a service (CEaaS) model for cloud computing adoption in higher education institutions', in *2018 Fourth International Conference on Information Retrieval and Knowledge Management (CAMP)*, pp.1–8, IEEE, doi.org/10.1109/INFRKM.2018.8464763.

Qasem, Y.A., Abdullah, R., Yah, Y., Atan, R., Al-Sharafi, M.A. and Al-Emran, M. (2021) 'Towards the development of a comprehensive theoretical model for examining the cloud computing adoption at the organizational level', *Recent Advances in Intelligent Systems and Smart Applications*, pp.63–74, doi.org/10.1007/978-3-030-47411-9_4.

Qasem, Y.A., Asadi, S., Abdullah, R., Yah, Y., Atan, R., Al-Sharafi, M.A. and Yassin, A.A. (2020) 'A multi-analytical approach to predict the determinants of cloud computing adoption in higher education institutions', *Applied Sciences*, Vol. 10, No. 14, p.4905, doi.org/10.3390/app10144905.

Qian, L.Y., Baharudin, A.S. and Kanaan-Jebna, A. (2016) 'Factors affecting the adoption of enterprise resource planning (ERP) on cloud among small and medium enterprises (SMES) in Penang, Malaysia', *Journal of Theoretical and Applied Information Technology*, Vol. 88, No. 3, pp.398–409.

Raut, R., Priyadarshinee, P., Jha, M., Gardas, B.B. and Kamble, S. (2018b) 'Modeling the implementation barriers of cloud computing adoption: an interpretive structural modeling', *Benchmarking*, Vol. 25, No. 8, pp.2760–2782, doi.org/10.1108/BIJ-12-2016-0189.

Raut, R.D., Priyadarshinee, P., Gardas, B.B. and Jha, M.K. (2018a) 'Analyzing the factors influencing cloud computing adoption using three stage hybrid SEM-ANN-ISM (SEANIS) approach', *Technological Forecasting and Social Change*, Vol. 134, pp.98–123, doi.org/10.1016/j.techfore.2018.05.020.

Razzaq, A. and Mohammed, A.A. (2020) 'Cloud ERP in Malaysia: benefits, challenges, and opportunities', *International Journal*, Vol. 9, No. 5, doi.org/10.30534/ijatcse/2020/85952020.

Research and Markets (2020) *Cloud Computing Market by Service Model (Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS)), Deployment Model (Public and Private), Organization Size, Vertical, and Region - Global Forecast to 2025* [online] https://www.researchandmarkets.com/reports/5136796/cloud-computing-market-by-service-model#pos-0 (accessed 10 January 2021).

Rogers, E.M. and Williams, D. (1983) *Diffusion of Innovations*, The Free Press, Glencoe, IL.

Sabi, H.M., Uzoka, F-M.E., Langmia, K., Njeh, F.N. and Tsuma, C.K. (2017) 'A cross-country model of contextual factors impacting cloud computing adoption at universities in sub-Saharan Africa', *Information Systems Frontiers*, Vol. 20, pp.1381–1404, doi:10.1007/s10796-017-9739-1.

Sallehudin, H., Che Razak, R., Ismail, M., Md Fadzil, A.F. and Baker, R. (2018) 'Cloud computing implementation in the public sector: factors and impact', *Asia-Pacific Journal of Information Technology and Multimedia*, Vol. 7, No. 2, pp.27–42, doi.org/10.17576/apjitm-2018-0702(02)-03.

Senyo, P.K., Effah, J. and Addae, E. (2016) 'Preliminary insight into cloud computing adoption in a developing country', *Journal of Enterprise Information Management*, Vol. 29, No. 4, pp.505–524, doi.org/10.1108/JEIM-09-2014-0094.

Shahzad, F., Xiu, G.Y., Khan, I., Shahbaz, M., Riaz, M.U. and Abbas, A. (2020) 'The moderating role of intrinsic motivation in cloud computing adoption in online education in a developing country: a structural equation model', *Asia Pacific Education Review*, Vol. 21, No. 1, pp.121–141, doi.org/10.1007/s12564-019-09611-2.

Shee, H., Miah, S.J., Fairfield, L. and Pujawan, N. (2018) 'The impact of cloud-enabled process integration on supply chain performance and firm sustainability: the moderating role of top management', *Supply Chain Management: An International Journal*, Vol. 23, No. 6, pp.500–517, doi.org/10.1108/scm-09-2017-0309.

Singh, J. and Mansotra, V. (2019) 'Factors affecting cloud computing adoption in the Indian school education system', *Education and Information Technologies*, Vol. 24, No. 4, pp.2453–2475, doi.org/10.1007/s10639-019-09878-3.

SME Corp. Malaysia (2021) *Challenges in Digital Adoption* [online] https://smecorp.gov.my/index.php/en/resources/2015-12-21-10-55-22/news/4461-challenges-in-digital-adoption (accessed 31 August 2021).

Statista (2022) *Total Size of the Public Cloud Computing Market From 2008 to 2020* [online] https://www.statista.com/statistics/510350/worldwide-public-cloud-computing (accessed 13 June 2023).

Teece, D.J., Pisano, G. and Shuen, A. (1997) 'Dynamic capabilities and strategic management', *Strategic Management Journal*, Vol. 18, No. 7, pp.509–533, doi.org/10.1002/(sici)1097-266(199708)18:7<509::aid-smj882>3.0.co;2-z.

Teh, R. (2023) 'An empirical analysis of the relationship between motivation-mediated incentive and sales performance in the Malaysian IT industry', *ASEAN Journal of Management and Innovation (AJMI)*, Vol. 10, No. 2, pp.56–73.

Teh, R. and Subramaniam, A. (2023) 'A bibliometric analysis on cloud computing literature development', *International Journal of Innovative Computing*, Vol. 13, No. 2, pp.49–57, doi.org/10.11113/ijic.v13n2.396.

Teh, R., Subramaniam, A., Ho, J.A. and Basha, N.K. (2021) 'Antecedents of cloud computing adoption in the malaysian context: a systematic literature review', *Journal of Technology Management and Business*, Vol. 8, No. 2, pp.56–65, doi.org/10.30880/jtmb.2021.08.02.006.

Tehseen, S., Ramayah, T. and Sajilan, S. (2017) 'Testing and controlling for common method variance: a review of available methods', *Journal of Management Sciences*, Vol. 4, No. 2, pp.142–168, doi.org/10.20547/jms.2014.1704202.

To, M.L. and Ngai, E.W. (2006) 'Predicting the organisational adoption of B2C e-commerce: an empirical study', *Industrial Management and Data Systems*, Vol. 106, No. 8, pp.1133–1147, doi.org/10.1108/02635570610710791.

Tornatzky, L.G., Fleischer, M. and Chakrabarti, A.K. (1990) 'Technological innovation as a process', *The Processes of Technological Innovation*, pp.27–50.

Twinbit (2020) *Public cloud market in Malaysia reached US$643.4million* [online] https://twimbit.com/cloud/public-cloud-spending-in-malaysia-to-reach-us986-million-in-2020 (accessed 10 July 2022).

Wahsh, M.A. and Dhillon, J.S. (2015) 'An investigation of factors affecting the adoption of cloud computing for E-government implementation', in *2015 IEEE Student Conference on Research and Development (SCOReD)*, pp.323–328, IEEE, doi.org/10.1109/scored.2015.7449349.

Wang, N., Xue, Y., Liang, H., Wang, Z. and Ge, S. (2018) 'The dual roles of the government in cloud computing assimilation: an empirical study in China', *Information Technology and People*, Vol. 32, No. 1, pp.147–170, doi.org/10.1108/itp-01-2018-0047.

Wiener, M. (2018) 'Open foresight: the influence of organizational context', *Creativity and Innovation Management*, Vol. 27, No. 1, pp.56–68, doi.org/10.1111/caim.12238.

Yigitbasioglu, O.M. (2015) 'The role of institutional pressures and top management support in the intention to adopt cloud computing solutions', *Journal of Enterprise Information Management*, Vol. 28, No. 4, pp.579–594, doi.org/10.1108/jeim-09-2014-0087.

Yoo, S.K. and Kim, B.Y. (2019) 'The effective factors of cloud computing adoption success in organization', *Journal of Asian Finance, Economics and Business*, Vol. 6, No. 1, pp.217–229, doi.org/10.13106/jafeb.2019.vol6.no1.217.