FACTORS AFFECTING SMEs INTENTION TO USE CLOUD COMPUTING IN WEST MALAYSIA: THE ROLES OF MEDIATING AND MODERATING FACTORS

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UNIVERSITI SAINS MALAYSIA

2020

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by

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Thesis submitted in fulfilment of the requirement
for the degree of
Doctor of Philosophy

June 2020

ACKNOWLEDGEMENT

I would like to express my genuine gratitude to my beloved family, relatives and friends for their unending support and inspiration. My great appreciations to my valued supervisor Assoc. Prof. Dr Ahmad Suhaimi Bin Baharudin and respected panel members for advising me through PhD studies. Special thanks to Universiti Sains Malaysia for the given opportunity to perform my research. My sincere thanks to SME Corp Malaysia for the provided information, and SMEs participated in this survey study. Special thanks to dear Prof. Christian M. Ringle, and SmartPLS's support team for their valuable advice and cooperation. Finally, my greatest thanks are to God for his endless graces.

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
ASP	Application Service Provider
ATT	Attitude towards using
AVE	Average Variance Extracted
CB-SEM	Covariance-Based Structural Equation Modeling
CC	Cloud Computing
CCA	Cloud Computing Adoption
CCIF	Cloud Computing Interoperability Forum
CMB	Common Method Bias
CP	Competitive Pressure
CR	Composite Reliability
CRM	Customer Relationship Management
CS	Cost-Saving
CSP	Cloud Service Provider
CSS	Cloud Storage Service
DL	Data Lock-in
DOI	Diffusion of Innovation
EC2	Elastic Compute Cloud
EFA	Exploratory Factor Analysis
EOFS	Easiness of File Sharing
ERP	Enterprise Resource Planning
GDP	Gross Domestic Product
HCC	Higher Level of Cloud Computing

IaaS	Infrastructure as a Service
ICT	Information and Communications Technology
INT	Intention to use
IoT	Internet of Thing
IP	Internet Protocol
IPv6	Internet Protocol version 6
IS	Information System
IT	Information Technology
MCC	Mobile Cloud Computing
OA	Organizational Agility
OLS	Ordinary Least Square
PaaS	Platform as a Service
PCA	Principal Component Analysis
PCC	Public Cloud Computing
PEOU	Perceived Ease of Use
PLS-SEM	Partial Least Squares-Structural Equation Modeling
PTC	Perceived Technical Competence
PU	Perceived Usefulness
QoS	Quality of Service
RFID	Radio Frequency Identification
RI	Reliability Issue
ROI	Return on Investment
S3	Simple Storage Service
SaaS	Software as a Service
SC	Security Concern

SEM	Structural Equations Modeling
SLA	Services Level Agreement
SLAI	Services Level Agreement Issue
SMB	Small and Medium Business
SME	Small and Medium Enterprise
SPI	Security and Privacy Issue
TAM	Technology Acceptance Model
TMS	Top Management Support
TOE	Technology Organization Environment
TPB	Theory of Planned Behavior
TPP	Trading Partner Pressure
TR	Technology Readiness
TRA	Theory of Reasoned Action
UTAUT	Unified Theory of Acceptance and Use of Technology
VIF	Variance Inflation Factor
VPN	Virtual Private Network

LIST OF APPENDICES

FAKTOR FAKTOR YANG MEMPENGARUHI PERUSAHAAN KECIL DAN SEDERHANA (SMES) DI MALAYSIA BARAT DALAM PENGGUNAAN PENGKOMPUTERAN AWAN: PERANAN FAKTOR-FAKTOR PENGANTARAAN DAN PENGUBAHAN

ABSTRAK

Pengkomputeran awan (CC) menawarkan perkhidmatan IT terkini dengan model bayar per penggunaan kepada perusahaan kecil dan sederhana (SMEs), yang membawa kepada penjimatan anggaran yang besar. Sementara itu, mereka tidak perlu menangani masalah teknikal yang biasa, seperti kegagalan perkakasan dan gangguan bekalan elektrik, yang biasa berlaku di infrastruktur IT dalaman. Walau bagaimanapun, tahap penggunaan CC masih rendah di kalangan SMEs di Malaysia. Hanya beberapa kajian yang mengkaji faktor-faktor yang mempengaruhi tahap penerapan di peringkat organisasi, sementara kajian-kajian ini biasanya menumpukan pada menentukan kesan langsung dari ciri inovasi. Kajian penggunaan pengkomputeran awan secara meluas menggunakan rangka Model Penerimaan Teknologi (TAM) dan Persekitaran Organisasi Teknologi (TOE). Walau bagaimanapun, TAM telah dikritik kerana kurang mempertimbangkan faktor organisasi dan kesederhanaannya. Tambahan pula, kerangka TOE tidak mengkaji peranan ciri-ciri individu. Oleh itu, model terpadu TOE dan TAM digunakan untuk meneliti kesan faktor teknologi, organisasi, dan persekitaran terhadap penerimaan CC di kalangan pembuat keputusan IT di Malaysia Barat. Faktor kontekstual kerangka TOE ditambahkan ke TAM sebagai pemboleh ubah luaran, sementara risiko yang dirasakan berubah hubungan antara sikap menggunakan (ATT) CC dan hasrat untuk

menggunakan (INT) CC. Selain itu, ATT bertindak sebagai faktor pengantaraan dalam model. Satu tinjauan dilakukan di antara 137 SMEs yang beroperasi di sektor perkhidmatan di Malaysia Barat untuk menguji model yang dicadangkan. Pemodelan persamaan struktur separa terkecil (PLS-SEM) digunakan untuk penilaian model pengukuran dan untuk menguji kesan langsung, pengubahan, dan pengantaraan. Hasil kajian menunjukkan bahawa tahap INT tinggi. Lebih-lebih lagi, pemboleh ubah bebas, iaitu kemudahan kemudahan perkongsian fail (EOFS), sokongan pengurusan atasan (TMS), kecekapan teknikal yang dirasakan (PTC), tekanan kompetitif (CP), dan tekanan rakan dagang (TPP) mempengaruhi secara signifikan dan positif pada ATT. Lebih-lebih lagi, ATT memberi impak kepada INT secara signifikan dan positif. Kesan tidak langsung EOFS, TMS, OA, CP, dan TPP pada INT juga disokong. Kesan pengubahan masalah penguncian data (DL) dan isu perjanjian tahap perkhidmatan (SLAI) terhadap hubungan antara ATT dan INT juga disetujui. Kajian ini menyumbang kepada pengetahuan teori mengenai faktor-faktor berpengaruh yang mempengaruhi penerimaan CC di kalangan SMEs di Malaysia Barat. Lebih-lebih lagi, ini memberikan implikasi praktikal untuk CSP, pemilik SMEs, dan kerajaan Malaysia.

FACTORS AFFECTING SMEs INTENTION TO USE CLOUD COMPUTING IN WEST MALAYSIA: THE ROLES OF MEDIATING AND MODERATING FACTORS

ABSTRACT

Cloud computing (CC) offers up-to-date IT services on a pay per use model to small and medium enterprises (SMEs), which leads to massive budget-saving. Meanwhile, they do not require to deal with common technical difficulties, such as hardware failure and power outages, which are common in in-house IT infrastructure. However, the adoption level of CC is still low among SMEs in Malaysia. Only a few studies examined factors that impact the adoption level at an organizational level, while these studies commonly focused on determining the direct impacts of innovation characteristics. Cloud computing adoption studies widely adopted the Technology Acceptance Model (TAM) and the Technology Organization Environment (TOE) framework. However, the TAM has been criticized due to a lack of considering the organizational factors and its simplicity. Moreover, the TOE framework does not examine the role of individual characteristics. Therefore, an integrated model of the TOE and the TAM is applied to examine the impacts of technological, organizational, and environmental factors on the acceptance of CC among SMEs' IT decision-makers in West Malaysia. The TOE framework's contextual factors are added to the TAM as the external variables, while the perceived risks moderate the relationship between attitude towards using (ATT) CC and intention to use (INT) CC. Besides, ATT acts as a mediator in the model. A survey was conducted among 137 SMEs operating in the services sector in West Malaysia to

test the proposed model. Partial least squares-structural equation modeling (PLS-SEM) applied for assessment of the measurement models and to test the direct, moderating, and mediating effects. The findings showed that the level of INT was high. Moreover, the independent variables, i.e., easiness of file sharing (EOFS), top management support (TMS), perceived technical competence (PTC), competitive pressure (CP), and trading partner pressure (TPP) influenced significantly and positively on ATT. Moreover, ATT impacted INT significantly and positively. The indirect effects of EOFS, TMS, OA, CP, and TPP on INT were also supported. The moderating effects of data lock-in (DL) issues and services level agreement issues (SLAIs) on the relationship between ATT and INT were also approved. This study contributes to the theoretical body of knowledge about the influential factors which impact the acceptance of CC among SMEs in West Malaysia. Moreover, it provides practical implications for CSPs, owners of SMEs, and the government of Malaysia.

CHAPTER 1

INTRODUCTION

1.1 Introduction

In this chapter, the background of the study covering the importance of small and medium enterprises (SMEs), the definition of SMEs in Malaysia, their contribution to Malaysia gross domestic product (GDP), the advantageous of cloud computing (CC) for SMEs, the examples of CC usage among SMEs and Malaysia government's initiative to encourage CC among SMEs is stated. Afterward, the research problem, the research questions, and the research scope are mentioned. Next, the significance of the research, including theoretical and practical contributions, are discussed. Finally, the key terms are defined in the final section.

1.2 Background of the Study

In this section, the importance of SMEs and the definition of SME in Malaysia are stated. Besides, SMEs' contribution to GDP, the benefits of CC for SMEs, the examples of CC usage among SMEs, and the government of Malaysia's initiative to promote CC among SMEs are mentioned.

1.2.1 Importance of SMEs

SMEs are the backbone of the economy, and they contribute to Malaysia's financial system extensively and offer a robust foundation for the growth of the industries, for Malaysia's development (SME Info, 2017). In most economies around the world, SMEs play a main role in the development of nations, especially in developing

countries. For instance, they supply goods and services to low-income people in society and encourage the workforce to be innovative (Alibhai et al., 2017).

They also offer many jobs to everyone, including women and adolescents (Alibhai et al., 2017). It is estimated that 600 million jobs will be required by business entities in the following 15 years to pick up the rising global workforce which is primarily located in Asia and Sub-Saharan Africa. In developing markets, 4 out of 5 new positions for formal jobs belong to SMEs (The World Bank, 2015). It means that 80% of jobs are offered by SMEs in the market.

However, SMEs are vulnerable when they encounter global economic crises due to their restricted financial resources. Besides, their deficiencies in terms of technological, managerial and human capabilities may decline their capacity to overcome global economic crises (Bourletidis & Triantafyllopoulos, 2014).

1.2.2 SMEs in Malaysia

The Companies Commission of Malaysia covers business entities in Malaysia as SMEs. The new definition of SMEs was stated on 11th July 2013, and it is shown in Table 1.1 (SME Corporation Malaysia, 2016). Therefore, more enterprises will be considered as SMEs, and the percentage of SMEs to the total business establishments in Malaysia is expected to increase from 97.3% to 98.5% (Bank Negara Malaysia, 2011).

According to the new definition of SMEs in Malaysia (SME Corporation Malaysi, 2016), the enterprises are categorized as micro, small and medium based on their nature of the industry, the amount of sales turnovers and the number of full-time employees. Sales turnovers and the number of full-time employees are the two standards used in determining the size of enterprises with the “OR” basis.

Table 1.1: The Definition of SMEs in Malaysia

Size	Micro		Small		Medium	
	Sales Turnover	Employees	Sales Turnover	Employees	Sales Turnover	Employees
Manufacturing	< RM300,000	< 5 employees	RM300,000 to < 15 Million	5 to < 75 employees	RM15 Million to ≤ 50 Million	75 to ≤ 200 employees
Services & Others			RM300,000 to < 3 Million	5 to < 30 employees	RM3 Million to ≤ 20 Million	30 to ≤ 75 employees

Note : < is less than
≤ is not exceeding

Source: SME Corporation Malaysia (2016)

Table 1.2 shows the number of micro, SMEs in Malaysia by type of sector and size. Most of the SMEs are operating in the services sector (90% in the year 2010), and the total number of SMEs in the services sector is 580,985 in the year 2010. Around 80 percent of SMEs in the services sector are micro-enterprises. However, the minority of the enterprises are in the mining and quarrying sector (0.1% in the year 2010).

Table 1.2: Number of Micro, Small and Medium Enterprises by Sector and Size in Malaysia in the year 2010

Sector	Micro	Small	Medium	Total SMEs	Total SMEs
	Number of Establishments				% Share
Manufacturing	21,619	13,934	2,308	37,861	5.9
Services	462,420	106,061	12,504	580,985	90.0
Agriculture	3,775	1,941	992	6,708	1.0
Construction	8,587	6,725	3,971	19,283	3.0
Mining & Quarrying	57	126	116	299	0.1
Total SMEs	**496,458**	**128,787**	**19,891**	**645,136**	**100.0**

Source: SME Corporation Malaysia (2016)

1.2.3 SMEs' Contribution to Malaysia Gross Domestic Product

GDP is used to measure the health of a country's economy, and it represents the total market value of all goods and services produced inside a country's borders within a specific period, generally a calendar year (Bygrave & Zacharakis, 2010).

Department of Statistics Malaysia (2019) stated that SMEs contributed to Malaysia's GDP 37.8% and 38.3% in the years 2017 and 2018 accordingly. Besides, Malaysian SMEs operating in the services, manufacturing, agriculture, construction, and mining and quarrying sectors respectively contributed 62.4 percent, 20.1 percent, 10.1 percent, 5.9 percent, and 0.5 percent towards the total SMEs' GDP in Malaysia in the year 2018.

However, Malaysian SMEs still fall behind SMEs' contribution to GDP in developed and developing countries, for instance, Singapore and Thailand. Consequently, the government of Malaysia provides financial supports such as subsidies and loans for SMEs to stimulate them to play a significant role in the development of the economy. For instance, the government allocated around RM5 billion through 150 government programs, which profited above 580,100 SMEs in the year 2015 (SME Corporation Malaysia, 2016).

1.2.4 Benefits of Cloud Computing for SMEs

IT infrastructures are criticized due to their high replacement rate and short service life circles (Yang & Lin, 2015). Therefore, CC is a rising computing paradigm which is gaining attention by SMEs. It offers on-demand and unlimited computing resources on the Internet as "pay-per-use" services at low price (The Sun Daily, 2017; Raut et al., 2018; Senyo et al., 2016; Buyya et al., 2010; Abo-alian et al., 2017). SMEs do not require to purchase expensive software and hardware to benefit from CC services

(Yang & Lin, 2015; Raut et al., 2018). They can use common IT devices such as mobile phones, tablets, laptops, and workstations (Abo-alian et al., 2017; Mell & Grance, 2011) to utilize CC services and modify and release their needed computing resources with minimal management effort or communication with cloud service providers (CSPs) (Mell & Grance, 2011).

CSPs also simplify processes such as data backup and file sharing for their subscribers. In case, users lose their data on cloud storage, they can recover them from backups on CC's data centers (Akar & Mardiyan, 2016). CC also makes file sharing and collaboration effortless for SMEs. They can upload their data on cloud storage. Afterward, CC synchronizes the data within their Internet-connected devices. Therefore, it can be a good replacement for traditional tools of file sharing like file storage devices (Yan et al., 2014; Teneyuca, 2011).

SMEs are also not limited to specific CSPs' services. In case that they are unsatisfied with their CSPs, they can switch to other providers without losing much capital. This reduction in upfront expenses gives them a suitable return on investment (ROI). Consequently, they can concentrate on what certainly benefits their customers which results in their competitive advantage (Alshamaila, 2013; Yu et al., 2018; Raut et al., 2018).

In conclusion, CC might fulfill SMEs' IT needs, which may have inadequate financial and human resources (Tarmidi et al., 2014). SMEs are often challenged with information system (IS) obstacles, such inadequate number of IT employees, limited access to financial funds, and limited slack resources (Yu et al., 2018). As a solution, CC increases SMEs' IT capability with low investment and switching costs (Yu et al., 2018). The extensive use of CC helps SMEs to contribute further to Malaysia's GDP

since it helps them in saving budgets and improving their efficiency, performance and productivity (Raut et al., 2018, Khayer et al., 2020; van de Weerd et al., 2016).

1.2.5 How SMEs can Use Cloud Computing

According to ("Examples of cloud computing," n.d.), Microsoft Azure stated the eight ways that businesses utilize CC, as following:

1.2.5(a) Communication

CC provides users with convenient, web-based access to communication and collaboration tools such as email and calendaring. Messaging, and voice and video call applications like Skype, besides, benefit from the technology. Users' messages and information are stored on CSPs instead of on their personal device ("Examples of cloud computing," n.d.).

1.2.5(b) Productivity

Office tools, e.g., Microsoft Office 365, are cloud-based, enabling users to connect to widely used applications on the Internet. Users can work in their document, presentation, or spreadsheet software ubiquitously. With their information located in the cloud, users do not require to be concerned about losing data if their device breaks down. Most applications can be run directly from web browsers without the need to download or install any special software ("Examples of cloud computing," n.d.).

1.2.5(c) Business Processes

Most advanced business applications, e.g., customer relationship management (CRM), business resource planning, and document management can also be rented from CSPs.

Therefore, the accessibility and security of organizations' business-critical resources are guaranteed, and users can access such tools via web browsers easily (“Examples of cloud computing,” n.d.).

1.2.5(d) File Storage

User can easily store their data since CC services automatically synchronize files from their device. Moreover, if they switch to another device, they can still recover their files (“Examples of cloud computing,” n.d.).

1.2.5(e) Backup and Recovery

Since enterprises rely on CC services for backup and recovery, they can save capital for infrastructure and administration. Alternatively, CSPs are liable for handling data and meeting legal and compliance obligations. Meanwhile, they are capable of providing higher elasticity to allocate unforeseen storage and backup requests. Besides, enterprises can recover data quicker since the information is recorded on CC datacenters (“Examples of cloud computing,” n.d.).

1.2.5(f) Application Development

CSPs help businesses rapidly and easily create cross-platform experiences that scale based on users' demand. Most CSPs offer pre-coded tools, e.g., directory services, search, and security (“Examples of cloud computing,” n.d.).

1.2.5(g) Test and Development

CSPs offer an environment for testing and developing applications. This environment helps businesses save costs and make their applications available to the market more quickly ("Examples of cloud computing," n.d.).

1.2.5(h) Big Data Analytics

CSPs permit businesses to analyze their data to gain patterns and insights, make predictions, enhance forecasting, and make other business decisions. CSPs give more powerful processing power and advanced tools for mining massive amounts of data ("Examples of cloud computing," n.d.).

1.2.6 Malaysia Government's Initiative to Promote Cloud Computing among SMEs

The government under the eleventh Malaysia Plan (11MP) considers information and communication technology (ICT) development among the key initiatives for SMEs. In ICT development initiative, cloud services, e-commerce, Internet of Things (IoTs) applications and services, e-payment and crowdfunding are promoted (SME Corporation Malaysia, 2016).

The government allocated RM208.1 million through 20 SME development programs in the focus area of innovation and technology adoption in the year 2016, and 7,004 SMEs are expected to benefit from the financial allocation. This financial allocation intended for supporting SMEs in exploring innovation and technology adoption, and to help SMEs in differentiating themselves from competitors and advancing their operational standards (SME Corporation Malaysia, 2016).

1.3 Research Problem

Despite the mentioned advantages of using CC in this chapter and the efforts by the government of Malaysia to promote CC, the adoption level of CC is still low among SMEs in Malaysia (Asiaei & Rahim, 2019; Khayer et al., 2020; Ming et al., 2018; Tarmidi et al., 2014; Qian et al., 2016; VMware, 2012; VMware, 2013; EMC, 2013; RightScale, 2016; DSA, 2016; van de Weerd et al., 2016). Most Malaysian SMEs do not utilize CC services comprehensively, and they only use common services, such as email and social networking websites (Hassan & Nasir, 2017; Alshamaila et al., 2013). Indeed, they are overlooking CC as a top priority for their enterprises, and they mostly are not testing the compatibility of their IT infrastructure with CC platform (VMware, 2012; VMware, 2013; EMC, 2013; RightScale, 2016; DSA, 2016). Besides, Khayer et al. (2020) mentioned that the possible reasons for the low adoption were the absence of industry-specific standards and technology readiness, unawareness about the potential benefits and disappointing quality of CC services, and the difference between SMEs' initial expectations and real experience in CC. RightScale (2016) also counted the critical obstacles for cloud computing adoption (CCA), i.e., a lack of resources and expertise, security issues, and compliance concerns. Moreover, DSA (2016) mentioned data backup and security concerns (SCs) as the two major anxieties of IT managers shifting their information systems into the cloud. As a result of the low adoption, SMEs are unable to improve their efficiency, performance, productivity and competitiveness by using CC (Alshamaila, 2013; Yu et al., 2018; Raut et al., 2018; Khayer et al., 2020).

After reviewing the literature, it is noticed that only few studies about CCA among SMEs in Malaysia and other emerging economies were conducted (Asiaei & Rahim, 2019; Ming et al., 2018; Hassan, 2017; Hassan & Nasir, 2017; Abdulgadr et

al., 2017; Alam et al., 2018; Kumar et al., 2017; Mangula et al., 2014; Raut et al., 2018). Moreover, the majority of these studies (Qian et al., 2016; Hassan & Nasir, 2017; Hassan, 2017; Alam et al., 2018; Ming et al., 2018; Gupta et al., 2013; Amron et al., 2019; Almjlae et al., 2019; Low et al., 2011; Hsu et al., 2014; van de Weerd et al., 2016) were not comprehensive because of the exclusion of influential factors.

The findings of several studies were also not generalizable due to the following reasons. Firstly, these studies conducted in other sectors rather than the services sector (Ooi et al., 2018; Kumar et al., 2017; Rahi et al., 2017; Low et al., 2011). Secondly, the findings were not categorized based on types of sectors (Asiaei & Rahim, 2019; Ming et al., 2018; Almjlae et al., 2019; Li et al., 2015; Hsu et al., 2014; Alkhater et al., 2017; Raut et al., 2018; Mangula et al., 2014; Gangwar et al., 2015a; Lin & Chen, 2012; van de Weerd et al., 2016). Thirdly, they were performed at an individual level (Yang & Lin, 2015), and fourthly, they collected an insufficient sample size (Jianwen & Wakil, 2019; Hassan, 2017; Qian et al., 2016; Lin & Chen, 2012; van de Weerd et al., 2016) or the dependent variable were measured as a dichotomous variable (Low et al., 2011).

Moreover, some survey studies were questionable since they applied a non-random sampling technique (Alam et al., 2018; Hassan & Nasir, 2017) or used doubtful items to measure constructs (Hsu et al., 2014). Only one research (Gangwar et al., 2015a) also applied an integrated framework to study CCA intensively by considering the organizational and individual perspectives. Furthermore, no study examined the moderating effects of the perceived risks on the relationship between attitude and intention. In addition, according to Kandil et al. (2018) and Hassan et al. (2017), only few studies examined the effects of technological, organizational, and environmental factors on CCA in developing countries.

The above existing gap in the literature is in line with Alkhater et al. (2017) that mentioned that the number of studies, which examined CCA at an organizational level, is minor. Oliveira et al. (2014) and Trigueros-Preciado et al. (2013) also stated that few studies, which examined CCA from an organizational perspective, generally evaluated the direct impacts of the innovation characteristics. Besides, Hsu et al. (2014) asked for further empirical studies that entirely examine significant factors of CCA.

Therefore, in order to fill the existing gap in the literature, this survey study is conducted among SMEs' IT decision-makers in the services sector in West Malaysia, which are contributing the most to Malaysia's GDP (Department of Statistics Malaysia, 2019). This study applies an integrated model of the TOE and the TAM to examine the impact of technological, organizational, and environmental factors on the acceptance of CC. Meanwhile, the perceived risks negatively moderate the relationship between attitude and intention as the TAM's main variables. Besides, among the eight ways that businesses utilize CC ("Examples of cloud computing," n.d.), this study excludes the communication, which is considered as the lower level of CC usage, because SMEs widely use it (Hassan & Nasir, 2017; Alshamaila et al., 2013). Therefore, this study examines the acceptance factors of the other seven ways, which are considered as the higher level. In the following, it is discussed why the TAM is considered as one of the two underlying theories and why the TOE's contextual factors are considered as the TAM's external variables. Furthermore, the reason that the moderations of the perceived risks are considered in the integrated model is explained.

According to Lal and Bharadwaj (2016), the role of individuals at top management is essential as their views regarding innovations and their implementations impact the decision-making process significantly. In this study, IT

decision-makers are either owners, managers, or key executives who are involved in the IT decision-making process. Therefore, they have the same role as individuals at top management. Consequently, the Technology Acceptance Model (TAM; Davis, 1989), which has been one of the most influential models of technology acceptance at an individual level, has been applied to examine the acceptance of CC. Since the TAM does not consider the impacts of vital organizational and environmental factors surrounding enterprises in the adoption process of technology (Wu et al., 2011), the TOE's technological, organizational, and environmental factors are added to the TAM as external contextual variables to robust the proposed model by providing applicability and predictive power (Gangwar et al., 2015a). The reason for adding these factors is that the TOE is an organization-level theory which describes how the three contexts surrounding enterprises, i.e., technological, organizational, and environmental, influence the adoption and implementation of innovations in companies (Baker, 2012). Moreover, among all organization-level theories, this framework achieves a robust theoretical foundation and reliable experimental support in IS and IT innovation adoption studies (Oliveira & Martins, 2011). Besides, the freedom to change the factors or measures for each new research context makes this framework adaptable (Baker, 2012).

Besides, the TAM was developed to explain voluntary individual adoption of simple systems such as spreadsheets and word processors (Lucas Jr et al., 2007; Bouwman et al., 2007; Lopez-Nicolas et al., 2008) rather than CC as a type of network application service that carries more risks. Therefore, it is vital to consider the effects of the perceived risks on acceptance of CC (Yang and Lin, 2015), which are not considered in the TAM. This study, consequently, examines the negative moderating effects of the perceived risks on the relationship between attitude and intention.

1.4 Research Objectives

This study will examine the level of intention to use CC for SMEs' IT decision-makers in West Malaysia. Moreover, the relationships between technological, organizational, and environmental factors on the attitude will be examined. Afterward, the relationship between the attitude and the intention is also examined. Next, the mediating effects of the attitude between the technological, organizational, environmental factors, and intention are examined. Finally, the moderating effects of the perceived risks on the relationship between the attitude and the intention are examined. The present study, therefore, aims:

1. To examine the level of intention to use CC for SMEs' IT decision-makers in West Malaysia.
2. To examine the relationships between the technological, organizational, environmental factors and attitude towards using CC for SMEs' IT decision-makers in West Malaysia.
3. To examine the relationship between the attitude and intention to use CC for SMEs' IT decision-makers in West Malaysia.
4. To examine the mediating effect of the attitude on the relationships between the technological, organizational, environmental factors and intention to use CC for SMEs' IT decision-makers in West Malaysia.
5. To examine the moderating effect of the perceived risks on the relationship between the attitude and intention to use CC for SMEs' IT decision-makers in West Malaysia.

1.5 Research Questions

Based on the research objectives, the following research questions are defined:

1. What is the level of intention to use CC for SMEs' IT decision-makers in West Malaysia?
2. What are the relationships between the technological, organizational and environmental factors and attitude towards using CC for SMEs' IT decision-makers in West Malaysia?
3. What is the relationship between the attitude and intention to use CC for SMEs' IT decision-makers in West Malaysia?
4. Does attitude towards using CC mediate the relationship between the technological, organizational, environmental factors and intention to use CC for SMEs' IT decision-makers in West Malaysia?
5. What are the moderating effects of the perceived risks on the relationship between the attitude and intention to use CC for SMEs' IT decision-makers in West Malaysia?

1.6 Research Scope

The majority of Malaysian SMEs are located in West Malaysia, and those SMEs, which are operating in the services sector, are contributing the most towards the total SMEs' GDP in Malaysia in the year 2018 (Department of Statistics Malaysia, 2019). This study, therefore, only covers those SMEs in West Malaysia that use the lower level of CC, and are operating in all industry groups of the services sector, i.e., distributive trade (wholesale and retail), food and beverage, transport equipment, and business and professional services.

In each SME, a single informant who is either owner, manager, or key executive is asked to complete the survey. The informants should also involve in IT decision making to ensure that they are capable of answering the questionnaire

precisely. Moreover, their enterprises need to have less or equal 75 full-time employees with the amount of sales turnover less or equal RM50 million. In this study, the informant called IT decision-maker.

1.7 Significance of the Research

This research contributes to the theoretical body of knowledge and practice, as mentioned below.

1.7.1 Theoretical Contributions

The TAM model has been criticized, as it is reluctant to consider the impacts of essential aspects like organizational and environmental factors in the adoption process of technology (Wu et al., 2011). This research, therefore, contributes to the theoretical body of knowledge and the existing literature in the domain of IS about the influential factors regarding the acceptance of CC, by adding the contextual factors of the TOE to the TAM, as external factors, to gain applicability and predictive power in the proposed research model. This study also examines the mediating effects of attitude between the contextual factors of the TOE framework and intention to use CC. Moreover, the moderating effects of the perceived risks are examined since the TAM overlooks the effects of existing issues with technology, as it was initially developed for simple systems (Yang & Lin, 2015). Besides, Asiaei and Rahim (2019) called for future studies on the influence of perceived risks on CCA among Malaysian SMEs.

1.7.2 Practical Contributions

Recognizing the vital factors affecting the acceptance of CC among SMEs operating in the services sector in West Malaysia serves as a vital guide for CSPs, owners, and

the government of Malaysia to increase the determination of SMEs to utilize CC by applying better strategies.

The findings provide insights for CSPs to provide excellent CC services to SMEs to convince them to subscribe to CC subscription plans. The results also help owners of Malaysian SMEs to identify the empowering and preventive factors that influence the approval of CC among SMEs' IT decision-makers in West Malaysia. Furthermore, investigating the essential organizational characteristic impacting the acceptance of the technology offers clear guidance for owners for the smooth and successful usage of CC in SMEs. The practical implication is also provided for the government of Malaysia to protect the data security of Malaysian SMEs on CC data centers and sustain their rights in CC service level agreements.

1.8 Definition of Key Terms

The definition of the key terms used in this study are stated below:

1.8.1 Cloud Computing Usage among SMEs

CC usage among SMEs is defined as using CC' software to manage the business, platform to develop and deploy applications, and infrastructure to allocate storage and processing power to IT workloads within SMEs. This study focuses on the seven ways of utilizing CC, i.e., productivity, business processes, file storage, backup and recovery, application development, test and development, and big data analytics ("Examples of cloud computing," n.d.).

1.8.2 Attitude towards Using Cloud Computing

Attitude towards using CC is defined as the extent to the positive feelings of SMEs' IT decision-makers about working with CC (Davis et al., 1989).

1.8.3 Intention to Use Cloud Computing

The intention to use CC is defined as the degree of the determination of SMEs' IT decision-makers' aim to use CC (Davis et al., 1989).

1.8.4 Easiness of File Sharing

The easiness of file sharing (EOFS) is defined as the extent that SMEs' IT decision-makers believe that the use of CC helps them share their work with their business partners smoother (Gupta et al., 2013).

1.8.5 Top Management Support

Top management support (TMS) is defined as the extent that SMEs' top managements support the implementation of CC regardless of potential financial and organizational risks (Oliveira et al., 2014; Lian et al., 2014).

1.8.6 Perceived Technical Competence

Perceived technical competence (PTC) is defined as the extent to which an organization's members own a relatively high level of IT knowledge and expertise in CC, usually measured by the members' range of occupational specialties and their degree of professionalism expressed by formal training (Rogers, 2003).

1.8.7 Organizational Agility

Organizational agility (OA) is defined as the extent to measure the capability of SMEs to effortlessly and rapidly change their strategy in terms of customer responsiveness, business partnerships, and operations (Tallon & Pinsonneault, 2011) by using CC.

1.8.8 Cost-Saving

Cost-saving (CS) is defined as the extent that SMEs' IT decision-makers believe they can save their upfront and operating costs by using CC (Oliveira et al., 2014; Gupta et al., 2013).

1.8.9 Competitive Pressure

Competitive pressure (CP) is defined as the extent to the observed pressure from business competitors that force an SME to use CC to sustain competitiveness (Hsu et al., 2014).

1.8.10 Trading Partner Pressure

Trading partner pressure (TPP) is defined as the extent to the observed pressure from business partners that influences SMEs to use CC to sustain cooperative relationships (Hsu et al., 2014).

1.8.11 Security and Privacy Issues

Security and privacy issues (SPIs) are defined as the extent that SMEs are concerned about privacy, confidentiality, and protection of their data on CC (Oliveira et al., 2014; Trigueros-Preciado et al., 2013).

1.8.12 Reliability Issues

Reliability issues (RIs) are defined as the extent that SMEs are concerned with CC's capability to perform in a consistent and precise manner (Rahi et al., 2017).

1.8.13 Data Lock-in Issues

Data lock-in (DL) issues are defined as the extent that SMEs believe that data migration from CSPs to their in-house IT infrastructures and switching CSPs are costly and complicated (Benlian & Hess, 2011).

1.8.14 Services Level Agreement Issues

Services level agreement issues (SLAIs) are defined as the extent that SMEs are concerned about CC services level agreement (SLA) due to its contractual gaps and unclarity (Benlian & Hess, 2011).

1.8.15 Small and Medium Enterprises

Based on the new definition of SMEs in Malaysia (SME Corporation Malaysia, 2016), the enterprises are categorized as micro, small and medium based on their nature of the industry, the amount of sales turnovers and the number of full-time employees. Sales turnovers and the number of full-time employees are the two standards used to determine the size of enterprises with the "OR" basis.

CHAPTER 2

LITERATURE REVIEW

2.1 Introducton

In this chapter, the emergence of CC, its definitions, and its characteristics are stated. Moreover, the deployment and service models of the technology are mentioned. Afterward, the critical issues and projection of CC usage are discussed. Next, main IT adoption models are explained, and the application of a mixture of the TOE Framework and the TAM Model is justified. Then, a critical literature review is conducted about CC adoption studies, and the constructs of the study are conceptualized. In the last two parts, the research model is proposed, and the hypotheses regarding direct, moderating, and indirect effects are developed.

2.2 The Emergence of Cloud Computing Technology

The term CC appeared for the first time in the commercial arena in the year 2006. In the same year, Amazon started offering Elastic Compute Cloud (EC2) services which allowed organizations to rent computing capability and processing power to run enterprise applications. Moreover, Google Apps started providing browser-based enterprise applications running on CC. Three years later, Google App Engine, a CC computing platform for developing and hosting web applications, became another remarkable milestone (Erl et al., 2013) in the IT market.

CC is not entirely a novel concept (Marston et al., 2011; Zhang et al., 2010) since it utilizes the current computing technologies, i.e., virtualization, autonomic computing, grid computing, and utility-based pricing (Zhang et al., 2010). The merging of technology fields leads significantly to the appearance of CC (Buyya et

al., 2010). The integration of technology arenas, causing the presence of CC, is shown in Figure 2.1.

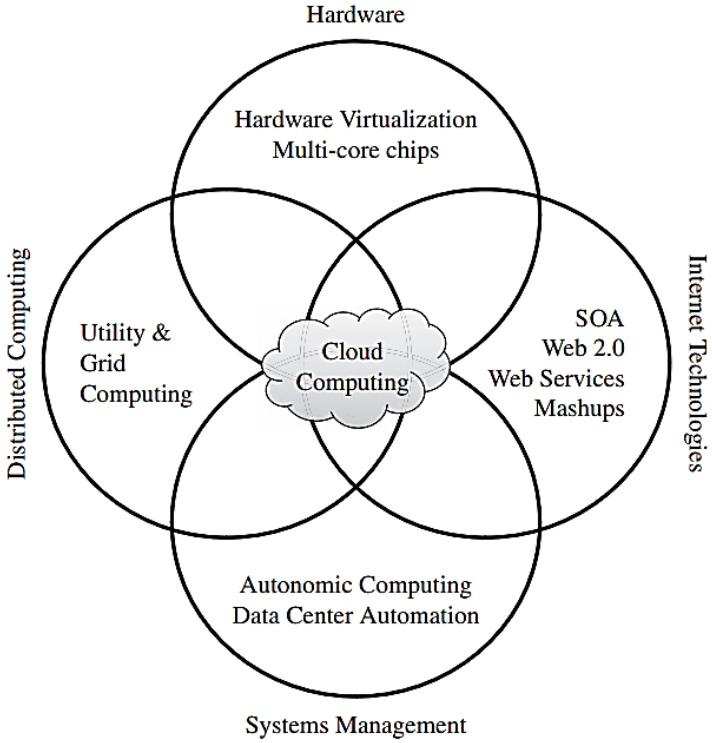

Figure 2.1: Merging of Technology Fields Leading to the Appearance of Cloud Computing (Buyya et al., 2010)

The actual emergence of CC had occurred due to the arrival of the application service providers (ASPs) businesses (Aziz et al., 2017) which developed, managed and delivered software application capacities to many entities from data centers on the Internet (Sharma & Gupta, 2002). ASPs rented computational abilities to run clients' applications for a predefined price (Aziz et al., 2017). Nevertheless, the ASP model underperformed, as users were unable to customize it (Xin & Levina, 2008).

Therefore, Software as a Service (SaaS) model, as a type of CC service models, appeared to solve the customization issue on ASPs. SaaS was proposed as a feasible outsourcing alternative for clients willing to pay for accesing to a standardized set of business software utilities via a network. SaaS model improved the ASPs model by

developing a structure that did not require any tools for modifying the software on the CSP side. Therefore, all customizations were performed at the client-side by using standardized interfaces (Xin & Levina, 2008). Following the emergence of SaaS, CC technology has arisen. CC technology is comprised of application services and all infrastructures or platforms providing application service delivery (Li et al., 2015) for CC users on a network like the Internet.

2.3 Cloud Computing Definitions in the Literature

No standard definition of the term CC exists in the literature (Morgan & Conboy, 2013) since scholars define the technology concerning its essential components and their comprehension (Madhavaiah et al., 2012). As a result, the definition of CC has already changed several times and will undergo further alterations (Kim et al., 2009). For instance, in just one year, the definition of CC by Gartner, a research and advisory company, changed (Plummer et al., 2008; "Gartner's Cloud Computing Special Report," 2009). Table 2.1 shows that CC has been defined in many ways in the literature.

In this study, the definition of CC by Mell and Grance (2011), as listed in Table 2.1, is adopted since it is the utmost accepted, reliable and restated definition by scholars (Trigueros-Preciado et al., 2013). Moreove, the definition clearly represents the concept of CC.

Table 2.1: The Definitions of Cloud Computing

Reference	Definition
(Buyya et al., 2008)	Cloud Computing is a group of inter-connected virtualized computers that deliver services to the customers.
(Plummer et al., 2008)	"a style of computing where massively scalable IT-enabled capabilities are delivered 'as a service' to external customers using Internet technologies"
(Fox et al., 2009)	"Cloud Computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the datacenters that provide those services."
("Gartner's Cloud Computing Special Report," 2009)	"a style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service to external customers using Internet technologies."
(Kim, 2009)	CC is defined as a browser via the Internet provided by a third-party service provider, with the option to pay as per usage.
(Vaquero et al., 2009)	"Clouds are a large pool of easily usable and accessible virtualized resources (such as hardware, development platforms and/or services). These resources can be dynamically reconfigured to adjust to a variable load (scale), allowing also for an optimum resource utilization. This pool of resources is typically exploited by a pay-per-use model in which guarantees are offered by the Infrastructure Provider by means of customized SLAs".
(Marks & Lozano, 2010)	CC is defined as on-demand services of the shared hardware and software resources, shared by third-party CC service providers on the web.
(Wang et al., 2010a)	"A computing cloud is a set of network enabled services, providing scalable, QoS guaranteed, normally personalized, inexpensive computing infrastructures on demand, which could be accessed in a simple and pervasive way."
(Buyya et al., 2010)	CC, as an umbrella term, characterizes a classification of complicated on-demand computing services mainly offered by productive suppliers.
(Marston et al., 2011)	CC allows us to use the power of computers efficiently. Moreover, it provides IT as a business tool for real-time applications through hardware and software.
(Mell & Grance, 2011)	"Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."
(Staten et al., 2011)	"a standardized IT capability (services, software, or infrastructure) delivered via Internet standard technologies in a pay-per-use, self-service way."

Reference	Definition
(Subashini & Kavitha, 2011)	"Cloud computing is a way to increase the capacity or add capabilities dynamically without investing in new infrastructure, training new personnel, or licensing new software."
(Teneyuca, 2011)	"Cloud computing is a computer science terminology that means using the Internet and servers to secure and maintain data and its applications."
(Erl et al., 2013)	"Cloud computing is a specialized form of distributed computing that introduces utilization models for remotely provisioning scalable and measured resources."
(Oliveira et al., 2014)	"The 'cloud' metaphor is a reference to the ubiquitous availability and accessibility of computing resources via Internet technologies."
(Li et al., 2015)	"Compared with ASP and SaaS, cloud service is a broader conception, including application services and all infrastructures or platforms that support application service delivery."
(Yang & Lin, 2015)	"The cloud computing is the user in an Internet-accessible environment can quickly share or access network resources (e.g., remote servers, storage spaces and network service applications) and interact with service providers through some easy operating interfaces and management modes."
(Yuvaraj, 2015)	"An integrated package of computing services and applications on the web offered as a utility."
(Abo-alian et al., 2017)	"Cloud computing can be defined as a type of computing in which dynamically scalable resources (i.e., storage, network, and computing) are provided on demand as a service over the Internet."
(Aziz et al., 2017)	"The cloud not only provides a storage resources but also provide computation over the internet, users often entitled it the 'Cloud Computing'."

2.4 Characteristics of Cloud Computing

Mell and Grance (2011) stated five main characteristics of CC, i.e., on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service. In the following, each characteristic is explained in detail:

- **On-demand Self-service:** Users can allocate automatically computing resources such as processor and network storage (Mell & Grance, 2011). Therefore, users are able to modify their service requirements without the necessity to contact CSPs and pay based on usage (Aharony, 2015; Mell & Grance, 2011).