ADOPTION OF CLOUD COMPUTING BY MALAYSIAN SMALL AND MEDIUM ENTERPRISES

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DEDICATION

“To my beloved mother, father, brothers, and sister”

This is for all of you

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ABSTRACT

Cloud computing is recognized as an emerging paradigm in today's business environment. However, the literature presented a gap in knowledge regarding the innovation of cloud computing and the adoption of small enterprises for their economic sustainability. Nevertheless, it is not completely new technology as it is widespread due to the fast development of the internet, mobile phones, higher bandwidth, and increasing mobility requirements of the clients. In spite of the fact that the adoption of cloud computing services is proliferating in large companies, SMEs are still reluctant to employ cloud computing services due to the lack of knowledge and a clear guideline in this area. This study intends to address the SMEs' problem of adopting cloud computing technology and highlight the considerable potential of cloud computing for SMEs in today's competitive market. In this regard, various dimensions of this technology are emphasized and the serious challenges that are hindering the adoption of cloud computing in SMEs are highlighted in this research. The purpose of this study is to develop a model to understand the relationship among technology, organizational, and environmental (TOE) contexts, intention to adopt cloud computing (IACC), and actual usage of cloud computing (AUCC) in SMEs in Malaysia as a developing country. More specifically, this research seeks to explore the mediation effect of IACC on the relationship between TOE context and AUCC. A positivist research paradigm was selected for this research. Drawing largely upon the extended TOE framework, this study utilized survey data from 203 Malaysian SMEs. Structural equation modeling (SEM) based on partial least squares (PLS) was used to assess the structural relations of the research model. The results of the structural model showed that data security, technology readiness, cost saving, top management support, competitive pressure were the most significant factors in predicting the adoption of cloud computing in Malaysian SMEs. Further, the results indicated that intention to adopt cloud computing can play a mediating role between TOE factors and the actual usage of cloud computing. Regarding the current state of cloud computing adoption in Malaysian SMEs, 55.67 percent stated to continue using cloud computing and 51.72 percent intend to use cloud computing.

ABSTRAK

Pengkomputeran awan diakui sebagai paradigma yang muncul dalam persekitaran perniagaan masa kini. Walau bagaimanapun, kajian lepas menunjukkan jurang pengetahuan mengenai inovasi pengkomputeran awan dan penerapan dalam perusahaan kecil untuk kelestarian ekonomi mereka. Walaupun begitu, ini bukan teknologi baru, ia meluas kerana perkembangan internet, penggunaan telefon pintar yang cepat, jaringan jalur lebar yang tinggi, dan peningkatan keperluan mobiliti pelanggan. Walaupun penggunaan perkhidmatan pengkomputeran awan berkembang pesat di syarikat-syarikat besar, Sektor Perusahaan Kecil dan Sederhana (PKS) masih enggan menggunakan perkhidmatan pengkomputeran awan kerana kurangnya pengetahuan dan garis panduan yang jelas dalam bidang ini. Kajian ini bertujuan untuk mengatasi masalah PKS dalam mengadaptasi teknologi pengkomputeran awan dan menyoroti potensi besar pengkomputeran awan untuk PKS di pasaran yang kompetitif. Dalam hal ini, pelbagai dimensi teknologi diambil kira dan cabaran serius yang menghalangi penerapan pengkomputeran awan di PKS telah diketengahkan dalam penyelidikan ini. Tujuan kajian ini adalah untuk membangunkan model bagi memahami hubungan antara teknologi, organisasi, dan persekitaran (TOE), hasrat untuk mengadaptasi pengkomputeran awan (IACC), dan penggunaan sebenar pengkomputeran awan (AUCC) di PKS Malaysia sebagai negara membangun. Lebih khusus lagi, kajian ini bertujuan untuk meneroka kesan perantara IACC terhadap hubungan antara konteks TOE dan AUCC. Paradigma penyelidikan positivisme dipilih untuk penyelidikan ini. Berdasarkan sebahagian besar kerangka TOE yang diperluas, kajian ini menggunakan data tinjauan dari 203 PKS Malaysia. Pemodelan persamaan struktur (SEM) berdasarkan kuasa dua terkecil separa (PLS) digunakan untuk menilai hubungan struktur model kajian. Hasil model struktur menunjukkan bahawa keselamatan data, kesediaan teknologi, penjimatan kos, sokongan pengurusan atasan, tekanan kompetitif adalah faktor yang paling penting dalam meramalkan penerapan pengkomputeran awan di PKS Malaysia. Selanjutnya, hasil menunjukkan bahawa hala tuju untuk mengadaptasi pengkomputeran awan dapat memainkan peranan perantara antara faktor TOE dan penggunaan sebenarnya pengkomputeran awan. Mengenai keadaan penggunaan pengkomputeran awan semasa di PKS Malaysia, 55.67 peratus menyatakan akan terus menggunakan pengkomputeran awan dan 51.72 peratus berhasrat menggunakan pengkomputeran awan.

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IT	-	Information Technology
CCA	-	Cloud Computing Adoption
AUCC	-	Actual Usage of Cloud Computing
IACC	-	Intention to Adopt Cloud Computing
DS	-	Data Security
TR	-	Technology Readiness
CS	-	Cost Saving
TMS	-	Top Management Support
INN	-	Innovativeness
CP	-	Competitive Pressure
RS	-	Regulatory Support
SMES	-	Small and Medium-Sized Enterprises
TOE	-	Technology Organization Environment
TAM	-	Technology Acceptance Model
SEM	-	Structural Equation Modelling
PLS	-	Partial Least Squares
ICT	-	Information and Communications Technology
SaaS	-	Software as a Service
PaaS	-	Platform as a Service
IaaS	-	Infrastructure as a Service
CaaS	-	Composite as a Service
NIST	-	National Institute of Standards and Technology
DOI	-	Diffusion of Innovation
IDT	-	Innovation Diffusion Theory
ISP	-	Internet Service Provider
ERP	-	Enterprise Resource Planning
SLAs	-	Service Level Agreements
CSFs	-	Critical Success Factors
CRI	-	Cloud Readiness Index
APEC	-	Asia-Pacific Economic Cooperation

OECD	-	Organisation for Economic Co-operation and Development
GVCs	-	Global Value Chains
MDEC	-	Malaysia Digital Economy Corporation
VPN	-	Virtual Private Network
SMBs	-	Small and Medium Businesses
TRA	-	Theory of Reasoned Action
TPB	-	Theory of Planned Behaviour
CC	-	Cloud Computing

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CHAPTER 1

INTRODUCTION

1.1 Overview

Many organizations encounter difficulties in acquiring and maintaining the vast Information Technology (IT) infrastructure needed for their effective business operations. These organizations include the public and private sectors, such as schools, hospitals, retailers, and government agencies. The organizations experience the difficulties mainly in acquiring, hosting, maintaining, and supporting the required IT systems, applications, and infrastructure that drive the alignment of their IT objectives with business objectives that lead to efficient business operations (Wilkin et al, 2016; Islam et al, 2017). These difficulties in the acquisition and maintenance pose greater challenges, especially for small and medium enterprises (SMEs), preventing them from taking advantage of the huge computational powers their counterparts in large organizations enjoy (Melendez et al, 2016; Kirche and Srivastava, 2017). Nguyen et al. (2015) pointed out that the difficulty in infrastructure acquisition and maintenance, in turn, causes loss of substantial amounts of revenue to those organizations. As a result, some organizations resort to the implementation of emerging new computing technologies, such as cloud computing, in processing business information. Despite the efforts of some organizations in embracing cloud technology, the utilization is still limited (Alshamaila et al, 2013; Tarmidi et al, 2014; Gangwar et al, 2015; Raza et al, 2015; Ma et al., 2016; Changchit and Chuchuen, 2018).

1.2 Background of the Problem

Many organizations still feel reluctant in embracing new and emerging technology due to a variety of concerns, such as security, privacy, data integrity, and data confidentiality that are considered major issues in cloud computing (Lee et al., 2013a; Yigitbasioglu, 2015; Senyo et al., 2018). Previous researches had attempted to address these problems; however, in cloud computing, there has been inadequate research to answer the question of predicting adoption of the technology by organizations (Salmeron and Palos, 2016; Sharma et al., 2016; Ding et al., 2017).

The rapid progress of technology, hardware, distributed computing, virtualization, and service delivery through the Internet, developed cloud computing services. The "cloud" is a term for computing services that are widely available and accessible through the Internet (Rong et al., 2013; Sultan, 2014; Wall, 2017). The users and businesses can easily access to vast computing resources at negligible expenses by deploying cloud-based solutions. Moreover, businesses could potentially diminish the total costs of IT through migrating the IT operations such as business applications, storage, and services to the cloud (Alshamaila et al., 2013; Raza et al., 2015; Zhang et al., 2016; Shi et al., 2016; Mansouri et al., 2017). Accordingly, it is not possible for businesses to ignore the considerable advantages of cloud computing.

Cloud computing services are categorized into three general models: (1) Software-as-a-Service (SaaS) (2) Platform-as-a-Service (PaaS) (3) Infrastructure-as-a-Service (IaaS). Enhancing cloud computing capabilities is known as an essential component of improving the competitive advantage, due to the fact that it is not just quickly changing the method which firms sell, buy, and connect to the clients, but it is also embedding in the central part of companies' business strategy (Ross and Blumenstein, 2013; Doherty et al., 2015; Liu et al., 2016; Maqueira-Marín et al., 2017).

Nowadays, there has been a surge of interest in cloud computing as an increasingly important area that can be attributable to its functionality to act as an enabler for enterprises in order to carry out data transactions in line with value chain processes such as finance, sales, distribution, manufacturing, information sharing, cooperation with trading partners, and customer service (Fülöp et al., 2014; Wang et al., 2016; Alex and Kishore, 2017; Lee, 2017). Moreover, according to NIST documents, there are two types of deployment models: Public Cloud and Private Cloud. Public cloud has the key feature that the infrastructure and computational resources are made available to the general public through the Internet, and it is owned and operated by a cloud provider; also, it is external to the consumer's organization (Hsu et al., 2014; Kizza, 2015; Sabi et al., 2016; Botta et al., 2016; Halabi and Bellaiche, 2017; Spanaki and Sklavos, 2018). Examples of public cloud providers include Amazon, Google, Microsoft, and Rackspace (De Carvalho et al., 2017; Segrelles et al., 2017).

In contrast to a public cloud, a private cloud is a deployment model that maintains the computing environment exclusively for a single organization, so granting a firm greater control over the infrastructure and computational resources, as compared to the public cloud (Chunlin and LaYuan, 2017). Private cloud providers include HP, IBM, Novell, and VMware, etc. (da Rosa Righi et al., 2016; Dreher et al., 2016). Given these characteristics of public and private clouds, firms need to evaluate carefully when facing cloud computing adoption decisions (Hsu et al., 2014; Chang et al., 2016b; Maresova et al., 2017).

In spite of the fact that the cloud computing has tremendous potential, it has not been deployed by the clients with the deserved interest and rate (Bogataj and Pucihar, 2013; Zarvić et al., 2013; Benkhelifa and Fernando, 2014; Hsu et al., 2014; Raza et al., 2015; Harris et al., 2015; Sharma et al., 2016; Sabi et al., 2017). The slower rate of cloud computing adoption could be ascribed to the adoption gaps. The National Institute of Standards and Technology (NIST) asserted that portability, interoperability, and security are the main obstacles to broader adoption of cloud computing (Lian, 2015). Moreover, some scholars from the University of California at Berkeley specified 10 barriers to the adoption of cloud computing (Fox et al., 2009).

These barriers include data lock-in, data transfer bottlenecks, scalable storage, scaling quickly, software licensing, availability of service, reputation fate sharing, data confidentiality and auditability, performance unpredictability, and bugs in large distributed systems. In addition, Ness (2009) claimed that there are three main obstacles in the adoption of cloud computing. The first one is the dependency of the cloud computing on novel methods to security, the second one is the capability of cloud computing to break static networks, and the third one is the considerable importance of network automation. Furthermore, Leavitt (2009) introduced six principal challenges which include security and privacy, transparency, related bandwidth costs, performance, reliability and latency, vendor lock-in and standards, and control.

Kampschroeder et al. (2008) exposed the adverse rippling economic fallout of failed small businesses. Faced with large-company and global competition, small businesses have experienced high discontinuance rates: 76% of new firms remain open after 2 years, 47% after 4 years, and 38% after 6 years (Liao et al., 2008; Laperche and Liu, 2013; Zhou, 2016). Likewise, Tan et al. (2009) reported that somewhere between 50% and 80% of small businesses fail. However, equating small business closure with business failure was misleading. Bates (2005) reported that according to the U.S. Bureau of the Census survey data, approximately 37% of Year 6 firm closures were deemed successful at the time that the decision was made to cease operations. Understanding the rationale for small business discontinuance was an important consideration in their economic contributions (Liao et al., 2008; Kumlu, 2014; Mohsin et al., 2015). However, the literature review exposed a gap in knowledge in relation to cloud computing innovation and small business adoption for economic sustainability.

This research is mainly motivated by three factors. First, much of the literature in cloud computing has concentrated on technical issues such as deployment requirements, visualization, performance, and interfaces. Within the scope of organizational studies, research related to cloud computing is rare (Mohammed et al., 2016; Kumar et al., 2017; Alghamdi et al., 2018; Liu et al., 2018). Accordingly, this study will address the non-technical issues of cloud implementation through the lens of organizational theories. Second, cloud computing is not simply an IT innovation, it

also presents a paradigm shift in the business model. Theories on the IT innovation and findings from traditional IS studies may not be capable of offering sufficient and accurate explanations of some of the new emerging issues (Ricciardi et al., 2018; Kohli and Melville, 2019). Cloud computing implementation as a nascent research area has great potential for theory generation and extension. Third, the inquiry on the topic has significant practical implications. The implementation of cloud computing has been often a strategic initiative that involves substantial capital and human resource investment and gives rise to irreversible organizational changes. A better understanding of cloud computing implementation, as well as its organizational implications, is not only a matter of making a cloud initiative success but also a matter of leading organizations in the achievement of strategic goals (Suo, 2013).

1.3 Problem Statement

Small businesses that do not embrace cloud computing forfeit its benefits and the competitive advantage that the technology could give to them. It might then threatens small businesses' sustainability and economic contribution. The low levels of cloud computing knowledge can be attributed as one of the inhibitors of cloud computing adoption within the SMEs sector. This is causing a gap between the technological advancement of cloud computing and its implementation by the organizations, which do not take advantage of new developments and therefore lose opportunities. According to the ICT adoption and diffusion literature, some SMEs still reluctant to adopt cloud computing due to the lack of clear guidelines and acceptable standards. Moreover, SMEs' lack of understanding of the cloud computing concept has affected its cloud computing adoption rate. This, in turn, limits SMEs to explore the benefits of cloud computing for their businesses. The objective of this study is to find out which factors influence the adoption of cloud computing within SMEs. Cloud Computing offers new opportunities, particularly for SMEs, due to the accessibility of resources equal to those of large international corporate groups. For these reasons, the focus of this research was placed on cloud computing adoption in SMEs.

1.4 Research Questions

With respect to the problem statement explained in the previous section, this research mainly aims to examine the influences of different cloud computing determinants on SMEs' cloud computing adoption in terms of the capability of SMEs' leaders to make a conscious and critical decision about their business in the today competitive market. Accordingly, the following research questions are addressed in this research:

1) What are the factors that influence SMEs' adoption of cloud computing for their businesses?
2) What framework can be used to study cloud computing adoption in SMEs?
3) What is the current state of cloud computing adoption in Malaysian SMEs?

1.5 Research Objectives

The purpose of this quantitative study is to evaluate the significance of different cloud computing determinants, and their influences on the intention of business leaders in SMEs towards adopting cloud computing. Therefore, the current study endeavours to provide answers to the foregoing questions by accomplishing the following research objectives:

1) To identify the factors that influence the SMEs' adoption of cloud computing for their businesses.
2) To develop a framework that can be used to study cloud computing adoption in SMEs.
3) To determine the current state of cloud computing adoption in Malaysian SMEs.

1.6 Significance of the Study

This research makes significant contributions to the body of knowledge in the adoption of cloud computing and emerging technologies in SMEs. During the past years, scholars proposed to employ more extensive methods which integrate two or more theoretical perspectives to explore the adoption of IT phenomenon containing innovative modern technologies (Oliveira et al., 2014, Wu et al., 2013a). In this study, the proposed model will be developed through the extension of the chosen underpinning theory. The proposed model integrates the technology, organization, and environmental contexts of the organization and the innovation attributes of cloud computing that highlight the cloud computing adoption. It is totally different from other studies that generally assess the integrated impact of the contextual elements and the innovation attributes. The reliability, validity, and discriminant tests are conducted to validate the employed instrument in this study. Therefore, the research model and the instrument form the basis of the perception of determinants of cloud computing adoption. Accordingly, the proposed model and the instrument can be employed in other innovation researches.

In the organization, decision makers who consider cloud-based initiative of the results of this research establish a sound basis for assessing the direct and indirect impacts of the innovation attributes of cloud computing and also the related literature on its adoption in SMEs. The lack of a clear understanding of modern technology and resistance to any changes in conventional business procedures could be the reason for the concerns for the complication of cloud computing adoption in SMEs (Gupta et al., 2013). But, cloud computing is able to reduce the complication of IT service by presenting commonality among business processes and automation in the management procedure.

The results of this research could shed light on the cloud computing adoption in SMEs and how their managers can reach a conscious decision. In assessing this quite modern technology, this research places emphasis on the significance of evaluating the technology, organization, and environment context of the organization towards the innovation attributes before adopting cloud computing services. Without

considering the top management support and technological readiness in the organization, even in the existence of supportive regulation and competitive pressure, maybe it is hard to transform the relative advantage of cloud computing into financial value for the organization.

1.7 Scope of the Study

A questionnaire survey has been conducted in this study and the sampling frame applied is constructed based on SME Corp. Malaysia members in Malaysia. SMEs are the focus of the study for two reasons. First, there is little research conducted in this area using this type of organization. Second, the aim of this study is to evaluate the adoption of cloud computing services in this sector. Most majority of the enterprises are SMEs based on the Malaysian industrial structure (SME Annual Report, 2016/17).

A multi-industry sample will allow the study to examine inter-industry impacts and theoretically expand the study's generalization (Navarro-García et al., 2016; Martynov, 2017; Bodlaj et al., 2020). In addition, Kumar et al. (2018) claimed that the involvement of a large group of companies and sectors is intended to optimize the heterogeneity of variables and thus improve the generalizability of results. In this regard, worldwide analyses of multi-industry economies in various stages of growth enable economists to obtain useful insights into momentous structural features that might produce meaningful and desirable outcomes (Foster and Kharazi, 2008). Accordingly, the population of this study comprises all SMEs listed in the SME Corp. Malaysia in the year 2017. According to the "SME Corp. Malaysia Annual Report 2015/16" (as of September 2016), 907,065 SMEs with 37.1% contribution to overall GDP were listed on SME Corp. Malaysia.

The term cloud computing might be well known in research which just focusing on large enterprises. On the other hand, the areas of IT usage will not essentially be specified when this study is focusing on SMEs. The database consists of manufacturing and service companies and the private sector. Since much of the

research on IT usage has an emphasis on Electronics and Electrical manufacturing industry, this could be considered as an advantage (Alam et al., 2011). The individual who is responsible to make decisions in the organization is targeted in the questionnaire. The leaders are selected for the subjects of the study due to the fact that they play a key role in decisions that result in the technology adoption in their business structure (Dahnil et al., 2014). Accordingly, the ultimate responsibility for most of the critical decisions in the organization such as budget, finance, and maintenance lies with the leaders. Moreover, leaders are able to identify dynamic and complicated matters and propose the best solution to solve the problems in order to benefit the organization (Sharma and Rai, 2015; Vagnani and Volpe, 2017). Since this study aims to explore the SMEs' adoption of cloud computing services, both of the companies which already adopt cloud computing and those ones which are willing to employ cloud computing technology in the future are considered in this research.

1.8 Definition of Terms

The key terms used in this research are described and further explained in this section to generate a better understanding among readers.

1.8.1 Data Security

Data security generally addresses the variety of data security challenges from both an architectural and a technological viewpoint (Change and Ramachandran, 2016). Data security, as defined by Oracle in 2012, refers to data manipulation (unauthorized data alteration), eavesdropping and hacking (personal data fraud, such as credit cards), identity theft (misrepresentation of personal identity), theft of passwords, unauthorized access to the server, incompetent system management, bad user management.

1.8.2 Technology Readiness

The technology readiness term defined by Parasuraman (2000) as a tendency to accept new technology to achieve goals determined by the overall mindset arising from a mental contributor and inhibitor gesture. Thus, depending on their technological readiness, companies will break into five categories from adventurers who are the first to adopt technology to laggards who have little technology inspiration and would usually be the last group to embrace a new technological product or service (Parasuraman and Colby, 2001). Organizations with high-tech readiness are mindful of the existing capability and shortcomings of IT infrastructure and are keen to offer sufficient training to allow the cognitive ability needed for the cloud computing adoption (Gutierrez et al., 2015). To sum up, organizations with technological readiness are better prepared for cloud computing adoption.

1.8.3 Cost Saving

From a financial standpoint, the return on investment (ROI) of a cloud-based business system could be long-term, and it could involve risks to focus purely on costs (Venters and Whitley, 2012). Nonetheless, management needs to minimize costs and gain the ability to forecast costs involved with the market entry of cloud-based business resources (Kaltenecker et al., 2015; Werfs et al., 2013). One of the main reasons that companies shift to cloud computing is cost-saving, but these anticipated savings are not always perceived. In fact, whether seeking short-term or long-term gains, not all administrators perceive cloud-based business technology innovation as an investment (Lin and Chen, 2012; Ali et al., 2017).

1.8.4 Top Management Support

Top management support plays a crucial role in the introduction, execution and IT adoption (Parasuraman, 2000). Such support is shown in its strategies and investments relevant to the organization's adoption of new technologies. Top managers are creditworthy to establish goals and lead the new innovative technologies. Top managers can identify the necessary cloud computing resources and support environment (Teo et al., 2004). Their understanding of the potential advantages of adopting cloud computing is perceived to be crucial in handling potential corporate transformation by clear view and commitment, providing positive signals of confidence regarding the adoption of the new innovation to all staff working for the company (Goscinski and Brock 2010). This support prevents internal barriers and changes in opposition. Thus, it can be inferred that top management support is essential for successful organizations to create a competitive atmosphere and to provide the necessary resources to adopt a cloud computing platform (Singh and Mansotra, 2019).

1.8.5 Innovativeness

Broadly speaking, innovativeness is linked to the willingness to employ new approaches and the methods by which customers process information, make decisions and deal with issues (Kirton, 2003; Marcati et al., 2008). At the organization scale, an organization's receptivity to new ideas plays an important role in SMEs ' adoption of innovations (Marcati et al., 2008). Reviewing earlier studies indicates that a background of innovativeness increases the probability of further constructive decisions for new technological innovations within organizations (Marcati et al., 2008; Alshamaila, 2013).

1.8.6 Competitive Pressure

Competitive pressure refers to the levels of pressure and intensity faced by companies from their rivals in the same sector, emphasizing its significance as a strong motivation and adoption factor (Laforet, 2011). This applies to the company's competition with market competitors (Low et al., 2011; Oliveira and Martins, 2010; Zhu et al., 2003). Companies will benefit greatly from higher operational efficiencies and lower costs by cloud adoption that will bring higher revenues to companies. Furthermore, cloud computing technology would be embraced by many organizations to enable more accurate data collection and a clear picture of customer awareness and further develop new products and services (Low et al., 2011; Gutierrez et al., 2015; Oliveira et al., 2014).

1.8.7 Regulatory Support

Regulatory support relates to the support provided by a country's regulatory authority to encourage companies to assimilate IT innovation (Zhu et al., 2006b; Oliveira et al., 2014). In adopting new technologies, the effect of current laws and regulations may be crucial. Adopting cloud computing by organizations can be facilitated or restricted by government regulations. For instance, policymakers in the EU member states and the United States have strict requirements to safeguard institutional records. If a government obliges organizations to follow cloud-specific standards and guidelines, organizations will be more interested to adopt cloud computing.

1.8.8 Intention to Adopt Cloud Computing

The organizations' intention to adopt cloud computing can be described as an innovation or IT resource that is received as a practice, idea or object and found as new by a group of people or an individual (Rogers, 2003). Although it seems to be quite a simple definition, the overall innovation diffusion paradigm is extensive and covers

theories that address both the actual innovation dimension and adopter of the innovation (Wu and Chiu, 2015; Agag and El-Masry, 2016; Andergassen et al., 2017). Many scholars highlighted the importance of local, organizational and individual cultural traditions and practices in the intention to adopt an innovation (Sabi et al., 2017).

1.8.9 Actual Usage of Cloud Computing

Usage intentions as predicted in TAM and empirically verified in other researches employing TAM (Sabi et al., 2016) should function as predictors for the actual usage of cloud computing in companies that do not use cloud computing. As this study plans to collect data at the same period of time, previous usage trends, attitudes and beliefs, and the behavioral intention to use or continue to use cloud computing would provide a basis for the actual usage of cloud computing (Bhatiasevi and Naglis, 2016). Cloud computing behavioral intentions would be assessed concurrently with new technology beliefs and attitudes. Earlier researches also indicated that behavioral intention to use a system offers sensible measures of potential actual usage of the system (Shyu and Huang, 2011; Sabi et al., 2016).

1.9 Organization of the Thesis

This research is presented in five chapters. This first chapter provides overall information and motivation for the research in the area of cloud computing adoption and the SMEs' adoption of cloud computing. The rest of the thesis is organized as follows. Chapter two consists of an in-depth literature survey along with the definitions and conceptualizations of research variables and their dimensions, including cloud computing technology, organization's intention to adopt cloud computing, cloud computing attributes. This chapter also introduces the underlying theories underpin the study, namely the innovation diffusion theory (IDT), and the TOE framework. Chapter three includes the development of the theoretical framework and hypotheses that underpinned by the theories introduced in the literature. Chapter four provides a

comprehensive explanation about the research design and methodology encompasses the research paradigm and research approach, the variables measurement development, data collection tools and methods as well as sampling design, and finally introducing data analysis techniques that will be used in the research. The last chapter presents the initial findings that derive from the expert interviews and preliminary analysis.

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Appendix A Interview Findings

Company A

Company A is an American market research, analysis and advisory firm specializing in information technology, telecommunications, and consumer technology. Company A is headquartered in Framingham, Massachusetts, United States (U.S.) and consists of over 1,000 analysts, who provide consultancy in relation to technology related opportunities and trends for over 110 countries. With a strong team of industry analysts and consulting talent in Asia/Pacific complementing it's international research expertise, it is the leading provider of data-driven research and analysis in the region. They underpin their unrivaled global coverage with regional and local presence, knowledge, expertise and support in 14 countries throughout Asia/Pacific, delivering insightful analysis and credible forecasts to help organizations deliver sound business strategies. The first interviewee from Company A is a senior market analyst and his valuable viewpoints regarding the state of cloud computing adoption in Malaysia is presented in the below Table.

Interview with Respondent 1

Name	Company	Work Experience in IT Sector	Viewpoints
Respondent 1	Company A	9 years	a) We asked about 200 Bursa Malaysia listed companies what they though about having and outsource data center or cloud infrastructure and most, including a bank said that they would rather have their own infrastructure. b) They also have a fragmented understanding of the different cloud technologies, the benefits, risks and cost of ownership.

			c) A terrible lack of cloud knowledge according to industry feedback and some cloud service providers who are pushing cloud technology. d) Malaysian companies also have a strong 'wait and see' attitude.

Company B

Company B aspires to become premier global ICT Infrastructure solutions provider by providing world-class managed services. They draws its strength from innovative and integrated ICT infrastructure solutions which are based from proven and reliable technology, cost-effective, customer-driven and empowered by global best practices. They lives by its philosophy to be the trusted partner for its customer's business transformation while continuously striving towards organizational excellence. They has invested RM40 million in a Tier 4 friendly data center now duly completed in Bukit Jelutong, Shah Alam, Selangor and was launched on 28th, May 2008. This state-of-the-art data center facility is now available for current and future customers to ensure better governance of customer's data management. Combined with the fully redundant and high availability managed network infrastructure, they intends to provide a full breadth of ICT infrastructure solutions. The second interviewee is a Chief Executive Officer (CEO) and his beneficial viewpoints concerning the state of cloud computing adoption in Malaysia is presented in the below Table.

Interview with Respondent 2

Name	Company	Work Experience in IT Sector	Viewpoints
Respondent 2	Company B	14 years	a) There's much talk about implementing cloud in Malaysia but too many legacy applications are not cloud-ready. b) Malaysia is a growing economy that is relatively stable and developed. The government is starting to show positive signs in regards to encourage Cloud Computing. c) The challenge for Malaysia in becoming a desired hub for Cloud Computing is mainly related to networking; international connectivity, costs and broadband quality.

Company C

Company C is a multinational information technology equipment and services company. They chiefly makes computing products, but the company and its subsidiaries also offer a diversity of products and services in the areas of personal computing, telecommunications and advanced microelectronics. Its products and services are available in over 100 countries. The third interviewee is a Lead-Cloud Management Solutions at Company C. A brief overview of his helpful viewpoints concerning the state of cloud computing adoption in Malaysia is presented in the below Table.

Interview with Respondent 3

Name	Company	Work Experience in IT Sector	Viewpoints
Respondent 3	Company C	25 years	a) The main challenges that Malaysian organizations face while adopting cloud continue to be on the security and privacy concerns of business assets. b) We see the slow alignment of local industry compliance requirements with cloud computing deployment in the country; and lack of independent authoritative sources that businesses can turn to for help and advice on cloud related matters. c) Malaysia is the second largest cloud computing market in the Asean region, with major enterprises beginning to move their services to the cloud. However, cloud computing is still relatively new in this region and slowness in adopting cloud is attributed to the reasons/factors as discussed. d) Besides the government sectors, there are three other major sectors in Malaysia that have shown increasing interest on cloud solutions, namely manufacturing/hi-tech industrial,

			healthcare and retail, and small and medium enterprises (SMEs).

Company D

Company D is a global solutions provider with core expertise in digital identity, business, farming and environmental solutions. They introduced the Autopot system, an innovative farming solutions and environmental friendly fertigation system designed to supply water and nutrient to the exact needs of a plant. Moreover, their environmental solutions were launched with the introduction of a green gas-powered waste disposal system capable of environmental-friendly incineration of solid and liquid waste. The fourth interviewee is a Divisional Marketing Executive at Company D. A brief overview of his useful viewpoints concerning the state of cloud computing adoption in Malaysia is presented in the below Table.

Interview with Respondent 4

Name	Company	Work Experience in IT Sector	Viewpoints
Respondent 4	Company D	5 years	a) Cloud computing is becoming an integral part of organizational IT strategy in the Malaysian market. b) Malaysian enterprises are looking for low and flexible price points with high security and privacy guarantees from service providers before making the jump to a cloud model. c) Enterprises have also expressed their concerns about security, privacy and sovereignty of data,

Company E

Company E is a global growth consulting firm which provides market research and analysis, growth strategy consulting, and corporate training services across multiple industries including automotive, healthcare, internet and communication technology, and more. Its headquarters are located in Mountain View, California, with offices in over 40 countries. They enables clients to accelerate growth and achieve best-in-class positions in growth, innovation and leadership. The company's Growth Partnership Service provides the CEO and the CEO's Growth Team with disciplined research and best-practice models to drive the generation, evaluation, and implementation of powerful growth strategies. They leverage 50 years of experience in partnering with Global 1000 companies, emerging businesses and the investment community from over 40 offices on six continents. The fifth interviewee is a industry manager for Data Centre and Cloud Computing Practice at Company E. A brief overview of his invaluable viewpoints regarding the state of cloud computing adoption in Malaysia is presented in the below Table.

Interview with Respondent 5

Name	Company	Work Experience in IT Sector	Viewpoints
Respondent 5	Company E	10 years	a) About 68% of enterprises have experienced or expect cost savings through the adoption of Cloud services. b) Malaysia maintained its position in the middle tier of the cloud readiness Index. While it made progress in some areas, such as its nationwide Cloud On-boarding Program for SMEs, it ranked well behind the leaders in broadband and international connectivity, despite achieving the targeted penetration rate set in the National Broadband Initiative

			and extending regional connectivity with new cables to Indonesia and Japan. c) Recommendation: Malaysia's priorities should be in IP protection and data center risk, both areas where it scored poorly. It also needs to introduce the Personal Data Protection Act 2010, which has not yet been brought into force.

Summary

These findings have important implications and great value to the research community, managers and ICT providers, in terms of formulating better strategies for cloud computing adoption. For service providers, using the research model in this study can assist in increasing their understanding of why some SMEs choose to adopt cloud computing services, while seemingly similar ones facing similar market conditions do not. On the other hand, however, cloud computing providers may need to improve their interaction with SMEs who are involved in the cloud computing experience, in an effort to create a healthy environment for cloud computing adoption, and to remove any vagueness surrounding this type of technology. Providers may need to clarify their position and stance when it comes to offering in-house services vs cloud services, which in turn can affect clients' confidence.

To sum up, based on the literature and the interviews, most of the companies in Malaysia have a fragmented understanding of the cloud computing services and the lack of cloud knowledge has limited their migration to the cloud. Additionally, they have a strong wait and see attitude toward cloud computing adoption. Too many legacy applications are not cloud ready in Malaysia while there is considerable enthusiasm for adopting the cloud computing. Moreover, security and privacy concerns are the main challenges of cloud computing adoption that Malaysian organization face today same as all other organizations all over the world. On the other hand, Malaysia is the second largest cloud computing market in the ASEAN region and cloud computing is

becoming an integral part of organizational IT strategy in the Malaysian market. Besides the government sectors, there are three other major sectors in Malaysia that have shown increasing interest on cloud solutions, namely manufacturing/hi-tech industrial, healthcare and retail, and SMEs. In addition, Malaysian enterprises are looking for low and flexible price points with high security and privacy guarantees from service providers before migrating to the cloud. consequently, the apparent lack of a clear and concise guideline is identified as the main obstacle for adopting cloud computing in organizations. This study intends to shed light on this problem by specifying the most significant determinants of cloud computing adoption and exploring their difference impacts in Malaysian SMEs. The results of this study can help the IT managers and decision makers in the organization to efficiently monitor the current situation of their organization and make a conscious decisions in migrating to the cloud computing.

Appendix B COPY OF THE QUESTIONNAIRE

Advanced Informatics School, Level 5, Menara Razak, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra (Jalan Semarak), 54100 Kuala Lumpur, Malaysia

INSTRUCTIONS:
1. Please write your response in the tables.
2. Please tick your response in the box provided
3. Please write your response when additional information is required.
4. For any question, please contact to the following number or send an email.

Tel: +60-149314043
Email: aarash5@live.utm.my

YOUR COOPERATION IS HIGHLY APPRECIATED.

ALL INFORMATION GIVEN IS CONFIDENTIAL.

THANK YOU.

Purposes:

In comparison to large companies and today's global trend, small enterprises have faced high rates of discontinuance. Finding the reason behind this discontinuance of small businesses is a significant matter in their economic contributions. A resource-based perspective of emerging entrepreneurs showed that technical knowledge and financial resources were principal elements in small business discontinuance. However, the literature presented a gap in knowledge regarding the innovation of cloud computing and the adoption of small enterprises for their economic sustainability. Cloud computing is recognized as an emerging paradigm in today's business environment. Nevertheless, it is not completely new technology, it is widespread due to the fast development of the internet, mobile phones, higher bandwidth, and increasing mobility requirements of the clients. In spite of the fact that the adoption of cloud computing technology is proliferating in large companies, SMEs still reluctant to employ cloud computing technology due to the lack of knowledge and a clear guideline in this area. This study intends to address the SMEs' problem of adopting cloud computing technology and highlight the considerable potential of cloud computing for SMEs in today's competitive market. In this regard, various dimensions of this technology are emphasized and the serious challenges that are hindering the adoption of cloud computing in SMEs are highlighted in this research. Despite the existing concerns in adopting cloud computing in SMEs, its commercial viability, and the easy pay-as-you-go cost system, especially in the existing economic complexities are discussed in detail. To evaluate the determinants of cloud computing adoption in SMEs, a research model is developed according to the technology-organization-environment (TOE) framework, diffusion of innovation (DOI) theory and technology of acceptance model (TAM). Malaysian SMEs are selected to examine the identified hypotheses. Finally, the proposed framework and hypotheses are evaluated and analyzed through a comprehensive survey.

Note: All respondents will be informed of the final results and further analyses through email.

Part A:
Respond to each of the questions by selecting one of the answer choices numbered from 1 through 5. A score of 1 indicates that you "Strongly Disagree" whereas a score of 5 indicates that you "Strongly Agree"

(1) Strongly Disagree	(2) Disagree	(3) Undecided	(4) Agree	(5) Strongly Agree

Technology Context:

Data Security – (Al-Somali et al., 2009; Pikkarainen et al., 2004**)**

No		(1)	(2)	(3)	(4)	(5)
1	Data stored on cloud computing is secure.					
2	Data would be adequately protected through cloud computing systems.					
3	Cloud computing providers have stronger security systems.					

Technology Readiness – (Oliveira et al., 2014; Low et al., 2011; Aboelmaged, 2014**)**

No		(1)	(2)	(3)	(4)	(5)
1	The percentage of employees who have internet access is high.					
2	The company knows how IT can be used to support operations.					
3	Within the company there are the necessary skills to implement cloud computing.					

Cost Savings – (Sangle, 2010; Thiesse et al., 2011; Oliveira et al., 2014**)**

No		(1)	(2)	(3)	(4)	(5)
1	The benefits of cloud computing are greater than the costs of this adoption.					
2	With cloud computing there is a reduction of energy costs and environmental costs.					
3	Maintenance costs of cloud computing are very low.					

Organizational Context:

Top Management Support – (Gutierrez et al., 2015; Oliveira et al., 2014; Alshamaila et al., 2013; Low et al., 2011**)**

No		**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
1	The company's management supports the implementation of cloud computing.					
2	The company's top management provides strong leadership and engages in the process when it comes to the adoption of cloud computing.					
3	The company's management is willing to take risk (financial and organizational) involved in the adoption of cloud computing.					

Organizational Innovativeness - (Wang and Ahmed, 2004)

No		**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
1	We are constantly improving our business processes.					
2	In new product and service introductions, our company is often first-to market.					
3	Our new products and services are often perceived very novel by customers.					
4	Our recent new products and services are only of minor changes from our previous products and services.					
5	In comparison with our competitors, our company has introduced more innovative products and services during the past five years.					

Environmental Context:

Competitive Pressure - (Oliveira et al., 2014; Ifinedo, 2011; Oliveira and Martins, 2010a, 2010b)

No		**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
1	Cloud computing has an influence on competition in our industry.					
2	Our company is under pressure from competitors to adopt cloud computing.					
3	Some of our competitors have already started using cloud computing.					

Regulatory Support - (Oliveira et al., 2014; Alam et al., 2011; Zhu and Kraemer, 2005)

No		**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
1	There is legal protection in the use of cloud computing.					
2	The laws and regulations that exist nowadays are sufficient to protect the use of cloud computing.					

Intention to adopt cloud computing - (Sabi et al., 2017; Sabi et al. 2016)

No		**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
1	My company intend to use cloud computing.					
2	My company consider using cloud computing for computing needs.					
3	My company intend to recommend adoption of cloud computing.					

Actual usage of cloud computing - (Sabi et al., 2017; Sabi et al. 2016)

No		**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
1	My company using cloud computing for our work.					
2	My company continue using cloud computing.					
3	My company has no difficulty recommending use of cloud computing.					

Part B: General Information

I would be most grateful if you would kindly fill in the following personal details that will help with future communication and the analysis of the survey results. Please at least fill in these *** (Questions number 6, 7, 8). Neither you nor your organization will be identified subsequently.

1. Gender
   Male ☐ Female ☐

2. Education
   Diploma ☐ Bachelor Degree ☐ Master Degree ☐ Others ☐

3. Ethnicity
   Asian ☐ Black ☐ Caucasian ☐ Hispanic ☐ Other ☐

4. Job title
   Manager ☐ Cloud Developer ☐ IT Professional ☐ Other ☐

5. Years in current position
   0-2 ☐ 3-5 ☐ 6-10 ☐11-15 ☐ 16-20 ☐ >21 ☐

6. Industry type:

Computer/IT/Communications ☐	Engineering/Construction☐
Banking/Finance/Insurance ☐	Retail/Trading/Wholesale ☐
Healthcare/Hospitality ☐	Education/Training ☐
Manufacturing/Logistics ☐	Government Agency ☐
Others ☐	

7. Years of organization experience with cloud technology if applicable

<3 ☐ 3-5 ☐ 6-10 ☐11-15 ☐ 16-20 ☐ 21-25☐ >25 ☐

8. The total number of employees in your organization: (Please tick (/))

[ ] Less than 50
[ ] 50 – 90
[ ] 90 – 130
[ ] 130 – 170
[ ] 170 – 200

9. Your current organization's sales / turnover (Based on Million Ringgits): (Please tick **(/))**

[ ] Less than 10
[ ] 10 – 20
[ ] 20 – 30
[ ] 30 – 40
[ ] 40 – 50

10. Name and address of your organization:
_____

_____

11. Your organization's telephone number:
_____

12. Your name: (in capital letters, please):
_____

13. Your department:
_____

14. Your position: _____

15. Your telephone number:
_____

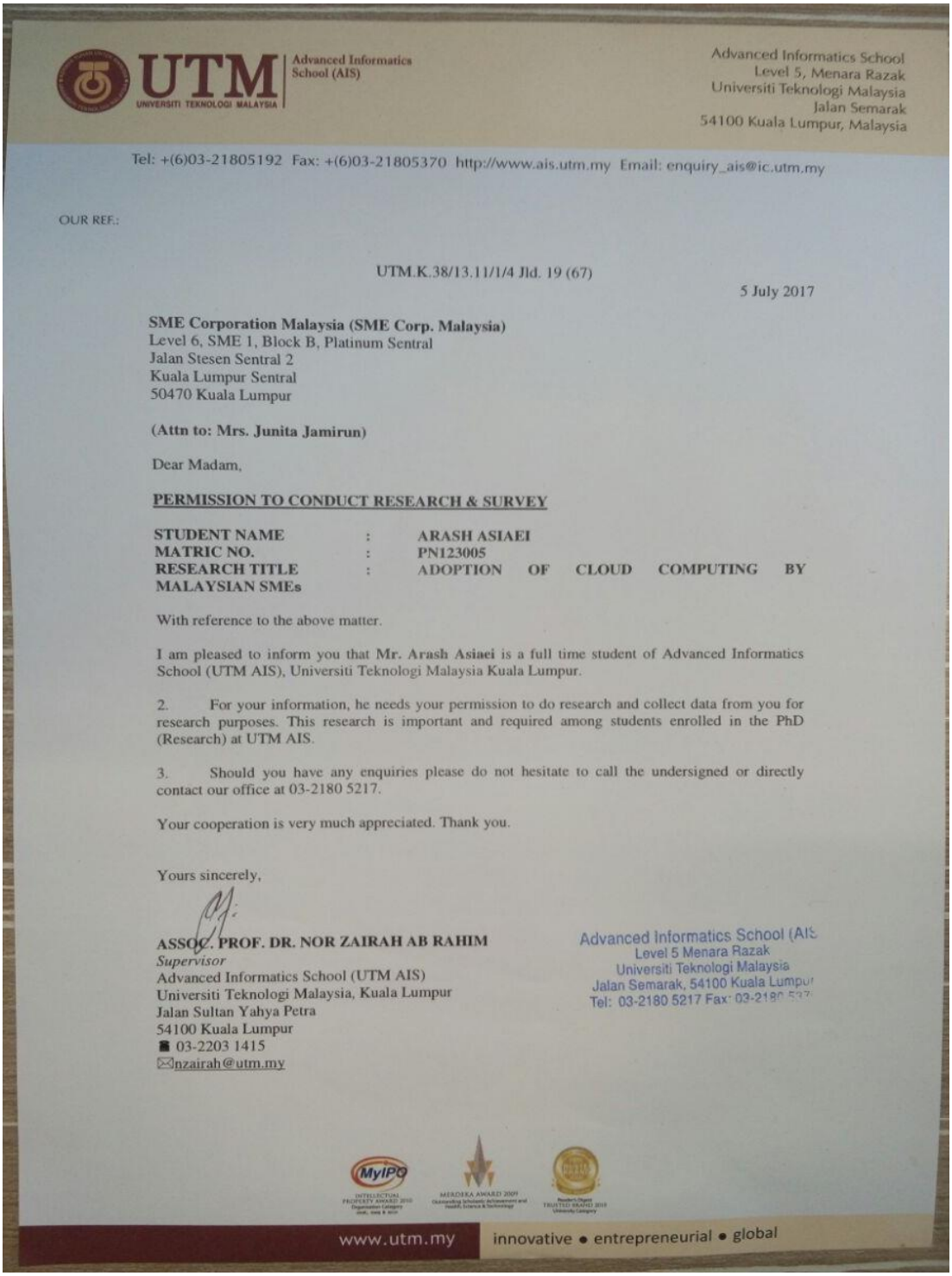
16. Your e-mail address:
_____

17. Would you like to have a copy of the findings of the study? (Please tick (/))
[ ] Yes [ ] No

18. Do you have any comments on this questionnaire? If yes, please specify in the space provided. Your opinion is very important to me.

Thank you very much for your participation in this survey

Appendix C Permission letter for data collection



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OUR REF.:

UTM.K.38/13.11/1/4 Jld. 19 (67)

5 July 2017

SME Corporation Malaysia (SME Corp. Malaysia)
Level 6, SME 1, Block B, Platinum Sentral
Jalan Stesen Sentral 2
Kuala Lumpur Sentral
50470 Kuala Lumpur

(Attn to: Mrs. Junita Jamirun)

Dear Madam,

PERMISSION TO CONDUCT RESEARCH & SURVEY

STUDENT NAME	:	**ARASH ASIAEI**
MATRIC NO.	:	**PN123005**
RESEARCH TITLE	:	**ADOPTION OF CLOUD COMPUTING BY MALAYSIAN SMEs**

With reference to the above matter.

I am pleased to inform you that **Mr. Arash Asiaei** is a full time student of Advanced Informatics School (UTM AIS), Universiti Teknologi Malaysia Kuala Lumpur.

2. For your information, he needs your permission to do research and collect data from you for research purposes. This research is important and required among students enrolled in the PhD (Research) at UTM AIS.

3. Should you have any enquiries please do not hesitate to call the undersigned or directly contact our office at 03-2180 5217.

Your cooperation is very much appreciated. Thank you.

Yours sincerely,

ASSOC. PROF. DR. NOR ZAIRAH AB RAHIM
Supervisor
Advanced Informatics School (UTM AIS)
Universiti Teknologi Malaysia, Kuala Lumpur
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Appendix D Final Results

Path Coefficients

	AUCC	Age	CP	CS	DS	IACC	INN	Location	RS	TMS	TR	Type
AUCC												
Age						0.021						
CP	0.082					0.207						
CS	0.175					-0.027						
DS	0.034					0.167						
IACC	0.368											
INN	0.041					-0.005						
Location						-0.025						
RS	0.093					0.017						
TMS	0.231					0.324						
TR	0.060					0.248						
Type						-0.128						

Indirect Effects

Total Indirect Effects

	AUCC	Age	CP	CS	DS	IACC	INN	Location	RS	TMS	TR	Type
AUCC	-											
Age	0.008											
CP	0.076											
CS	-0.010											
DS	0.062											
IACC	-											
INN	-0.002											
Location	-0.009											
RS	0.006											
TMS	0.119											
TR	0.091											
Type	-0.047											

Total Effects

	AUCC	Age	CP	CS	DS	IACC	INN	Location	RS	TMS	TR	Type
AUCC												
Age	0.008					0.021						
CP	0.158					0.207						
CS	0.165					-0.027						
DS	0.095					0.167						
IACC	0.368											
INN	0.039					-0.005						
Location	-0.009					-0.025						
RS	0.099					0.017						
TMS	0.351					0.324						
TR	0.151					0.248						
Type	-0.047					-0.128						

Outer Loadings

	AUCC	Age	CP	CS	DS	IACC	INN	Location	RS	TMS	TR	Type
ADP1						0.786						
ADP2						0.879						
ADP3						0.844						
Age		1.000										
CP1			0.873									
CP3			0.747									
CS1				0.948								
CS2				0.931								
DS1					0.872							
DS2					0.872							
DS3					0.644							
IN1							0.857					
IN2							0.775					
IN3							0.802					
IN4							0.867					
IN5							0.861					
Location								1.000				
RS1									0.839			
RS2									0.836			
TR1											0.853	
TR2											0.913	
TR3											0.861	
TS1										0.908		
TS2										0.944		

TS3										0.942		
Type												1.000
USG1	0.789											
USG2	0.857											
USG3	0.864											

Outer Weights

	AUCC	**Age**	**CP**	**CS**	**DS**	**IACC**	**INN**	**Location**	**RS**	**TMS**	**TR**	**Type**
ADP1						0.388						
ADP2						0.426						
ADP3						0.379						
Age		1.000										
CP1			0.704									
CP3			0.516									
CS1				0.569								
CS2				0.495								
DS1					0.403							
DS2					0.430							
DS3					0.426							
IN1							0.244					
IN2							0.235					
IN3							0.195					
IN4							0.270					
IN5							0.254					
Location								1.000				
RS1									0.600			
RS2									0.595			
TR1											0.387	
TR2											0.358	
TR3											0.398	
TS1										0.367		
TS2										0.345		
TS3										0.363		
Type												1.000
USG1	0.025											
USG2	0.567											
USG3	0.572											

Latent Variable Correlations

	AUCC	Age	CP	CS	DS	IACC	INN	Location	RS	TMS	TR	Type
AUCC	1.000	-0.044	0.518	0.438	0.495	0.699	0.491	0.021	0.506	0.619	0.512	-0.058
Age	-0.044	1.000	-0.123	-0.119	0.082	-0.044	-0.076	-0.052	0.029	-0.032	-0.132	0.120
CP	0.518	-0.123	1.000	0.372	0.467	0.496	0.367	0.041	0.483	0.392	0.366	-0.006
CS	0.438	-0.119	0.372	1.000	0.338	0.290	0.433	0.035	0.233	0.205	0.470	-0.016
DS	0.495	0.082	0.467	0.338	1.000	0.485	0.496	-0.003	0.425	0.444	0.372	0.089
IACC	0.699	-0.044	0.496	0.290	0.485	1.000	0.445	0.004	0.431	0.580	0.502	-0.151
INN	0.491	-0.076	0.367	0.433	0.496	0.445	1.000	-0.075	0.294	0.416	0.666	0.012
Location	0.021	-0.052	0.041	0.035	-0.003	0.004	-0.075	1.000	0.076	0.038	0.033	-0.004
RS	0.506	0.029	0.483	0.233	0.425	0.431	0.294	0.076	1.000	0.558	0.305	0.034
TMS	0.619	-0.032	0.392	0.205	0.444	0.580	0.416	0.038	0.558	1.000	0.373	-0.064
TR	0.512	-0.132	0.366	0.470	0.372	0.502	0.666	0.033	0.305	0.373	1.000	-0.076
Type	-0.058	0.120	-0.006	-0.016	0.089	-0.151	0.012	-0.004	0.034	-0.064	-0.076	1.000

Latent Variable Covariances

	AUCC	Age	CP	CS	DS	IACC	INN	Location	RS	TMS	TR	Type
AUCC	1.000	-0.044	0.518	0.438	0.495	0.699	0.491	0.021	0.506	0.619	0.512	-0.058
Age	-0.044	1.000	-0.123	-0.119	0.082	-0.044	-0.076	-0.052	0.029	-0.032	-0.132	0.120
CP	0.518	-0.123	1.000	0.372	0.467	0.496	0.367	0.041	0.483	0.392	0.366	-0.006
CS	0.438	-0.119	0.372	1.000	0.338	0.290	0.433	0.035	0.233	0.205	0.470	-0.016
DS	0.495	0.082	0.467	0.338	1.000	0.485	0.496	-0.003	0.425	0.444	0.372	0.089
IACC	0.699	-0.044	0.496	0.290	0.485	1.000	0.445	0.004	0.431	0.580	0.502	-0.151
INN	0.491	-0.076	0.367	0.433	0.496	0.445	1.000	-0.075	0.294	0.416	0.666	0.012
Location	0.021	-0.052	0.041	0.035	-0.003	0.004	-0.075	1.000	0.076	0.038	0.033	-0.004
RS	0.506	0.029	0.483	0.233	0.425	0.431	0.294	0.076	1.000	0.558	0.305	0.034
TMS	0.619	-0.032	0.392	0.205	0.444	0.580	0.416	0.038	0.558	1.000	0.373	-0.064
TR	0.512	-0.132	0.366	0.470	0.372	0.502	0.666	0.033	0.305	0.373	1.000	-0.076
Type	-0.058	0.120	-0.006	-0.016	0.089	-0.151	0.012	-0.004	0.034	-0.064	-0.076	1.000

Quality Criteria

R Square

	R Square	R Square Adjusted
AUCC	0.634	0.619
IACC	0.512	0.486

f Square

	AUCC	Age	CP	CS	DS	IACC	INN	Location	RS	TMS	TR	Type
AUCC	-					-						
Age	-					**0.001**						
CP	**0.011**					**0.054**						
CS	**0.059**					**0.001**						
DS	**0.002**					**0.033**						
IACC	**0.187**					-						
INN	**0.002**					**0.000**						
Location	-					**0.001**						
RS	**0.014**					**0.000**						
TMS	**0.076**					**0.126**						
TR	**0.005**					**0.061**						
Type	-					**0.032**						

Construct Reliability and Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
AUCC	0.823	0.700	0.875	0.701
Age	1.000	1.000	1.000	1.000
CP	0.493	0.523	0.794	0.660
CS	0.868	0.880	0.938	0.883
DS	0.711	0.709	0.843	0.645
IACC	0.785	0.790	0.875	0.701
INN	0.889	0.896	0.919	0.694
Location	1.000	1.000	1.000	1.000
RS	0.573	0.573	0.824	0.701
TMS	0.923	0.924	0.952	0.867
TR	0.848	0.849	0.908	0.768
Type	1.000	1.000	1.000	1.000

Discriminant Validity

Fornell-Larcker Criterion

	AUCC	Age	CP	CS	DS	IACC	INN	Location	RS	TMS	TR	Type
AUCC	0.837											
Age	-0.044	1.000										
CP	0.518	-0.123	0.812									
CS	0.438	-0.119	0.372	0.940								
DS	0.495	0.082	0.467	0.338	0.803							
IACC	0.699	-0.044	0.496	0.290	0.485	0.837						
INN	0.491	-0.076	0.367	0.433	0.496	0.445	0.833					
Location	0.021	-0.052	0.041	0.035	-0.003	0.004	-0.075	1.000				
RS	0.506	0.029	0.483	0.233	0.425	0.431	0.294	0.076	0.837			
TMS	0.619	-0.032	0.392	0.205	0.444	0.580	0.416	0.038	0.558	0.931		
TR	0.512	-0.132	0.366	0.470	0.372	0.502	0.666	0.033	0.305	0.373	0.876	
Type	-0.058	0.120	-0.006	-0.016	0.089	-0.151	0.012	-0.004	0.034	-0.064	-0.076	1.000

Cross Loadings

	AUCC	Age	CP	CS	DS	IACC	INN	Location	RS	TMS	TR	Type
ADP1	0.540	0.052	0.457	0.276	0.511	0.786	0.514	-0.020	0.349	0.399	0.490	-0.075
ADP2	0.658	-0.043	0.357	0.279	0.390	0.879	0.332	-0.022	0.364	0.539	0.437	-0.128
ADP3	0.550	-0.121	0.439	0.167	0.319	0.844	0.275	0.055	0.370	0.516	0.329	-0.176
Age	-0.044	1.000	-0.123	-0.119	0.082	-0.044	-0.076	-0.052	0.029	-0.032	-0.132	0.120
CP1	0.457	-0.081	0.873	0.278	0.419	0.481	0.346	0.067	0.476	0.385	0.354	-0.005
CP3	0.380	-0.128	0.747	0.342	0.333	0.306	0.240	-0.013	0.286	0.233	0.227	-0.006
CS1	0.443	-0.095	0.310	0.948	0.322	0.283	0.456	0.017	0.191	0.147	0.463	0.005
CS2	0.376	-0.132	0.396	0.931	0.313	0.260	0.351	0.051	0.251	0.246	0.419	-0.038
DS1	0.373	0.074	0.393	0.313	0.872	0.374	0.440	-0.036	0.334	0.265	0.274	0.080
DS2	0.413	0.090	0.353	0.256	0.872	0.384	0.455	0.040	0.425	0.332	0.344	0.102
DS3	0.392	0.031	0.368	0.238	0.644	0.399	0.291	-0.013	0.254	0.457	0.266	0.030
IN1	0.394	-0.085	0.330	0.320	0.346	0.394	0.857	-0.044	0.241	0.319	0.591	0.003
IN2	0.399	-0.026	0.309	0.396	0.428	0.360	0.775	-0.026	0.286	0.371	0.425	0.004
IN3	0.325	-0.032	0.291	0.291	0.347	0.305	0.802	-0.075	0.252	0.415	0.471	0.055
IN4	0.469	-0.093	0.367	0.419	0.500	0.401	0.867	-0.080	0.198	0.311	0.631	-0.021
IN5	0.438	-0.071	0.229	0.362	0.429	0.382	0.861	-0.085	0.256	0.340	0.630	0.022
Location	0.021	-0.052	0.041	0.035	-0.003	0.004	-0.075	1.000	0.076	0.038	0.033	-0.004
RS1	0.419	0.062	0.369	0.225	0.377	0.370	0.340	0.049	0.839	0.480	0.231	0.032
RS2	0.429	-0.013	0.440	0.165	0.335	0.351	0.151	0.078	0.836	0.455	0.281	0.025
TR1	0.474	-0.128	0.331	0.380	0.419	0.424	0.674	-0.006	0.306	0.326	0.853	-0.033
TR2	0.418	-0.123	0.304	0.369	0.290	0.413	0.561	-0.007	0.209	0.335	0.913	-0.105
TR3	0.449	-0.096	0.325	0.480	0.266	0.476	0.514	0.095	0.281	0.319	0.861	-0.064
TS1	0.586	-0.056	0.327	0.197	0.386	0.556	0.323	0.040	0.466	0.908	0.365	-0.101
TS2	0.555	-0.007	0.350	0.175	0.375	0.520	0.394	0.020	0.511	0.944	0.323	-0.037
TS3	0.587	-0.024	0.417	0.200	0.478	0.543	0.445	0.044	0.583	0.942	0.354	-0.039
Type	-0.058	0.120	-0.006	-0.016	0.089	-0.151	0.012	-0.004	0.034	-0.064	-0.076	1.000

USG1	0.789	-0.005	0.409	0.397	0.408	0.606	0.419	0.019	0.313	0.371	0.474	-0.014
USG2	0.857	-0.024	0.443	0.393	0.552	0.562	0.429	0.034	0.446	0.559	0.403	-0.068
USG3	0.864	-0.053	0.449	0.359	0.300	0.638	0.415	0.002	0.429	0.512	0.474	-0.033

Heterotrait-Monotrait Ratio (HTMT)

	AUCC	Age	CP	CS	DS	IACC	INN	Location	RS	TMS	TR	Type
AUCC												
Age	0.035											
CP	0.783	0.182										
CS	0.523	0.130	0.587									
DS	0.637	0.097	0.779	0.430								
IACC	0.868	0.097	0.780	0.348	0.649							
INN	0.566	0.078	0.542	0.485	0.619	0.531						
Location	0.024	0.052	0.070	0.039	0.044	0.044	0.079					
RS	0.672	0.059	0.881	0.334	0.664	0.643	0.414	0.100				
TMS	0.641	0.033	0.562	0.233	0.544	0.679	0.465	0.039	0.767			
TR	0.626	0.143	0.550	0.543	0.476	0.611	0.759	0.045	0.435	0.421		
Type	0.049	0.120	0.009	0.025	0.105	0.171	0.027	0.004	0.045	0.066	0.083	

Heterotrait-Monotrait Ratio (HTMT)

Confidence Intervals

	Original Sample (O)	Sample Mean (M)	5.00%	95.00%
Age -> AUCC	0.035	0.08	0.026	0.164
CP -> AUCC	0.783	0.826	0.599	1.137
CP -> Age	0.182	0.199	0.063	0.353
CS -> AUCC	0.523	0.523	0.399	0.637
CS -> Age	0.13	0.135	0.031	0.255
CS -> CP	0.587	0.627	0.379	0.948
DS -> AUCC	0.637	0.638	0.525	0.746
DS -> Age	0.097	0.12	0.034	0.235
DS -> CP	0.779	0.833	0.532	1.218
DS -> CS	0.43	0.431	0.289	0.567
IACC -> AUCC	0.868	0.869	0.808	0.928
IACC -> Age	0.097	0.117	0.051	0.201
IACC -> CP	0.78	0.82	0.611	1.123
IACC -> CS	0.348	0.35	0.218	0.485
IACC -> DS	0.649	0.65	0.546	0.751
INN -> AUCC	0.566	0.567	0.438	0.687
INN -> Age	0.078	0.101	0.037	0.195
INN -> CP	0.542	0.573	0.393	0.791
INN -> CS	0.485	0.483	0.374	0.585
INN -> DS	0.619	0.619	0.522	0.713
INN -> IACC	0.531	0.535	0.418	0.643

Location -> AUCC	0.024	0.077	0.023	0.16
Location -> Age	0.052	0.07	0.005	0.169
Location -> CP	0.07	0.128	0.033	0.265
Location -> CS	0.039	0.074	0.015	0.166
Location -> DS	0.044	0.093	0.037	0.173
Location -> IACC	0.044	0.083	0.029	0.156
Location -> INN	0.079	0.1	0.035	0.201
RS -> AUCC	0.672	0.678	0.531	0.82
RS -> Age	0.059	0.103	0.027	0.204
RS -> CP	0.881	0.952	0.579	1.441
RS -> CS	0.334	0.34	0.197	0.482
RS -> DS	0.664	0.671	0.541	0.8
RS -> IACC	0.643	0.649	0.5	0.803
RS -> INN	0.414	0.428	0.276	0.589
RS -> Location	0.1	0.124	0.03	0.245
TMS -> AUCC	0.641	0.641	0.541	0.729
TMS -> Age	0.033	0.073	0.019	0.163
TMS -> CP	0.562	0.592	0.379	0.861
TMS -> CS	0.233	0.233	0.101	0.36
TMS -> DS	0.544	0.543	0.428	0.651
TMS -> IACC	0.679	0.679	0.594	0.757
TMS -> INN	0.465	0.466	0.356	0.57
TMS -> Location	0.039	0.072	0.018	0.165
TMS -> RS	0.767	0.774	0.636	0.929
TR -> AUCC	0.626	0.627	0.504	0.742
TR -> Age	0.143	0.147	0.043	0.264
TR -> CP	0.55	0.579	0.401	0.792
TR -> CS	0.543	0.544	0.43	0.651
TR -> DS	0.476	0.477	0.346	0.599
TR -> IACC	0.611	0.611	0.517	0.695
TR -> INN	0.759	0.759	0.683	0.826
TR -> Location	0.045	0.089	0.036	0.168
TR -> RS	0.435	0.446	0.302	0.59
TR -> TMS	0.421	0.421	0.302	0.535
Type -> AUCC	0.049	0.087	0.027	0.18
Type -> Age	0.12	0.124	0.02	0.236
Type -> CP	0.009	0.104	0.024	0.215
Type -> CS	0.025	0.071	0.016	0.159
Type -> DS	0.105	0.128	0.036	0.244
Type -> IACC	0.171	0.178	0.066	0.301
Type -> INN	0.027	0.079	0.032	0.151
Type -> Location	0.004	0.056	0.004	0.139
Type -> RS	0.045	0.096	0.022	0.203
Type -> TMS	0.066	0.089	0.026	0.186
Type -> TR	0.083	0.103	0.032	0.21

Heterotrait-Monotrait Ratio (HTMT)

Confidence Intervals Bias Corrected

	Original Sample (O)	Sample Mean (M)	Bias	5.00 %	95.00 %
Age -> AUCC	0.035	0.08	0.045	0.002	0.046
CP -> AUCC	0.783	0.826	0.043	0.583	1.087
CP -> Age	0.182	0.199	0.017	0.049	0.325
CS -> AUCC	0.523	0.523	0	0.395	0.631
CS -> Age	0.13	0.135	0.006	0.029	0.251
CS -> CP	0.587	0.627	0.04	0.35	0.88
DS -> AUCC	0.637	0.638	0.001	0.52	0.741
DS -> Age	0.097	0.12	0.023	0.023	0.198
DS -> CP	0.779	0.833	0.054	0.494	1.124
DS -> CS	0.43	0.431	0.001	0.288	0.564
IACC -> AUCC	0.868	0.869	0.001	0.803	0.924
IACC -> Age	0.097	0.117	0.02	0.032	0.157
IACC -> CP	0.78	0.82	0.04	0.6	1.079
IACC -> CS	0.348	0.35	0.002	0.215	0.481
IACC -> DS	0.649	0.65	0.001	0.543	0.747
INN -> AUCC	0.566	0.567	0.001	0.432	0.685
INN -> Age	0.078	0.101	0.022	0.027	0.154
INN -> CP	0.542	0.573	0.031	0.367	0.741
INN -> CS	0.485	0.483	-0.001	0.374	0.584
INN -> DS	0.619	0.619	0	0.518	0.71
INN -> IACC	0.531	0.535	0.004	0.401	0.629
Location -> AUCC	0.024	0.077	0.053	0.003	0.024
Location -> Age	0.052	0.07	0.018	0.003	0.145
Location -> CP	0.07	0.128	0.058	0.004	0.125
Location -> CS	0.039	0.074	0.036	0.002	0.077
Location -> DS	0.044	0.093	0.049	0.004	0.051
Location -> IACC	0.044	0.083	0.039	0.004	0.061
Location -> INN	0.079	0.1	0.021	0.028	0.172
RS -> AUCC	0.672	0.678	0.006	0.516	0.802
RS -> Age	0.059	0.103	0.044	0.002	0.103
RS -> CP	0.881	0.952	0.071	0.527	1.327
RS -> CS	0.334	0.34	0.006	0.18	0.469
RS -> DS	0.664	0.671	0.007	0.52	0.784
RS -> IACC	0.643	0.649	0.005	0.496	0.797
RS -> INN	0.414	0.428	0.014	0.262	0.568
RS -> Location	0.1	0.124	0.023	0.018	0.21
TMS -> AUCC	0.641	0.641	0	0.538	0.725
TMS -> Age	0.033	0.073	0.04	0.005	0.053
TMS -> CP	0.562	0.592	0.03	0.363	0.832
TMS -> CS	0.233	0.233	0	0.097	0.356

TMS -> DS	0.544	0.543	-0.001	0.425	0.648
TMS -> IACC	0.679	0.679	-0.001	0.592	0.756
TMS -> INN	0.465	0.466	0.001	0.35	0.564
TMS -> Location	0.039	0.072	0.033	0.007	0.088
TMS -> RS	0.767	0.774	0.007	0.636	0.926
TR -> AUCC	0.626	0.627	0.001	0.495	0.735
TR -> Age	0.143	0.147	0.003	0.043	0.264
TR -> CP	0.55	0.579	0.029	0.373	0.741
TR -> CS	0.543	0.544	0.001	0.421	0.644
TR -> DS	0.476	0.477	0.001	0.338	0.591
TR -> IACC	0.611	0.611	0	0.512	0.691
TR -> INN	0.759	0.759	0	0.677	0.821
TR -> Location	0.045	0.089	0.045	0.008	0.054
TR -> RS	0.435	0.446	0.011	0.287	0.575
TR -> TMS	0.421	0.421	0	0.294	0.528
Type -> AUCC	0.049	0.087	0.038	0.005	0.082
Type -> Age	0.12	0.124	0.004	0.017	0.231
Type -> CP	0.009	0.104	0.095	0.001	0.001
Type -> CS	0.025	0.071	0.047	0.001	0.037
Type -> DS	0.105	0.128	0.023	0.024	0.208
Type -> IACC	0.171	0.178	0.007	0.062	0.294
Type -> INN	0.027	0.079	0.052	0.008	0.02
Type -> Location	0.004	0.056	0.053	0	0.003
Type -> RS	0.045	0.096	0.051	0.001	0.078
Type -> TMS	0.066	0.089	0.022	0.017	0.153
Type -> TR	0.083	0.103	0.02	0.025	0.18

Collinearity Statistics (VIF)

Outer VIF Values

	VIF
ADP1	1.420
ADP2	1.979
ADP3	1.854
Age	1.000
CP1	1.120
CP3	1.120
CS1	2.430
CS2	2.430
DS1	3.188
DS2	3.170
DS3	1.082

IN1	2.488
IN2	1.948
IN3	2.178
IN4	2.760
IN5	2.687
Location	1.000
RS1	1.192
RS2	1.192
TR1	1.988
TR2	2.843
TR3	2.032
TS1	2.679
TS2	4.696
TS3	4.520
Type	1.000
USG1	2.868
USG2	1.472
USG3	2.555

Inner VIF Values

	AUCC	Age	CP	CS	DS	IACC	INN	Location	RS	TMS	TR	Type
AUCC												
Age						1.087						
CP	1.661					1.611						
CS	1.416					1.423						
DS	1.689					1.712						
IACC	1.980											
INN	2.148					2.200						
Location						1.031						
RS	1.690					1.717						
TMS	1.916					1.711						
TR	2.134					2.043						
Type						1.047						

Model_Fit

Fit Summary

	Saturated Model	Estimated Model
SRMR	0.073	0.073
d_ULS	2.314	2.317
d_G	1.315	1.316
Chi-Square	1,496.727	1,497.275
NFI	0.630	0.630

rms Theta

rms Theta	0.189

Base Data

Setting

Data file Settings	
Data file	Final Data [203 records]
Missing value marker	none
Data Setup Settings	
Algorithm to handle missing data	Mean Replacement
Weighting Vector	-
PLS Algorithm Settings	
Data metric	Mean 0, Var 1
Initial Weights	1.0
Max. number of iterations	300
Stop criterion	7
Use Lohmoeller settings?	No
Weighting scheme	Path
Construct Outer Weighting Mode Settings	
AUCC	Mode B
Age	Automatic
CP	Automatic
CS	Automatic
DS	Automatic
IACC	Automatic
INN	Automatic
Location	Automatic
RS	Automatic
TMS	Automatic
TR	Automatic
Type	Automatic

LIST OF PUBLICATIONS

- Asiaei A. and Ab Rahim, N. Z. (2019). A multifaceted framework for adoption of cloud computing in Malaysian SMEs, Journal of Science and Technology Policy Management. (SCOPUS-Indexed).

- Asiaei, A. and Ab Rahim, N. Z. (2018). The Adoption and Usage of Cloud Computing by Malaysian SMEs: A Multifaceted Framework. IEEE International Conference on Smart Computing and Electronic Enterprise 2018.

- Asiaei, A. and Ab Rahim, N. Z. (2016). Conceptualizing a Model for Cloud Computing Adoption by SMEs. PARIS 2016.