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Enhancing the competitive nature of Malaysian small and medium enterprises (SMEs) through the cloud computing

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Abstract

Despite of cloud computing attractiveness for enterprises, it has been demonstrated SMEs are lagging behind when it comes from movement of traditional system into an innovative IT platform such as cloud computing taxonomy. Thus, this research aims to evaluate to what extent cloud computing adoption can develop the competitive nature of the SMEs in Malaysia through implementing the Technology Acceptance Model. The results reveal that SMEs would deploy and recommend cloud computing into their organization due to the significant benefits of the cloud computing in term of security, cost, organisation needs and reliability of the cloud system.

Keywords: Cloud computing; technology acceptance model; small and medium enterprises; Malaysia.

1 Introduction

In the modern economy, information technology (IT) as a primary management tool affects the competitive nature of the many enterprises. The economic globalization becomes a reality through IT whilst, the innovation is a vital tool for surviving the firms in the intensive competitive market [1]. Companies need an appropriate IT platform that assists them to achieve the greater competencies and enhance the overall performance. The concept of the cloud computing as a convenient and on demand network has gained the attention of businesses [2].The cloud computing has transformed the shape of the IT industry. The cloud computing has increased the elasticity of the resources without paying the premium for large scale [3].It means enterprises with the largest volume tasks can achieve the desired results quickly without the large investment.

The cloud computing has a profound impact on the macroeconomic side which facilitates admission of the small and medium enterprises (SME) and employment job creation. For instance, in Australia, the cloud users generate more sales and works by 120% than usual performance in their three-month pipeline hence; they have a positive perspective on the Australian economy [4]. Malaysian SMEs include 99.2% of businesses with 56% of the workforces. Also, it generates 32% of the national GDP [5]. In Malaysia, SME is defined based on two major characteristics such as not more than 150 full-time employees and annual sales turnover of RM25 million [6].

Forrester Research predicted the cloud computing market as $159.3 billion by 2020 [7]. Likewise, Gartner added the financial services and manufacturing industry are the largest early adopters of the cloud computing [8]. SMEs in Singapore and Malaysia exhibit higher readiness to deploy the cloud services among the ASEAN countries followed by Indonesia, Thailand and Philippines [9]. Globalization, data explosion, social business, mobility and upgrading legacy systems are the major key factors of the cloud adoption in Malaysia. Nonetheless, the various studies have shown cloud adoption by the SMEs has not reached the expectation and compare to larger firms is growing slowly [10], [1], [11]. SME has less chance of being sent for training and on cloud- related services compare to the larger firms [12]. Likewise, SMEs are the lack of confidence and internal expertise in understanding the cloud computing, hence they are not willing to embrace a new system [13]. This study aim is to investigate to what extent adoption of the cloud computing can develop the competitive nature of Malaysian SMEs. From this perspective, this paper examines the possible motivational factors can facilitate the cloud adoption and evaluate the cloud computing acceptance through Technology Acceptance Model (TAM).

2 Cloud Computing

There are various definitions for cloud computing. It refers as on demand and scalable distribution of hardware and software as a service [14], [15], [16]. In October 2009, National Institute of Standards and Technology released the formal definition of cloud computing as a convenient enabler model and on demand network that can share the configurable computing resources such as servers, storage, application and network with minimum interaction and effort of service provider. Likewise, cloud computing has been seen from different perspective. For instance, it is defined as the core concept of web 2.0 where internet can be determined as a software pattern [17]. Cloud computing includes three deployment models such as public, private and hybrid [18]. The cloud service as pay-as-you- manner to the public refers to the public cloud which is available from a third party provider via internet. Likewise, the private cloud is managed inside the organization itself with more control over the cloud infrastructure [2]. The combination of public and private cloud refers to the hybrid clouds [19]. This model relies on information and application sensitivity, differentiation and enterprises criticality. In addition, Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) are three cloud computing development models [20]. SaaS refers to the model which vendors have control over the applications in term of capabilities, updates and maintenance. Then, users can access to the application via a thin client such as a web browser [21]. Furthermore, in PaaS service provider offers a platform that enterprise can access the application via internet. Hence, companies can get advantage of design application, enhancement and testing regardless

of cost and infrastructure handling difficulties such as administration tools and database. Moreover, IaaS provides raw computing resources such as storage, memory, CPU, disk space, and bandwidth based on the users' demand [22].

2.1 Cloud computing Benefits

2.1.1 Cost effectiveness

The traditional IT platform required huge amount of investment in hardware, software and hiring expert to maintain and upgrade the software and servers. Nevertheless, cloud services evolution reduces these expenses in a cost effective manner. The cloud services can assist SMEs to manage the security, archiving and sustainability of business in the long term [23]. Cloud computing provides the simple, easy to use, advanced and high powered application at minimum cost anywhere and anytime [24]. Likewise, it avoids huge capital expenses through higher utilization of physical resources and elimination of over-provision of resources. Hence, the operation cost can be reduced and higher efficiency achieved [2].

2.1.2 Needs for organisation

Cloud computing provides resources on users' demand which allows them to pay based on their usage. It enables SMEs to lease the infrastructure in the cloud environment as a pay-per-use basis to store the data and deploy applications via internet [25]. The cloud services have created new business models for SMEs in order to achieve competitive advantage [26]. For instance, agents in a call centre in South Africa use the IP lines to log into the system from any location. Meanwhile, the software developers can do their work from home via logging into a virtual private network. Hence, the productivity of the call centres increased by 20% [27].Therefore, companies can implemented cloud services in accordance with organisational needs and objectives.

2.1.2 Reliability

Cloud computing facilitates product prototyping, innovation and market speed. Therefore, it enables SMEs to be more agile and flexible to the market changes and fulfil the customers' needs and expectations [28]. Moreover, it involves high reliability degree as services are administrated by various professional persons who solve the system problems at the shortest time with the minimum downtime. Hence, it would be useful for companies that need a reliable and fast response computing platform. Nevertheless, the cloud computing reliability can be affected through the software malware and safeguard [29].Moreover, the cloud services are more reliable than a stand-alone system. Thus, it must be managed correctly to increase customers' perception on the reliability of its solutions [30].

2.1.3 Security effectiveness

The security concern of cloud has been described in term of data controlling and integration, virtualization and data remote accessibility. Hence, professional people needed to close the possible gaps of research and development with actual practices [31].Therefore, cloud provider must ensure users' personal information protected through implementation of various processing cores [32].The cloud allows remote access of data at anywhere and anytime, therefore the service provider must use a secure login to protect the data from non- authorized users through encryption methods [33].

3 Technology Acceptance Model

The technology acceptance model (TAM) is a useful model to assist enterprises to measure the user's acceptance level on particular technology [34]. This theory is adopted from theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975). The TRA indicates performance can be recognized through determination of attitude, behaviour and subjective norms of individuals [35]. Based on TAM, users' attitude and behavioural intention can be determined by perceived usefulness (PU) and perceived ease of use (PEOU) to develop job performance of individuals. PU refers to a degree which a person believes deploying a particular system can develop the performance level. In contrast, PEOU determines individual's perception upon a system is free of physical and mental effort. Hence, this model shows individual's intention toward accepting a new technology is concluded by attitudes, perceived ease of use and perceived usefulness When a system is difficult and not user friendly, hence it would not perceive as useful and lead to resistance to change [36].Various studies have implemented TAM for cloud computing adoption. A study on cloud computing adoption in Indonesia depicted the various factors such as organisation needs, cost, security and reliability affect the intention toward using the cloud system [37]. Another empirical research in Jordan demonstrated cloud adoption leads to the balance of benefits over costs in term of time, space efficiencies, flexibility, automation and quality [38].

4 Research methodologies

A quantitative method has been used to collect and analyse the data to address the aim and objectives of this study. This method refers to the statistical analysis of data on attitudes, performance and behaviour of participants in a numeric format [39]. A survey instrument is a primary tool for collecting information based on this approach [40]. The survey included two parts such as participant demographic characteristics and cloud computing acceptance level based on three constructs of TAM such as perceived usefulness, perceived ease of use and behavioural intention. 300 SMEs involved in manufacturing sector in Klang Valley areas have been selected as the research population due to the participants' accessibility.

5 Data collection

Data was collected online via Google Drive. The participants' email addresses have been obtained from Malaysia External Trade Development Corporation SME directory. The directory provides list of companies in various industries,

particularly manufacturing sector. In addition, a pilot testing was conducted to minimise the design errors. The pilot testing refers to pre-testing of questionnaire prior to study completion [41]. Hence, 10 questionnaires were distributed to participants to pre-test the questionnaire. Nevertheless, 300 questionnaires were sent to the email addresses of participants, 106 complete responses were received. During the survey, respondents had rights to omit the study completion at any time and answer the questions at different times till submitting the survey.

6 Data Finding

The participant demographic characteristics are summarised in the table I. It demonstrates sex, job title, experience, organization size and industry based on the SME classification in Malaysia.

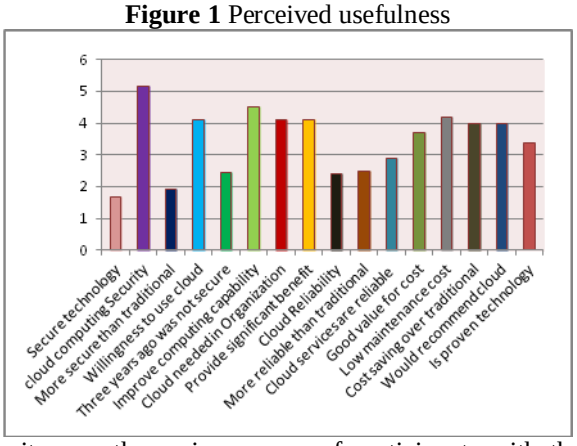
Table I The participants' demographic characteristics

Sample characteristics	Size	Percentage
Sex		
Male	44	41.5%
Female	62	58.5%
Job title		
Chief Executive Officer (CEO)	8	7.5%
Manager	46	43%
IT professional	35	33%
Others	17	16%
Job experience		
0-2	10	9.4%
3-5	11	10.3%
6-10	8	7.5%
11-15	35	33%
More than 15 Years	42	39.6%
Organization size Total: 100		
1-9 employees	18	17%
10-50 employees	22	20.7%
More than 50 employees	58	54.7%
Over 250 employees	8	7.5%
Industry		
Primary agriculture	10	9.4%
Manufacturing	76	71.6%
Manufacturing related services	8	7.5%
information and communication technology	12	11.3%

6.1 Perceived usefulness (PU)

The perceived usefulness refers to a degree which individuals perceive a particular technology enhances their performance [42]. The perceived usefulness items had been taken from [33] with the author's permission. In addition, the five Likert scales of strongly disagree, disagree, neutral, agree and strongly agree had been used to measure the cloud computing acceptance levels. Total 98 replied answers were collected for this construct.

Figure 1 Perceived usefulness



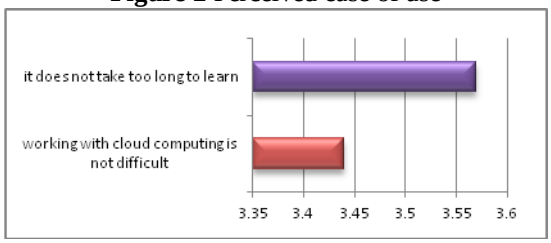
The figure 1 shows the security was the main concern of participants with the highest average rate of (5.16); respondents believed cloud computing delivers significant benefits in term of cost, need for computing capability, which are more reliable than traditional and legacy systems. Therefore, respondents were willingness to deploy the cloud computing services (4.13) and also, they would recommend the cloud services to their organisation (3.98). Hence, the results prove the previous studies upon on cloud computing adoption such as [37], [43], [33] who claimed security, cost, need and reliability have the positive relationship with users' actual behaviour.

6.2 Perceived ease of use (PEOU)

The items of perceived ease of use had been taken from [45]. PEOU refers to individual's perception as working with a new technology is free of physical and mental effort [42].Respondents answered the items with five Likert scales

of strongly disagree, disagree, neutral, agree and strongly disagree. Total 103 replied questions received from participants.

Figure 2 Perceived ease of use

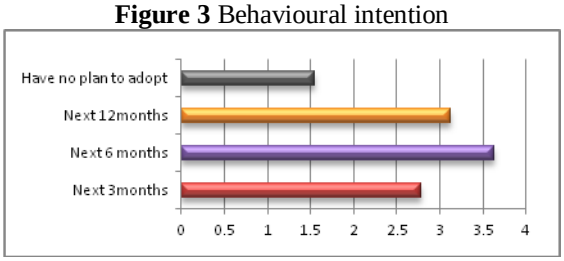


The figure 2 illustrates the participants believed working with cloud services is not complicated (3.44) and it does not take too long to learn how to use the cloud services (3.57). Consequently, the results are consistent with the previous literature reviews [36], [44] who acknowledged perceived ease of use has a significant impact on the technology usage behaviour.

6.3 Behavioural intention (BI)

These items have been taken from [44].Users' attitude and behavioural intention can be determined by (PU) and (PEOU). Overall, 99 replied questions have been collected from participants.

Figure 3 Behavioural intention

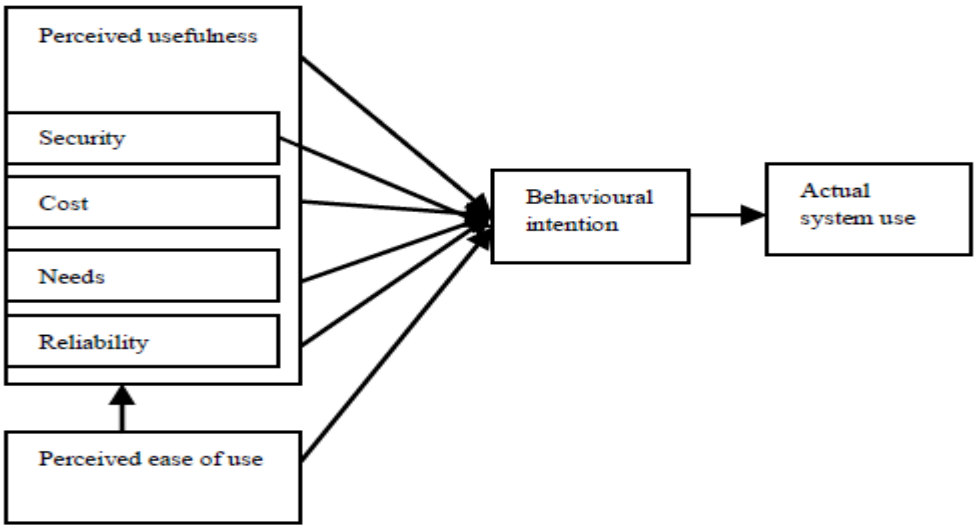


The figure 3 presents participants have plans to adopt the cloud computing in next 6 months with the highest average rate of **(**3.63). In contrast, SMEs who have no plan to adopt the cloud service with the lowest average rate of (1.55). Consequently, the majority of SMEs who participated in this research tend to deploy the cloud computing services to their operational level.

7 Research Artefacts

The primary findings demonstrated security, cost, needs and reliability have the positive relationship with cloud computing adoption. In addition, the study outcomes are consistent with the previous research [33], [37] who identified the security, cost, needs and reliability have the positive relationship with cloud adoption. Therefore, the artefact can be formulated based on the research results and previous findings.

Figure 4 Research Artefact



8 Conclusion

This study aimed to identify to what extent cloud computing adoption can enhance the competitive nature of the Malaysian SMEs. From this perspective, this research conducted the technology acceptance model to identify the factors that can affect the cloud computing adoption among SMEs in Malaysia. The results indicated security, cost, needs and reliability have the positive relationship with the cloud adoption. In summary, this research attempted to contribute knowledge to the limited studies upon on cloud computing deployment in the context of SMEs in Malaysia by yielding a comprehensive evaluation of the factors that can accelerate the cloud based-IT services.

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