A Survey on Cloud Computing Adoption among Malaysian SMEs
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Abstract
SMEs are lagging behind the large organisation to adopt cloud computing. Thus, this paper attempts to explore the main concerns and requirements of cloud computing adoption from small and medium enterprises’ perspectives. This paper targeted the decision makers of SMEs in Malaysia. The outcomes demonstrated that avoiding the capital expenditure and cost and profit margin were the main requirements for cloud adoption. Nonetheless, security, privacy and confidentiality were the major obstacles for the cloud computing deployment among Malaysian SMEs.

Keywords: Cloud computing; concerns and requirements; small and medium enterprises; Malaysia.

1 Introduction
Recently many enterprises, are struggling to look for any alternative service delivery and enterprise management systems to control the risk and increase the operation agility with the low cost. Hence, the cloud computing concept has attained the attention of many businesses [1]. Financial services and manufacturing industry are the largest early adopters of the cloud computing [2]. Meanwhile, high tech and communication industries deploy huge amount of investment on it. Forrester predicted the cloud market will be $159.3 billion by 2020 [3]. Amazon, IBM, Google, Microsoft, Salesforce.com and Oracle are the first movers in the cloud computing field that built huge data centres with numerous servers available for the users [4]. In addition, McKinsey Quarterly research demonstrated two- thirds of total public cloud market share are SMEs with the growth rate of 25% to 35% annually. Nevertheless, data storage and back up are the most desired services by SMEs, location based devices and vertical specific applications are the least favoured services [5].

The cloud computing has modified user’s collaboration whereby email and contact management can be performed in the real time. Therefore, knowledge based activities of workforce will be increased more effectively through virtual workspaces and social networking sites [6]. SMEs have been playing a significant role in the Malaysian economy and accounted more than 80% of the manufacturing and 35% of the workforce. However, SMEs in Malaysia depicted higher readiness to adopt the cloud computing compare to Indonesia, Thailand and Philippines [7], but the cloud adoption compare to the larger businesses is growing slowly [8]; [9]; [10]. Hereupon, this paper aim is to figure out the main concerns and requirements of cloud computing adoption from SME’s perspectives.

2 Cloud computing concept
Cloud computing refers to a service provisioning where services such as network access, security, data storage and processing software application can be supplied from the data centre to users based on the demand [11]. Cloud computing is the movement of computing resources as a product to service which delivers large scale data [12]. Nevertheless, cloud computing has been seen as the commoditization of IT investment which IT involves all technological infrastructures to support and guarantees the drastic commoditisation [13]. The basic could service are categorised into four parts such as cloud management platform; business support services which enables identification, order management, accounting; subscriber management function related to end users, operational support services which support successful delivery system [14].

Cloud computing comprises of public, private and hybrid models. The public or open cloud is available from a third party provider through internet at the lowest cost outside the firm. This model allows users to access to the services regardless of their knowledge, expertise and controlling of IT infrastructure[14]. For instance, AmazonWeb Services, Google AppEngine and Microsoft Azure are the examples of the public computing [15]. The private or enterprise cloud is managed inside the organization and delivers revolutionary benefit like business service management and Virtualization [1]. Enterprise resources planning, data mining, data warehouse or marts, transactional database, industry-specific application and long term data archiving are the business activity under the private cloud. The hybrid cloud is the mixture of public and hybrid models. In this model, the rules and policies are assigned by partnering companies in term of security, architecture and criticality [14]. For instance, banks use hybrid cloud strategy which is operated by a third party and within the bank itself [16].

Likewise, cloud development model includes Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) [17]. In SaaS, providers license an application to users based on demand; hence customers do not need to hire IT professional to install the software [18]. SaaS application consists of enterprise resource planning, customer relationship management, email and word processing, spreadsheet [19], accounting applications, sales, collaboration, management information systems [20]. In addition in PaaS, users can access to application via internet without deploying the infrastructure [21]. For instance, Google Cloud SQL is an example of PaaS that assists developers to create and monitor the databases without installing the software for database management, maintenance and administration [20]. In IaaS, cloud users maintain and patch the software application and operating system and the cost will be allocated based on the resource usage such as storage, memory, CPU, disk space, and bandwidth [22]. The service providers and administrators are the main targets of this model [23]. For instance, backup services, recovery, service management, platform hosting and content distribution network are example of IaaS services. The cloud platform...
features need to uphold the design principle of various cloud models to leverage the cloud potential benefits [20]. Therefore, SMEs need to carefully consider when and what computing resources can be the best option for outsourcing such as current software, bolt-on service pricing, cloud providers differences and risk to enhance their performance more effective [24].

2.1. Cloud computing adoption by SMEs

Different factors can influence the adoption of new technologies by SMEs such as organisation characteristics, competitiveness and management strategies, internal and external parties’ impact on adoption decision process [25]. A study among 300 UK SMEs demonstrates SMEs were highly interested in cloud services to lower the cost and enhance flexibility and scalability of their performance. Nonetheless, security, vendor lock-in, privacy and data protection were the major concerns [20]. A global survey by European Network and Information Security Agency revealed economies of scales and flexibility were the major requirements and data confidentiality and liability as the significant obstacles from SMEs’ perspective [26]. Moreover, a study concerned technological, organizational and environmental aspects of cloud in Malaysia determined the early cloud adopter SMEs can achieve more advantage compare to the late adopters [27]. A preliminary survey among 101 IT experts in Malaysia depicted the technological facets like accessibility, scalability, cost effectiveness can lead to growth and intention to use the cloud services [28].

2.2. Cloud computing barriers

Researchers pointed out security, confidentiality and privacy as the most significant issues on cloud adoption for SMEs [29]; [30]; [26]. Technical risks of cloud include its multi-tenant environment whereby various users share a common platform; internet connection; lack of control and system complexity [31]; [32]. The data progressed outside of firm before getting into the cloud may make data vulnerable to attack because, the common way to access to the cloud service is via web browser. Hence, the cloud services share same security vulnerabilities as any website like SQL injection [33]. Moreover, each model includes its own security pattern that needs to be controlled by the provider or customers itself or both parties. Therefore, a service level agreement required to ensure customers are aware of the security policies of each model. A service level agreement is a standard document to demonstrate the relationship among parties. The SLA should be involved a clear definition of customers’ requirement; framework for understanding; elimination of unrealistic expectation and conflict to simplify the complex issues and disputable situation [34].

3 Research Methodology

This research has used a quantitative method to generate and evaluate the findings. 300 questionnaires have been sent to managers and IT professionals of SMEs in Malaysia. The managerial levels are the most influential people for deploying a technology in an enterprise [35]. Nevertheless, only 106 complete surveys have been collected.

3.1. Ethic Consideration

Various ethical procedures and techniques were conducted to ensure this research is ethically reliable. The ethical practices comprise of the consent form, information safeguards, confidentiality and withdrawal options. A consent form was provided prior to answering the questionnaire for participants to inform them the voluntary aspect of research. Respondents had right to omit the certain questions that cause them uncomfortable hence, they could withdraw from answering the survey at any time without giving any particular reason.

4 Research findings

This study targeted managers and IT professional of manufacturing industry. The figure 1 exhibits 71.6% of participants were involved in the manufacturing industry. Participants answered seven questions such as cloud computing adoption reason; delivery models; cloud computing type; SME’s willingness to outsource to multiple service providers; disaster recovery; cloud application and barriers to the cloud computing adoption.

**Figure 1:** Target industry

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[Diagram showing target industry with Primary Agriculture, Manufacturing, Manufacturing related services, and Services]
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4.1. Adoption Reason

The figure 2 illustrates the motivational factors accelerate the cloud deployment in Malaysia. Total 98 replied questions have been collected. The results revealed avoiding capital expenditure, cost and profit margin were the major reasons behind the cloud computing adoption.
Cloud services deliver significant benefits for SMEs through elimination of capital expenditure such as infrastructure, maintenance and physical storage. It enables them to achieve an innovative business models to overcome their rivals. Likewise, findings depicted similar point of view with previous literatures such as [36]; [20]; [37];[11] who acknowledged on capital expenditure elimination, cost and profit margin as the significant cloud benefits.

4.2 Cloud computing delivery models

The figure 3 exhibits the cloud delivery models such as public, private, hybrid and partnership of cloud providers with different resources. Total 102 replied questions have been received from participants.

Image: Cloud computing delivery models

The outcomes demonstrated public cloud has the highest percentage rate of 54.90% followed by hybrid cloud 31.37%. In contrast, private cloud and partnership of the cloud providers with various resources had the percentage rate of 7.84% and 5.88% respectively.

4.3 Cloud computing types

Figure 3 presents SaaS, PaaS, IaaS and security services of cloud computing. Total 99 answers have been collected from participants. SaaS had the highest priority of 23.2% compared with PaaS and IaaS.

Image: Cloud computing types

4.4 Multiple outsourcing providers

The figure 4 shows majority of the respondents were willingness to outsource to multiple providers with the percentage rate of 62.5%. In addition, 27% of participants would not to outsource to any multiple providers.
4.5 Disaster Recovery (DR)

The figure 1 displays SMEs are interested in back-up plan with the percentage rate of 38.3. The back-up plan is based on internal resources such as infrastructure and platform that companies are using before the cloud deployment.

4.6 Cloud computing application

Various cloud applications have shown in the figure below. The outcomes revealed CRM application has the highest percentage rate of 33%. Likewise, project management and payroll application have ranked second and third with 30% and 22.6% correspondingly.

4.7 Cloud computing challenges

The bar chart 6 depicts the cloud computing challenges from SMEs’ point of view. Participants ranked their desire answers with five Likert scales such as Unimportant, Of Little Importance, Moderately Important, Important, Very Important. Total 105 replied questions have been generated from responders.
The outcome reveals security holds the highest ranking rate of 4.88. Likewise, privacy and confidentiality were placed second and third by an average rate of 4.74 and 4.72 relatively. Consequently, the results prove the previous literature reviews such as [38]; [39]; [29] who depicted security, confidentiality and privacy as the main issues in the cloud computing adoption by SMEs.

5 Conclusion
This research aimed to explore the main requirements and obstacles of cloud computing adoption among Malaysian SMEs. The results signified avoiding capital expenditure and profit margin were the main demand for cloud adoption from SMEs’ standpoint. Nevertheless, security, privacy and confidentiality were the major concerns for the cloud adoption. Meanwhile, a further study can be done to target wider geographic areas and various industries.

6 References
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