Critical Success Factors for Cloud-Based eLearning Adoption

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Abstract – Cloud-based eLearning network environment for institutions of higher learning (IHL) is an innovative technology today. Cloud-based network environment gives high impact and benefit to IHL. In Malaysia, there have a few IHLs are starting using the cloud-based network environment for eLearning but most of the IHLs have not comfortable using a cloud-based network environment. Among the reasons are fairness and deficiency of knowledge to shift to the cloud-based network environment. Based on the reason the identifying a success factor adoption is an important thing that must be considered in helping the IHL in using a Cloud-based network environment. Thus, the early stage of studies are needed to find the important factors adoption on cloud-based network environments. The study proposed the extension of the Technology-Organization-Environment (TOE) to identify the factor adoption that influences the adoption of the cloud-based network environment. The opinion and knowledge among a few experts at IHL are collected. The review of success factors of the employee, security, business need, strategic plan, cost-saving and provider selection are potential factors effect for the adoption of a cloud-based network environment are reviewed. The outcome of the study proposes the success factor adoption that creates knowledge for the positive adoption factor of a cloud-based network environment at IHL.

Keywords: success factor, network environment, higher learning, cloud, ownership, server farm.

I. INTRODUCTION

This studies focus on success factor adoption for cloud-based network environment used for eLearning at Higher Learning Institution (IHL). In these studies, a few models and frameworks were reviewed to ensure the decision-making framework was selected for the adoption of new technology in the network environment. After reviewing, a few models and frameworks, the technology-organization-environment (TOE) model was selected as a suitable model that influences technology adoption for new technology in ICT. The reason is supported by a few kinds of literature that mention the TOE model defined the process of adoption and implementation of new technology[1]. TOE model is also used for decision making in selecting the identifying the factor adoption in new ICT technology like cloud-based network environment [2]. Besides that, the IHL must choose the new technology with the

factor adoption is needed and must be inline in the context of education needs [3].

Based on the TOE model a few factors are required before adopting a cloud-based network environment. A few factors must be consent before the organization need to select the network technology in the Cloud network environment. The user must understand the cloud-based service model gives the impact and benefits to IHL. Many Institution has attention to moving to cloud computing, for easy managing, reducing the costs and optimising computing processes[4].

The decision to select the right network environment can affect the determination of network infrastructure onward to provide the best quality of eLearning service[5]. The fairness and deficiency of knowledge to shift to the right network environment for network infrastructure in using eLearning become more difficult and taking the worst scenario because the IHL mind still wants to use the traditional way of a network environment.

Nowadays, cloud computing is one new technology and innovation that adopted from other technology by using the internet, that can share the computer resources and other devices on demand. Many organizations seek to cloud computing to get more efficient use by saving the cost[6]. Using the cloud service also conveyed many benefits to educational institutions[7].

II. LITERATURE REVIEW

The appropriate network environment is the main issue in implementing a successful network environment. Today, the IHL faces the challenge to reduce the cost of maintenance and operation in handling an e-learning network environment. In e-Learning, the IHL must provide a suitable network environment to access the e-Learning server. There are three types of e-Learning network environments usually used by the IHL which is ownership, server farm and cloud-based network environment.

Ownership is one of the concepts of the network environment used for e-Learning [7]. All the infrastructures and services including the design of the network infrastructure, setup,

maintenance and management were done by the IHL. IHL must provide the appropriate bandwidth for ease of uploading and downloading the teaching materials[8]. The e-Learning network infrastructure resources are required to be provided entirely by IHL which consists of server requirement, internet connectivity at the local area network (LAN), computer operating system and network infrastructure. Based on the study the server requirement for e-Learning requires a minimum of 160 GB disk space and a maximum of 2TB with a minimum of 1GB memory to the 8GB maximum when the IHL is using the ownership network environment.

In using the Ownership the IHL prepare at least two servers, which are the development and live deployment server. The internet connectivity and local area network (LAN) as well as the best access using global and local access. The experiences and adequate manpower need to be provided to support the productivity of the e-Learning consisting[9].

Since then, the IHL looks for another network environment and the server farm is the other alternative for IHL. The server farm is a set of many servers together and housed within the same physical facilities to give effective service [5]. The server farm provides an efficient process by combining computing power for many servers by simultaneously executing one or more applications[10]. Server farms are ubiquitous in manufacturing system call centres and service centres.

One of the services at the server farm is a co-location, in which the IHL rents the space for the server and other computer hardware. It helps the IHL to make a proper plan with the appropriate budget. The server farm provider provides the building space, cooling, power, bandwidth, physical storage and physical security based on the cost requested and complexity. Server Farm has a predictable and operational expenditure model, provides additional capacity, can be rented easily, quickly and at the cheapest prices, provides better access to space and power and also experienced professionals to manage the Server Farm facility and a better roadmap for disaster recovery

Based on the literature that has been shown, the e-Learning system needs an appropriate network environment that contains sufficient network components to run the system. Now, cloud computing is one of the new technology and innovation that is adopted from other technology by using the internet that can share the computer resources and other devices on demand. Therefore, before adopting to the cloud-based network environment a success factor adoption need to be clarified. Cloud computing is an innovation of the technology and the TOE model is selected which included technology, organization and environment. TOE model describes the process of adoption of new technologies and implements technology innovations influenced by technological aspect, organizational aspect and environmental aspect[11].

From the literature, the important success factor in the network environment on cloud-based is defined. The factor was taken for validation with the IT expert in the

preliminary study. The success factor elements adoption will be categories based on the Technology-Organization-Environment (TOE) groups of factors. The benefits are given by the cloud, security consent by the user, cost-saving and provider selection is a factor that needs to be clarified by the expert in the preliminary study[12].

III. STUDY METHOD

The preliminary study provides a groundwork study that covers the particular statement of the studies. In this study preliminary process is to determine the validation of the success factor adoption for a cloud-based network environment that reaches out from the literature review. Figure 1 shows the preliminary study process of this study.
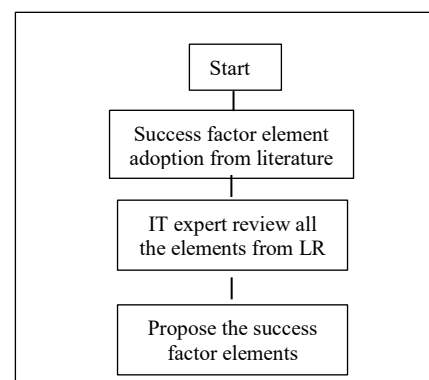

Figure 1: Preliminary study process

From the document analysis getting from the literature, a few success factors adoption for cloud-based network environment were highlighted. The factors will be validated in the preliminary study with the IT expert. IT expert is an IT Officer who comes from the IHL that has experience in handling a network environment at their IHL. The IT expert is selected based on the population and sampling defined. The population is an aggregate or totality of all the members that conform to a set of specifications [13].

In this study, the non-probability convenience sampling method is used. Non-probability convenience sampling method intent not necessary every person in the population has been included in the sample[14]. The non-probability convenience sampling method is made up of the people with expertise who are easy to reach, available at a given time and willingness of the participants to answer the questions[15].

After the document analysis was reviewed by the IT officer, a few important elements were identified as a data collection and recording of all the conversations mentioned in getting the success factor element adopted based on the reasons and comments. The factors proposed by the IT expert will be categorised using the TOE model.

IV. DATA COLLECTION

Many ideas, suggestions and comments were given by the IT expert when the IT expert review all the elements from the literature review. After taking the opinion from the IT expert they have a few success factors adopted as a highlight as an important factor adoption for successful aspect essential by using Cloud-based network environment.

In this preliminary study, the population selected come from the IHL IT Officer. Five respondents were taken among the IT expert respondent as IT Officers at the IHL. The respondent was coded starting from A1 to A5. All the expertise selected come from different IHLs in using a different network environment. The purpose is to get the idea of whether the Cloud-based is the convenient network environment used at IHL. Besides that understanding the success factor adoption getting from the literature review. Table 1 shows the IHL respondent list.

Table 1: IHL Respondent

IHL	CODE
UNISEL	A1
UKM	A2
UPM	A3
UPSI	A4
OUM	A5

In this preliminary study, the face-to-face interview and phone call interview was conducted to answer the questionnaires survey. This study deals with IT officers that believe the respondents feel comfortable while discussing their network environment. At the start of the session, the respondent is given a brief explanation regarding the study. Then they were asked about the demographic question as an ice breaker. To help groundwork the interview, respondents describe a network environment used at their IHL. When the interview was started, all the answers from the respondent noted down throughout the interview session. The respondent encouraged comments about the Cloud-based network environment implemented at IHL and the factor adoption before migrating to Cloud-based Services.

The respondents were describing their experiences in using the existing network environment at their IHL, the benefits use in Cloud-based Services and the factor that must be taken before selecting the Cloud-based network environment. The respondents in this study come from various experiences in using network environments at their IHL but they agree that a Cloud-based network environment is the best network environment selected as a network environment for eLearning.

V. DATA ANALYSIS

There have three network environments used which is Ownership, Data Centre and Cloud-based Services[16]. To ease interpretation the data getting from the interview will be categorised into three network environments used by the IHL which are ownership, data centre and Cloud-based Services and the expert experiences in network environment use at IHL.

After the interview, the answer from respondents was analysed. Table 2, shows the result from the respondent interview in the preliminary study.

Table 2: Results from respondent

Code	Respondent answer
A1	Awareness is a very important factor. Many organizations have a different perception of Cloud Services. Through the awareness of a clear perception of strengths, weaknesses, and beliefs before using cloud services. Cloud allows users to take benefit from the technologies. From the IHL perception, the business needs, Strategic Planning and cost-saving are very important for IHL. The IHL always find where the network environment gives the IHL need.
A2	IHL is most suitable to migrate to a Cloud-based network environment because it is easier to manage and maintain beside can reduce the cost. Before the move to a Cloud-based network environment, the perception of the IHL must be made right. The IHL must give explanations and motivation about the factor adoption before migrating to Cloud-based Services. Among the factor that can be stressed is the awareness, motivation, benefit, security and cloud provider. For the cloud provider may be the IHL must identify the local provider compare to the public provider to ensure the security of data.
A3	The IHL have an idea about the Cloud-based network environment but it is worried about the data that will be accessed by the public user. If the IHL need to move the eLearning server to the Cloud-based network environment IHL must have the preparation and do the study factor adoption before migrating to Cloud-based Services. Among the factor that should be considered are awareness, benefit, business need, strategy plan and provider selection.
A4	The IHL understand awareness and motivation is important before the move to a Cloud-based network environment and also the perception of the IHL must be made right. The IHL must give the explanation and motivation about the factor adoption before migrating to Cloud-based Services. Among the factor can be stressed is the awareness, motivation, benefit, security and cloud provider
A5	For implementing the cloud-based IHL must have an understanding of awareness and motivation. The business need and cost-saving must take as an important factors for the IHL. The IHL must give know the advantages of the factor adoption before migrating to Cloud-based Services.

The analysis also shows the network component device provided by IHL, network management operation and network criteria for the IHL business process. Table 3 shows the analysis of categories results between ownership, Data Center and Cloud-based Services for network environment based on the interview analysis

Table 3: Categories Analysis

Categories Analysis	Ownership	Data Centre	Cloud-based
Performance	Less	High	High
Flexibility	Less	High	High
Accessibility	Less	High	High
Privacy	Less	High	Private (High), Public (Less)
Scalability	None	Moderate	High
Connectivity	Less	High	Private (High), Public (Less)
Effectiveness	Less	Moderate/High	High
Reliability	Less	Moderate/High	High

Real-time	Less	Moderate/High	High
Stability	Less	Moderate/High	High
Consistency	Less	Moderate/High	High

The analysis also shows the success factors need and suitable before migrating to a Cloud-based network environment

The analysis from the interview result was given as a suggestion about the success factor adoption before migrating to a Cloud-based network environment at IHL. The factor that has frequently been mentioned is taking as a success factor adoption for moving to a Cloud-based network environment. The factors adopted are categories based on the TOE model.

From the analysis security, business needs, strategic planning, cost-saving, provider selection and employee are important factors before IHL needs to move to the cloud-based network environment. Inside the employee, there have a few factors that influence the success factor which is awareness, benefit and motivation.

Awareness for the organization is a very important factor before migrating eLearning to Cloud Services. Many organizations have a different perception of awareness of a Cloud-based network environment. The IHL must recognize the awareness before using the Cloud-based network environment by giving the explanation, motivation and training about how to use the Cloud-based network environment. Among the benefit of the organization is helping the IHL be more proactive besides can save the cost of operation[6].

Business needs are a business process to optimize the performance of eLearning. By using the Cloud base, it is easy to manage and can optimize the performance. The business process enables to reduce the cost of operation and improves the business performance process. Through the cloud service, the information technology infrastructure was created virtualize and it increased the growth of business needs [17]

The process of cloud architecture depends on the business Strategic Planning. Business Strategic Planning consists of activities whether human-based, system-based or a combination of human-computer interaction and gave the completed and successful process [18]. To succeed, the cloud strategy must be aligned with the IHL Strategic Planning.

With the world's current financial crisis and the demand for quality education, educational institutions are under increasing pressure to deliver more from less [16]. IHL can use the potential benefit of the cloud-based to deliver better services with many resources offered. Therefore, using the eLearning application in Cloud required IT infrastructure management as well as maintenance activities that higher cost saving[19].

Therefore, could be able to solve many problems regarding eLearning, the user just requests the information that the cloud service running to data Centre Cloud Services to give back the result in a very short time. By using the cloud-based the

organization need a broad set of policies and control deployment to protect the data, applications and infrastructure as well.

Cloud computing infrastructure will be rented from the service provider whereas the project managers must focus on choosing the right technology to choose the right vendor[20]. Apart from that the project manager also must look especially at service availability, data security, backup and contingency plans offered by a cloud vendor.

VI. CONCLUSION

In a conclusion, the study provides an early view that covers particular statements regarding the initial situation, opinion and problems. The goals are to achieve the combination of the research question, methodology and ways how to proceed with the research design. It also identified the grouping of factor adoption based on the TOE model which was defined. From the preliminary data analysis, many ideas, suggestions and comments were given by the participants. After considering the opinions given by experts during the preliminary study, there are a few factors adopted to be kept as an important factor in a successful essential aspect of using a cloud-based network environment.

The future studies are to propose the model in using the factor in the adoption of an eLearning cloud-based network environment and will be a guide for the IHL in the adoption of cloud-based as an eLearning network environment.

VII. REFERENCES

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