

Quantifying quantitative correlation of provider selection influences cloud security

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ABSTRACT

The cloud computing has been able to help users to access the data easily and effectively. However, cloud security is highly emphasized to cloud users to ensure data is securely stored. The cloud security can be handled well by chosen trusted cloud service provider in getting high impact on the cloud security. The relationship between cloud security with the provider selection is much needed to ensure the extent to which data is securely stored in a cloud. Therefore, in this paper the quantitative method was conducted to measure the correlation between the selected the right cloud service provider influence the cloud security. Thus, knowledgeable person in having the experiences in using the cloud service was taking from two institution of higher learning (IHL) as a respondent. In addition, variability and normality data analysis was firstly conducted to obtain the consistency of the data. Then, the correlation between cloud security factor and provider selection factor was conducted using spearman correlation matrix and scatter graph in identifying the closely and significant the value in influencing between the factors. Thus, the correlation relationship analysis result shown the selected the right cloud provider's give higher impact to cloud security.

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1. INTRODUCTION

Cloud eLearning for institution of higher learning (IHL) is a new innovative technology for higher education today. Cloud environment gives high impact to IHL because it can provide effective and efficient work [1]. In using the cloud, the accessing of data can be easily and scalable [2]. In Malaysia, there have a few IHL was starting using the cloud environment for eLearning. The IHL that have experience in using cloud environment believe that the cloud eLearning will bring numerous advantages for teaching and learning activities. They also believe in using cloud eLearning, the teaching and learning process will be enhanced and get better in the process [3]. However, most of the IHL has not comfortable moving to the cloud. They are worried about the security of data in the cloud and this challenge became a major issue among the users at the IHL. The IHL also worried either provider selected will be securing the data in the cloud and how the data can be a safety at cloud storage. To choose the cloud eLearning environment as part of the IHL storage option, the

fear about the weaknesses of cloud security was alarmed. The user wants to get protection and security of the data storage in the cloud environment [4]. The deficiency of knowledge making the reason that most of the IHL still does not shift to the cloud eLearning.

Thus, the experiences of the IHL in using cloud environment giving the advantage where the users are no longer feel hesitant to enter their data in the cloud. The selection of the correct cloud provider by IHL is giving the growth of user confidence in using the cloud services and selecting the correct provider will influence the cloud security issues [5]. The cloud provider needs to ensure the secureness of data in using the cloud but the proven are needed to be effective in terms of data security with the selection of the right cloud service provider [6]. Base on this reason the quantitative correlation study between the provider selection and cloud security will be conducted. In this aspect, the factors found from the knowledgeable expert consist of the provider selection factor and cloud security factor need to be identified to prove association correlation will significantly analyse. Identifying the factor from the knowledgeable expert together with confirming the cloud security and provider selection factor will offer the solution and right practice in using the cloud eLearning environment [7], [8].

2. RESEARCH DESIGN

The quantitative research design was conducted by finding the population and sampling of the study [9]. The population was identified from the IHL that have knowledgeable and experienced user in handling the eLearning as part of their teaching and learning process application that kept in the cloud [10]. The purpose is to get the opinion from the experienced users. Two of the IHL was the Open University (OUM) and Universiti Pendidikan Sultan Idris (UPSI) was identified as a population because they have experience in using the cloud for their eLearning. From these two universities, the IT experts were taken as the respondent as a sampling population to answer the questionnaire. The percentage taken from the population is required to get a representative of the sampling base on the sampling size activity [11]. The purpose is to define the views and opinion for those who are experienced and responsible for regulating in handling the cloud services. The convenient sampling is selected which the respondent that has the allocation of time, willingness to answering the question [12]. The qualitative method is used to provide a better understanding start from distribution of questionnaire in selected populating and sampling, data collection and data analysis [13]. Figure 1 shows the step of research method for these studies.

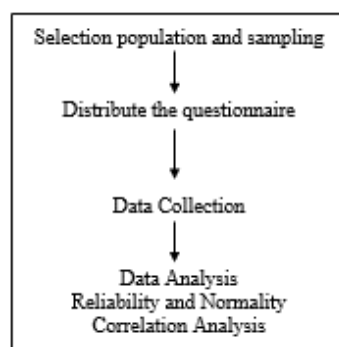


Figure 1. Research design

Thus, the distribution of the questionnaires to the respondent was conducted with giving time to answering the question. All 50 respondents from both IHL has answered and returned the questionnaire of which 25 were respondents from UPSI and the other 25 were from OUM. Afterwards, the analysis of data was conducted using mathematical-statistical SPSS software. First, the reliability and normality data analysis was conducted to check the consistency of the data analysis [14], [15]. In the normality analysis, the normal data was get has a result. Thus, parametric data was selected to identify the correlation between the factor.

3. RESULTS AND DISCUSSION

Firstly, the reliability and normality analysis were conducted. The purpose was to check the reliability and normality of data. Reliability is an estimation of the observation of factor measures an accurate value [16]. The reliability measurement by using statistical analysis is the most commonly using Cronbach's Alpha and

the value was greater than 0.60. The reliability was also measure values to consider the lower bound of acceptability [17]. Table 1 shows the reliability test of security and provider selection. The value of Cronbach's alpha for security is equal to 0.880 and the value of Cronbach alpha for provider selection is 0.879.

Table 1. Reliability test

Factors	No of sub-factors	Cronbach's alpha
Security	3	0.880
Provider selection	3	0.879

While the normality is used to precondition for many inference statistical techniques assumption. The normality of data analysis is important to identify and determine the type of data analysis. Table 2 shows the normality test between security factor provider selection where the normality of security the value of p-value is 0.096 and the provider selection the p-value is equal to 0.118.

Table 2. Normality test

Factors	Normality (KS)
	Asymp. p-value
Security	0.086
Provider selection	0.118

Therefore, the result of normality found the value of p-value is > 0.05 shown the normal distribution of data. Thus the parametric data was selected in finding the correlation of data analysis [18]. The spearman correlation analysis between cloud security and provider selection was conducted to show the extent of the correlation between cloud security and provider selection.

Correlation can be shown as the assumption to determine the closeness between two factors and the degree of relationship between two different factors. The correlation relationship assumed from positive to negative or none. The value of Pearson's correlation represents negative relationship when the value of "r" is -1.00 to -0.50, value is 0 shows weak correlation relationship and if the value is +0.50 to +1.00, it shows the positive relationship [19]. The correlation can be shown in the spearman correlation matrix table in Table 3.

Table 3. Cloud provider correlation

Factor	Relationship management	Good track record and achievement	Service level agreement (SLA)
Relationship management	1	.545**	.451**
Good track record and achievement	.545**	1	.421**
Service level agreement (SLA)	.451**	.421**	1

Table 3 shows the correlation between good track record and achievement with the relationship management shown the value of $r=0.545$ and the value shows the moderate positive correlation relationship. The result shows the evident of a good and an effective service by the service provider can be the reason for organization to maintain the relationship between them and provide a good experience and work results [20]. Where the result between service level agreement (SLA) and relationship management shown the weak positive correlation where $r=0.451$. Although the organization has a good relationship with the agreement of service level agreement is very important to be held between the service provider and the user to ensure the quality, availability, accessibility and responsibility [21]. The SLA service provided by the cloud provider should be agreed on in the contract with the user. Good track record and achievement have a weak positive correlation with the SLA with $r=0.421$. The result shown although the organization has a good track record and achievement the SLA needs to be implemented to ensure the success of an organization through a challenging contract agreed between cloud-provider [22]. Further, the provider selection will be determinate the increase the confidence of users on the data stored in the cloud under the care of the appointed provider selection. Good track record and achievement of the provider also increase user confidence of use in using cloud eLearning. The analysis of selected the right cloud provider can improve data security and it will be shown at Table 4.

Table 4. Cloud security correlation

Factor	Safe to store personal data in the cloud	Cloud provider ensure only the right person can access or modify the data	Fully outsourced disaster recovery and better data recovery process
Safe to store personal data in the cloud	1	.558**	.342*
Cloud provider ensure only the right person can access or modify the data.	.558**	1	.427**
Fully outsourced disaster recovery and better data recovery process	.342*	.427**	1

Table 4 shows the correlation result between the safe to store personal data in the cloud with the cloud provider to ensure only the right person can access or modify the data giving the value of $r=0.558$ shows the medium positive correlation. In another word, the agreement provided by the cloud provider was ensured only the right person can access or modified the data [23]. Other than that, the user has a weak positive correlation between safe to store personal data in the cloud with the fully outsourced disaster recovery and better data recovery process with $r=0.342$. Where the user is still taking precautionary steps by backing up the data and not the entire data is placed in the cloud even though the cloud has provided agreement with the user [22]. The correlation between the cloud provider is to ensure only the right person can access or modify the data with the fully outsourced disaster recovery and better data recovery process shows the $r=0.427$ shown the weak positive correlation. The users have weak trust for a cloud provider in the occurrence of a disaster whether the data is safe and the extent to which the data can be recovered by the cloud provider [24].

The positive coefficients indicate through the scatter graph in Figure 2. The graph showed the value was increased between provider selection score with the cloud security score [19]. Thus, it shows the score on positive relationships produce between the provider selection and cloud security. Therefore, choosing the right cloud provider can help improve cloud security [25]. The increased distribution on the graph shows that the two factors with is cloud provider selection and cloud security are interrelated with each other even there is a difference in value in the correlation between these factors [26].

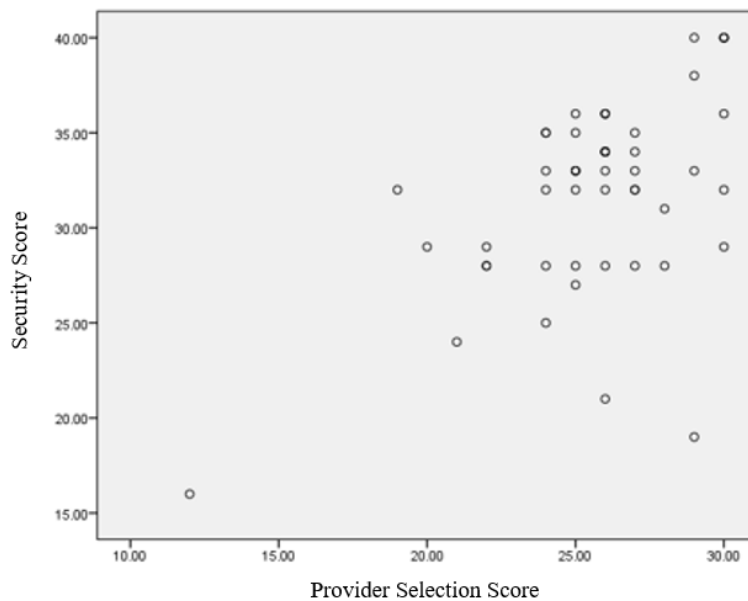


Figure 2. Correlation graph between cloud provider and cloud security

4. CONCLUSION

As a conclusion, this paper provides the result of the relationship between the appropriate cloud provider selection relationship to ensure cloud security can be proved. The information from the expert who has the knowledgeable and experience in using the cloud eLearning data stored in the cloud is especially important in determining the factors that need to be identified for the selection of correct providers in ensuring the security of the data. The views and opinions of experts can be translated into correlation analysis and give a clearer picture as a result. Therefore, this data insight for a solution to use the cloud eLearning for teaching and

learning purposes for IHL the selected of the cloud provider need to select correctly. Therefore, the right cloud provider can provide the good service to IHL include SLA and relationship management. Other than that, it can provide the good track record and achievement between provider selected and IHL. Moreover, it can keep the data from being accessing form the outsider and cloud provider ensure only the right person can access or modify the data. Onward this paper can give an indication into IHLs who are still hesitant to use the cloud eLearning.





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