

Critical Issues Refraining Implementation of Cloud Computing In Educational Institution

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Abstract- Cloud computing showed its existence in IT Industry long back, as well as it started influence in educational Institutions also. Many educational institutions have been started planning to shift onto it and few of them have already shifted as per their specific requirements in spite of quite a lot issues. Educational institutions have move fully or partially in favor of the infrastructure on the cloud but still some critical issues are there that refrain the adoption of cloud in the organizations. The fundamental aim of this paper is to highlight these issues, which will be resolved to move forward in favor of cloud computing.

Keywords – ASP, SaaS, PaaS, IaaS, CSPs

I. INTRODUCTION

Gartner defines “clouds computing as a style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service using Internet technologies” [5]. Youseff et al[14] defines Cloud computing as “an IT deployment model, which is based on virtualization, where resources, in terms of infrastructure, applications and data are deployed via the internet as a distributed service by one or several service providers. These services can be priced on a pay-per-use basis, and are scalable on demand. Cloud Computing can be described as —the long-awaited dream of computing as a utility.

II. REVIEW OF LITERATURE

Cloud computing increased the trend to outsourcing and subcontracting and ultimately moving larger fraction of the technology systems outside the control and liability of company [10]. This can be dazzling to those who would prefer to focus on non-technical aspects of their business and are interested to reduce their fixed IT costs, which they never consider to be contributing to the bottom line, reduced [12]. Gradually, all most all of the private educational institutions are becoming highly dependent on information technology services. These services are progressively more provided to faculty and students via web browsers using Internet technologies [3, 6].

Educational Institutions may believe that their data is more protected if, it is hosted within the institution. Transferring data to a third party for hosting in a remote data centre, which is not under the direct control of the institution and situated at some unknown location, will be risky [8].

Higher education is core of societal development. Contribution of government in partnership with university in the social environment development through the world has been proved by researchers (Lazowska et al., 2008) [9]. Cloud computing can be considered practical for educational institutions for lot of reasons. Indeed, cloud computing will enable certain educational institution to actually make use of the global internet resources for data analysis and data storage [7].

The academic institutions need to weigh the cost and benefits but a major factor of these decisions will be their level of trust in both the cloud deployment model under consideration and the entity providing it [13]. The infrastructure of cloud computing is often located off-site and accessible through the internet, usually provided by a 3rd-party without

nee technical expertise by the user. Common issues raised against cloud computing are lack of control and access along with potential security risks [1].

Dan Morrill [2] identified five major issues in the adoption of cloud computing such as:

- Only few colleges are adopting cloud computing or teach this as a subject.
- It is a multidiscipline subject so the administrators need some ideas about various areas like networking, routing, virtualization, data use and management, process management, and security which are difficult to find in a college environment right now.
- There is a crunch of qualified faculties in the college to teach this subject which deals with latest technologies.
- There are still a scarcity of tools to implement and teach the cloud computing people rather teaches virtualization instead of actual implementation of cloud computing.
- Another major constraint is lack of budget in the collages weather it is privately owned or public where budget is governed by the government.

Another security issue is Unsolicited advertising in which cloud providers will target users with unsolicited email or advertising [11]. Technical educational institutions are ready to adopt cloud computing services but some issues refrain the adoption of cloud computing in educational institutions. In the above context this paper attempts to discover the factors that actually affecting the implementation of cloud computing services.

III. RESEARCH METHODOLOGY

In this work, the descriptive research methodology was applied so as to investigate whether cloud computing technologies are being used in technical educational institutions during the time of study and to identify the factors that refrain the adoption of cloud computing by Indian educational institutions.

The online questionnaire was formulated for determining whether technical educational institutions currently use cloud computing or not and what are the critical issues which are considerable while adopting cloud computing. To construct the representative sample for educational environment, a request was sent to faculties and data center managers of 400 higher technical institutions across India through Emails. The selection criterion, for these 400 universities/institutions were multistage cluster sampling out of 4139 institutions across the country [4]. Overview of the questionnaire's outline is given in the activity diagram (Figure 1).

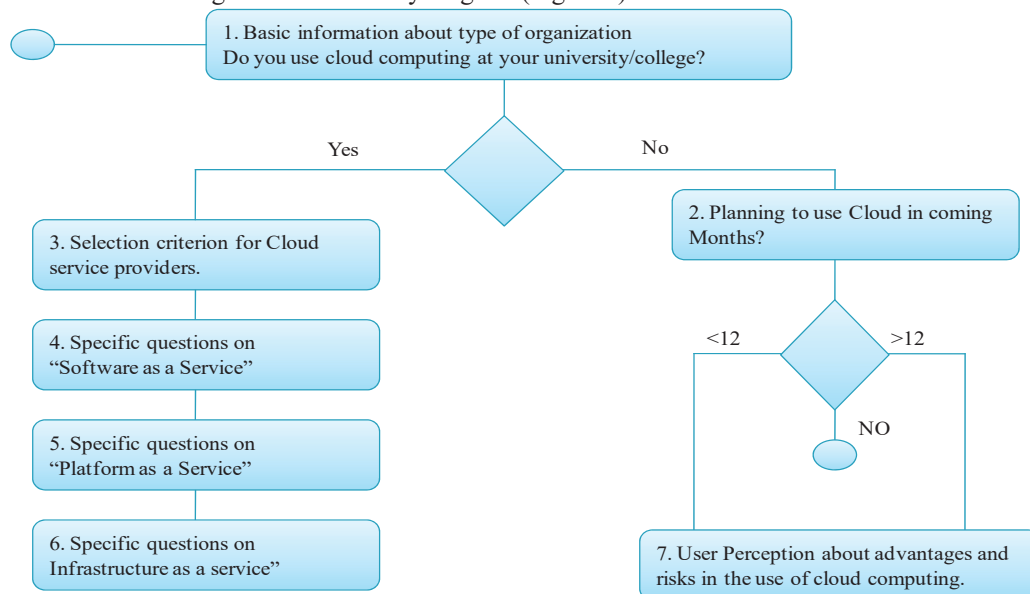


Figure 1. Activity Diagram for Online Questionnaire

After a runtime of 6 months, the contacted sample of technical educational institutions was formed as follows:

It can be clearly observed from Figure 2 that participation of universities and colleges in the survey is 31.7% (Count:

64 of 215) and 68.3% (Count: 138 of 215) of total sample size.

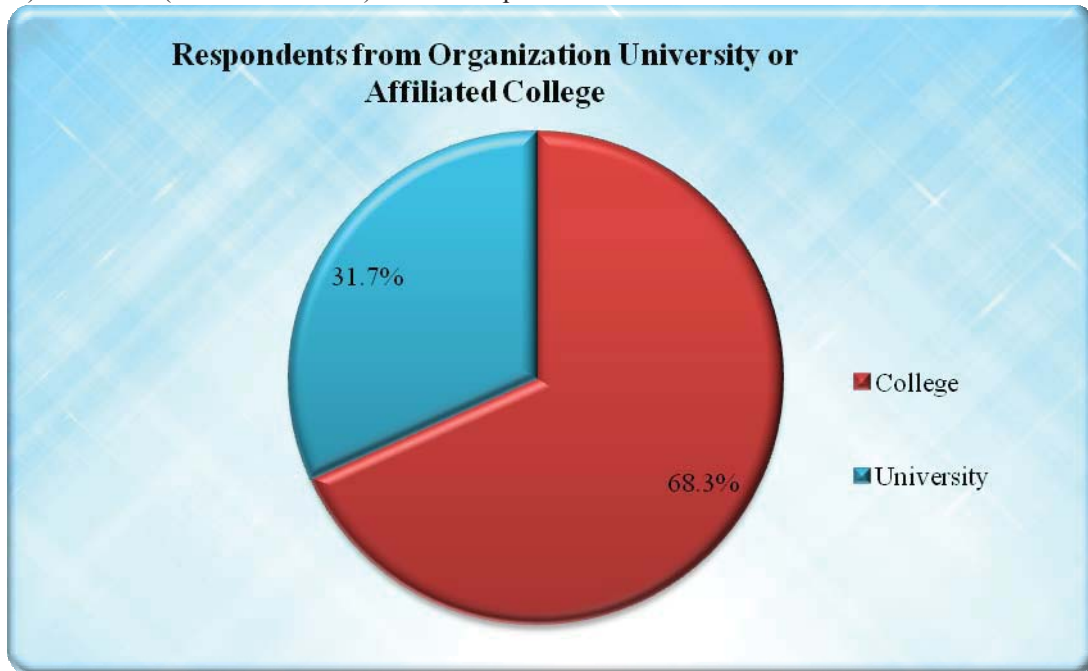


Figure 2. Representations of Respondents in Online Questionnaire (Universities vs. Colleges/Institutes)

In a further step of classification of participating institutions on the basis of type of their ownership as public/private, out of the total responses, it is 77% (Count: 153 of 198) and 23% (Count: 45 of 198) respectively from public and private institutions as shown in Figure 3.

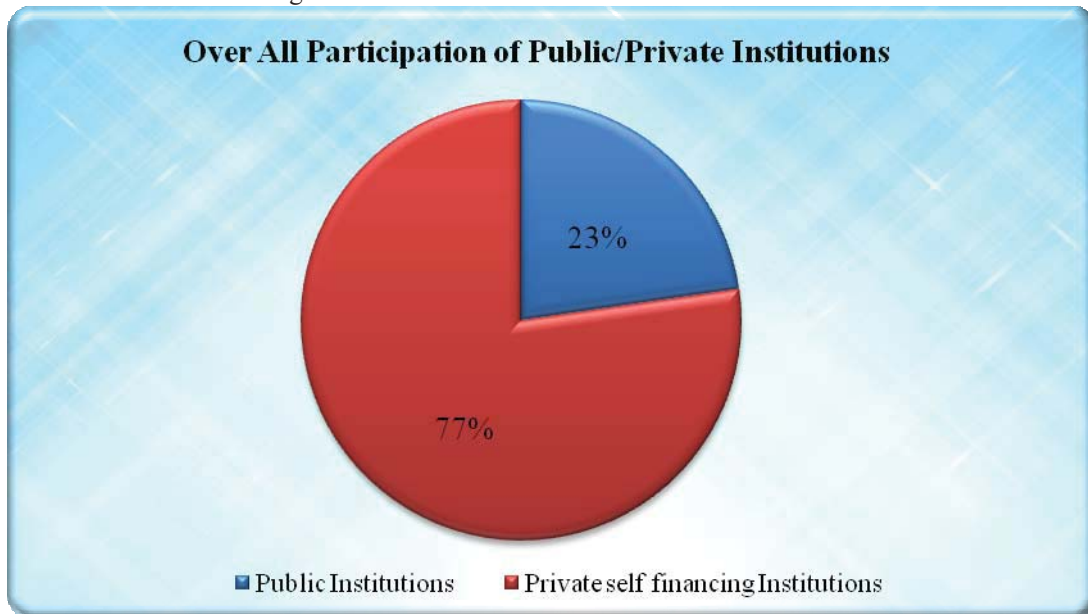


Figure 3. Representation of Respondents in Online Questionnaire (Public vs. Private Institutions)

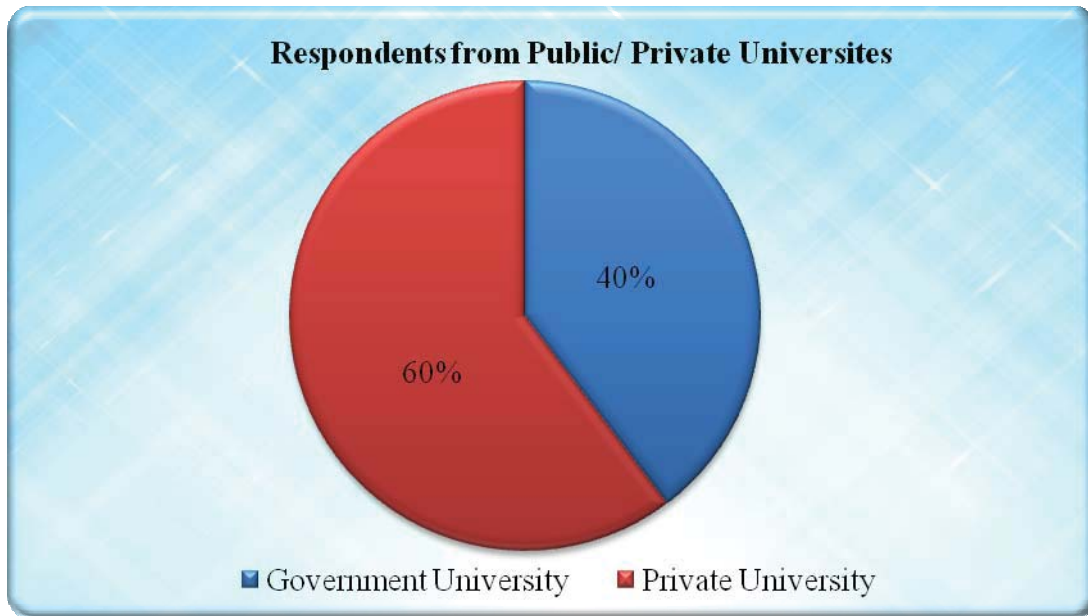


Figure 4. Representations of Respondents in online questionnaire (Public vs. Private Universities)

In one step further classification out of the 63 respondents from universities 40% (Count 25 of 63) and 60% (Count 38 of 63) are public and private universities respectively (Figure 4). Similarly classification of participating colleges from public and private is 14.8% (Count 20 of 135) and 85.2% (Count 115 of 135) respectively (Figure 5). The motivation behind this study is to find the factors that affecting the adoption of cloud computing and if addressed correctly cloud will be easily implemented in educational institutions as a better low cost solutions for computing requirements.

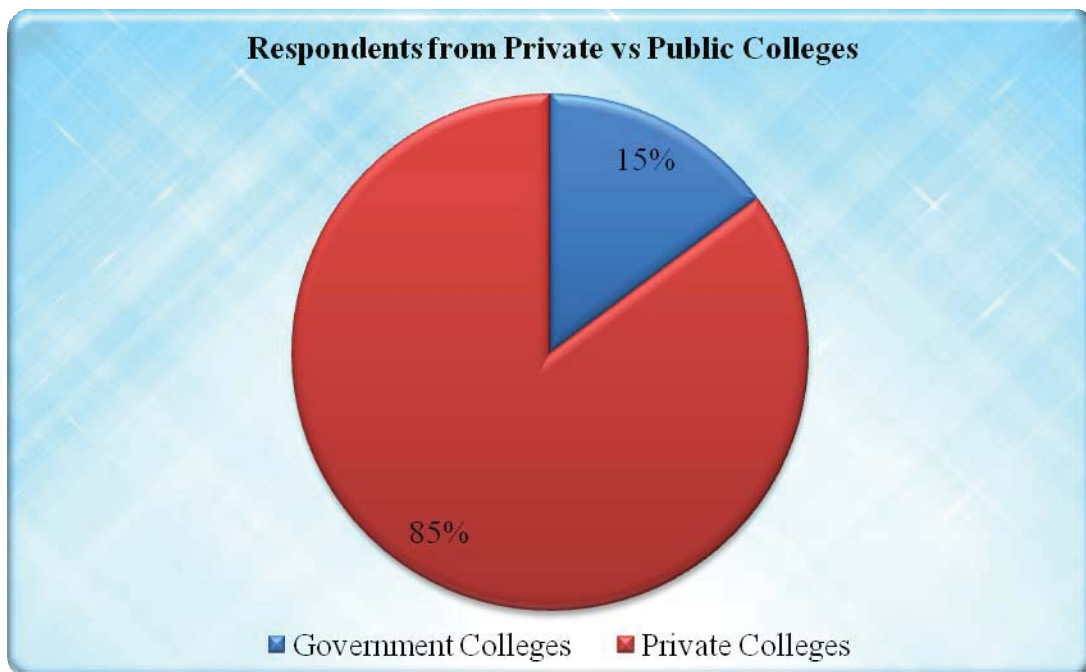


Figure 5. Representation of Respondents in Online Questionnaire (Public vs. Private Colleges)

IV. DATA ANALYSIS

As it has been already quoted in literature review that, there are many positive factors in the favor of cloud computing for educational institutions, and in general also. We have collected the opinion of participating institutions on

following factor:

- Improved Security
- Advanced Technology
- Better Functionality
- Green IT
- More Core Business Focus
- Switch from CapEx to OpEx
- Collaboration
- Complexity Reduction
- More Flexibility
- Better Scalability
- Cost Savings

Majority of organizations consider the following factors in favor of cloud computing. Top rank is given to “better functionality”, “advanced technology”, “cost saving” followed by marginally low priority to “improved security”, “green IT”, “better scalability” and “more flexibility”. Lowest ranked factors are “switch from CapEx to OpEx” and “More (core) business focus”, which is against the general perception of cloud service providers as they have been highlighting these factors as the top most advantages and opportunities for adoption of cloud computing as shown in Figure 6 below.

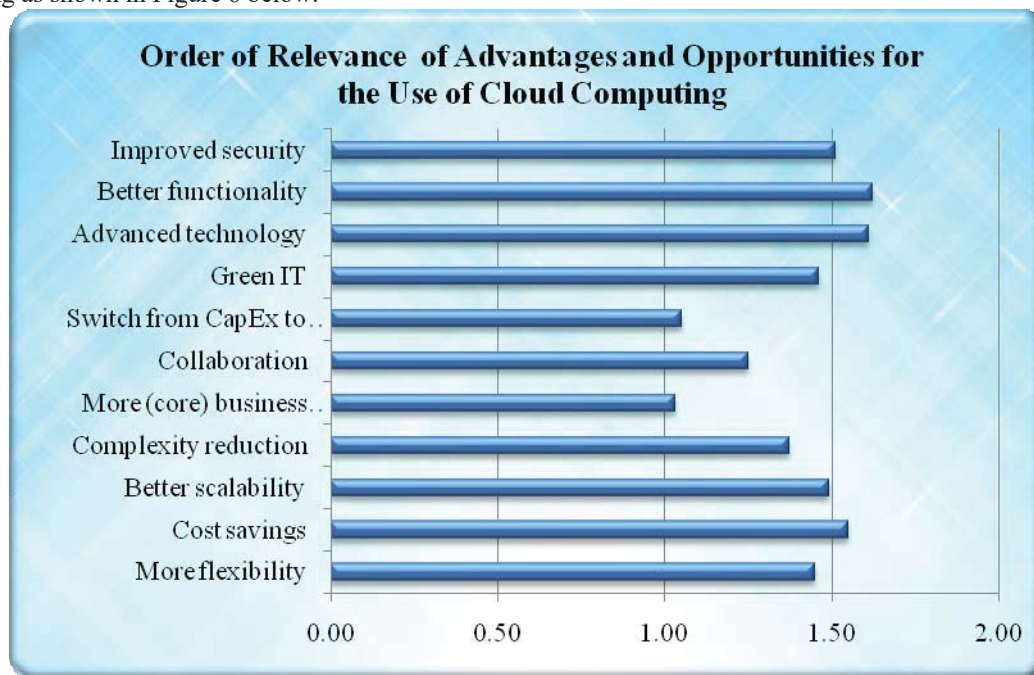


Figure 6. Motivating factors for adoption of Cloud Computing

Above statements supported through the results of Kruskal-Wallis test (Table 1) applied on the ranks given to various factors. Calculated Chi-Square is 291.426 at 10 d.f. so that, there is a significant difference between the various factors promoting the cloud computing, therefore, further POSTHOC was applied. Results of POSTHOC SCHEFFE and LSD are depicted in Table 2 and Table 3. It is also observed from Table 3 that “better functionality” is the top ranked factor and “more core business” is the least ranked factor and there is a significant difference between the ranks (Table 2) of these factors as already stated in the above Para.

Table -1: Kruskal-Wallis Test on Ranks of Factors Promoting the Use of Cloud Computing

	Group	N	Mean Rank
Rank	More flexibility	170	975.47
	Cost savings	175	971.66
	Better scalability	170	950.12
	Complexity reduction	172	741.64
	More (core) business focus	173	452.71
	Collaboration	170	975.44
	Switch from CapEx to OpEx	162	1083.30
	Green IT	173	785.50
	Advanced technology	171	1212.06
	Better functionality	170	1254.51
	Improved security	172	949.83
	Total	1878	

Table -2: One way Anova for Posthoc Scheffé and LSD at Alpha (0.05) Ranks of Factors promoting the use of Cloud Computing

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	102830.646	10	10283.065	21.774	.000
Within Groups	881725.167	1867	472.268		
Total	984555.813	1877			

Table -3: Homogeneous Subsets Ranks of Factors promoting the use of Cloud Computing

	Group	N	Subset for alpha = 0.05				
			1	2	3	4	5
Scheffea,b	More (core) business focus	173	62.4913				
	Complexity reduction	172		74.6163			
	Green IT	173		78.0173	78.0173		
	Switch from CapEx to OpEx	162		79.2346	79.2346	79.2346	
	Collaboration	170		79.4471	79.4471	79.4471	
	Improved security	172		80.0349	80.0349	80.0349	80.0349
	Better scalability	170		84.0824	84.0824	84.0824	84.0824
	More flexibility	170		84.5059	84.5059	84.5059	84.5059
	Cost savings	175			87.0457	87.0457	87.0457
	Advanced technology	171				88.7661	88.7661
	Better functionality	170					89.9647
	Sig.		1.000	.062	.143	.089	.059

In spite of increasing popularity of cloud computing, while considering its benefits in the order of ranks. As discussed above in detail, there are certain factors which actually refrains the adoption of cloud computing in educational institutions. We have considered following factors to be tested in the educational environment through the study. Factors under consideration are:

- Security issues
- Privacy issues
- Vendor lock-in
- Immature technology
- Legal issues
- Integration issues
- Insecure availability
- Insufficient financial benefits
- Lack of functionalities
- Compliance issues
- Lack of performance

Figure 7 describes major constraints which are pulling down the interest of organizations in adopting cloud are “privacy issues” and “security issues” at the top. Other threats in the order of rank are “lack of functionalities”, “lack of performances”, “insecure availability”, “and integration issues”, “compliance issues”, “legal issues”. “Immature

technology” and “insufficient financial benefits” are assigned lowest rank in the risk factors, therefore, it can also be concluded from this that cloud technology is now treated as a mature technology and also financially beneficial.

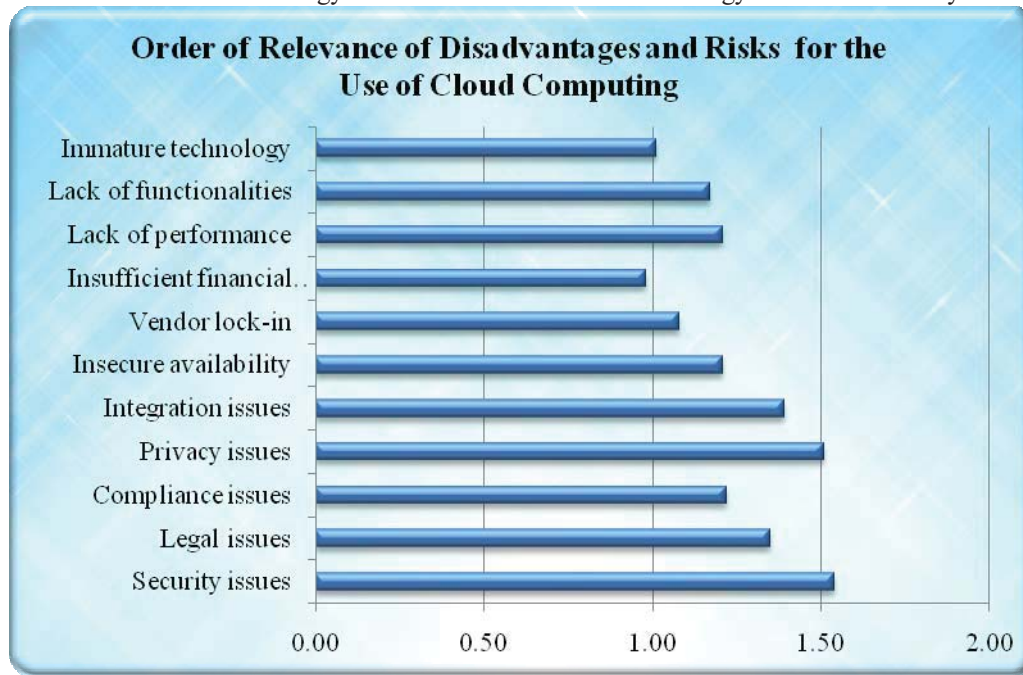


Figure 7. Disadvantage and Risks in the Use of Cloud Computing

Above statements are supported through the results of Kruskal-Wallis test (Table 4) applied on the ranks given to various factors. Calculated Chi-Square is 207.901 at 10 d.f. so that, there is a significant difference between the various factors affecting adoption of cloud computing, therefore, further POSTHOC was applied. Results of POSTHOC SCHEFFE and LSD are depicted in Table 5 and Table 6. It is also observed from Table 6 that “Security Issue” is the top ranked factor and “Insufficient financial benefits” is the least ranked factor and there is a significant difference between the ranks (Table 5) of these factors as already stated in the above Para.

Table -4: Kruskal-Wallis Test on Ranks of Factors Affecting The Use of Cloud Computing

Rank	Group	N	Mean Rank
	Security issues	154	1149.87
	Legal issues	153	688.78
	Compliance issues	151	826.32
	Privacy issues	152	1041.95
	Integration issues	151	858.74
	Insecure availability	151	990.09
	Vendor lock-in	149	698.40
	Insufficient financial benefits	150	547.50
	Lack of performance	150	684.76
	Lack of functionalities	150	792.14
	Immature technology	150	851.89
	Total	1661	

Table -5: One way Anova for Posthoc Scheffe and LSD at Alpha (0.05)for Ranks of Factors affecting the use of Cloud Computing

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	54508.263	10	5450.826	14.134	.000
Within Groups	636324.498	1650	385.651		
Total	690832.761	1660			

Table -6: Homogeneous Subsets for Ranks of Factors affecting the use of Cloud Computing

	Group	N	Subset for alpha = 0.05				
			1	2	3	4	5
Scheffe a,b	Insufficient financial benefits	150	54.44				
	Vendor lock-in	149	57.6711	57.6711			
	Lack of performance	150	58.2533	58.2533	58.2533		
	Immature technology	150	60.2533	60.2533	60.2533		
	Lack of functionalities	150	61.2533	61.2533	61.2533		
	Legal issues	153	62.451	62.451	62.451		
	Compliance issues	151	62.6821	62.6821	62.6821	62.6821	
	Insecure availability	151		64.7748	64.7748	64.7748	64.7748
	Integration issues	151			67.4238	67.4238	67.4238
	Privacy issues	152				72.1974	72.1974
	Security issues	154					73.8312
Sig.			0.209	0.452	0.088	0.061	0.099

V. CONCLUSIONS

As a result of this extensive literature survey, research on use of cloud computing, and the result of the analysis of online questionnaire filled by employees of technical educational intuitions, there are some issues that refrain to adopting the cloud services.

It is evident from the research work that adopting cloud-computing services in technical educational institutions have many concerns and challenges. Security is the most critical concern in the move to the cloud since computing system infrastructure will be under the control and/or supervision of a third-party provider. Other significant issues are integration issues, insecure availability and compliance issues.

Only a small number of cloud providers currently guarantee these issues and other issues related to storage and processing place of personal data which is a legal issue also. Cloud service providers should come out with a model that address the above identified issues to build more confidence and trust in the cloud model for Indian technical educational institutions.

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