

Applicability of Cloud Computing in University Libraries: A Feasibility Study

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Abstract:

The study aimed at identifying the role of change approaches in achieving competitive advantage in Jordanian telecom companies through a case study on Umniah Company. The researcher used the questionnaire to identify the role of change approaches. The study sample consisted of (70) employees in Umniah company. Descriptive and analytical approach was used. The study concluded with a set of results that the arithmetic mean of the items of the dimension of organizational culture has reached (3.59) which is at a high level, and this indicates that there is a role for organizational culture as one of the change approaches in achieving competitive advantage. The results also showed that the arithmetic mean of the dimension of quality management items has reached (3.52) which is also located in the high level, and this also indicates that there is a role of quality management as one of the change approaches in achieving competitive advantage, and finally the results of the study was showed that there are no statistically significant differences at the level of significance (0.05) among the responses of employees of Umniah company about the role of change approaches in achieving competitive advantage, attributed to study variables (job title, job department).

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INTRODUCTION

Since time immemorial, libraries have been considered one of the most important components of the society. With various and continuous advancements in computer technologies and internet technologies, the libraries also have undergone a total metamorphosis. There has been a lot of stress and preference to the technology driven automation so as to enhance the users experience of a library. However, the internet technologies so far have been proved to be a double edged sword, atleast for libraries. On one hand, these have improved the storage and dissemination of information in the libraries, while on the other, the users have started

comparing the library services with the internet, or to say, google searches. Gone were the days when users used to rush to libraries for high quality academic information. These days, the users explore the popular search engines on internet without even moving from their location. Therefore, it is high time that the librarians and information professionals started creating "internet like" or "google like" feel of their information retrieval to plug the fall of footfalls in their libraries.

In the recent years, cloud computing has been capturing the attention of the librarians the world over and one is seriously wondering if there are any possibilities and feasibility of applying it in the libraries. According to

National Institute of Standards and Technology (NIST) “cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources”. Cloud computing is an internet based service oriented technology which is remotely driven. It provides three types of services called infrastructure as a service (IaaS), software as a service (SaaS) and platform as a service (PaaS). Some of the characteristics of cloud computing like on demand self-service, broad network access, resource pooling and measured services have made this technology naturally amenable in the libraries. There have been a good number of success stories as well like, OCLC, discovery service, WorldCat, etc.

REVIEW OF RELATED WORK

Tomer (2017) has reviewed available technologies and relevant applications to find out how virtual machines of cloud computing and resources built thereon may be used to enhance the library and information science education. Mandal (2018) discussed the development of referencing management system in cloud computing environment. He selected one open source software Zotero in Ubuntu operating system environment and has shown how to manage referencing style in Zotero. Vargas (2018) elaborated upon storing digital files in the cloud computing in university libraries. The researcher lamented that cloud computing is recognized by many universities because it offers the possibility of concentrating on teaching and research activities and to offer quality service like e- learning. Kenneth, et al, (2018) explored cloud services and their roles that can be deployed to enhance library services. Wada (2018) submitted his ideas on cloud computing implementation in libraries and he argued that it can provide a synergy for library services optimization. The researcher has tried to justify the relevance of cloud computing in the libraries. The author has concluded that five facilities such as internet services, wireless access point, thin line architecture, digital resources and digital library are prerequisites for cloud computing deployment. Gandotra, Tyagi & Tiwari (2019) provided the basic knowledge of cloud computing, various models of cloud computing, its benefits in the libraries and also thrown light on some applications in the libraries.

OBJECTIVES OF THE STUDY

After detailed review of present research literature regarding use of cloud computing in libraries, it has been found that the cloud applications are still in infancy stage. Most of the studies are focused on understanding the concept of cloud computing and what benefits it can offer to the libraries once adopted. Therefore, there is a felt need of understanding the opinions and views of librarians on this aspect. Hence, the present research has following objectives:

- 1) To explore the views of librarians regarding characteristics of cloud computing for its applicability in libraries.
- 2) To find out the views of librarians regarding various advantages of cloud computing that make it amenable to be deployed in the libraries.

Further, the researchers also need to test the following hypotheses:

- 1) Cloud computing has several potentialities that are considered useful by the libraries.
- 2) Economic feasibility is more important than the technological factors while implementing cloud computing in libraries.

METHODOLOGY

The research has deployed the descriptive research methodology wherein survey method has been used. Qualitative techniques and purposive sampling methods were employed. The sample size of 28 university libraries was taken across the state of Maharashtra in India. To collect the quantitative as well as qualitative data, questionnaire method was used. Interviews and observations were recorded wherever necessary. The data was analyzed using SPSS to arrive at accurate quantifiable results. Systematic scientific tests like Chi-Square test, Pierson Correlation, etc. were used to validate the hypothesis.

SCOPE OF STUDY

The target population is university libraries in Maharashtra. There are total 41 university libraries in Maharashtra and the sample size taken is 28. The study is based on the views and opinions of libraries only in the university libraries. It does not include into account the views of computer experts.

Table No. 1: Category wise University Libraries

Types of University	Total	Considered
Agricultural University	6	4
Non-Agricultural University	29	18
Medical/Health University	5	5
Open University	1	1

Therefore, from table no.1, it is seen that all types of libraries have been considered for the study. Out of total 41 university libraries, a stratified random sample of 28 is taken.

DATA ANALYSIS AND DISCUSSIONS:

Table No. 2: – Ranking of Characteristics of Cloud Computing according to librarians views

Characteristics	Percentage of Libraries	Ranking
On demand self service	87%	1
Service Oriented	86.7%	2
Easily Accessible	85%	3
No Physical entities, Virtualized, Flexible	80%	4
Location Independent	76%	5
Pay Per Use	67%	6

There are several characteristics of cloud computing which make it amenable to be applied in libraries, viz. On-demand self service, Easily accessible, No physical entities, Location independent, Service oriented, pay per use, virtualized and flexible. From Table. No. 2, it is observed that 'On demand self service' has been considered as the highest characteristic by these libraries whereas the characteristic 'service oriented' is second. 'Easily accessible' characteristic of cloud computing has been rated third. 'Pay per view' has been rated the lowest amongst all the characteristics.

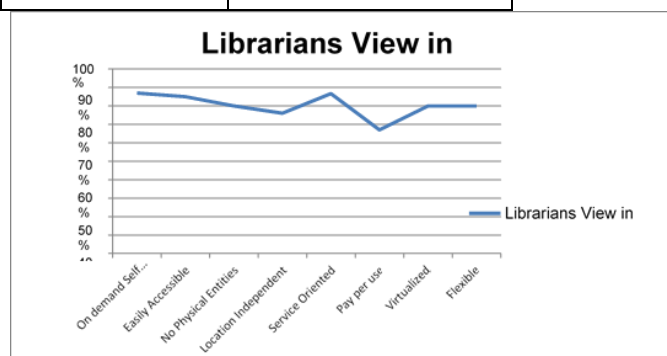


Figure 1- Characteristics of cloud computing in university libraries

Figure No. 2 shows that there are several advantages of application of cloud computing in libraries, viz. on-Demand self service, Broad Network access, Resource pooling, Rapid feasibility and Accountable services.

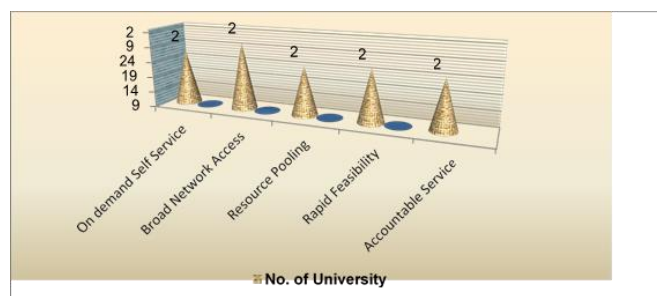


Figure 2- University Libraries wise advantages with applications of Cloud Computing

From Figure no. 2, it is observed that 96% libraries have considered 'Broad Network access' as the highest advantage of application of cloud computing. On demand self-service is the second highest 81 % advantage of cloud computing considered by these libraries. Rest other advantages namely, 'Rapid feasibility', 'Resource Pooling' and 'Accountable Service' are also considered racial by 78% and 74% libraries respectively. 50% libraries have opined that application of cloud computing will reap all the said advantages in the libraries.

Table No 3: Usefulness of Potentialities of Cloud Computing in University Libraries

Use of Potentialities of Cloud Computing in Libraries					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	1	3.7	3.7	3.7
	1.00	2	7.4	7.4	11.1
	2.00	6	22.2	22.2	33.3
	3.00	7	25.9	25.9	59.3
	4.00	3	11.1	11.1	70.4
	5.00	8	29.6	29.6	100.0
	Total	27	100.0	100.0	

There are five Usefulness of potentialities of cloud computing viz. Data security, Cost Effectiveness, System Scaling up & down, No Boundaries up & down and Deployable. Only one library doesn't see

any use of potentialities of cloud computing. Maximum 8 libraries find all the five use of potentialities.

Table No. 3.1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Use of Potentialities of Cloud Computing	27	.00	5.00	3.2222	1.47631
Valid N (list wise)	27				

Interpretation: From table no. 3.1, the mean is found to be 3.22. it means that on an average, the libraries have found at least three use of potentialities. Hence,

hypothesis 1 that cloud computing has several potentialities that are considered useful by the libraries is accepted.

Table No 4: Showing cross tabulation between Technological option as a consideration for Cloud computing and Economic option as a consideration for Cloud computing

Technological Option * Economic Option Crosstabulation								
			Economic Option					Total
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Technological Option	Strongly Disagree	Count	1	0	0	0	0	1
		Expected Count	.1	.1	.3	.3	.2	1.0
		% of Total	3.7%	0.0%	0.0%	0.0%	0.0%	3.7%
	Neutral	Count	2	1	8	0	0	11
		Expected Count	1.2	.8	3.3	3.3	2.4	11.0
		% of Total	7.4%	3.7%	29.6%	0.0%	0.0%	40.7%
	Agree	Count	0	1	0	8	0	9
		Expected Count	1.0	.7	2.7	2.7	2.0	9.0
		% of Total	0.0%	3.7%	0.0%	29.6%	0.0%	33.3%
		Count	0	0	0	0	6	6

	Strongly Agree	Expected Count	.7	.4	1.8	1.8	1.3	6.0
		% of Total	0.0%	0.0%	0.0%	0.0%	22.2%	22.2%
			3	2	8	8	6	27
			3.0					
			11.1%	7.4%	29.6%	29.6%	22.2%	100.0%

Table no.4 shows the relation between Technological and Economic option as a consideration for cloud computing in University Libraries in Maharashtra. It can be hypothesized that there should be relation between the two options. If cloud computing serves the purpose then will libraries pay more for Cloud computing? Chi-square test has been conducted to study the relation between two variables. Out of 28 libraries one librarian strongly disagree on the technological option as well as economic option for cloud computing. 11 i.e. 40.7% librarians are Neutral about Technological as

well Economic options for the use of Cloud Computing. Out of these 2 are Strongly disagree, 1 is Disagree while maximum 8 are Neutral on Economic option as a consideration for Cloud Computing. 9 librarians are Agree on Technological option as a consideration for Cloud Computing. Out of these maximum 8 are also agreeing with Economic option as a consideration for Cloud computing while 1 is Disagree on it. 6 librarians are Strongly agree on Technological as well as Economic option as a consideration for Cloud computing.

Table No. 4.1: Chi-Square Tests

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	58.636 ^a	12	.000
Likelihood Ratio	57.579	12	.000
Linear-by-Linear Association	19.080	1	.000
N of Valid Cases	27		
a. 20 cells (100.0%) have expected count less than 5. The minimum expected count is .07.			

Interpretation: Above table no.4.1 shows the results of Chi-square test conducted to study the relationship between Technological and Economic option as a consideration for cloud computing. This relationship has been tested at 5% level of significance. It is found that the calculated Chi-square value is 58.636 at 12 degrees of freedom. The p-value is found to be 0.000 which is less than 5% level of

significance.

Thus, it can be concluded that there is significant relationship between Technological option and Economic option as a consideration for Cloud computing. It means that even if libraries look for Technological option, they also look for Economic option for consideration of Cloud computing which has to be spend within the given budget.

Table No 5: Technological option and Cost saving Cross tabulation

Technological Option * Cost Saving Cross tabulation							
			Cost Saving				Total
			Strongly Disagree	Neutral	Agree	Strongly Agree	
Technological Option	Strongly Disagree	Count	0	1	0	0	1
		Expected Count	.0	.0	.4	.6	1.0
		% of Total	0.0%	3.7%	0.0%	0.0%	3.7%
	Neutral	Count	1	0	6	4	11
		Expected Count	.4	.4	4.1	6.1	11.0
		% of Total	3.7%	0.0%	22.2%	14.8%	40.7%
	Agree	Count	0	0	4	5	9
		Expected Count	.3	.3	3.3	5.0	9.0
		% of Total	0.0%	0.0%	14.8%	18.5%	33.3%
	Strongly Agree	Count	0	0	0	6	6
		Expected Count	.2	.2	2.2	3.3	6.0
		% of Total	0.0%	0.0%	0.0%	22.2%	22.2%
Total		Count	1	1	10	15	27
		Expected Count	1.0	1.0	10.0	15.0	27.0
		% of Total	3.7%	3.7%	37.0%	55.6%	100.0%

Table no.5 shows the relation between Technological and Cost saving as a Motivation for cloud computing in University Libraries in Maharashtra. It can be hypothesized that there should be relation between the two options. If cloud computing serves the purpose then will libraries save more by using Cloud computing? Chi-square test has been conducted to study the relation between two variables. Out of 27 libraries one library strongly disagree on the technological option but Neutral on Cost Saving as a motivation for cloud computing. 11 i.e. 40.7% librarians are Neutral about Technological options for the use of Cloud

Computing. Out of these 1 is Strongly disagree, 6 are Agree while maximum 4 are Strongly agree on Cost saving as a motivation for Cloud Computing. 9 librarians are Agree on Technological option as a consideration for Cloud Computing. Out of these maximum 5 are Strongly agreeing on Cost saving as a Motivation for Cloud computing while 4 librarians are Agree with it. 6 librarians are Strongly agree on Technological option as a consideration for Cloud computing and Cost saving is the motivation to implement Cloud computing.

Table No. 5.1: Chi-Square Test

Chi-Square Tests			
	Value	df	Asymp. Sig. (2- sided)
Pearson Chi-Square	34.509 ^a	9	.000
Likelihood Ratio	18.154	9	.033
Linear-by-Linear Association	6.798	1	.009
N of Valid Cases	27		
a. 14 cells (87.5%) have expected count less than 5. The minimum expected count is .04.			

Interpretation: Table no. 5.1, shows the results of Chi-square test conducted to study the relationship between Technological option as a consideration for cloud computing and Cost saving as a motivation to implement cloud computing. This relationship has been tested at 5% level of significance. It is found that the calculated Chi-square value is 34.509 at 9 degrees of freedom. The p-value is found to be 0.000 which is less than 5% level of significance.

Thus, it can be concluded that there is significant relationship between Technological option as a consideration for cloud computing and cost saving as a motivation to implement cloud computing. It means that libraries implement cloud computing for Technological option which is useful in saving cost.

Therefore, it is revealed from the above two tests that economic feasibility is given equal importance as is given to technological factors while implementing cloud computing in libraries. Hence, hypotheses 2 is rejected.

Major findings of the study can be summarized as follows:

1. 'On-Demand self service' is the most desirable characteristic of cloud computing as opined by the librarians of university librarians.
2. 'Pay-per-use' characteristic of cloud computing does not get much importance from university librarians.
3. 'Broad Network access' is the advantage of cloud computing which makes it naturally applicable in the libraries according to the views of librarians.
4. Though cloud computing technology is a very good option for libraries, however, it has to be cost effective also.

SUGGESTIONS

The university librarians should start deployment of cloud technologies as it will benefit the libraries in more ways than one. 'Private cloud' can be better solution to overcome the problems related with data security. The expectations of the users can be met with the help of this promising technology. The librarians should upgrade their skills in handling cloud as a service, platform and infrastructure. The librarians should adopt latest technologies to enhance the experience of their users.

CONCLUSIONS

The librarians will always be among the first ones to embrace new technologies fast so as to move further to become smart libraries. With the promising technologies like Internet of Things and Big data analytics, the face of libraries will eventually change for good. The day is not far when users will get desired service on go. Nevertheless, the role of librarians is going to become more challenging as he will have to multi task now. He will have to collaborate with other libraries to pool resources. The form, look and feel of the libraries are bound to change, however, libraries are here to stay forever.

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