

An Analysis of Issues for Adoption of Cloud Computing in Telecom Industries

Case Study of Pakistan

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Abstract—In the modern era companies seek the use of modern technologies in order to upgrade their infrastructure and enhance their business growth. The use of business intelligence, data science and cloud computing (CC) has become an integral part of business. Different factors play important role in the adoption of cloud services. An organization willing to adopt cloud services should consider them. This paper explores the factors and addresses the issues in implementing and deploying CC in telecom companies. In addition, this study also shares the benefits of utilizing CC which is a novel technical pattern which can change the use of different associations of information technology as a service. CC concentrates on the idea of definition, security problems, service models and infrastructures of its development. The important point is to analyze how this paradigm should be adopted in telecom industries and its results. This research study presents a comparative analysis of adaptation of CC by various telecom industries. The results identify certain limitations which also play their role for adaptation of CC in telecom companies.

Keywords—cloud computing; telecom industry; IaaS; SaaS; benefits of cloud computing

I. INTRODUCTION

The continuous increase in the data volume captured by social media and multimedia has brought forth an intense flow of data in structured and unstructured format. This data production is referred to as big data. Big data is seeking attention from government, academic institutions and industry. The progress in data storage gave rise to data mining technologies including classification methods [1, 2], social web analysis [3-6], sentiment analysis [7, 8], scientometrics [9, 10] and cloud computing (CC). CC is the big shift in technology

and provides an effective platform for big data computation. CC is a paradigm of information technology that allows clients and companies to get the required quantity of computing resources. CC has many advantages that attract individuals and enterprises to store and process their data on cloud platforms. These advantages are virtualization, scalability, parallel processing and security. CC reduces the cost of automation and infrastructure [11]. Small and large companies are moving towards CC due to its efficacy, automatic software update, capital-expenditure fee, document control, security and competitiveness. CC provides large data storage and computing services through huge data centers. CC is among the top 5 influential technologies on a global basis [12]. Sixty percent of small and large business purchases are based on cloud services, and 30% of businesses purchased more than five cloud services [13]. CC provides service-based low cost IT solutions. Companies can globalize their operations. CC services provide scalability and elasticity which increase business flexibility [14]. CC has different limitations along with its advantages, especially related to security issues [15] such as data leakage, and unauthorized access. Companies are interested in shifting their business on cloud. Security risks, privacy threats, national, and internal regulations are preventing organizations from adopting CC and implement it to avail new opportunities. Organizations need to take into account all factors which are acting as a barrier for CC adoption. This paper focuses on studying CC in telecom industry. Two things are addressed in this paper: The study of the level of knowledge, which identifies the issues of CC and its performance and to show the results, which come from CC utilization in different companies. With help from this study IT professionals and researchers can

identify the barriers in adopting CC in telecom industry. The study has been carried out in Pakistan telecom industry.

II. RELATED WORK

In this section CC benefits, challenges, risks and limitations in their adoption in the IT field are discussed. National institute of standards and technology (NIST), defined CC as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. Cloud computing is developed through hardware, virtualization, distributed computing and service delivery over the internet. Using CC, business can utilize computing services on low-cost [16]. Transferring business towards cloud reduces the cost of IT resources [17]. CC eliminates traditional boundaries in business. CC provides services in three categories: infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS). These models are used to match the computing demand, deploy and integrate applications, provide user access to applications using a client (web browser) respectively. Different CC models exist for deployment. The public cloud is provided for all industries. Private cloud is used by a particular organization. Hybrid cloud uses the services of both public and private cloud [18, 19]. Still, the concept of CC is not well known and misunderstood [20] while CC is not well established for deployment [21, 22].

Nowadays emphasis is given on the advancement of knowledge related to IT services [23]. There is a need to enhance the knowledge of IT services including CC services [24]. CC services across different industries need to be explored in future. This involves the issues related to technical and organizational issues on adoption of CC services [24]. A business that needs to adopt CC should consider its risks, opportunities, and challenges [17, 25]. Business challenges need to make a strategy to decide how to use different transformed services [26]. IT managers must have comprehensive knowledge of organizational structure, interdependencies, processes and habits to make decisions about the choices of organizational structures [27].

III. RESEARCH METHODOLOGY

This section identifies and discusses the issues in the selection of CC and its benefits in telecom sector. In this study, quantitative and qualitative techniques are applied. The main purpose of the quantitative approach is to improve the knowledge about different types of CC applications in the field of telecom and also to improve the quantitative approach in different phases. In 2011 different telecom industry managers were requested, to participate in meetings regarding the improvement of different quantitative phases. 17 people responded in two meetings and two main ideas were presented: research and concepts of CC and their different applications in the telecom field. On these meetings, different applications of CC in the telecom field were identified and are still concerning different telecom companies:

- How to measure the security of different companies in

telecom industry.

- How to measure the different result in CC environments.
- How to improve the quantitative phase.

In quantitative phase enough data were collected and analyzed regarding different CC applications and different tests were applied. On the basis of the test results, various issues were identified. Fifteen questions about these issues emerged which belong to three categories: The first group of questions relates to the employees of the company, the total sales, and the years the company is active. The second group is about the company's knowledge about CC in telecom field. The third group is related to all barriers that were faced. Surveys were conducted in all telecom industries by using random sampling in October 2011 to December 2011. In these surveys the decision makers targeted the IT managers. Interviews were also conducted in companies with no IT department. The data set obtained from the responses was composed of 83% IT managers, 9.6% managing directors excluding the IT managers, and 7.4% owners. To get better responses the sample was divided into two different categories: The 1st category includes the available IT managers and the 2nd category includes the unavailable IT managers. The mean of the factor scores of these two categories is compared by using the ANOVA. The result obtained after using the ANOVA showed no main difference. It was concluded that in any survey the respondents' position did not matter. After getting 94 responses, the main features of both phases, quantitative and qualitative, were identified and are shown in Table I.

TABLE I. FEATURES USED IN QUALITATIVE AND QUANTITATIVE PHASE

Staff			
Interval	Year/month	Rate N	Avg.
0-9	>18	16.5	35
10-50	>60	59	
50-249	>19	18	
Sum	100%	94.5	
Sale			
Periodic sale (mill. euro)	%age	Rate N	Avg.
0-0.5	More than 12	11	1.8 mill
0.5-1	50%	48	
More than 1	39%	37.5	
Sum	100%	94.5	
Years			
Interval	%	Rate N	Avg.
0-9	14.9%	14	24
10-20	51.1%	47.5	
More than 20	34%	32	

By using SPSS the collected data were statistically processed and two aims were addressed. The first one was the degree of information on CC and the second was the result received from the use of CC. For computing the group differences, statistic methods were used. ANOVA test is one approach which is used for the appropriateness of the test, and for the variance of the group. By using ANOVA, assumptions of parameters were also checked. In the same type of samples the statistical evaluation is obtained by using the ANOVA test, for industrial telecom with and without CC. For different dimensions dependent and independent variables were found. By using the dependent variables the consequences of the CC

on telecom were identified. Aforementioned literature shows the benefits of the utilization of CC, but there is unavailability of quantitative analyzed results. The results obtained by the implementation of the CC, are not to be used as financial and economic variables because there are some issues which affect the results that may or may not be related to CC. In the review of the literature the following points are noted:

- The effort to reduce the cost of software and hardware.
- The effort to access the improved IT resources.
- The concentration on the main business point of view.

In different group meetings it was shown that the main barrier of adoption of CC is related to security. This part consists of how cloud computing improved security in different telecom industries.

TABLE II. IT COST REDUCTION

Features	Range of Values
F1	Costs of hardware have been reduced in the previous two years
F2	Costs of software have been reduced in the previous two years
F3	Costs of IT people have been reduced in the previous two years

Alpha value : 0.829

TABLE III. LEVEL OF IT RESOURCES USED AND ORGANIZATIONAL ISSUES

Characteristics	The range of less value
T1	Scalability, flexibility, accessibility, enhanced in the previous two years
T2	In the previous two years IT resources increased
T3	Costs of IT people have minimized in the previous two years
T4	Security issues are minimized in the last two years

Alpha value : 0.72

TABLE IV. CC UTILIZATION

CC Concept	Identify		Implemented		
	%age for Yes	%age for No	%age for Yes	%age for No	%age for Yes
	19.5	80.5	11.60	88.40	195

IV. RESULTS

The results are divided into two sections. In the first section all elements regarding different barriers faced when implementing CC were identified, while in the second section all effects that occurred while using CC in telecom industry were identified.

A. Barriers to CC Implementation in Telecom Industry

Companies and academic sector know the benefits of CC. There are two main concerns: The first is to understand CC in the context of usage in the organization and the attitude of telecom industry in adoption of CC and the second one regards the elements that should be contained in different telecom companies when utilizing CC. On the basis of the survey, a small ratio of companies is aware of the concepts of CC. Only 18 different companies (19.15% of the total) are aware of CC. Only 11 companies (11.70%) have implemented CC services. The survey results show that 80.85% of the companies do not

know about the CC concept. The CC characteristics are explained, as shown in Table VI.

TABLE V. ORGANIZATION LAUNCH OF THE CC CONCEPT

The idea of CC	Interested or not for in applying it	
	%age for Yes	%age for No
	55.5	4.5

TABLE VI. ORGANIZATIONS NOT IMPLEMENTING CC

Used value Significant and not significant	Avg. Value
The problem in data surety	6.37
Data loses while transferring to some other party	6.48
CC Advantages	6.14
How to use services with their value	6.08
Lock-in data, not easy for the client to modify a new supplier	7.87
Privacy of data, protection with the position of given data	5.46

A number of companies started to use CC in their organization: 55.26% of the companies utilized CC services. Some factors were identified on the basis of which different companies rejected or did not show their interest to utilize CC. An important barrier to the utilization of CC in the organization is the unavailability of IT managers.

B. Effects of CC Use in the Telecom Industry

Table VIII shows the association of the different used variables in which the highest level of significance is <0.01. Secondly, as stated in the given methodology portion, the investigation of different models is ANOVA, which was made to detect the presence of important statistics among the uses of CC for every attribute of the scales (for the variables that are dependent and independent on the test).

C. Effect of CC Use In Cost Reduction

Table IX shows us that companies that use CC have improved behavior in all attributes. The test significance value is less than 0.01, proving the relationship between the usage of CC and IT decreasing costs.

D. Effect of Using CC on Organizational problems and IT Resources

Table X shows that all companies that use CC acquire significantly better behavior. But the association is statistically better in the main three attributes: ease of access, scalability and augmented flexibility in the utilization of IT. Accessibility of resources related to IT and problems that are related to security are reduced.

V. DISCUSSION AND FUTURE WORK

CC is a novel technological IT organizational model. The addition of technical progress can modernize the organization. CC analysis shows that the main things on which this topic concentrates are its concepts, its main attributes, different exploitation model, main issues related to security and different services from the technological view. However, there is a lack of CC research for use in companies, identifying different barriers to its use and the identification of the main factors used for the assessment of the effect by implementing CC. This is important for the telecom field which is important in the

economic field for any company. Empirical qualitative and quantitative research methodology is used to identify the obstacles faced for its implementation in telecom industries. The effects or benefits of using CC in telecom companies are investigated. In this regard it is shown that most of telecom companies have small knowledge about the usage of CC, but when these telecom companies acquire that knowledge, they have shown their interest on implementing CC. This shows that the ignorance of CC is the main cause of not implementing it. This study is beneficial for those who want to bring the telecom

closer to CC because the obstacles companies face while adapting CC are identified. These obstacles are organized hierarchically, according to their importance in telecom industry. The telecom companies identified that the two most important barriers for using CC are security issues and transferring data to a third party. A third barrier is the unawareness of the managers on how to calculate the results produced by CC. Another barrier is the benefit of cost by using CC. Other barriers identified include quality, availability of services, and requirements for data protection.

TABLE VII. DIFFERENT PRODUCTION LEVEL FOR MINIMIZING COST

Bilateral Pearson association	Descriptive figures						
Characteristics	cl-T1	cl-T2	cl-T3	Avg.	Std	Min	Max
Scalability & ease of use costs minimized in the previous two years	1			4.404	1.712	1	7
Access to previously unavailable IT improved the previous two years	0.6	0.791	1	4.476	1.521	1	7
Increased resources	0.676	0.735	0.586	3.380	1.72	1	7
Issues related to security minimized in the previous two years	0.535			3.678	1.663	1	7

TABLE VIII. LEVEL USED FOR ORGANIZATIONAL PROBLEMS

Bilateral Pearson association	Descriptive figures							
Characteristics	RI-T1	RI-T2	RI-T3	RI-T4	Avg.	Std	Min	Max
Scalability & ease of use costs minimized in the previous two years	1				4.450	1.3	1	7
Access to previously unavailable IT improved the previous two years	0.6	0.791	1		4.296	1.672	1	7
Increased resources	0.676	0.735	0.586	1	3.487	1.420	1	7
Issues related to security minimized in the previous two years	0.53				3.678	1.663	1	7

TABLE IX. ANOVA OF MINIMIZATION COST

By using CC	Avg. r-IT 1		c-IT 2	c-IT 3
Y	5.45		5.93	5.5
N	3.36		2.82	3.23
	Value of F	9.15	13.37	13.37
	implication	0.007	0.002	0.002

TABLE X. ANOVA OF ORGANIZATIONAL PROBLEMS WHILE USING CC

CC utilization	Avg. r-IT 1		e-IT 2	e-IT 3	e-IT 4
Y	5.64		5.78	3.46	5.54
N	3.32		2.86	3.42	2.43
	Value of F	9.42	11.23	5.46	15.54
	implication	0.006	0.001	0.118	0.001

The second objective is investigating the main effects that arise while using CC in different companies. On the basis of sampled companies the result concluded as follows while using CC: 1) Cost reduction for hardware, software and IT resource persons, 2) flexibility and scalability in the uses of IT and 3) access to IT resources that are not available to the companies without CC. The companies that are using CC have their security issues reduced. This is an important thing to notice, companies identified that using of CC increases security issues, but actually the companies that are using CC increase the level of their IT security.

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