Cloud Computing Applications in Saudi Arabia with its Main Challenges

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Abstract

Cloud computing is a general term used to denote a new type of computer services that are essentially networked and the Internet is a place to create a user-friendly environment that includes applications that are stored on the cloud and required by the client as needed to run through the browser. On-demand network, which can provide a number of integrated computer services without local resources to facilitate the user. These resources include a space to take data backup, including processing programs and scheduling tasks, e-mail and medicine remote user can control when it is connected to the network in these resources through a simple software interface.

Applications and services of cloud computing help to benefit from modern and future science and processing large data and the use of specialized networks and databases, and develop mechanisms and ways of trading and sharing this information. The main objective of this article is to shed the light on the factors that influence the decisions to use and implement applications and services based on the cloud. Using the Technology Acceptance Model (TAM), so to achieve this target, a questionnaire was designed and distributed to a group of practitioners involved in the implementation of cloud based solutions in their organizations. Data analysis was performed using structural equation modeling software. The major outcomes of this article indicate the role of image and personal innovativeness on behavioral intention towards the adoption of cloud-based applications and services.

Keywords: Cloud computing; DDoS, Technology Acceptance Model (TAM); Structural Equation Modeling

1. Introduction

Cloud computing means that computers work in the cloud or remain locked in space while users reach it. As for its real meaning, it is contrary to what traditional computing needs. We use both the data used and manufactured by the user and all the programs used by the user The cloud computing is based on the user does not need to store any of his data on his personal machine and not need to various programs or complex may need only what happens from the processes and all the programs used and access to files and data stored on computers in networks away from him For a user) and a lot called cloud computing word cloud only.

Cloud computing is an advanced IT model to host and share both software and hardware resources over the Internet. It allows organizations to use IT resources and applications as service virtually through the web to be accessible in any

location and at any time (Dutta et al., 2013; Scale, 2009). In recent years there has been an increased attention on cloud technologies in the academic literature (Goyal, 2014; Li and Ping, 2009; Vaquero et al., 2009). However, there is few studies that studied the acceptance of cloud-based technologies in developing countries. This paper intends to investigate the use of cloud-based applications in Saudi Arabia and explore the factors that influence the acceptance of cloud-based applications in Saudi Arabia. We adopt the theory of Technology Acceptance Model (TAM) by Davis (1989) in the area of cloud applications.

We prefer the usage of cloud computing based on the major advantages of cloud computing which can be summarized as follows: (A) Self-service: The ability to use applications available in the cloud, such as Google Docs applications, spreadsheets and databases, so that any user can create files and modify and save in the cloud structure using the web browser according to his needs. (B) Availability and flexibility: access to applications and resources available in the cloud from anywhere and at any time, helping to facilitate access to data and information in a timely manner and provides more flexibility by enabling access to information and applications through a wide range of sites and services, Through computing services provide greater ease and flexibility when performing different tasks. (C) Save and reduce costs: Organizations can reduce and reduce expenses by paying only for services they use, and potentially by reducing or redeploying IT staff.

Also, cloud service provides a flexible, low-cost way to access the IT resources needed to support the diverse operations of e-business. If you choose to work with cloud computing, there is no need to invest in advance in any equipment or spend time on the technical complications of managing this equipment. In turn, you can attract the right size and type of IT platform to support your online-based projects. You can access any of the sources immediately and pay by use only. In cloud computing we need five key elements:

I - A personal computer and any device with medium-capacity medium enough only to connect to the Internet.

II - Any operating system that allows Internet connection Any system that can allow access to the Internet and this feature is available in almost all current operating systems.

III - Internet browser There is no condition on the type of browser used in cloud computing as long as the large site is compatible with it is suitable for the use of cloud computing without any obstacles

IV. Providing Internet Connection The Internet connection in this case is separated by a high-speed link between the user and all his data and all the programs he uses.

V - Provider of cloud services in most of its characteristics is similar to the hosting service provider, but an increase in some features in order to allow both developers and users to use resources available in the servers more efficiently as the survival of both users and application developers will be longer on the servers of cloud service providers .

Cloud computing enables the user to have a service that allows him to store all of his data outside his personal computer, that is, he stores his files and data on cloud computing servers on files that he can access from anywhere with an Internet connection.

2. Cloud Computing Technology with its Major Benefits & Limitation

The most common classification of cloud computing is the (1) software-as-a-service, (2) platform-as-a-service and (3) infrastructure-as a-service. Software-as-a-service (SaaS) allows cloud customers to take advantage of software running on the provider's infrastructure through the web. Platform-as-a-service (PaaS) enables cloud customers to deploy their own applications and data on platform tools. Finally, Infrastructure-as a-service (IaaS) finally, provides the use of a virtual computer infrastructure environment as a service on a rental pay-per-use basis (Ataur Rahman and Masudur Rahman, 2014). Cloud computing offers unique advantages such as online delivery of software, virtual storage, everywhere network access, and usage-based pricing. Users of this technology can access the provided services on the Internet without having any previous operational knowledge (Aljabre, 2012). Amazon.com provides the following explanation: "Cloud computing provides an easy way to access servers, volumes, databases, and a variety of online service applications." Cloud service providers maintain and maintain the network - Equipment for such service applications, while defining and using exactly what you want through a web-related application. In the following subsections, we'll summarize some benefits and advantages of cloud computing:-

2.1. Low cost

There is no need to invest in the servers, data centers and the technical manpower necessary for operation. You only pay for what you use from cloud computing sources. The main advantage is economic as the cost varies according to usage and overall, the use is less than any other method currently available.

2.2. Faster Services

Increased speed - With cloud computing, advances in IT are only a push away. This means that the time to get the latest technology can be reduced to just minutes. This also helps speed up the tasks required by institutions that rely heavily on the availability of the Internet, as the time to test and develop tasks is less than any other method available. Recently, many services have been built using cloud computing. These services provide integrated solutions for different organizations. Amazon and Google provide service-oriented equipment, and Sales force provides a comprehensive service management platform. So there are some applications come in the form of a service. One of the most popular examples is e-shops. The first one to offer this service in our Arab region is the Pluto shop of Cloud Wings, an e-shop in the form of a full-service web hosting service.

2.3. Flexibility

Here we should not worry about the site's infrastructure before you actually start working on it where as you submit a space decision before launching the site, application or online store, you will get either one of two results, additional space or a shortage. While when you use cloud computing you will get rid of this problem as you will be able to access enough space for your business with the possibility to increase or reduce as needed. From the moment the company needs more space, the cloud-based server will be ready to be delivered in record time due to the high efficiency of such servers. In fact, this flexibility is very important as 65% of respondents to the InformationWeek poll point out that "one of the main reasons for moving to cloud computing is the high capacity to respond quickly to business requirements."

2.4. Recovery from Crisis

When a company begins to use cloud computing, it no longer needs complex plans to address any errors or crises that could harm their business. Cloud computing takes care of most problems and resolves them faster than the employer will need to take care of. Aberdeen Group found that cloud-based business areas can recover from crises at an average of 2.1 hours, four times faster than business areas that rely on other hosting services (8 hours).

2.5. Competitiveness

Cloud computing for small and medium businesses ensures access to enterprise-class technology and support for small business owners to operate faster and thus grow in record time compared to the past. One study suggests that companies that do not use cloud computing have to rely on complex procedures and backup copies to recover from a crisis - which means hardship and slow recovery.

2.6. Environmentally Friendly

Cloud-based business uses just the space it needs, which reduces its carbon footprint. The use of cloud services provides 31% of the energy and carbon emissions used by traditional servers. Again, small and medium-sized companies are the biggest winners: energy savings and carbon emissions are up to 90%.

2.7. Safety Criteria

There have been many questions about whether older ways of hosting are safer than cloud computing while their advocates argue otherwise. Experience has shown that cloud computing is safer than other methods currently available. In [Patel, Ahmed and Ali Seyfi, Yiqi Tew, Ayman Jaradat, (2011)], the author assure that "cyber-attacks on web applications target service environments (53 percent) and work environments (44 percent). However, customers and service users suffer more attacks compared to providers of these services with a rate of 61.4 attacks compared to 27.8 attacks. The report also notes that users are facing more aggressive attacks than service providers. "On other hand, [Wasike, Jotham Milimo and Lawrence Njoroge, (2015)] published an article in it the author clarifies "the scope of the distribution of attacks suggests the need for new means to detect and mitigate their consequences. "The report also notes that companies should employ a class security strategy based on a focus on enhanced exploratory and defensive lines to provide a deterrent to the impact of DDoS attacks while providing high-traffic and seamless traffic. In such cases it is wise to carefully choose the time and place to host your website. The choice of cloud computing as a host ensures the security of use due to strict measures to prevent any attack before it occurs. In addition, all sites are monitored at all times to prevent any damage. Not all

cloud hosting companies provide clear cost information as the offer initially seems reasonable, but additional charges start to appear after signing the contract. The positive is that the cost is reasonable so you should choose with caution. Your website serves as a gateway to your business so you should take the safety issue seriously.

With regards to the major cloud computing challenges, we confirm that cloud computing system, which receives many requests from users, requires large storage space to ensure backups of the files used. The main server of the cloud system intervenes in case of network failure and identifies the server on which the client files are backed up. The most important challenges are how to maintain the confidentiality of customer data because many large companies and institutions will not allow any party to view their databases, especially that dealing with the cloud computing system is through the Internet and therefore the companies provides cloud computing services using secure systems that ensure the privacy and confidentiality of customer data. The second challenge is the availability of applications suitable for all organizations and the cost should be less than the cost of using the normal computer networks in companies and institutions

In cloud computing systems, computer users, both individuals and users, are less dependent on the applications and programs as well as the hardware capabilities in their devices. Instead, they rely on the capabilities of the cloud computing hardware and all that individuals or employees need on a network is a computer Connected to the Internet regardless of the capabilities of this device in terms of hardware and software, that the system of work will move from devices located in a specific place to other devices swimming in the Internet space and hence came the name known cloud computing

3. Cloud Computing Application

Cloud computing offers new ways to reduce the time and costs spent on developing these new ideas that take the path of customer engagement to new heights. This makes it possible to invest our scarce resources in the most important areas: to create new applications for customer participation, rather than to differentiate the vast amount of hardware and middleware. Equally important, cloud computing offers new options for instilling a culture of consistently superior customer service. Specifically, cloud computing enables companies of all types and sizes to speed up innovation and encourage non-innovating competitors. The real diversity of customer participation is fueled by the creation of new ideas. Many companies have no problems generating these ideas. In fact, many of these companies face the problem of "redundant ideas" because they receive large amounts of customer feedback and feedback through social media and the Internet. The real issue that preoccupies these companies' ideas is that they have a lot of time and resources to identify and apply the possible ideas for overall change on the ground Makori, Elisha Ondieki (2016).

3.1. E-mail Services

We all use e-mail services from different service providers such as Gmail, Outlook or others, whether for personal use or corporate use. In this case, the service providers are responsible for all the burden of storage, maintenance, backup, Your mail all the time from anywhere on different platforms. Perhaps the best scenario to use the cloud is the testing and development environment. This entails securing the budget, preparing your environment of the necessary physical equipment, human capacity and time. Then comes the installation and configuration of your platform. All of this can often increase the time it takes to complete a particular project. With cloud computing, there are now easily available environments designed to meet your needs.

3.2. Big Data Analytics

One aspect of the use of cloud computing is the ability to take advantage of massive amounts of structured and unstructured data to harness their value in business. Retailers and suppliers are now extracting information from consumer buying patterns to target their advertising and marketing campaigns to a particular segment of the population. Social networking platforms now provide the basis for analyzes of behavioral patterns used by organizations to extract meaningful information.

3.3. File Storage

Cloud can provide you with the ability to store, access, store, and retrieve your files from any web-enabled interface. Web services interfaces are usually simple. At any time and place, you have high availability, speed, scalability and security for your environment. In this scenario, organizations only pay for the amount of storage they actually consume, and do so without worrying about supervising the daily maintenance of their storage infrastructure.

3.4. Data Backup

Data backup has always been a complex and time-consuming process. This included maintaining a collection of drives, manually assembling them and sending them to a backup facility, taking into account all problems that may occur between the original storage location and the storage location. As this backup method is not immune to problems such as running out of backup space, there is also time to load backup devices to restore the process that takes time and is prone to malfunctions and human errors. The cloud-based backup of course is not the magic solution, but it is certainly far from what it was before. Now you can automatically send data to anywhere in the world while ensuring that there are no problems with security, availability, or storage.

4. Theoretical Background

With the development of technologies available through the web with the emergence of Web 2.0 and Web 3.0 and the steady increase in Internet speeds available to users, many organizations have made their applications available for use through the Internet in what is known as cloud computing, The user has the best features such as saving expenses and providing information services to a larger sector of the beneficiaries. The beneficiary and information organizations also have the ability to store, process, transfer and share information from anywhere and at any time without committing to using the personal computer. T (storage, processing, participation) in external servers available on the Internet cloud while ensuring the security of this information and keep them from the excesses of hackers or viruses.

The aim of this paper is to analyses the factors encouraging and hindering the acceptance of cloud computing technology. This analysis is guided by the Technology Acceptance Model (TAM), originally developed by Davis et al., (1989). Through applying TAM, this research, focuses on the views of those agents responsible for making the technological decisions surrounding the potential use of cloud computing technology. In fact, it is believed that, IT decision makers' perceptions and appraisals of new innovations play an important role in organisations' adoption of new innovations (Sharma and Rai,2013).

TAM is one of the most utilized models for studying technology acceptance. The basic conceptual framework of TAM is that an individual's reaction to using technology, in terms of their perception of ease of use (PEOU) and usefulness (PU), affects their behavioural intention to use technology. Their intention to

use technology affects their actual usage. Perceived usefulness (PU) captures the user's perception that a particular system may improve their work performance (Davis, 1989). Perceived ease of use (PEOU) concerns the degree to which an individual believes that the technology does not require additional effort (Davis et. al., 1989). Behavioral intention to use (BI) is determined by attitude towards use (ATT) and perceived usefulness (PU). Finally, the actual system use is determined by behavioural intention (BI).

5. Research Model and Hypotheses

The papers tested the most frequently listed factors namely image and personal innovativeness. Personal innovativeness (PIIT) in this study is defined as employees' willingness to try cloud computing and its applications. Moreover, image (IMG) is defined as "the degree to which use of an innovation is perceived to enhance one's image or status in one's social system" (Moore and Benbasat, 1991, pg. 195). Based on the theoretical components of the TAM, this study proposes the following hypotheses with regard to the use of cloud computing technology in developing countries.

> **H1:** PEOU has a positive effect on PU
>
> **H2**: PEOU has a positive effect on the attitude toward using (ATT) cloud computing
>
> **H3:** PU has a positive effect on the attitude toward using (ATT) cloud-based applications and services
>
> **H4:** PU has a positive effect on behavioural intention (BI) to use cloud computing
>
> **H5:** ATT has a positive effect on behavioural intention (BI) to use cloud computing
>
> **H6:** PIIT has a positive effect on employees' behavioural intentions to use cloud computing.
>
> **H7:** image (IMG)has a positive effect on employees' behavioural intentions to use cloud computing

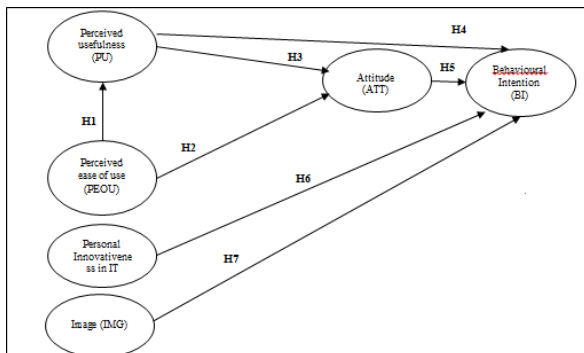The proposed research model of this study is presented in Fig. 1.

Fig. 1: Extended TAM Model for cloud computing acceptance

6. Research Methodology

A survey questionnaire was distributed to 259 employees who used cloud-based applications in their organizations. 22 questionnaires were because large sections of the questionnaires were incomplete. *Table 1* summarises the demographic characteristics of the research sample.

7. Results and Data Analysis

A five-point Likert scale was used , with (1) being "strongly disagree" and (5) being "strongly agree". Structural equation modeling (SEM) was applied to test the measurement model. The test of the measurement model included an estimation of internal consistency reliability as well as the convergent and discriminate

validity of the research instruments. All reliability measures were well above the recommended level of 0.70 as an indicator for adequate internal consistency. The constructs also illustrated satisfactory convergent and discriminate validity.

Table 1: Sample Profile

Respondents characteristics	Final Sample size (n =155)	Percentage (%)
Gender		
Male	143	92.3%
Female	12	7.74%
Age (yr), (%)		
18-25	89	57.4%
26-35	50	32.3%
36-45	8	5.2%
46-55	1	0.6%
56-65	7	4.5%
Education		
High School	4	2.6%
Bachelor	94	60.6%
Master	46	29.7%
Doctorate	4	2.6%
Diploma	7	4.5%
Work experience		
Less than one year	8	5.2%
1-5	29	18.7%
6-10	49	31.6%
11-20	57	36.8%
More than 20 years	12	7.7%

The results of statistical analysis of the research model are presented in **figure 2** and the results of the estimated path coefficients along with the associated p-values and R^2 value are reported in table 2. The results indicate that H1, H2, H3, H4, H5 and H6 are statistically significant and only H7 is statistically insignificant in which we did not find a relationship between image and behavioral intention.

Table 2: Assessment of the Structural Model

No.	Hypothesis path	R^2	Path coefficient (β)	T-Value	p-Value	Supported?
H 1	PEOU → PU	0.227	0.388	6.498	0.000***	Yes
H 2	PEOU → ATT	0.385	0.624	9.686	0.000***	Yes
H 3	PU → ATT	0.582	0.765	13.569	0.000***	Yes
H 4	PU → BI	0.475	0.872	11.462	0.000***	Yes
H 5	ATT → BI	0.802	0.945	17.537	0.000***	Yes
H 6	PIIT → BI	0.320	0.468	6.874	0.000***	Yes
H 7	IMG → BI	0.002	0.064	1.113	0.167	No

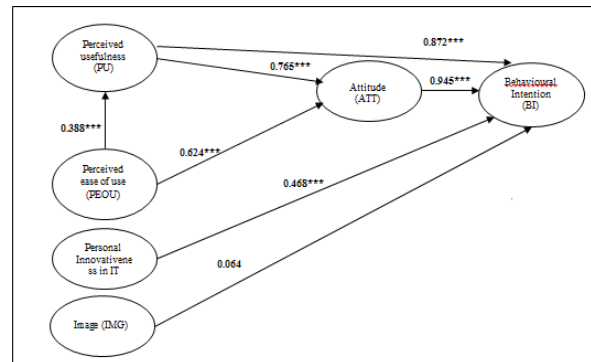Note: *** denotes statistical significance at 1% ; ** denotes statistical significance at 5%

Fig. 2: The suggested structural model

8. Concluded Comments and Future Work

The current study confirms the applicability of TAM to explain the acceptance of cloud based applications and systems. All the relationships proposed by TAM have been tested satisfactorily and the findings demonstrate the role of image and personal innovativeness on the intention towards the acceptance cloud computing. This study investigating the factors affecting the acceptance of cloud computing. The results reveal that perceived usefulness impact the use cloud computing. The study suggested that future research to analyse how firms are using cloud applications and identify business benefits and challenges of adopting cloud applications. This study has contributed towards validating previous TAM studies from different contexts and

shows the applicability of the extended TAM in predicting the factors that influence the accept of cloud computing

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