

Cloud Computing in SMEs: Case of Saudi Arabia

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Abstract - *Cloud computing technology is now in an advance stage having crossed many hurdles that came in its way to broad acceptability by the business world as well individuals. Cloud computing not only provides storage but also provides a range of services on a rental basis, which enables firms to limit their infrastructure to a minimum and so makes it affordable by many. Cloud computing provides many entrepreneurs as well as businesses, especially the small and medium- sized enterprises (SMEs), with low cost alternatives to for starting and managing their businesses. In particular SMEs of many developing countries, who cannot always afford to mobilise huge capitals to start new businesses are immensely benefiting from this technology. Saudi Arabia is a developing country with a good infrastructure for small to medium sized industries. Many of the Saudi SMEs are using a range of technologies and platforms including cloud computing to sustain and manage their businesses. In this article we look at the extent of cloud computing applications in SMEs in the Kingdom of Saudi Arabia. To measure the extent of the use of cloud computing, we present an analysis of a comprehensive survey conducted on a large number of small organisations in the West Coast of Saudi Arabia during the course of this research.*

Index Terms – *Cloud Computing, Entrepreneurs, SMEs, IT Infrastructure, Developing Countries, Saudi Arabia*

1.0 INTRODUCTION

Cloud computing has now emerged as a leading technology of the 21st century and has been embraced by industries around the globe. Its progress and advancement could be compared to the advances of E-Commerce at the turn of the last century. Many entrepreneurs and businesses, in particular the small to medium sized businesses (SMEs) find it very helpful in setting up new business as well as sustaining old businesses. In this article, authors will analyse the extent of cloud computing presence in Saudi SMEs. This study will be carried out with the help of an industry survey conducted by the authors. An example of a government who brought in cloud computing initiatives to enrich and strengthen SMEs is the UK government, which has initiated a cloud framework called "G-Cloud framework" [1]. The difference between G-Cloud and other frameworks is that SMEs can pay for services as they use them, rather than being tied to inflexible, long-term contracts. This model of G-Clouds is very attractive to SMEs.

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1.1 Growth of SMEs in Saudi Arabia

The Kingdom of Saudi Arabia (KSA) is one of the richest countries in the world. Yet, it falls into the category of developing countries. The main reason for it not making into the list of the developed countries is the slow advancement in the industrial sector, in particular the SMEs. The export of petroleum has contributed significantly to the economic growth, which has earned the Kingdom a membership of G20, an alliance of countries whose economies are highly influential in the world. The G20 countries have a lion's share or more than three-fourth of the world trade [2]. Therefore, it would seem to be unfair to find some statistics suggesting Saudi Arabia to be one of the developing countries. However, some other sources like the International Statistical Institute [3], excludes Saudi from the list of Developing Countries. Likewise, a former US diplomat [4] is convinced that Saudi Arabia is a semi-developed country.

1.2 Historical and religious Significance of Saudi Arabia

Makkah (Mecca) in Saudi Arabia is well known for housing the Kaaba, which marks the direction of prayers for Muslims all over the world. Makkah is more than four thousand years old. The city is the centre of the annual pilgrimages known as the Hajj and Omrah, which are attended by millions of people every year. Some information and details of the Hajj and Omrah can be found in [5]. These pilgrimages further inject about 16 billion dollars to the economy[6]. Currently Saudi Arabia is undergoing a number of major projects involving various arms of the Saudi industry and in particular the SMEs. These projects include a rail link between major cities and Makkah, huge expansion of the holy mosques in Makkah and Madinah and various other educational, health and cultural projects which are amounting to hundreds of billions of dollars in expenditures by the Saudi Arabian government, see [7] and [8]. Mohammad Yamin [9] and Abdullah Basahel [10] provided some more information about Saudi Arabia, who has earned the reputation of being the leading economy not only in the Middle East but the whole Arab World.

As has been the case with many developing countries, the growth of SMEs in Saudi Arabia was slow at the beginning. However, as the oil revenue increased and economy boomed, industrial growth picked up pace. As a result, in addition to having a considerable presence of multi-national companies, the KSA has achieved remarkable growth in local businesses and home grown industries. Some of the details of SMEs in Saudi Arabia can be obtained from [11]. The aim of our study in this paper is carry out a study on the presence and impact of Cloud Computing in SMEs in Saudi Arabia. In particular, we look at the case of Sanitary Ware, which represents a small industry. To analyse the impact of Cloud computing in SMEs,

we have surveyed eighty businesses, whose analysis will be presented in this article.

1.3 Role of SMEs in World Economy

According to a major study conducted by Sweden's Globalisation Council [12], "One main conclusion is that changes by globalization will affect the SMEs and entrepreneurs in different type of economies both on a national and regional perspective. The world is globalized so is the world for entrepreneurs and innovations. All type of companies will be affected by the changes that one nowadays could observe, not only SMEs or innovative entrepreneurship but of course also the behaviour of multinationals and large firms, and the relations between large and small firms". In another major study conducted by UNU World Institute for Development Economics Research [13], from a theoretical perspective, SMEs have several advantages over both SOEs and large privatized SOEs (PSOEs). In SMEs the incentives for both managers and workers tend to be clearer and stronger than in larger organizations. Governance problems are less significant since in many cases the managers and owners are the same people. The small size of many of the SME firms allows owners easily to monitor the performance of managers while the cost of monitoring labour is also lower. Table 1 shows SME employment as a percentage of total employment and manufacturing employment in various countries. For details, see [13].

Table 1: SMEs share in employment

Country	Year	Country	Year
EU	69	Japan	33
France	69	Croatia	30
Germany	64	Romania	27
Belgium	72	Hungary	24
Italy	80	Poland	23
Georgia	58	Slovenia	19
US	53	Russian Fed	10
Estonia	43	Belarus	6
Czech Rep	37	Kyrgyz Rep	3

SMEs in Saudi Arabia represent almost 93 percent of total enterprises and account for about 24.7 percent of total employment, which is fairly low as compared to many of the developed countries listed in Table 1, see [13]. Moreover, Saudi Arabia's businesses contribute about 33% of the national GDP whereas the figures for some developed countries are as follows: US (50%), France (56%), Spain (57%) and Japan (64%), for details see [14]. As can be seen, the GDP share of SMEs of Saudi Arabia is much lower as compared to the countries of G20. A detailed analysis of SMEs and their socio-economic contribution can be found in [15]. However, investment in small and medium enterprises in Saudi Arabia is expected to grow to more than USD 70 billion by the end of 2015, with the government and banks providing much-needed funding, according to industry data compiled by Zawya [16].

Having realised the importance of SMEs, the Saudi Arabian government has endorsed some attractive ways to finance the SMEs, details of these ways can be found [17] and [18]. These measures are expected to lower the unemployment rate of the Kingdom, and provide highly needed support to the development of the local economy. Once this happens, the Kingdom of Saudi Arabia may find itself a step closer to be classified as a developed country.

2.0 CLOUD COMPUTING

Cloud computing is a disruptive innovation and technology of the 21st century. It has affected the industrial world in the same manner as outsourcing, E-Business and E-Learning did in the 20th century. Cloud computing has created opportunities to new and existing businesses, especially the entrepreneurs to setup and realise their dream businesses without much of the infrastructure and capital of their own, as the technology provides much of these on a rental basis.

2.1 Models and Characteristics

To be able to comprehend cloud computing, a well-organized definition is essential. As described in [19], The National Institute of Standards and Technology (NIST) has defined cloud computing 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. The NST definition as

Cloud Computing - Definitions ...

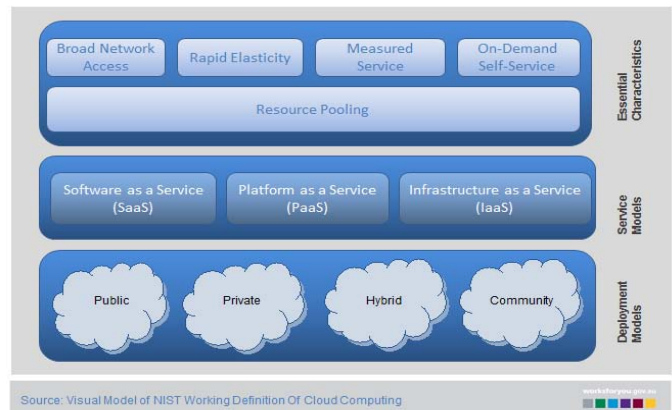


Figure 1: Cloud Computing Definition

seen in Fig 2 includes four characteristics namely, Broad Network Access, Rapid elasticity, Measured Service and On-Demand Self-Service. The service models for cloud computing can be Software as a Service (SaaS), Platform as a service (PaaS), and Information as a service (IaaS), and can be deployed as Public, Private, Hybrid or Community. Many other people have defined and described cloud computing. For example, in [20], cloud computing is referred to as both the delivery of applications as services over Internet, and the hardware and systems software in the data centres that provide services (SaaS).

There have been concerns about the security of data in the custody of the cloud providers. Initially, there were serious concerns and many organisations, especially the government owned businesses and corporations were very reluctant to make use of the cloud computing platforms. Considerations of data security and privacy would assume a very high priority when trans-border data sharing was involved. As discussed in Security and Resilience in Governmental Clouds (2009), this has significant implications for the use of cloud databases to manage private and sensitive data. Thus, one of the main considerations for many corporate and government organizations, especially in the industrial world where security and privacy is paramount, is whether to make the sensitive (e.g. defence, national security) personal data available to cloud providers. However applications used in periodic processing and those involving activities like database development and testing, data mining, database backups and off-site disaster recovery are regarded as safe and can be managed and stored through clouds. These considerations have been quite critical for many government corporations including those of the Saudi government sector, where cloud computing is slowly and gradually taking its share in the government and privately owned businesses. For example, the webmail system of the King Abdulaziz University is hosted on cloud. From these and other numerous descriptions, cloud computing has emerged as an easy to acquire and use infrastructure, software, systems, memory and maintenance in a variety of ways to all kinds of organisations and individuals. This has allowed new starters of businesses to benefit from these facilities.

2.2 Impact of Cloud Computing on Economy

With the prospects of eliminating a need for a large capital investment, the economy of many countries, especially the developing countries, is significantly improving the financial abilities of the organisations and businesses. This trend is likely to continue and is expected to affect the economies of a large number of countries, getting deeper into the poor nations of Africa and Asia. Cloud computing is redefining methods and models, reducing the burden of having huge capital to start a new or sustain and expand an established business. Many entrepreneurs, who would otherwise find it impossible to start their dream business due to lack of resources and capital for investing in IT infrastructure and systems technology, would now be in a position to fulfil their aspirations and expectations. The most attractive feature of cloud computing is its affordability, an aspect that SMEs are expected to benefit from. It is expected that many bonuses in poor and developing countries would be able to enhance and strengthen their business activity for many new IT organizations.. In the last two decades, many leading organizations of the western world have resorted to outsourcing, especially offshore outsourcing. This model of business has so far benefited countries both in the developing and the developed world. However, with the advent of Cloud Computing, outsourcing is likely to undergo structural changes and is likely to involve cloud computing in

its model. On the other hand, many organisations, with the help of local IT support, may resort to cloud computing in place of outsourcing; hence the outsourcing activity might decline. Initially the cloud providers, and hence the large corporations of the developed countries and their economies may benefit in the way of providing systems, infrastructure and other resources need by the cloud providers. However, once the saturation point occurs, the developing countries might make significant gains due to picking up the lost business of outsourcing. It is expected that the use of cloud computing will increase in Saudi Arabia, which currently has only some businesses making use of it. In this paper we shall analyse the result of a survey conducted in 2014 of several businesses in Saudi Arabia to measure the usage and impact of cloud computing. An economic impact of cloud computing, known as Cloud Economy, was presented by Mohammad Yamin in [21].

2.3 Cloud Computing and Small Businesses

With the help of cloud computing, many SMEs can start their businesses with little capital. Cloud computing can be used by existing firms as well, where they can reorganize their way of doing business. With the implementation of cloud computing services, many services can be achieved such as rent data storage, software and systems, maintenance and services for a fee. Moreover, it's well known that offshore and onshore outsourcing enables organization to do their business with less capital and infrastructure. As for when both cloud computing and outsourcing join together to save capital for organizations, it is expected that many existing businesses which outsource some of their work process, would reorganize their ways of doing business to benefit from cloud computing services, and that would maximize their efficiency. For details, see [22]. According to a survey, conducted by Janet Kourik [23], by 2020, over 70% of users will use internet-based (cloud) software to perform work." Moreover, the usage of cloud computing would grow at an astonishing rate. According to the survey, about 69% of the Americans use cloud computing services such as online backup, webmail, and other services. People in developed countries are not the only users of cloud computing services. Moreover, there are about one thousand and five hundred Indian companies who use cloud computing. In [23], it was remarked that senior decision-makers in SMEs often are not aware of cloud computing. In view of [24] and [25], further benefits to SMEs are in the form of: friendliness, lower cost of organisational ownership, better return on

Gartner Emerging Technology Hype Cycle – Cloud Computing – 2008 - 2014

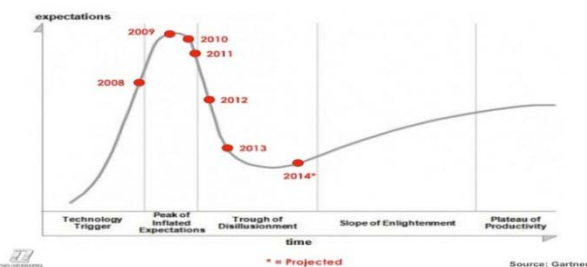


Figure 2: Gartner Hyper Cycle Emerging Technologies

investment, greater flexibility with range of plans, packages, and add-ons to address diverse business requirements

2.4 Proliferation of Cloud Computing

In the recent decades, with the introduction of the Internet, web 2.0, technologies, and E-Business have changed the way business is conducted in the 21st century. The political, economic, social, and other factors have also changed the ways in which the businesses are run. The technological factor, for instance, has made it easy for all kind of firms to achieve more efficiency in almost all fields. Cloud computing is now a hot topic in the field of technology. Cloud computing has been developing at an astonishing rate [26]. Through Gartner's Hype Cycle methodology which provides a graphical view of the maturity, adoption and business application of specific technologies, this section aims to expose the high improvement that cloud computing has achieved. Gartner releases an annual update to the Hype Cycle showing how close technologies are to high growth adoption [25]. Below are graphs presenting cloud computing on the Hype Cycle from 2008 – 2014 [27]. Cloud computing's projected positioning on the Hyper Cycle for 2014 is also included. Firstly, let us look at Fig 3, which suggests that this year in 2015 cloud computing should be enjoying a period of enlightenment, after going through a technology trigger in 2008, peak of inflated expectation during 2009-11, and tough disillusionment during 2012-13. Let us now analyse the extent of cloud computing in 2010 as shown in Fig 4. In 2010, cloud computing was only an emerging technology in the Hyper Cloud of Information Technology of 2010, and Gartner did consider making a separate cycle for this technology. However, starting from 2011 onwards, Gartner has produced separate hyper cycles for cloud computing. In 2011, as is seen in Fig 5 Hyper Cloud for year 2012 shows the peak of activity as a hyper activity and figure 6 of that of year 2014 shows continuation of the hyper activity of inflated expectation, steadily rising the slope of enlightenment. These hyper cycles are very much in line of the projections given by Gartner.

3.0 SURVEY: CLOUD COMPUTING AND SMEs

In this section, we shall describe our survey, which was conducted in 2014 to measure the extent of cloud computing in

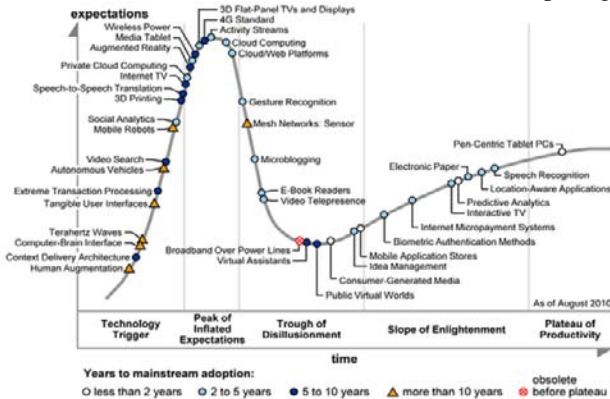


Figure 3: Gartner 2010 Hype Cycle Emerging Technologies

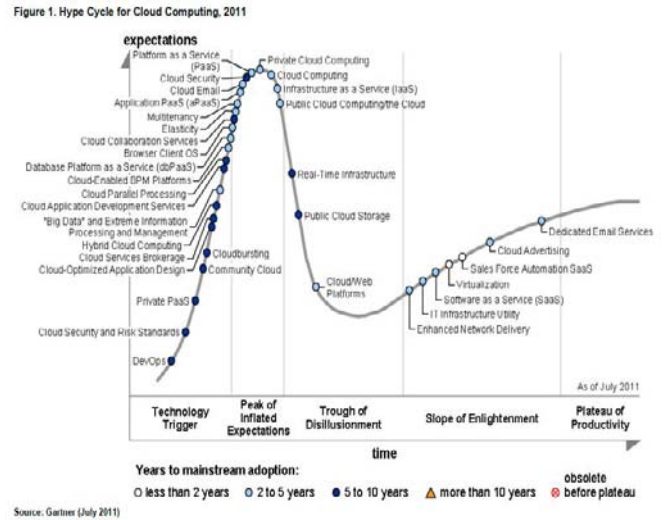


Figure 4: Gartner 2011 Hyper Cycle for Cloud Computing

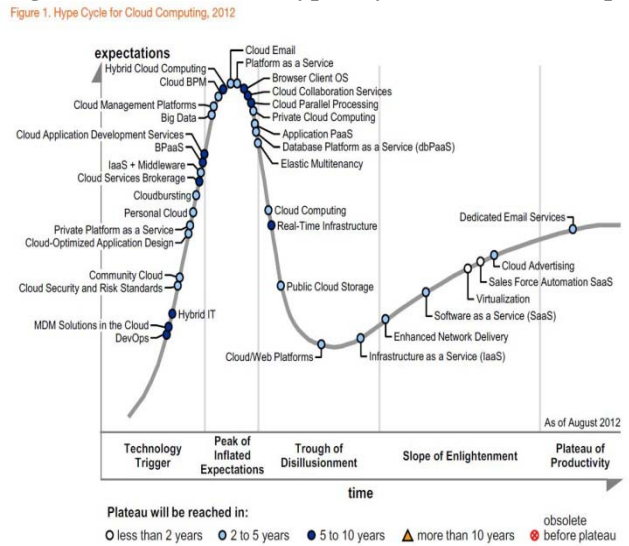


Figure 5: Gartner 2014 Hyper Cycle Cloud Computing

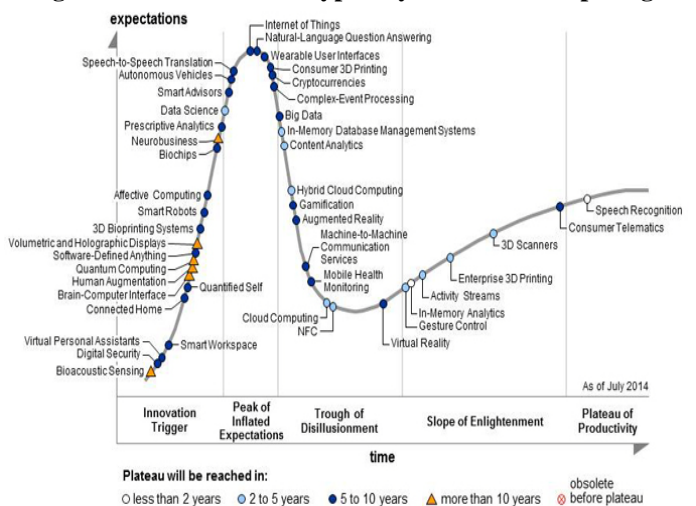


Figure 6: Gartner 2014 Hyper Cycle Cloud Computing

Saudi Arabian SMEs. The main objective of the survey was to guide the direction of this and future research related with SMEs and cloud computing. The success of business unquestionably depends on information systems.

SMEs and cloud computing. It is a forgone conclusion that most of the modern enterprises today depend on information systems for their effective, efficient and smooth functioning. Business intelligence is driving businesses to be increasingly dependent on IT solutions. However, information systems require an IT environment and facilities for their operation and the cost of the IT infrastructure for operating such systems has traditionally been very costly. With the availability and advancement of cloud computing paradigm, many companies now can lease cloud computing services as an alternative to upfront payment for setting up the needed infrastructure. As discussed earlier, cloud computing provides IT infrastructure, systems, software, tools, services and services on a rental basis for a specified time or by a meter system of usage. For many entrepreneurs, cloud computing is an economical way to start their businesses.

Saudi Arabia has many small enterprises that are still looking for ways to reduce their cost of setting up a business and running it efficiently - cloud computing is cost-effective and easy to acquire. To measure the extent of cloud computing usage in Saudi Arabian small enterprises, a survey was conducted of eighty companies in Jeddah. Due to the small size of Saudi population and a relatively small number of companies in the Kingdom, it was concluded that a sample of eighty companies was sufficiently robust to enable generalisations to be made about SMEs in the emergent economy.

3.1 Choice of Method

This research paper aims to develop a research model which would determine the extent of the use of cloud computing amongst Saudi SMEs. One of the major challenges in conducting our survey was to determine and select suitable SMEs to obtain the relevant data from. Another challenge was to educate officials of some of the SMEs who had never heard of Cloud Computing. Under the circumstances, the research methodology and questionnaire, used for the survey, were kept very simple. For relevant literature, publications and studies were reviewed in order to get in-depth information on the use of cloud computing in Saudi Arabian SMEs. The survey was selected as a suitable tool for gathering the relevant data because it was capable to collect first-hand information from actual companies within the demographic region under consideration. Only the selected SMEs in Jeddah were surveyed through a simple questionnaire. We acknowledge that there are some limitations to quantitative research methods. However, the strengths of such methods, related to the research aim, render a quantitative survey and the potential scope of such a survey preferable over a qualitative alternative. While interviews could perhaps produce more detailed responses, they are not suited for determining widespread usage because of their smaller size.

3.2 Sample of the Survey

A suitable sample size was estimated using industry standards, firms were selected with the help their publications and public records related to the selected demographic for the research, and were contacted either by email or in person. Once an organisation agreed to take part in the survey, the questionnaire was emailed or handed personally to the nominated representatives of the SMEs; they were asked to return the survey within a two-week period. Unfortunately, many organisations declined to receive the questionnaire despite agreeing to participate, and three organisations did not return the questionnaire. One organisation was late with its responses and was therefore not included in the research data. Although more than one hundred organisations were contacted as described above, only eighty of them provided the data.

3.3 Ethical Considerations

The aim of this survey was only to measure the extent of usage of cloud computing SME enterprises in Saudi Arabia. Therefore, seeking highly personal and sensitive information was not required. Only general questions were asked like name of the officer, the name of the company, contact details, name of the Cloud Computing provider used by the company and the location of the company. Moreover, they were assured that this information would be used purely for the use of the researcher and would not be made public. In keeping up with established norms, information provided by the participants was treated confidentially and used for the sole purpose of this research. Ethical considerations related to the research study were primarily based on anonymity. The data collected, as published here, does not identify the organisations or individuals who provided the data. The respondents knew that their answers would not be linked to their identity. As a result the respondents did not show any anxiety or fear on account of their participation. For example, if an organisation admitted to not knowing anything about cloud computing, linking their organisation to such a response would have rendered their brand or business being labelled 'old-fashioned' or 'out-of-date'. That would have affected their reputation, sales, investment, and partners. So, confidentiality was a key element in ensuring that the study followed an ethical code of conduct.

4.0 SURVEY CONTENT AND RESULTS

The survey questionnaire contained thirteen questioners, with a purpose of asking simple questions. Participants were asked to provide their responses on a scale of seven indicators as follows: 1 = completely disagree, 2 = disagree, 3 = somewhat disagree, 4 = neutral, 5 = somewhat agree, 6 = agree, 7 = absolutely agree. Our choice of the scale of seven choices was to allow the respondents with greater flexibility. The questioner is presented in Table 8, and the results of the survey are presented in Table 9.

Table 2: Survey Questionnaire

1	My company doesn't use any Cloud Computing services.
2	My company is planning to use hire Cloud Computing services in the next 12 months.
3	My company is using some Cloud Computing services.
4	My company is missing-on/taking an advantages of Cloud Computing services.
5	Cloud Computing is an economical way of employing IT facilities.
6	Cloud Computing is a better way of dealing with technical issues of enterprises
7	Cloud Computing is helpful for establishing a new business.
8	Cloud Computing is way to get rid of old IT systems.
9	Cloud Computing eliminates the need for having technical expertise.
10	There are privacy issues with use of Cloud Computing services.
11	There are data security issues associated with the use of Cloud Computing.
12	Use of Cloud Computing doesn't require significant training for the enterprise personnel.
13	Cloud Computing improves performance of workers on job

After carefully analysing the survey responses from our eighty completed responses from various SMEs, we decided to base our research simply on the averages of responses for each question. These averages are provided in Table 9.

4.1 Implications of the Survey Responses

From the results of the survey, analysts can see that it is evident that majority of small enterprises in Jeddah in the province of Makkah of Saudi Arabia do not use cloud computing services. It also shows that the small enterprises indicated that the SMEs have fair awareness of Clouds and their benefits. In fact managers of many of these enterprises have admitted to the fact that if they were using cloud computing, they would gain many advantages. However, small private sector companies were sceptical or uncertain whether there were any advantages of having this technology. In other words, the analysis shows that small enterprises are not against hiring products or services from the cloud computing providers. It was also indicated that the small enterprises had very little or no concerns about privacy and data security issues associated with the use of cloud computing. Therefore, there

Table 3: Survey Results

Questions	Average	Questions	Average
Question 1	7	Question 8	5
Question 2	4	Question 9	5
Question 3	2	Question 10	4.4
Question 4	4	Question 11	4.3
Question 5	4	Question 12	4.3
Question 6	4	Question 13	4.3
Question 7	4		

is no reason for the slow growth of the usage of cloud computing in small enterprises sector in Jeddah, Saudi Arabia. Performance of these SMEs could be much better. Also, more cost reduction would be feasible on hiring cloud computing services. A further research is warranted to examine the cases of different parts in the kingdom and other developing countries of the Middle East and the region..

4.2 Limitations

This was a quantitative survey of only eight SMEs, in only one region namely Jeddah, Saudi Arabia. Jeddah is the main port city of Saudi Arabia and has a well-developed industry presence. While it provides important and generalizable data and highlights deficiencies that need to be studied more rigorously, it is far from exhaustive. However, the results of the research study seem to be congruent with the published data related to the subject. Further research would be needed to identify the barriers proliferation of cloud computing services in the Kingdom of Saudi Arabia and perhaps the entire Middle East.

5.0 CONCLUSIONS

As we find from the analysis of our survey, all of the SMEs who participated in the survey do not use cloud computing. However, the majority of them said that their firm would benefit from having cloud computing and were in the process of acquiring the technology for the future. Most of the respondents were of the view that cloud computing improves the performance of the workers. Many responses confirmed that cloud computing helps in getting rid of old and ailing systems. Hence, Saudi Arabia needs to strengthen its cloud computing industry so that SMEs can benefit from this technology. This would be a step closer to the Kingdom's aspiration to find itself in the list of developed countries. It is fair to say that the Saudi Arabian government has been trying to make the latest technology available to the business community of the country. The role of cloud computing, especially in the SMEs should not be ignored otherwise the industry will find it difficult to keep up with pace of the developed countries. Saudi Arabia, having a good technological base, is a candidate for excelling in cloud

computing technologies. Cloud computing is out there and it will reach the private SMEs. Therefore, in the future, we might expect a higher growth rate in the private as well as the public sector. The Saudi government on its part needs to continuously support and bring in fresh incentives to enrich and increase the industry, especially the SMEs.

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