IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 7, Issue 4, April 2019

A Theoretical Model for Cloud Computing Adoption Saudi Arabia For Small and Medium Size Enterprise (SMEs) in ICT Sector

Fahad Badr Al-Ameen Nasser[1], Mohammad Saaed Jawad[2]

Post Graduate Centre, Limkokwing University of Creative Technology[1,2]

Abstract: Cloud computing technology provides different solutions to organizations on demand in order to improve their performance and to lower hardware and software procurement and maintenance cost. There is a rich body of literature on its benefits for SMEs, however, studies that investigate the factors influencing the adoption by SMEs in developing countries especially Saudi Arabia and particularly in Information and Communication Sector (ICT) are still lacking. To fill this gap, this study examines the factors that influence the adoption of cloud computing by Saudi Arabian SMEs. This study seeks to develop a research framework that integrates the innovation characteristics as well as the Technology-Organization-Environment (TOE) perspectives that underlie its adoption. Primarily, the adoption factors for cloud computing are identified and classified into different dimensions using the Technology, Organization and Environment (TOE) framework. This study therefore presents a more holistic assessment of the factors of cloud computing adoption than earlier studies. The study contributes to the wider body of scientific knowledge that, so far, has not studied the adoption of cloud computing in this sector. The findings confirm a high potential for use of the cloud computing market within developing countries and further recommend cloud computing vendors to focus on cloud computing knowledge.

Keywords: Cloud computing, SMEs, adoption

I. INTRODUCTION

Cloud-Computing (CC) has viewed by many researchers as a technology that enable individuals, organizations and other types business to affordable access more facilities such as data storage and software service through the use of Web (Negm and Benton, 2015). In reality, the users rather than investing much financial resource for acquiring servers and applications which can enable company tools based on their business requirement but using the pay-as-you-go pricing version (Misra, 2015). Currently, one of the very significant discussions issue in industries is on cloud-computing technology. In the last several decades, there's been an increasing interest in cloud-computing (Zhao, Raicu; Lu, 2013). Cloud decrease hardware cost and boost storage capacity. Also, there are endemic of service adoption for computing and web 2.0 applications. Thus, many businesses need to move to cloud-computing since it provides the fastest expanding part of their technology. One of the files that some organisation would like to proceed to the cloud-computing is the financial files.

The rising number of companies that adopt cloud computing services in Saudi Arabia delivers signs of climbing interest and spending in the ICT industry, notably cloud computing in Saudi Arabia (Shetty, 2015). Saudi Arabia is one of the most Arab states that use ICT into a terrific extent in the marketplace, now Saudi Arabia is among the top cloud computing adopters in the Arab world (Al Sanea and Wainwright, 2014; Ministry of Communications and Information Technology, 2014). However, cloud computing technology gives African American associations and organisations such as the SMEs together with chances to use state-of-the-art technologies using minimal financing (Tashkandi and Al-Jabri, 2015). Findings in Alharbi (2012) showed a favourable attitude of end customers towards accepting cloud computing in Saudi Arabian associations. However, the cloud technology is still not extensively utilised from Saudi Arabia SMEs, probably because of issues like lack of cloud wisdom awareness, safety anxieties, along with a shortage of qualified IT skills (Wills and Walters, 2015; Alkhater and Walters, 2014; IDC, 2014). As a result, the rate in which the SMEs are embracing cloud service is reduced, and few researchers have attempted in fixing the topics of adoption within the circumstance of Arab SMEs.

II. LETERATURE REVIEW

Several studies have made efforts to help decisionmakers in organisations to deal with their concerns regarding cloud-computing adoption. Nearly all these studies concentrate on variables affecting the adoption of cloud-computing in

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Vol. 7, Issue 4, April 2019

government companies such as education and businesses in Saudi Arabia. However, few of studies have targeted the adoption of cloud-computing from SMEs organisations. All these studies divided the problems influencing the adoption of cloud-computing into government ecological, Profession and technological advancement. The factor incorporates top management support venture size, company openness, and enterprise status. The variable incorporates government aid, external reinforcement, pressure policies and compliance. The technology factor concerns solitude, security, technology preparation reliability, seller lock-in, technical challenges and confidence. Is a scarcity of quantitative measures for the Present Condition of cloud-computing in SMEs of Saudi Arabia. Using measures for the current state of cloud adoption is just as important since they create the process in cloud providers and SMEs accurate and objective. By the literature, only a few studies have focused on the sorts of factors that impact cloud computing adoption in Saudi Arabia according to empirical investigation, and most handle particular government businesses or organisations. Noorminshah (2013) utilised the Diffusion of Innovation theory to research users' approval of cloud-computing in Saudi Arabia SMEs. Yamin demonstrated a general view of cloud adoption in SMEs and reasoned that a shortage of proper regulation had become the obstacle to embracing cloud-computing from the SMEs. Alkhater et al., (2013) noticed that there are no rules or regulations which govern associations' sensitive information transferred to a cloud supplier. The Islamic government has committed to thinking of the regulations because of its cloud design, to ease its adoption through the duration of institutions.

Assessing the relevant literature review shows that a restricted number of empirical research efforts focused on the essence of factors that have an effect on the penetration level of cloud-computing solutions in SMEs in Saudi Arabia, and the majority of possible research efforts come with a scope restricted to government organisations and the public sector. Among the noteworthy research efforts done in this field are research conducted by Noorminshah (2013); this study adopted a Diffusion of Innovation theory to measure consumer's approval of cloud-computing applications and services in Saudi Arabia. Additionally, a study conducted by Yamin (2015) highlighted that cloud-computing solutions penetration in Saudi Arabia's associations and pointed out that the lack of suitable reform comprised one of the critical obstacles to the spread of technology among SMEs from Saudi Arabia. Recently, Saudi Arabia's authorities established an effort together with the appointment of a special committee tasked with establishing the required and necessary rules and regulations to get cloud support administration. This committee aimed to make it easier for government organisations to embrace this innovative technology. Ahead of cloud-computing technologies are incorporated, a multitude of considerations must make concerning the practices and capabilities related to them.

This research effort aims to examine the capacities of medium-size and small businesses along with the susceptibility of associations to be penetrated by a novel technology; together with the aim of helping those organisations in their efforts to embrace cloud-computing solutions. The analysis will offer a picture backed by a thorough effort to provide SMEs with an extensive set of recommendations associated with the advantages and disadvantages of cloud-computing solutions and stated the procedure could implement effectively. The purpose of this research endeavour would be to provide insights into SMEs' requirements for cloud-computing technology. Limited attempts have made in which the factors impacting the adoption of cloud-computing technology are evaluated in Saudi Arabia which remains a nation.

III METHODOLOGY

Data collection procedure of this research is based on a survey. We developed a questionnaire which was reviewed and modified by a panel of experts, consisting of three ITM professors and four PhD students. We used Qualtrics to develop our online questionnaire. The responses to our questions were captured on a 5-point Likert-type scale. The survey was sent to more than 500 decision makers. The response rate of 20% left us with 101 completed questionnaires. Both adopter and non-adopter companies were asked to participate in this survey. In order to assure the quality of the responses, several quality assurance (QA) questions were added to the questionnaire. The questions asked of participants were adapted mainly from papers already published in this field. In addition to the standard questions, we also developed some questions that are specific to the context of cloud computing.

IV.RESULT

The Reliability of Survey

The reliability was tested using Cronbach's Alpha and CR. In most studies, greater than 0.70 is recommended (Sekaran and Bougie, 2010). Table 4.5 shows the results of Cronbach's Alpha and CR tests. A construct reliability is measured using Cronbach's Alpha coefficient (CA) and Composite Reliability (CR). A measurement model demonstrates a satisfactory internal consistency when the Cronbach's Alpha coefficient and Composite Reliability for each construct is equal to or above 0.7, whereas values below 0.6 indicate lack of reliability. Table 4.3 shows that the CR of each

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

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construct for the main study is above the recommended value of 0.7. Therefore, all constructs have reached satisfactory internal consistency reliability.

Table 4.3: The Results of Reliability Test

Constructs	Cronbach's Alpha (CA)	Composite Reliability (CR)
CB	0.89	0.93
CCA	0.59	0.83
CK	0.87	0.92
CP	0.85	0.90
CS	0.53	0.56
CX	0.95	0.96
FS	0.86	0.90
RA	0.61	0.77
RS	0.80	0.86
SC	0.63	0.80
TMS	0.78	0.82
TR	0.92	0.95

Table 4.3 shows Cronbach's Alpha for this study ranges from 0.53 to 0.95 and CR ranges from 0.56 to 0.96 and this is above the recommended value. Therefore, the results illustrate that the items used to represent the constructs are reliable.

4.3.3 Convergent Validity

Convergent validity of measurement model is assessed by examining average variance extracted (AVE). Convergent validity is acceptable when all constructs have an AVE of greater than 0.5; if so, they warrant remaining in the mode. Table 4.4 indicates that all constructs have AVE ranging from 0.558 to 0.806, which exceeded the recommended threshold value of 0.5.

Table 4.4 Convergent validity

Constructs	(AVE)
Cloud computing Adoption	0.82
Cloud Knowledge	0.70
Compatibility	0.79
Competitive Pressure	0.71
Complexity	0.40
Cost Savings	0.83
Firm Size	0.70
Regulatory Support	0.46
Relative Advantage	0.60
Security Concerns	0.58
Technology Readiness	0.54
Top Management Support	0.86

Table 4.4 shows AVE is greater than 0.5 for all of the constructs so the value was considered to indicate good convergent validity. Barclay, Higgins and Thompson (1995) stated that the value greater than 0.5 revealed that the set of items possessed sufficient convergence for investigating the relevant constructs.

Results illustrate that the total predicted R^2 for intention to adopt is 0.421 which indicates that 42% of the variance in individual intention to adopt cloud-based collaborative learning applications is explained by its independent variables. Cost saving, relatively advantage, complexity, cloud knowledge are able to explain 48.6% of the variance of cloud computing adoption. Meanwhile, familiarity with others, firm size, government regulation and competitive pleasure fit explain 63.7% of the variance in Performance Expectancy. Finally, 35.3% of the variance in compatibility is explained by familiarity with others, self-efficacy, and technology experience. Table 4.10 presents the R-square of dependent variables in the research model which all fall within the "moderate" explanatory power.

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Table 4.7 R-square of dependent variables

Dependent variable	**Notation**	**R Square**	Level of explanatory power
Cloud computing Adoption	CEA	0.916	Moderate
Relative advantage	RA	0.734	moderate

Therefore, in this research, PLS algorithm was performed to calculate path coefficients (see Figure 6.1). Bootstrapping procedure was carried out using 209 cases and 1,000 samples to obtain the signature of each structural path (i.e. the T-value). 5.11 lists the results of the structural model (path coefficients (β), statistics and its significance level) for all hypothesized paths.

Table 4.8: Path coefficients (β), t-statistics and its significance level

Path	**T Statistics**	**P Values**
Top Management Support -> Cloud computing Adoption	0.04	0.49
Technology Readiness -> Cloud computing Adoption	1.37	0.09
Security Concerns -> Relative Advantage	0.01	0.50
Relative Advantage -> Cloud computing Adoption	4.10	0.00
Regulatory Support -> Cloud computing Adoption	1.98	0.02
Firm Size -> Cloud computing Adoption	2.23	0.01
Cost Savings -> Relative Advantage	1.09	0.14
Complexity -> Cloud computing Adoption	0.04	0.48
Competitive Pressure -> Cloud computing Adoption	2.01	0.02
Compatibility -> Cloud computing Adoption	0.18	0.43
Cloud Knowledge -> Cloud computing Adoption	0.06	0.48

The analysis of hypotheses was based on the examination of the standardized paths. The path significance levels were estimated using the bootstrapping method (300 samples). The results of the analysis are summarized in Table 7. For the full sample, an examination of R2 as a descriptive measure shows that security concerns and cost savings explain 44.9% of the relative advantage of cloud computing. For the full sample, the hypothesis of cost savings as a predictor of the relative advantage of cloud computing (H1a) is confirmed ($p < 0.01$), and the hypothesis of security concerns (H1b) ($p > 0.10$) is not confirmed. The hypotheses for relative advantage (H1) ($p < 0.05$), complexity (H2) ($p < 0.10$), technology readiness (H4) ($p < 0.01$), top management support (H5) ($p < 0.01$), and firm size (H6) ($p < 0.01$) are also confirmed for the full sample. Compatibility (H3), competitive pressure (H7), and regulatory support (H8) are not statistically significant for the full sample. In our model, the indirect effect of cost savings in cloud computing adoption is the path coefficient of cost savings to explain relative advantage multiplied by the path coefficient of relative advantage to explain cloud-computing adoption. For the full sample, this equates to 0.099 (0.644*0.154), and the results of our analysis indicate that the indirect effect of cost savings is statistically significant ($p < 0.05$). Based on a similar analysis, our findings indicate that the indirect effect of security concerns is not statistically significant ($p > 0.10$) for the full sample. The research model explains 38.1% of cloud-computing adoption. The findings indicate that the research model is significant in explaining the adoption of cloud computing by firms.

The examination of R^2 as a descriptive measure for the industry-specific sub-samples shows that security concerns and cost savings explain 44.6% and 42.9% of the relative advantage of cloud computing for the SMEs, respectively. For the samples, the hypothesis of cost savings as a predictor of the relative advantage of cloud computing (H1a) is confirmed ($p < 0.01$). The hypothesis of security concerns (H1b) ($p > 0.10$) is not confirmed for either of the sub-samples.

For the following findings are noteworthy. Hypotheses for relative advantage (H1) ($p < 0.01$), technology readiness (H4) ($p < 0.05$), and firm size (H6) ($p < 0.01$) are confirmed. Complexity (H2), compatibility (H3), top management support (H5), competitive pressure (H7), and regulatory support (H8) are not statistically significant. The indirect effect of cost savings for the SMEs sample is 0.227 (0.645*0.351) and is statistically significant ($p < 0.01$), whereas the indirect effect of security concerns is found to be not statistically significant. This indicates that cost savings not only

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 7, Issue 4, April 2019

explains relative advantage but also that it indirectly influences cloud-computing adoption. The research model explains 36.1% of cloud-computing adoption among SMEs organizations

For the and for the complexity (H2) ($p < 0.05$), compatibility (H3) ($p < 0.10$), technology readiness (H4) ($p < 0.01$), top management support (H5) ($p < 0.01$), and firm size (H6) ($p < 0.05$) are confirmed. The relative advantage (H6), competitive pressure (H7) and regulatory support are not statistically significant. For the indirect effect of cost savings is 0.053 (0.627*0.085) and 0.007 (0.079*0.085) for security concerns. The results indicate that cost savings and security concerns are not statistically significant ($p > 0.10$) for the SMEs. The research model explains 40.8% of cloud computing adoption among firms SMEs organizations.

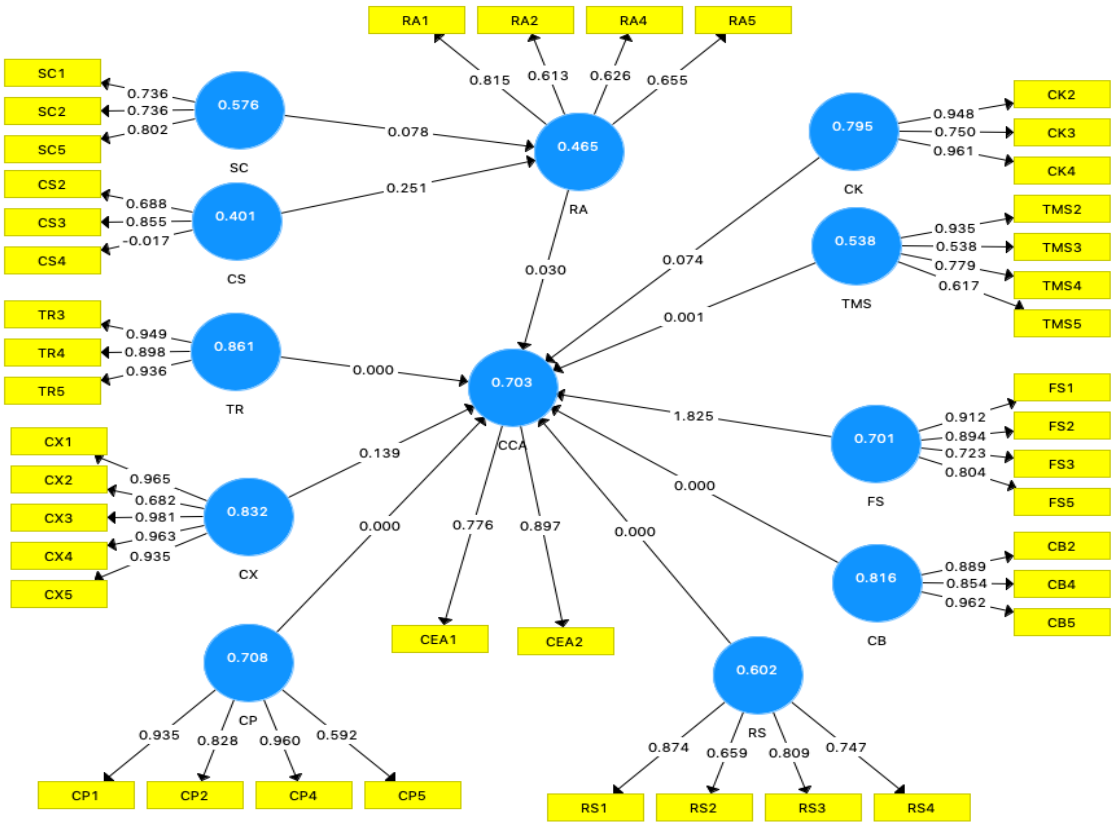

FIGURE 1: MEASUREMENT MODEL

V. DISCUSSION

This study employed a method that is a quantitative approach to achieve its research objectives. This section summarises the accomplishments with the study depending on the research objectives. To recall, the primary and second objectives of this study were to explore and assess the factors of cloud-computing adoption by SMEs. In the type with this, the researcher examined the existing literature about cloud-computing adoption, TOE framework, and Innovation faculties theory (DOI). In details, the TOE frame and DOI suggested for having a model for cloud-computing adoption by SMEs. Educating literature also implied that cost-savings, relative advantages, compatibility, technology readiness, security concern, government support, competitions pressure, regulatory support and cloud-computing knowledge would be the factors on cloud-computing adoption by SMEs. This study provides an insight into the factors influences the adoption of cloud-computing by SMEs and clinic these issues among Saudi services SMEs. This study made an integrated conceptual model that has been developed from the literature review and also enriched and examined using qualitative study, respectively. This research is anticipated to contribute to a method, hypothesis, and training.

VI. LIMITATIONS AND FUTURE STUDIES

This research has some limitations, because of which the results cannot be generalized to all SMEs. Our main limitation is related to sample size. Sample size becomes problematic because, in order to get significant results, there should be

at least 10 observations per each group of the dependent variable. Having eight different variables, our ideal sample size is 160, which is well beyond our actual sample size. Moreover, our sample is selected from North American companies. The results of this research are thus only applicable to SMEs located in North America. Moreover, the data is not restricted to a specific industry; this is problematic because each industry has its own characteristics and requirements. Performing further research in this field is highly recommended. Cloud computing is a new phenomenon; not many studies have been conducted in this field. The same study may be replicated using larger sample sizes and in different industries. Performing a longitudinal study would also prove useful

VII. CONCLUSION

This thesis analysis useful insights to the connection between these factors, result or findings out of this study are solely based on main and secondary information which is out of surveys and previous literature respectively, so the motivational factors are confined by the scope that's identified from the functions of literature. This study not only react to academic research by providing a set of cloud-computing adoption factors, though, will also provide ideas relating to this particular research topic area. This study will also offer consequences for coaching since cloud-computing strategies are becoming prominent as it is forecast annually 2015, affordable cloud-computing services will probably cannibalise around 15 per cent of high recruiting players' earnings (Plummer et al. 2011). This study provides computing customers and consultants, sellers using a substantial implication in lots of ways. The supplier is an example of a part for this study. This study will also describe as a study to understand further factors that might emphasise from persuading to embrace cloud-computing merchandise. From a customer perspective, this study will at least provide a general picture on which they may count on from calculating vendors to embrace or not cloud-computing.

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IJIREEICE

ISSN (Online) 2321-2004
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International Journal of Innovative Research in
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Vol. 7, Issue 4, April 2019

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