

Factors Influencing SMEs towards Execution of Technology Adoption Model in Cloud Computing

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Abstract - SMEs are the base for any economy, and the adoption of ICT has been the survival strategy for many small business owners. SMEs have to adapt to the latest technologies to meet up to the customers' expectations. However, they have their cost constraints in the process of adopting themselves to such technologies. The study aimed to apply the Technology Adoption Model to identify the variables that propel SMEs in the process of implementing Cloud computing. The objective of the study is to match TAM with respect to the adoption of Cloud technology by SMEs. TAM is based on key principles such as expected acceptance, expected ease of implementation, behavioral purpose, and real intent to implement the application that seeks to communicate with Cloud computing. TAM was adopted for designing a conceptual model of the study. 101 SMEs were the respondents of the present online survey. The hypotheses were tested based on TAM, and the inference was concluded based on appropriate statistical tests. The study findings showed that the relative impact of perceived use of deployment in Cloud computing was statistically substantial, and perceived affluence of deployment in Cloud computing. The position of the behavioral need to embrace Cloud computing is statistically imperative in terms of shaping the real purpose of SMEs to implement Cloud computing.

Keywords: Cloud Computing, SME, TAM, Perceived External Support, Information Intensity, Competitive Environment, Complexity, Compatibility, Perceived Use, Perceived Ease of Use

I. INTRODUCTION

The Enterprises, both small as well as medium Enterprises, add to the GDP and other fiscal parameters of every nation to a remarkable extent. Hence, planning strategies and evolving new systems have twin benefits - to SMEs and for the nation's economy. Tan et al. (2009) clarified that appropriate ICT usage supports 'SME's in terms of competence and efficiency [1-3]. However, SMEs lack access to sufficient resources in terms of affordability. Cloud computing, an approach to on-site software and services, lets small to medium-sized businesses tackle many of the problems inherent with IT programs, such as high costs and risk. Cloud computing has four benefits:

- 1) Data storage is secure; Cloud backend teams efficiently maintain the data by shielding the data from numerous virus and crack attacks.
- 2) Cloud computing can support various applications.
- 3) The applications and data have always been easy to share.
- 4) The Cloud has thousands of computers with robust storage and computational capability.

Given the advantages and core obstacles to embracing Cloud computing, it is clear that implementing cloud computing is still a matter for some enterprises. Many enterprises oppose Cloud infrastructure, and it is in favor of increasing the use of Cloud computing due to advantages. As for Cloud infrastructure, Amazon, Google, Microsoft, IBM participate.

In 2007 the Cloud computing revolution was launched. Cloud computing is the computational mechanism where the data and services are distributed over the Internet. Cloud computing refers to a self-propelling internet system that permits operators to utilize computing services from anywhere at any point in time. Cloud Computing is the delivery over the internet of information resources like servers, databases, files, networking, applications, analytics, acumen, and more. Within this section, we discuss the Cloud infrastructure architecture, the Cloud computing platform's features, difficulties, and challenges.

A. Cloud Computing - A change

The evolution of Cloud Computing transpired in a phased means, which depicts in Figure 1. The notion of a global network began in the 1960s. Accessibility of data and programs from any site located anywhere on the globe to get interconnected was the primary objective behind Cloud computing.

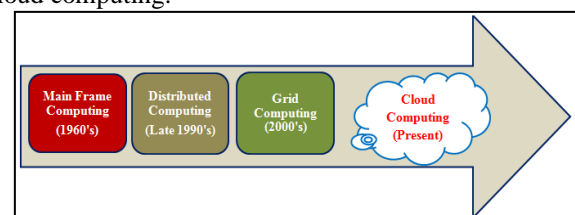


Fig. 1: Evolution of Cloud Computing

B. Cloud Computing Service Model

Cloud computing has three types of service models as explained in Figure 2. Gartner predicted that cloud computing usages would improve to an extent of 13 % to



16 % from the year 2020 to 2022 various cloud applications. The same is explained in vide Figure 3.

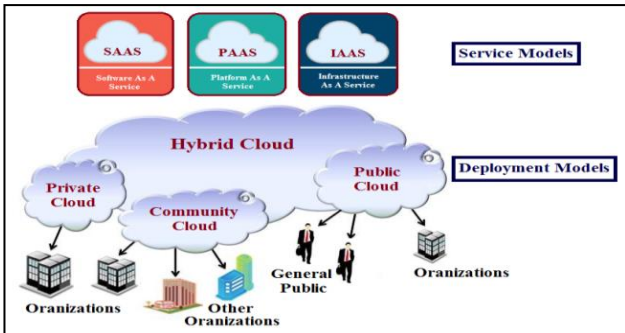


Fig. 2: Operation Models of Cloud Computing Services

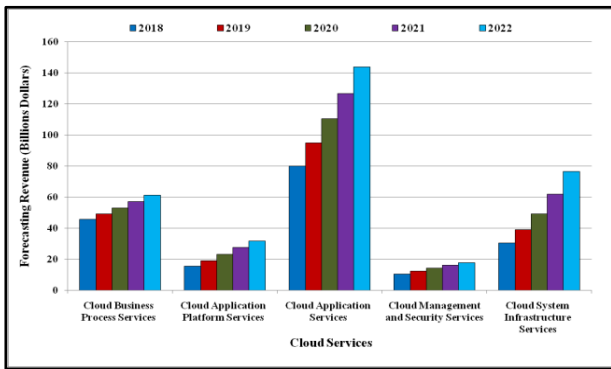


Fig. 3: Forecasting Revenue of Global Level Civic Cloud Service

C. Adoption of Cloud Computing to SME’s through TAM

SMEs adapt to technology as a survival strategy. In such a process, the primary factor SMEs focus is cost-effectiveness which drives them to opt for Cloud computing for accessing their business. Some of the external variables, such as perceived external support, competitive environment, information intensity, perceived level of complexity, and high level of compatibility. The high degree of comparability leads to the expected need for technological implementation and perceived affluence use of applying new technology that addresses the action aim to embrace Cloud computing as a joint endeavor and eventually to consider the real purpose of adapting to the technology. TAM is used to explain SMEs' embracing of Cloud-computing over perception of using its technology and perception of the affluence of using its relevant

services that elucidates purpose of study. The same illustrates in Figure 4.

II. LITERATURE REVIEW

A. SMEs and Cloud Computing

According to Berisha & Pula (2011) the concept of SMEs scales alternatively, where SME’ s identified as private companies usually employing fewer than 250 workers. Davenport (2013) studied that [4] ICT adoption by SMEs earned numerous benefits which included improved business performance as productivity enabling factor, efficiency and an influencer of competitive advantage[5].

Ong, Habidin, Ithnin, & Fuzi (2016) defined by extending the benefits of adoption to ICT, often obtained by adoption to Cloud-based services as Cloud computing falls into broader ICT context. Consequently, [6] SME’s reaps the benefits of ICTs by embracing Cloud computing services[7,8].

Seok-Keun Yoo (2018) explored that the IT services ecosystem has undergone successive modifications, companies have been critical in implementing a Cloud computing framework in the business model formulation process; such an effort will pave the way for market achievements and growth. The study evidenced vital characteristics such as infrastructure, organization, and environment as the fundamental deciding drivers for Analytic Hierarchy Process and Delphi analysis to implement Cloud computing.

SMEs are vital players for every market, according to Tan (2019). ICT use is an effective strategy developed by SMEs to enhance the ability to compete with more prominent companies[9]. Despite the competitive advantage, such strategies generally involve high costs[10]. As a modern computing model, Cloud computing provides many benefits for organizations, including smaller ones.

Hamed Tabrizchi (2020) looked at the information security challenges posed by various cloud computing systems that applied a particular class of security solutions recently available in this area. They identified several security threats of cloud computing services encounters. This paper focuses and presents a detailed understanding of the protection problems of cloud organizations, data holders, ‘cloud service ’benefactor, and Cloud user-face.

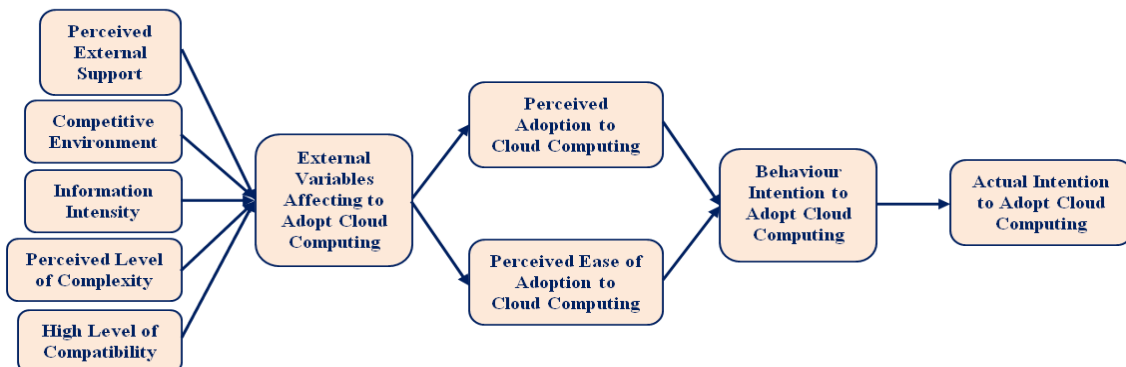


Fig. 4: Adoption To Cloud Computing by SME’s through TAM

B. Technology Adoption Model for Cloud Computing

Duo-Theme Decision Making Trial and Wu et al. (2013), with the aid of DEMATEL using TAM, created a valuation overview as well a review of the ground reason that hampers adoption of core cloud computing at Taiwan University[11].

From database experts besides librarians, Aharony(2015) performed empirical investigation expending TAM[12] by exploring factors that affect Cloud computing adoption in administration decision making[13]. Our findings showed that the significant determining influences were personal characteristics.

Yigitbasioglu (2015) reported that, in most of the current Cloud computing reports, the support provided by top management towards Cloud computing adoption has proven essential.

Lal and Bharadwaj (2016) applied the Software Adoption Model to scrutinize the variables that affected the organizational versatility of implementing Cloud computing. From the tech expert's view. They found that Cloud infrastructure offered a competitive advantage as a result of scalability, flexibility [14], and on-demand delivery of applications, as well as the factors of fast-to-use design, involvement, and knowledge of service providers of Cloud and upper administration support, took significant optimistic outcome on the decision to adopt Cloud computing. They found that Cloud infrastructure offered scalability and competitive advantages, flexibility included in-demand application delivery as well as the criteria and easy-to-use design, experience, and knowledge of cloud service providers and top management support had a substantial positive effect on the decision to implement Cloud computing.

Sharma et al.(2016) included three outer independent variables with machine self-efficacy, trust as well as career prospects to determine the aspects which influence the cloud computing approval by IT experts. Their research described best interpreters of Cloud computing acceptance as machine personal-efficacy, apparent utility, confidence, apparent affluence of usage, and career opportunities considered as finest cloud-computing adoption interpreters[15].

Sabi et al. (2018) conducted an SSA university study to identify aspects that broadly impact Cloud computing dispersion, acceptance, and practice [16]. A computational model was proposed based on a triangulation of the theoretical concepts DOI and TAM constructs. The findings showed a high degree of Cloud-computing knowledge amongst University professionals. The findings highlighted evidence that cost is also not the only show stopper against Cloud adoption and that there are other factors that allow for the Cloud program's durability after adoption.

M MM Rahman et al.(2019) researched the causes, benefits, and drawbacks of implementing Cloud computing at higher education institutions in Bangladesh. Many HEIs are adopting Cloud services because of the efficiency and effectiveness of the academic processes. Cloud storage is implemented because it reduces the cost and the price-per-

use model[17]. Throughout the process of migration to Cloud Computing, Bangladeshi HEIs face important influences, incentives, and disadvantages. The research concluded that TAM and TOE theory implemented in order to establish a methodological paradigm in the context of determining the critical factors for Bangladeshi HEIs.

III. RESEARCH MODEL AND HYPOTHESES

A computational paradigm for investigating the use of Cloud computing by SMEs is proposed. As per this model, eight variables, shown in figure 3, are affecting the decision to implement Cloud computing. Cloud computing emergence has a favorable impact on all aspects except the perceived level of sophistication. Actualsignificant research by 'Tornatzky and Klein' showed public encouragement, competitive benefit, and usability are features of novelty having the strongest impact on advance acceptance. Thirteen similar theories were suggested based on the sample. Perceived peripheral backing described 'Cloud providers' perceived value of support.' The first set of hypotheses are,

H1a: Higher levels of perceived public funding from service vendors have a beneficial impact on the probability that SMEs will implement cloud computing

H1b: High-levels of perceived additional help through cloud services get a significant effect on the probability of perceived easiness for small and medium-sized businesses to accept cloud computing. Competitive gravity is the intensity of competitiveness amongst businesses within that industry in which the enterprise works.

The development of hypotheses is as follows.

H2a: Enterprises working in more dynamic markets are more likely to experience cloud computing acceptance.

H2b: Businesses working in highly dynamic markets get cloud computing assumed ease of acceptance.

Rendering to Thong (1999), the intensity of information defines as 'the degree to which information is present in the product or service of a business [18, 19].

By this, the construct is related to the following hypothesis.

H3a: The amount of knowledge significantly related to the expected Cloud computing adoption

H3b: The amount of knowledge significantly determines the perceived ease of embracing Cloud computing.

A technology that is difficult to understand and whose implementation classifies as complicated is not commonly used.

Then it establishes the following hypotheses.

H4a: The increased degree of complexity in Cloud technology is having a negative impact on the planned adoption of Cloud computing.

H4b: The perceived amount of difficulty of Cloud computing destructs the apparent affluence with Cloud computing acquiescence.

In this study, flexibility defines as ‘the degree to which Cloud computing sees as reacting to present values, past participation and customer requirements.’The hypotheses about this are as follows:

H5a: High convergence rates between Cloud infrastructure and the standards and technology of an organization have a significant impact on perceived Cloud computing acceptance.

H5b: Elevated levels of interoperability between a company's Cloud computing and its standards and technologies positively influence the functional simplicity of adoption in Cloud technology.

TAM-based hypotheses are as follows.

H6a: The assumed acceptance of Cloud computing has a favorable effect on SMEs.

H6b: SMEs' assumed user-friendliness of ‘Cloud competing favorably affects the conduct of small and medium-sized enterprises

The study's final hypothesis describing the direct trajectory is given as.

H7: Behavior expected by SMEs to implement Cloud computing significantly impacts the real purpose to be implemented.

IV. RESULTS AND DISCUSSION

A computational paradigm for investigating the use of Cloud computing by SMEs is being proposed. As per this model, eight variables, shown in figure 3, are affecting the decision to implement Cloud computing [20, 21]. Cloud computing emergence has a favorable impact on all aspects except the perceived level of sophistication. A very notable research by Tornatzky and Klein shows characteristics to the development have the most significant effect on the acceptance of an innovation which includes public support, competitive advantage, and

usability. There are 13 similar theories suggested based on the sample. Perceived peripheral backing describes as ‘Cloud providers' perceived value of support.’

Table 2: Reliability of Constructs

Reliability of Composite Scores	No of Items	Inter-Item Correlation Mean	Cronbach Alpha
Perceived External Support	3	0.623	0.949
Competitive Environment	3	0.657	0.851
Information Intensity	3	0.787	0.982
Perceived Level of Complexity	4	0.591	0.847
High Level of Compatibility	4	0.725	0.752

Hypothesis analysis builds on examining standardized paths and the direction, meaning rates determine the survey's 101 samples. The empirical findings are summarized in Table 3.Economic climate (H2) and High-reliability rates (H5) are statistically crucial for the full study. However, knowledge strength (H3) & perceived degree of sophistication (H4) did not prove statistically essential to affect Cloud computing’s perceived acceptance.

In the presented work, the composite values determine using the Hair analysis (2010) dependent average variables in scale. The accuracy of the end set of variables was checked again. Table 2 lists the final findings from a durability test. All items have strong alpha, and inter-item interaction means at Cronbach.

The indirect effect of perceived Cloud computing dependency in the current conceptual model and perceived ease of ‘Cloud services’ transition by SMEs highlight the indirect direction towards the actual purpose of Cloud computing introduced by SMEs.The results indicate that the indirect impact of perceived Cloud computing adoption usage and perceived ease of adoption into Cloud computing are statistically relevant. In terms of impacting Cloud computing on the actual purpose of SMEs to do so, the direct path of behavioral encouragement to adopt Cloud computing is statistically significant. The study report indicates that SMEs use 42.7 percent of Cloud computing.

Table 3 : Summary of Hypothesis

Hypothesis Statement		Result
H1a	Higher levels of perceived public assistance from service vendors impacts the possibility of SMEs embracing ‘Cloud computing’	Supported
H1b	Advanced stages of perceived peripheral support from Cloud providers have a positive effect on the perceived ease for SMEs to embrace 'Cloud computing'	Supported
H2a	Enterprises working in more dynamic markets are expected to experience ‘Cloud computing’ acceptance.	Supported

H2b	Businesses working in highly dynamic markets get 'Cloud computing' assumed acceptance with ease.	Supported
H3a	Amount based on knowledge favorably linked to the expected 'Cloud computing' adoption	Not Supported
H3b	The information volume is linked positively perceived simplicity of 'Cloud computing' adoption	Not Supported
H4a	Increased level of Cloud computing sophistication is having a detrimental effect on expected 'Cloud computing' adoption.	Not Supported
H4b	Cloud computing 's perceived level of complexity impacts negatively on 'Cloud computing 's' perceived easiness to adopt.	Not Supported
H5a	High convergence rates between Cloud infrastructure and the standards and technology of an organization impact significantly on perceived 'Cloud computing' acceptance.	Supported
H5b	High compatibility levels between Cloud computing and the technological standards of an organization positively impact on perceived ease of embracing 'Cloud computing.'	Supported
H6a	SMEs' perceived acceptance of 'Cloud competing favorably affects the conduct of SMEs businesses	Supported
H6b	The perceived ease of use of Cloud computing by SMEs businesses has a positive impact on the conduct.	Supported
H7	'SMEs' behavior in adopting Cloud computing strongly affects the actual intent to adopt Cloud computing.	Supported

This study used statistical tools to accomplish the analysis aims and is a quantitative methodology. Each section outlines the successes of the analysis according to the goals of the report. By recalling the primary and second objectives of this study were to explore and evaluate the factors of small and medium-sized enterprises which adopt Cloud computing. We reviewed the current literature implementation of Cloud computing with TAM system concerning SMEs in the form of this. Educating literature has indicated that external variables such as perceived international support, and economic environment, and high levels of availability will be factors influencing SMEs' adoption of Cloud computing. This study offers an insight into the factors influencing SMEs' adoption of Cloud computing and canonicalization among Chennai SMEs of those problems further studied using observational tests, respectively.

A. Limitations of the Study

- 1) A Test sample size may have been higher.
- 2) The analysis refers primarily to 'SME's' in Chennai; as a result, it cannot be generalized.
- 3) Data are not restricted to any single sector; It is cumbersome since every sector fulfills its features and necessities.

V. CONCLUSION

As for every breakthrough, Cloud computing expansion depends on multiple factors. The present study packs with technological implications of 'Cloud computing as well as management considerations. A computational model has been proposed for this reason and empirically evaluated. The suggested model has been developed using

the TAM (Technology Adoption Model) methodology. A collection of theories is suggested and tested to get conclusions based on the theoretical sample. This study contributes to academic as well as a business practice. The study findings could be used by Cloud providers to increase adoption rates among SMEs. Grounded on findings of the above study, 'Cloud computing' external factors are the main drivers in Cloud computing diffusion, those small and medium-sized companies consider the hype process. The choice by SMEs to migrate to a particular Cloud computing system relies on the expected benefit of Cloud technology adoption and the expected simplicity of SMEs' use of Cloud technology adoption.

We highly suggest supplementary research work in this area of study. 'Cloud computing is a recent technology in this field of study; there are not many piloted projects, and they are underway. By using larger sample sizes, the same analysis replicates in various fields. This will be valuable for carrying out a retrospective analysis as well.

REFERENCES

- [1] Tan K.S., Chong S.C., Lin B. and Eze U.C., Internet-based ICT adoption: evidence from Malaysian SMEs, *Industrial Management & Data Systems*,109(2) (2009) 224-244.
- [2] AutryC.W., Grawe, S. J., DaughertyP.J. and RicheyR.G., The effects of technological turbulence and breadth on supply chain technology acceptance and adoption, *Journal of Operations Management*, 28(6) (2010) 522-536.
- [3] Balakannan K et al., Performance evaluation of supply chain and logistics management system using balanced scorecard for efficiency enhancement in Indian automotive industries, *Indian Journal of Science and Technology*, 9(35) (2016) 1-9.
- [4] Berisha G. and Pula J.S., Defining Small and Medium Enterprises: a critical review, *Academic Journal of Business, Administration, Law and Social Sciences*, 1(1) (2015) 17-28.

- [5] Davenport T.H., Process innovation: reengineering work through information technology, Harvard Business Press, (2013).
- [6] Ong S.Y.Y. et al., The relationship between ICT adoption and business performance in Malaysia and Indonesia, Malaysian Journal of Society and Space, 12(12) (2016) 40-49.
- [7] Yoo S.K. and Kim B.Y., A decision-making model for adopting a cloud computing system, Sustainability, 10(8) (2018) 2952-2961.
- [8] Priya P.S.S., Nandhini S., Thangamani M., and Nallusamy S., A review on exploring the deep learning concepts and applications for medical diagnosis, SSRG International Journal of Engineering Trends and Technology, 68(10) (2020) 63-66.
- [9] Li A., Tan S. and Jia Y., A method for achieving provable data integrity in cloud computing, The Journal of Supercomputing, 75(1) (2019) 92-108.
- [10] Hamed Tabrizchi and Marjan Kuchaki Rafsanjani., A survey on security challenges in cloud computing: issues, threats, and solutions, The Journal of Supercomputing, 76 (2020) 9493-9532.
- [11] Wu D., Greer M.J., Rosen D.W. and Schaefer, D., Cloud manufacturing: Strategic vision and state-of-the-art, Journal of Manufacturing Systems, 32(4) (2013) 564-579.
- [12] Aharony N., An exploratory study on factors affecting the adoption of cloud computing by information professionals, The Electronic Library, (2015).
- [13] Husein Osman Abdullahi, Abdikarim Abi Hassan, Murni Mahmud, Abdifatah Farah Ali, Determinants of ICT Adoption Among Small Scale Agribusiness Enterprises In Somalia International Journal of Engineering Trends and Technology 69(2)(2021) 68-76.
- [14] Yigitbasioglu, Ogan M., External auditors' perceptions of cloud computing adoption in Australia, International Journal of Accounting Information Systems, 18 (2015) 46-62.
- [15] Lal P. and Bharadwaj S.S., Understanding the impact of cloud-based services adoption on organizational flexibility, Journal of Enterprise Information Management, 29(4) (2016) 566-588.
- [16] Sharma S.K., Al-Badi A.H., Govindaluri S.M., and Al-Kharusi M.H., Predicting motivators of cloud computing adoption: A developing country perspective, Computers in Human Behavior. 62 (2016) 61-69.
- [17] Sabi H.M., Uzoka F.E., Langmia, K. et al., A cross-country model of contextual factors impacting cloud computing adoption at universities in sub-Saharan Africa, Inf Syst Front, 20 (2018) 1381-1404.
- [18] Rahman M.M. and Rahman M.A., Cloud computing in Bangladeshi higher educational institutions: influential factors and adoption model, AIUB Journal of Business and Economics, 16(1) (2019) 44-55.
- [19] James Y.L. Thong., An integrated model of information systems adoption in small businesses, Journal of Management Information Systems, 15(4) (1999) 187-214.
- [20] Soby D., Data compression analysis of rocket engines with vector quantization based on FCM algorithm, International Journal of Engineering Research in Africa, 22 (2016) 135-140.
- [21] Nallusamy S., Overall performance improvement of a small scale venture using critical key performance indicators, International Journal of Engineering Research in Africa, 27 (2016) 158-166.
- [22] Chen L.D. and Tan J., Technology adaptation in E-commerce: key determinants of virtual stores acceptance, European Management Journal, 22(1) (2004) 74-86.