

Cloud Computing Adoption in Small and Medium-Sized Enterprises (SMEs) of Asia and Africa

A Cross-Continent Overview of Advantages and Challenges

Babur Hayat Malik¹, Jazba Asad², Sabila Kousar³, Faiza Nawaz⁴, Zainab⁵
Farania Hayder⁶, Sehresh Bibi⁷, Amina Yousaf⁸, Ali Raza⁹
Department of Computer Science and Information Technology
University of Lahore, Chenab Campus Gujrat, Pakistan

Abstract—Cloud computing is a rapidly emerging technology over the last few years that has abolished the burden of purchasing heavy hardware and licensed software. Cloud computing has been advantageous to Small and Medium-sized Enterprises (SMEs), but still numerous SMEs have not adopted cloud computing to delve into its appealing benefits. Asia and Africa vary notably regarding their innovative capability. Asia has been competent to advance and sustain world leadership in technological innovations whereas Africa has not developed significantly in these terms. A seldom comparative study has been implemented on the reasons for the innovation gap between these two continents. This article examines and compares the cloud computing adoption from a Geo-regional framework; Asia and Africa. A comparative study is used to organize the findings from China in Asia, and Nigeria in Africa. The article identifies the probable benefits, usage of cloud computing and level of cloud computing adoption amid SMEs in Nigeria and China. The paper explores the margin that subsists amongst the level of cloud computing adoption in SMEs of these two countries and specifies challenges particular to each country intercepting the complete cloud computing adoption and proposes solutions for Nigerian SMEs to beat these challenges. Furthermore, the article contributes proof-supported intrusion for cloud service providers, the government and the capitalism to enhance the cloud computing adoption amid SMEs to eventually determine the enterprises for the probable financial advantage.

Keywords—Cloud computing; adoption; Asia; Africa; small and medium-sized enterprises; analysis

I. INTRODUCTION

Over the last decade, cloud computing has been a major agenda in the computing field. Cloud computing is the on-demand delivery of computer system resources as a service over the network. [1] The features of cloud computing, including scalability, flexibility and pay-per-usage model [2] has the potential to influence the various aspects of social and economic activities globally.

Cloud computing offers enormous benefits to all organizations and enterprises, including SMEs [3]. Small and medium Enterprises (SMEs) -are the enterprises in which amount of personnel are less than certain limits, and they are control the data of high sensitivity. Some cases of sensitive data which is controlled by SMEs are: data of intelligence agencies and government federal, financial data of companies,

purchase contracts, company databases, de-identified research data, bank associated data like bank accounts, pin, passwords, balances and dealings, trade secrets, email accounts, drug formulas, accounting records and source codes [4].

The adoption of cloud computing is growing rapidly as it allows enterprises to concentrate on their essential business events, and, thus, efficiency is improved [5]. An adequately adopted cloud provides a plenty of benefits to the enterprises such as unlimited computing power, easy access of data and applications, lower IT expenditure, and build up competitive advantage. Recently, SMEs has shown a great concern in including cloud computing to their overall Information technology (IT) strategies. A recent report by Mckinsey [6] on the adoption rate of cloud service by SMEs informed that, 70% of SMEs have formerly bought at least two cloud service, and 40% have bought six or more cloud services. Nevertheless the touted benefits of cloud computing, its adoption and implementation in SMEs is faced with many challenges including national and international regulations, shortage of industry-specific conformism to principles, security and privacy threats [7][8][9]. Due to these challenges, some enterprises are quiet anxious around the threats of shifting business-critical applications to the cloud.

A. Contribution and Paper Organization

Asia and Africa vary notably regarding their innovative capability. Asia has been competent to advance and sustain world leadership in innovation and technology, whereas Africa has not developed significantly in these terms. A very little comparative study is implemented on the reasons for innovation gap in these two continents. Motivated by this issue, this study sets out to examine and compare the cloud computing adoption from two regions; Asia and Africa. A comparative analysis is used to organize the findings from China in Asia, and Nigeria in Africa. Outcomes from this examination show that, in Nigeria security, privacy and trust, good internet connection, and level of awareness can pose as interferences to complete adoption of cloud computing. While, in China, these issues are not seen as hindering cloud computing adoption because of cheaper access to computing properties and reliable services in the cloud compared to locally hosted services.

The definite purposes of the paper were:

- To review systematically the extant literature regarding adoption of cloud computing amid SMEs in Nigeria and China.
- To recognize the probable benefits and usage of cloud computing amid SMEs in China and Nigeria.
- To contrast the level of cloud computing adoption amid SMEs in Nigeria and China.
- To determine main problems critical to complete adoption of cloud computing in the two states.
- To propose solution for Nigerian and Chinese SMEs to overcome these challenges.

The rest of the study is structured as follows: Section II presents the technical background of cloud computing and cloud computing adoption, by defining key concepts of cloud computing, discuss service and deployment models, and cloud computing adoption models. Section III presents the methodological approach for the literature search procedure. Section IV presents the explanation about SMEs in China and Nigeria, and also discusses about their impact to national GDP in the two countries. Section V presents the level of acceptance of cloud computing among SMEs in these two states. Section VI discusses the boundary between the adoption and practice of cloud computing in China and Nigeria. Section VII analyzes the potential benefits of cloud computing in Chinese and Nigerian SMEs. Section VIII examines some of the main competitions that impede the total adoption of cloud computing by SMEs in both states and recommends a series of recommendations to overcome these obstacles. Section IX covers the end of this review by highlighting the implications of the results.

II. TECHNICAL BACKGROUND

A. Cloud Computing Overview

Cloud computing is “an old idea whose time has (finally) come” [10]. As cloud computing has progressive nature, which is why it is hard to limit it to standard definition [11-13]. In the phrase Cloud Computing, the word “Cloud” is assumed to be evolved from (at least partly) the use of cloud symbol drawn in diagrams or flow charts as a metaphor, depicting some large networked environment or Internet [14].

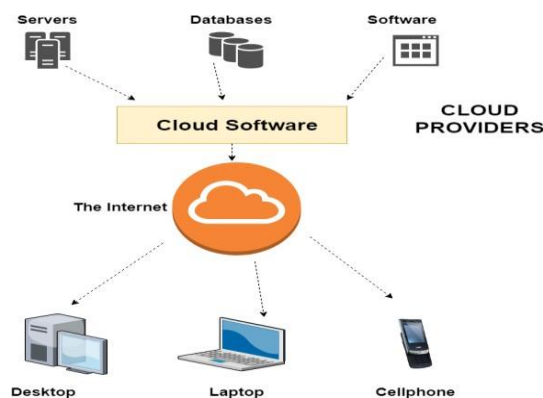


Fig. 1. Cloud Computing Environment.

The US-based National Institute for Standards and Technology (NIST) gave guidance on defining cloud computing. The NIST explains cloud computing as “a model for enabling 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” [15]. Conferring to this description, cloud computing is beneficial to both the cloud service provider and cloud service user as shown in Fig. 1. In case of provider, the adaptability of cloud computing resources to scale according to service needs devoid of recompensing for this big scale is unique in the history of Information Technology (IT). In case of user, for retrieving responsive web-based applications, processing power on server-side require minimum system specifications for electronic devices [16].

The cloud computing has five vital features: [17]

- **Rapid elasticity:** Refers to near-instantaneous provisioning of capabilities of the application delivery infrastructure to expand and contract spontaneously according to needs.
- **Broad network access:** Potential and control of a cloud computing services can be retrieved via internet or other networks by means of standard protocols or thin/thick customer platforms e.g., work stations, laptops, mobile phones, and PDAs.
- **Measured Service:** Customers’ use of the resources is optimized, reported, monitored and charged with some metering competencies, as an allocation to both the consumer and provider.
- **On-demand self-service:** Clients can separately use computing competences as desired, deprived of the requirement of human collaboration with the service’s provider in the cloud.
- **Resource pooling:** Simulated and physical properties are dynamically assigned and reassigned to assist frequent consumers by a multi-tenant software conferring to consumers’ requirements.

1) *Types of cloud Service models:* Types of cloud service models are shown in Fig. 2.

a) *Infrastructure-as-a-Service (IaaS):* In this form of cloud computing, the cloud service provider delivers the users with a “pay-per-use” cloud computing set-up over the network to set up and run arbitrary software [18].

b) *Platform-as-a-service (PaaS):* PaaS allows customers to generate web service-based programs quickly deprived of expense and complications of purchasing and handling the fundamental computing resources [19].

c) *Software-as-a-Service (SaaS):* In this cloud service, the consumers are provisioned to commercially accessible applications as a service [19].

d) *Data-as-a-Service (DaaS):* In this cloud service, comprises structures data and unstructured content (i.e. Content-as-a-Service). Data or information that is provided from the

cloud is in the form of raw data sets or used up by an analytics interface [20].

e) *Business Process-as-a-Service (BPaaS)*: Cloud provided organization facilities that are adjusted to organization forms and related quantifiable business organization [20].

2) *Types of cloud deployment models*: The types of cloud deployment models are shown in Fig. 3.

a) *Public Cloud*: The framework of public cloud exist outside of the companies' own firewall and is provisioned to a big business set or the common community for open use [21].

b) *Private Cloud*: The framework of private cloud exists inside the company's own firewall and is provisioned to multiple employees of single organization (e.g., business units) for exclusive use [22].

c) *Community Cloud*: The framework of community cloud is available to customers of particular network for selective use, that have common interests like necessities, safety, strategy, mission, and agreement considerations [23].

d) *Hybrid Cloud*: The framework of hybrid cloud is a mixture of more than two clouds (mostly public and private), that stay exclusive units but remain composed by copyrighted technology [23].

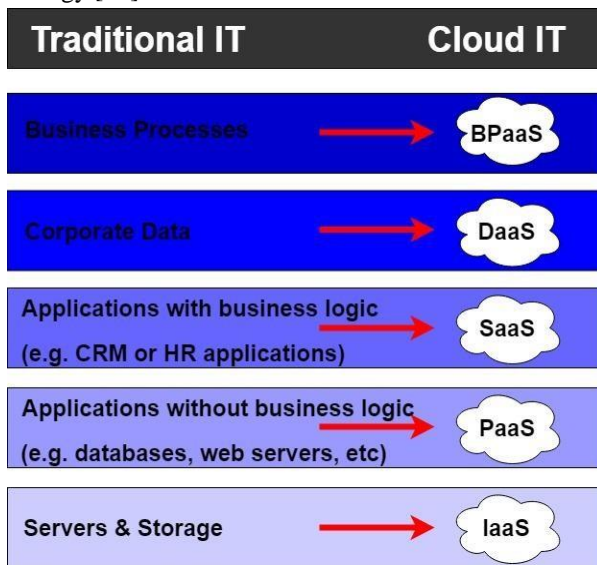


Fig. 2. Cloud Computing Service Models.

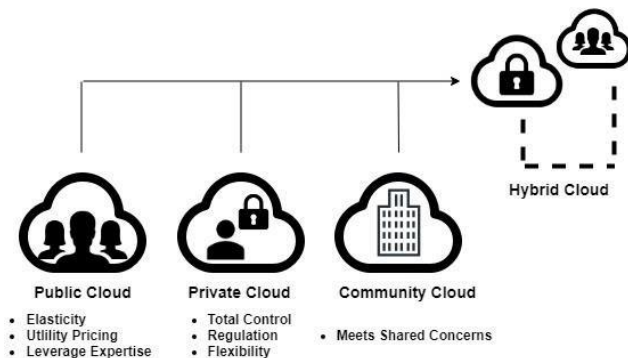


Fig. 3. Cloud Computing Deployment Models.

B. Cloud Computing Adoption: overview

Cloud computing adoption raises to the approval and contract to utilize cloud-support facilities as a novel method of installing applications. Company's effectiveness can be enhanced by deploying innovative services. Fig. 4 shows the cloud computing adoption models. Types of cloud computing adoption models are discussed below:

- **Technology-Organization-Environment (TOE) Framework**: The technological organization environment (TOE) is a model at the organizational level and a multi-point charter. The technological, organizational and environmental features of an organizational framework affect the method of adoption of technological invention [24].
- **Theory of Reasoned Action (TRA)**: In this framework, all human actions is prophesied and clarified over three main cognitive modules, namely attitudes (bad luck or favor of behavior), social standards (social impact) and intents [25].
- **Theory of Planned Behavior (TPB)**: In this framework, the perceived behavior control (PBC) by means of a novel inconstant to spread the TRA model is extended. In essence, PCB is resolute by the accessibility of assets, chances and skills, as well as by the assessed status of these assets, chances and capabilities to reach consequences [25].
- **Theory of Interpersonal Behavior (TIB)**: This typical framework mostly illuminates the difficulty of human actions, which is unfair by societal and expressive aspects. Therefore, this model not merely offerings all the features of TRA and TPB, but moreover contributes to practices, facilitates circumstances and effects to recover predicted power [25].
- **Technology Acceptance Model (TAM)**: This model originates from the TRA model. TAM clarifies the user's motivation over three features: perceived uses, ease of use and attitude to use.
- **Diffusion of Innovations Theory (DOI)**: The DOI model observes a variety of inventions by means of announcing four features (time, communication channels, innovation, or social system) that effect the diffusion of a new notion [24].
- **Perceived Characteristics of Innovating Theory (PCIT)**: This model extends to DOI theory by recognizing three further characteristics, namely: image, volunteerism and behavior [25].
- **Unified Theory of Acceptance and Use of Technology (UTAUT)**: This analyzed four precursors for the adoption of information systems. Important events are the anticipation of effort, the expectation of results, social impact and conditions [25].
- **Compatibility UTAUT (C-UTAUT)**: The objective of this model is to increase a improved considerate of how cognitive occurrences are done in the UTAUT model by identifying and testing new boundary conditions [25].

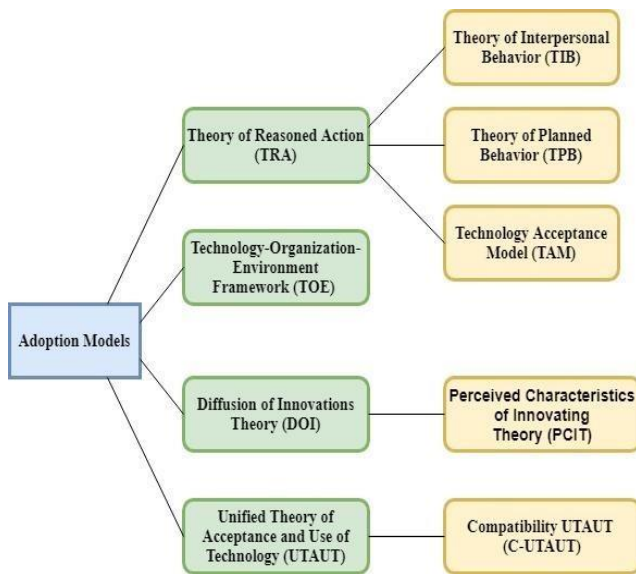


Fig. 4. Cloud Computing Adoption Models.

III. METHODOLOGY

An organized comparative study was conducted on the comparison of cloud computing adoption in SMEs of China and Nigeria.

The following keywords, comprising truncation signs (symbolized by *), and Boolean operators (e.g., OR, AND), were chosen for this paper: (Cloud Computing) OR (Cloud Computing Adoption) OR (Comparison) AND (Analysis) OR (Comparative study) AND (Asia) OR (Africa) OR (China) OR (Nigeria) AND (SMEs) OR (Enterprises).

The following electronic databases were retrieved for the literature search, chosen due to their content being related to the discipline: Google Scholar and browsing over academic databases including IEEEExplore, Springer Link, ScienceDirect, and ACM Digital Library.

IV. INFLUENCE OF SMES TO NATIONAL GROSS DOMESTIC PRODUCT (GDP) IN CHINA AND NIGERIA

Small and Medium-sized Enterprise (SMEs) have developed much significance in the worldwide budget, which cannot only be dignified by the growing quantity of SMEs signifying the 90% of total enterprises globally, but also their momentous part in producing occupation chances [27], decreasing poverty, making profits and helping state's prosperity.

The definition of SMEs is different for each country. In China, there are at least 300 employees in a medium-sized company with total assets and annual revenues that do not exceed 40 million RMB and 30 million as a result. Whatsoever fewer than that is categorized by means of a small-sized enterprise [28]. In Nigeria, the number of employees in SMEs ranges from 11 to 200, with a base of 5 million N and no more than 500 million (without houses and land).

In china, the quantity of SMEs are abundant comprising above 99% of the aggregate amount of businesses, amongst

which are small organizations [26]. Conferring to [29], Chinese SMEs offers 70% GDP, 62.3% of gross trade value, 74.7% of industrial added productivity rate and it also gives 80% of city employment. Consequently, it could be said that SMEs are vital for driving financial development in China. Fig. 5 shows the GDP of Chinese SMEs.

In Nigeria, it is expected that SMEs generate about 60% of the country's GDP and signify several commercial areas i.e. 50% as distributive trade, 10% in service, 10% in the manufacturing and 30% in agriculture as shown in Fig. 6 [30].

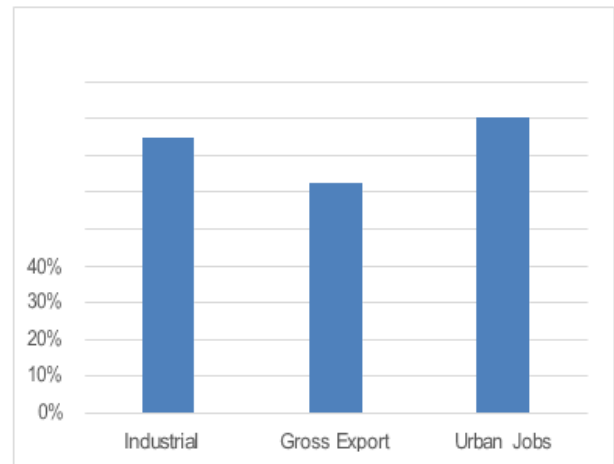


Fig. 5. GDP of Chinese SMEs.

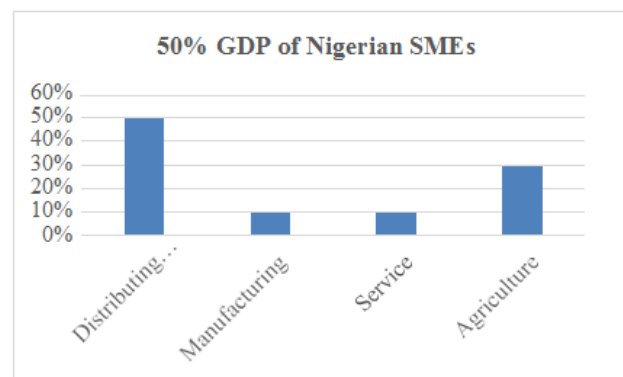


Fig. 6. GDP of Nigerian SMEs.

China is taking advantage of cloud by delivering economical internet facilities to SMEs as a constituent of a determined virtualization platform [31].

V. ADOPTION OF CLOUD COMPUTING BY SMES IN CHINA AND NIGERIA

It can be said that the adoption of cloud computing by SMEs in China has evolved to specific point (yet not completely settled). According to [32], the cloud services market for initiatives in the continent is estimated at 33.8 billion in 2016, a high-level adoption index for cloud computing by Chinese SMEs. In China, credible companies are being developed to use cloud computing, data transfer, computer facilities, software, full-service and commercial services.

TABLE I. CONTRAST OF LEVEL OF CLOUD COMPUTING ADOPTION AMID CHINESE SMEs AND NIGERIAN SMEs

	SMEs of China	SMEs of Nigeria	Related Studies
Service Model	Platform as a Service , Infrastructure as a Service , and Software as a Service	Mostly Infrastructure as a Service , and Software as a Service	[32][34] [35]
Deployment Model	Public cloud service , Private cloud service	Public cloud service , Private cloud service	[35]
Types of Industries	Health, Education, Computer Administrations and Software, Wholesale and Retail, Manufacturing, Government	Telecommunication, Computer Administration and Software	[32][36]
Barriers in Adoption	High Cost, Uncertainty regarding Security and Steadiness	Scarce Infrastructure, Security and Privacy, Good Internet Connection, Low Level of Awareness	[32][34] [35]
Objective of usage	Email Services, Portal Website, Media services, Enterprise storage	Web Portal, Email Service, Enterprise storage	[35]

With domestic maintenance for small organizations and the Internet setting, Chinese restaurants are booming. Conferring to [32], the Chinese network industry has reached 1,880 million CNY. Today, 36% of SMEs have a commercial website, of which 76% are SMEs and 94% of Chinese SMEs have already been tested for online management applications. In Africa, there is no new cloud computing, they are considered weak. According to [33], 24% of Nigerian SMEs (in 2015) used the facilities in their business and remained as a service (IaaS), monitored by software (SaaS).

In a study [33], it was noted that 100% of SMEs applied in the research use one or another system of ICT in their association, but that 41% of them are connected to the Internet. Apparently, 29% of SMEs use cloud applications in their company, and 24% of them presently use cloud facilities in their association. According to the previous research presented in [32] and [33], Chinese and Nigeria SMEs demonstrate the matches and variances amongst the adoption of cloud computing by SMEs in China and Nigeria. A series of comparison level of adoption are discussed in Table I.

Table I shows some of the matches and variances in the adoption of cloud computing by SMEs in China and Nigeria. The motive for this difference can be explained by the mass and financial strength of China, as the major economy globally. Additionally, the reason may be China's success in research and development and its contribution in science. All this gives China a lead in the domain of cloud computing. Although there are variances amid the use of cloud computing in Chinese and Nigerian SMEs, the document addresses a few problems that avert the complete implementation of cloud computing amid SMEs in both states.

VI. STRUCTURAL GAP BETWEEN CLOUD COMPUTING ADOPTION AND USAGE IN CHINA AND NIGERIA

The Chinese government led the Chinese IT leadership over tactical venture and support [37]. Government reflects

cloud computing as a tactical precedence and contain it in the 12th Five-Year Plan of the country [38] [37]. Conferring to the Chinese administration and private companies, there is a very high investment in China, and China has a special capacity in this field. Cloud computing in China is 156 billion dollars in the coming years. An internet corporation in China named as "Tencent", declared in 2016 that in the coming six years, it proposes to devote 1.6 billion dollars in the cloud computing areas. The Alibaba group similarly declared a US \$ 1 billion stock in Aliyun [38]. Consequently, we can reduce the level of acceptance of computer science in China.

Instead, the adoption of cloud computing technology is increasing in unindustrialized states. The road cloud has unlocked to deliver better-quality chances for developing countries [39], mainly in Nigeria. It cannot be said that the adoption of cloud computing in Nigeria has enlarged pointedly, but the IT market potential in Nigeria exceeds \$ 100 million per year. According to [40], the subsequent main development is high-level cloud computing in Nigeria between IT professionals, government administrations and activities. But there are quiet obstacles to occupied acceptance in Nigeria, including: Data ownership and security, cloud information.

VII. ADVANTAGES FOR CLOUD ADOPTION IN CHINA AND NIGERIA

Technical advance in cloud computing and its adoption has given much capability to SMEs in supporting administrations to accomplish their goals, increase economic benefit and delivering improved facilities to customers. SMEs that are unaware of the advantages of accessibilities of cloud computing are expected to be defeat in this greatly economical market. Table II indicates some of the most important advantages of cloud computing adoption.

TABLE II. ADVANTAGES OF CLOUD COMPUTING ADOPTION AMONG CHINESE SMEs AND NIGERIAN SMEs

Advantages	Description
Storage	Cloud-supporting systems have no environmental restrictions on records storing. The consumer can easily rise storing strategy deprived of spending much in computer equipment.
Expenses	Through recession of measure, cloud technology suppliers can allocate business-class quality to much little expenses SMEs, supporting small organizations to be extra dynamic compared to greater challengers and giving license fees for small businesses. This is also reduced.
Protected and Secure Data	Utmost of the data directed to the cloud is encoded, so remote sensors cannot be distinguished, and septic files are not spontaneously archived, somewhere they are, which avoids widespread network infections.
Disaster-proof	Cloud computing solutions support small businesses reduce the threat of data loss. Since records is presented and kept ubiquitously, society data can be delivered as rapidly as promising.
Reliability and accessibility	As the data is stored off-site and supported on other sites, all IT assets can be rapidly reestablished in case of server failure.
Focus on main capability	SMEs no longer have to concern about contracting an IT specialist, as cloud service providers admit this and can emphasis on the main capabilities of the association.
Adaptability and Remoteness	The cloud computing provision allows a reliable individual to entrance the essential assets over a protected Internet association and a well-suited device without working in the office.
Usage of updated applications	SMEs have entrance to the newest sort of the software (necessary for their work) as the service provider installs updates and manages the software licenses.

VIII. CHALLENGES FOR FULL ADOPTION IN CHINA AND NIGERIA

In China, despite of the fact that cloud computing has been considered much crucial and massively established, still many Chinese SMEs has not completely adopted it. The challenges hindering the complete cloud computing adoption amongst Chinese SMEs comprises costs (still expensive), and doubts and fears on the security and steadiness (as cloud computing is still at initial phase) of cloud computing [32].

The main challenges averting the complete adoption of cloud computing in Nigerian SMEs along with the solutions to beat these problems for taking lead of cloud computing are discussed in Table III.

TABLE III. CHALLENGES AND THEIR SOLUTIONS FOR CLOUD COMPUTING ADOPTION AMONG NIGERIAN SMEs

Privacy and Security	
Challenge 1	Solution of challenge
<i>Description of challenge</i>	<i>Solution of challenge</i>
The first and foremost challenge to Nigerian SMEs averting the complete cloud computing adoption is security and privacy [34]. Because according to many SMEs, for having assurance in adopting this novel technology, the security of data and privacy of SMEs needs to follow some strict standards [33].	The problem of security and privacy of data deposited in a cloud of SMEs can be resolved by availability of cloud services to consumers on free trial for a specific duration.
Good Internet Connection	
Challenge 2	Solution of challenge
<i>Description of challenge</i>	<i>Solution of challenge</i>
The second problem for Nigerian SMEs that is responsible for an extensive hindrance to complete cloud computing adoption is the accessibility of good internet connection. Because in utmost regions of Nigeria, the internet speed is gradual causing delay in delivery of data from/to the cloud [33] [41].	To escalate the bandwidth and internet speed for downloading from the cloud or uploading to the cloud, the interested company needs to offer the enhanced internet connection, which will eventually reassure the clients for cloud computing adoption.
Level of Awareness	
Challenge 3	Solution of challenge
<i>Description of challenge</i>	<i>Solution of challenge</i>
The third challenge is the very little knowledge about the advantages of cloud computing adoption in SMEs, which is why organization's management team is anxious of adopting and approving cloud computing usage in SMEs [32][33][35].	To eliminate the uncertainty about cloud computing adoption [42] [43], it is essential for companies (both public and private) in the country to have comprehensive information about cloud computing, its benefits and drawbacks.

IX. CONCLUSION AND FUTURE WORK

Cloud computing, that has been regarded as rapidly emergent technology, is still unfamiliar to many enterprises particularly small and medium-sized enterprises (SMEs). In china, the level of cloud computing adoption amid SMEs is assumed to be excessive (however not completely adopted). Although, the level of cloud computing adoption in African states mainly in Nigeria is comparatively deficient. A few issues averting the SMEs from complete cloud computing adoption have been debated in this paper. The capitalism and the government need to examine the challenges and their expected solutions to contribute the fundamental framework (great strategies, quick and reasonable internet, consistent power supply etc.) and permitting environment to Nigerian SMEs to be efficient for complete cloud computing adoption.

This study is momentous as it presents the comparative study of cloud computing adoption amid SMEs in the states (China, Nigeria) of two different continents (Asia and Africa), determine the main issues of adoption and propose possibly efficacious solutions for Nigerian SMEs to completely adopt the cloud computing.

REFERENCES

- [1] Buyya, Rajkumar, Chee Shin Yeo, Sri Kumar Venugopal, James Broberg, and Ivona Brandic. "Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility." *Future Generation computer systems* 25, no. 6 (2009): 599-616.
- [2] Dahiru, A. A., Julian M. Bass, and Ian K. Allison. "Cloud Computing: A comparison of adoption issues between UK and Sub-Saharan Africa Smes." In *Eur. Mediterr. Middle East. Conf. Inf. Syst.* 2014, Oct. 27th-28th 2014, vol. 2014, no. 2010, pp. 1-12. 2014.
- [3] Benton, D. "How cloud computing will influence banking strategies in the future." (2010): 2014. Retrieved 15 March, 2019, from www.accenture.com/banking
- [4] Misra, Subhas Chandra, and Arka Mondal. "Identification of a company's suitability for the adoption of cloud computing and modeling its corresponding Return on Investment." *Mathematical and Computer Modelling* 53, no. 3-4 (2011): 504-521.
- [5] Garrison, Gary, Sanghyun Kim, and Robin L. Wakefield. "Success factors for deploying cloud computing." *Communications of the ACM* 55, no. 9 (2012): 62-68.
- [6] Avrane-Chopard, J., Th Bourgault, A. Dubey, and L. Moodley. "Big business in small business: Cloud services for SMBs." *RECALL No 25* (2014). Available at: http://www.mckinsey.com/~media/McKinsey/dotcom/client_service/HighTech/PDFs/Big_business_in_small_business_Cloudservices_for_SMBs.
- [7] Armbrust, M., Armando Fox, Rean Griffith, Anthony D. Joseph, R. H. Katz, Andy Konwinski, Gunho Lee et al. "A view of Cloud Computing." *Communications of the ACM*. vol 53 (2010): 5058.
- [8] Kern, Thomas, Jeroen Kreijger, and Leslie Willcocks. "Exploring ASP as sourcing strategy: theoretical perspectives, propositions for practice." *The Journal of Strategic Information Systems* 11, no. 2 (2002): 153-177.
- [9] Marston, Sean, Zhi Li, Subhajyoti Bandyopadhyay, Juheng Zhang, and Anand Ghalsasi. "Cloud computing—The business perspective." *Decision support systems* 51, no. 1 (2011): 176-189.
- [10] Fox, Armando, et al. "Above the clouds: A Berkeley view of cloud computing." Dept. Electrical Eng. and Comput. Sciences, University of California, Berkeley, Rep. UCB/EERC28.13 (2009): 2009.
- [11] Foster, Ian, Yong Zhao, Ioan Raicu, and Shiyong Lu. "Cloud computing and grid computing 360-degree compared." *arXiv preprint arXiv:0901.0131* (2008).
- [12] Gong, Chunye, Jie Liu, Qiang Zhang, Haitao Chen, and Zhenghu Gong. "The characteristics of cloud computing." In *2010 39th International Conference on Parallel Processing Workshops*, pp. 275-279. IEEE, 2010.
- [13] Zhang, Shuai, Shufen Zhang, Xuebin Chen, and Xiuzhen Huo. "Cloud computing research and development trend." In *2010 Second international conference on future networks*, pp. 93-97. Ieee, 2010.
- [14] Sultan, Nabil Ahmed. "Reaching for the "cloud": How SMEs can manage." *International journal of information management* 31, no. 3 (2011): 272-278.
- [15] Mell, Peter, and Tim Grance. "The NIST definition of cloud computing." (2011).
- [16] Hogan, Michael, Fang Liu, Annie Sokol, and Jin Tong. "Nist cloud computing standards roadmap." *NIST Special Publication* 35(2011):6-11.
- [17] Mujinga, Mathias, and Baldrick Chipangura. "Cloud computing concerns in developing economies." (2011).
- [18] Goscinski, A., and Brock, M. (2010). Toward dynamic and attribute based publication, discovery and selection for cloud computing. *Future Generation Computer Systems*, 26 (7), 947-970
- [19] Brohi, Sarfraz Nawaz, and Mervat Adib Bamiah. "Challenges and benefits for adopting the paradigm of cloud computing." *International Journal of Advanced Engineering Sciences and Technology* 8, no. 2 (2011): 286-290.
- [20] Mitchell, Ian. *Isherwood, Stephen. The white bok of ... cloud adoption.* London: Fujitsu Services Ltd, 2011.
- [21] Mather, Tim, Subra Kumaraswamy, and Shahed Latif. *Cloud security and privacy: an enterprise perspective on risks and compliance.* "O'Reilly Media, Inc.", 2009.
- [22] Kim, Won, Soo Dong Kim, Eunseok Lee, and Sungyoung Lee. "Adoption issues for cloud computing." In *Proceedings of the 7th International Conference on Advances in Mobile Computing and Multimedia*, pp. 2-5. ACM, 2009.
- [23] Dillon, Tharam, Chen Wu, and Elizabeth Chang. "Cloud computing: issues and challenges." In *2010 24th IEEE international conference on advanced information networking and applications*, pp. 27-33. Ieee, 2010.
- [24] Al-Hujran, Omar, Enas M. Al-Lozi, Mutaz M. Al-Debei, and Mahmoud Maqableh. "Challenges of cloud computing adoption from the TOE framework perspective." *International Journal of E-Business Research (IJEBR)* 14, no. 3 (2018): 77-94.
- [25] Taherdoost, Hamed. "A review of technology acceptance and adoption models and theories." *Procedia manufacturing* 22 (2018): 960-967.
- [26] Yu, Jia, and Jun Ni. "Development strategies for SME e-commerce based on cloud computing." In *2013 Seventh International Conference on Internet Computing for Engineering and Science*, pp. 1-8. IEEE, 2013.
- [27] Bao, Jinlong, and Xuewen Sun. "A conceptual model of factors affecting e-Commerce adoption by SMEs in China." In *2010 International Conference on Management of e-Commerce and e- Government*, pp. 172-175. IEEE, 2010.
- [28] Xiangfeng, Liu. "SME development in China: A policy perspective on SME industrial clustering." *Asian SMEs and Globalization*, ERIA Research Project Report 5 (2007).
- [29] He, Yuan. "Sustainable development pattern of small and medium enterprises (SMEs) in China." In *2011 2nd International Conference on Artificial Intelligence, Management Science and Electronic Commerce (AIMSEC)*, pp. 1593-1596. IEEE, 2011.
- [30] <https://www.ukessays.com/essays/economics/impact-of-small-and-medium-enterprises-on-development-economic-s-essay.php>
- [31] Kshetri, Nir. "Diffusion and Effects of cloud computing in China: Economic and institutional considerations." In *PTC 2013 (Pacific Telecommun. Counc. Conf., pp. 20-21. 2013.*
- [32] Asia Cloud Computing Association. "SMEs in Asia Pacific: The market for cloud computing 2015." (2015): 1-217.
- [33] Ofili, Onyeka Uche. "The use and challenges of cloud computing services adoption among SMEs in Nigeria." *European Scientific Journal, ESJ* 11, no. 34 (2015).
- [34] Otuka, Richard, David Preston, and Elias Pimenidis. "The use and challenges of cloud computing services in SMEs in Nigeria." In *proceedings of the European Conference on Information Management and Evaluation*, vol. 43, no. 10, pp. 47-55. 2014.
- [35] Awosan, R. K. "Factor analysis of the adoption of cloud computing in Nigeria." *African Journal of Computing & ICT* 7, no. 1 (2014): 33-42.
- [36] Kshetri, Nir. "Cloud computing in developing economies." *Computer* 43, no. 10 (2010): 47-55.
- [37] Ragland, Leigh Ann, Joseph McReynolds, Matthew Southerland, and James Mulvenon. *Red cloud rising: cloud computing in China.* Defense Group Incorporated, 2013.
- [38] To, Wai-Ming, Linda SL Lai, and Andy WL Chung. "Cloud computing in China: barriers and potential." *IT Professional* 15, no. 3 (2013): 48-53.
- [39] Muhammad, Akilu Rilwan. "Towards cloud adoption in Africa: The case of Nigeria." *International Journal of Scientific & Engineering Research* 6, no. 1 (2015): 657-664.
- [40] Dogo, Eustace Manayi, Abdulazeez Salami, and Salim Salman. "Feasibility analysis of critical factors affecting cloud computing in Nigeria." *International Journal of Cloud Computing and Services Science* 2, no. 4 (2013): 276.
- [41] Abubakar, A. D., Julian M. Bass, and Ian Allison. "Cloud computing: Adoption issues for sub-Saharan African SMEs." *The Electronic Journal of Information Systems in Developing Countries* 62, no. 1 (2014): 1-17.
- [42] Muhammed, Kuliya, Kabir Rumana Isma'il Zaharaddeen, and Abdulkadir M. Turaki. "Cloud computing adoption in Nigeria: Challenges and benefits." *International Journal of Scientific and Research Publications* 5, no. 7 (2015): 1-7.
- [43] Dahunsi, F. M., and T. M. Owoseni. "Cloud computing in Nigeria: The cloud ecosystem perspective." *Nigerian Journal of Technology* 34, no. 1 (2015): 209-216.