



Adoption of Cloud Computing Services for Sustainable Development of Commercial Banks in Uganda

By Mugyenyi Raymond

Atlantic International University

Abstract- Commercial banks in Uganda have been realised to be continuously increasing in number of branches, sizes and operational activities in the last two decades. This increment has attracted high operational costs related to purchase and maintenance of IT infrastructure and even requiring larger spaces to accommodate them, which is always accompanied by poor data storage and management. Cloud computing is identified as the best and latest solution to curb the problems in commercial banks, if adopted. Cloud computing has the capacity to store and manage data on virtualized servers so that, applications, individuals and organizations around the world can have the ability to connect to data and computing resources anywhere and anytime which improves the reliability since the data and application are stored and backed up on a number of computers which reduces the chance of data and application loss. This paper aimed at studying the benefits of cloud computing to commercial institutions and how the services can be adopted by the institutions of Uganda so as to successfully overcome the continuous expanding challenges that are always reported.

Keywords: *cloud computing, commercial institutions, sustainable development.*

GJCST-B Classification: *H.3.4, C.2.4, D.4.2*



Strictly as per the compliance and regulations of:



Adoption of Cloud Computing Services for Sustainable Development of Commercial Banks in Uganda

Mugenyi Raymond

Abstract- Commercial banks in Uganda have been realised to be continuously increasing in number of branches, sizes and operational activities in the last two decades. This increment has attracted high operational costs related to purchase and maintenance of IT infrastructure and even requiring larger spaces to accommodate them, which is always accompanied by poor data storage and management. Cloud computing is identified as the best and latest solution to curb the problems in commercial banks, if adopted. Cloud computing has the capacity to store and manage data on virtualized servers so that, applications, individuals and organizations around the world can have the ability to connect to data and computing resources anywhere and anytime which improves the reliability since the data and application are stored and backed up on a number of computers which reduces the chance of data and application loss. This paper aimed at studying the benefits of cloud computing to commercial institutions and how the services can be adopted by the institutions of Uganda so as to successfully overcome the continuous expanding challenges that are always reported. A proposed system for cloud computing deployment to serve commercial banks has been developed together with recommendations for cloud computing adoption and effective utilization and management. The relevant conclusions for the paper have also been drawn.

Keywords: cloud computing, commercial institutions, sustainable development.

I. BACKGROUND

Cloud computing the technology that is drastically shaking the waters of change in the information technology environment (E. Mashandudze, 2015), provides services that are extensively renowned as the next generation's computing infrastructure. Its services permit systems users to use infrastructure services for example servers, networks, and storage platforms as well as middleware services, operating systems and software application programs provided by cloud service providers like Google and Amazon at a Low cost.

The rapid growth of cloud computing has become a dominant remarkable in the development of Information Communication Technology (ICT) as well as commerce and industry fields. Supplementary, with the introduction of internet/online banking, Cloud Computing has enabled financial users to elastically utilize resources in an on-demand fashion.

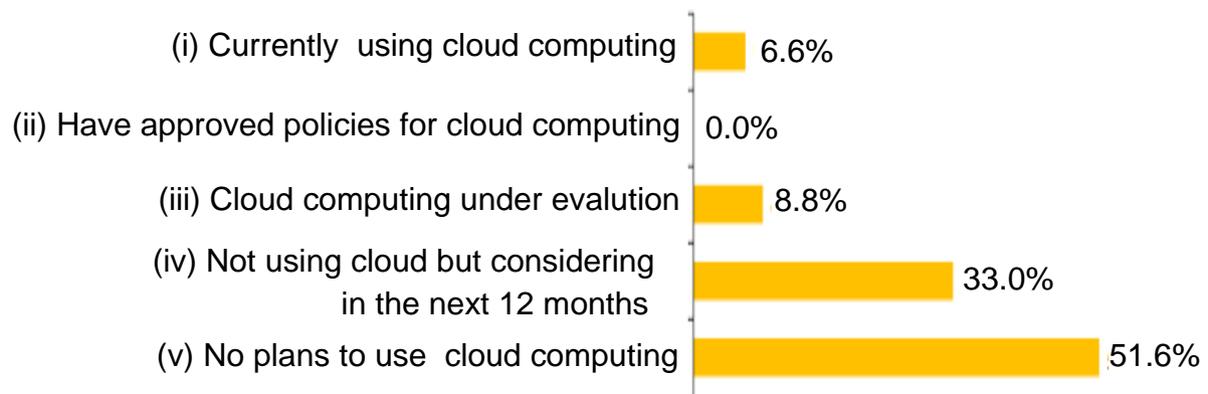
Currently, cloud computing technology has brought the idea of storing and managing data on virtualized servers so that, applications, individuals and organizations around the world can have the ability to connect to data and computing resources anywhere and anytime (Meskerem Alemu et al, 2014). This idea of storing data or running applications on clouds has been proved effective in improving the reliability since the data and application are stored and backed up on a number of computers which reduces the chance of data and application loss.

Cloud computing offers a number of benefits which include but not limited to time and cost saving, flexibility, reduction in loss of information, technological innovation, provision of a real competitive advantage and improved business performance (Fatuma Namisango et al, 2014).

The most important benefit with cloud computing in commercial sector its ability to offer cost effective services where clients/ customers are only charged for services they use, thus they are saved from other costs like IT infrastructure maintenance and occupation among others. Cloud service vendors are utilizing the concept of "Utility Computing". This means, just like the principle of electricity where one pays for the resources actually used (Radhakrishnan, Zu, & Grover, cited by Rashid James Mungai, 2012).

In Uganda, adoption of cloud computing is still at very low stages with few institutions trying to adopt it and most of institutions do not even have an idea about its benefits. NITA-U, report 2012 explained that the central government institutions appear to be cautious in their adoption of cloud computing-based services due to the lack of clarity around security implications and measures. The report provided percentage of central government institutions that are currently using cloud computing based services as indicated below;

Author: Atlantic International University. e-mail: rayzafrika@gmail.com



Source: NITA-U, report 2012

Figure 1: Percentages of Uganda central government institutions that are currently using cloud computing based services

However, the failure of Uganda to give first priority to ICT strategies of extending ICT infrastructure and services to Commercial Institutions have continued to push the country's economic development most especially banking sector to undesirable state and hence failure to sufficiently satisfy its clients.

Introduction of enhanced systems that provide improved quality of banking services can significantly improve the sustainability, productivity and profitability of commercial institutions in Uganda. The purpose of this paper therefore, is to study the benefits of cloud computing to commercial institutions and how the services can be adopted by the institutions of Uganda so as to successfully overcome the continuous expanding challenges that are always reported with her banking institutions. Using Cloud Computing, banks are able to reach their customers in new interactive ways as well as innovate in a faster more efficient way (rashid James mungai, 2012).

II. CLOUD COMPUTING

Cloud computing as a model is designed to give businesses convenience and technological capacitation with ease and agility (E. Mashandudze, 2015). It is the practice of using a network of remote servers hosted on the internet to store, manage, and process data, rather than a local server or a personal computer and the rise of application program interfaces [APIs]. (Nathan Were, 2016).

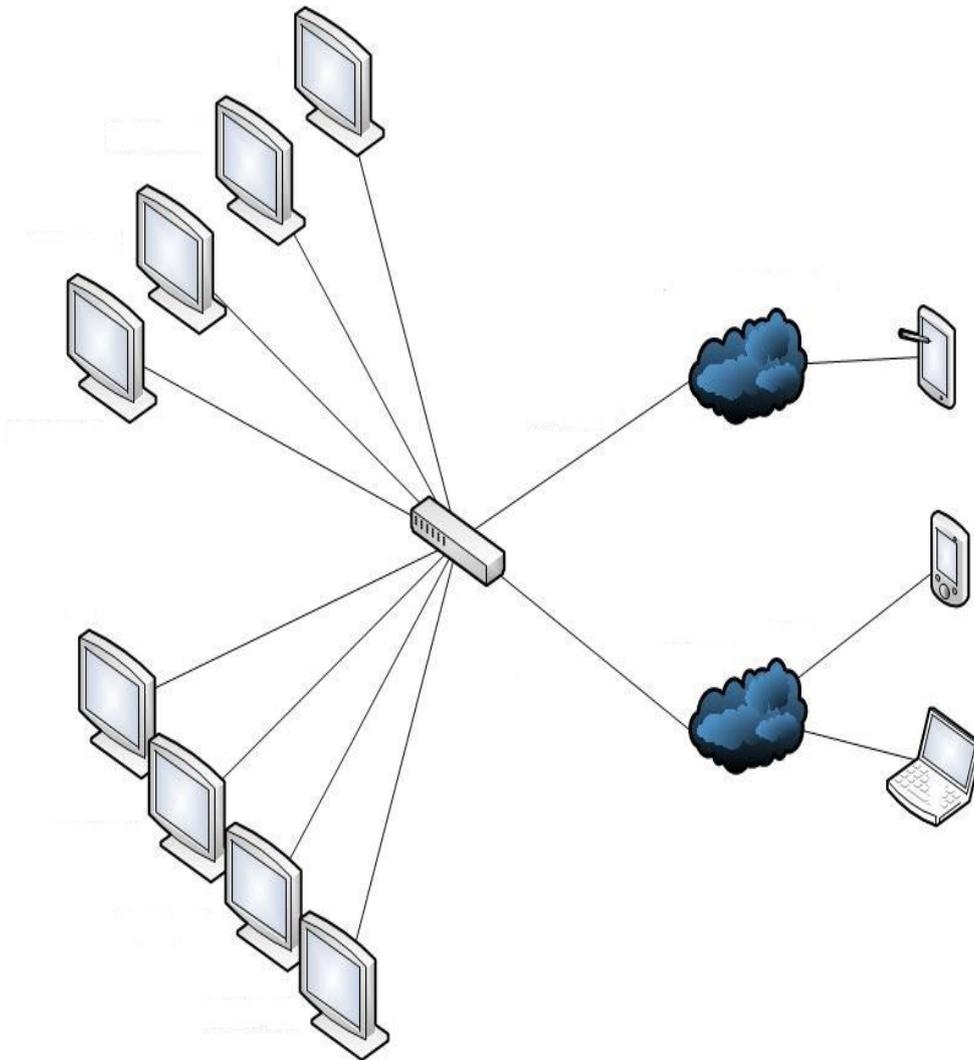
Cloud computing facilitates the ability to handle an increased volume of work without impacting on the performance of the system and also offers significant computing capability and economy of scale that might not otherwise be affordable to businesses, especially small and medium enterprises (SMEs) that may not have the financial and human resources to invest in IT infrastructure (E. Mashandudze, 2015).

Saman, Zarandioon, 2012, defined cloud computing as a computing model in which hardware,

platform, infrastructure and software are defined and delivered as a service rather than a product. Saman further explained that cloud computing is emerging from recent advances in technologies such as hardware virtualization, Web services, distributed computing, utility computing and system automation. It is emerging as a new computing paradigm which relies on the existing Information Technology infrastructure and tools such as Internet, virtualization, grid computing, Web services, etc to provide an improved efficiency, minimum service cost, and convenience in the development of Higher Education and services delivery (Sunday A. Idowu, etal 2012).

Rashid James Mungai, 2012 cited Feuerlicht & Govardhan, who sighted that three types of IT services which an organization can send into a cloud environment include Platform as a Service (PaaS), where users are offered application programming interfaces over the internet as opposed to creating fully-blown applications for example Google App Engine, Software as a Service (SaaS) where applications are delivered through a browser to thousands of customers using a multiuser architecture for example Internet Banking and Infrastructure as a Service (IaaS) which is the delivery of computer infrastructure as a service for example Amazon Web Service.

According to Anca Apostu et al, 2012, Banks are adopting cloud services with Saas (Software as a Service) being the most-widely deployed form, mainly in peripheral, non-core solution areas, such as collaboration, customer relationship management and human resources department, but exceptions do exist. Anca Apostu et al, 2012, further noted that cloud computing architecture is required to be implemented to enable the companies' activities more secured, flexible, and organized in a modern way. The performance of cloud computing architecture in linking up with variety of clients is illustrated in the figure below;



Source: (Anca Apostu et al, 2012).

Figure 2: Intranet in Cloud Computing

III. RELATED LITERATURE

Traditional IT computing technology has typically been a costly hurdle for financial institutions, particularly those in emerging markets where developing customized solutions or investing in advanced banking platforms has either been unfeasible or the result has been too many failures, too many resources used and too much time wasted (Meskerem Alemu et al, 2014).

Meskerem Alemu et al, 2014) further explained that adoption of cloud by banks is at infant stage because of security issue as there is no clear standards and frameworks that guide banks in using cloud services.

IV. COMMERCIAL BANKS

Commercial banks are the largest source of financing for the countries' investments which are work

under the authority of law to receive money from individuals, businesses and institutions and also lends out money to them.

Kent cited by *Ahsan Khan*, 2012 defined commercial bank as an organization whose principal operations are concerned with the accumulation of the temporarily idle money of the general public for the purpose of advancing to others for expenditure.

Commercial banks play a vital role in the economic resource allocation of countries where they channel funds from depositors to investors continuously (Ongore and Kusa, 2013).

Commercial banks play a significant role in the economic growth of countries through efficient allocation of resources of countries by mobilizing resources for productive activities and transfer funds from those who don't have productive use of it to those with productive venture. (Ongore and Kusa, 2013).

Commercial banks provide deposit and credit facilities for personal and corporate customers, making credit and liquidity available in adverse market conditions, and providing access to the nation's payments systems(Charles b. murerwa, 2015). They are also the channels used to transmit effective monetary policy of the central bank of the economy thus considered to share the responsibility of stabilizing economy of their country (Siddiqui and Shoab, 2011).

Uganda Commercial Bank was initially privatized through a sale of its majority shares to a purported company from *Malaysia* which became Stanbic bank Uganda after merging with Stanbic bank in early 2000s and later became commercial bank of Uganda in 2008. In 2009, total commercial bank assets in Uganda were estimated at UGX:8.73 trillion (Khis, Isaac2011) In 2010, there were 22 licensed commercial banks in Uganda, with nearly 400 bank branches and almost 600 *automated teller machines*. By 2011, the number of commercial banks had increased to 23 with over 400 branches and in 2012, the total number of commercial bank branches in the country reached 500 (Sanya 2012).

Uganda advanced the operational status of her commercial banks by adopting computer technology that result into electronic banking method. This method has done a lot to improve the performance of commercial sector in Uganda with a major one being improved internal bank operations, relationships with customers and inter-bank interactions (Nsambu Kijambu Frederick, 2014) which eventually added a great value to the services rendered by these banks to the clients at the same time attracting larger market which is definitely accompanied by increment in profits generation though the commercial banks incur a lot of expenses to achieve it.

However to achieve higher economic growth, a more advanced banking technology which can ensure effective service delivery with limited expenditure costs can have far-reaching supplement to the economic development of Uganda.

V. SUSTAINABLE DEVELOPMENT IN COMMERCIAL BANKS

Sustainable development is defined as a process of ensuring stability in utilisation of both natural and artificial resources to benefit the present needs of humankind without compromising the benefit of future generation. Sustainable development in commercial

banks is the best achievement every economy would require if it is to have steady progress in development.

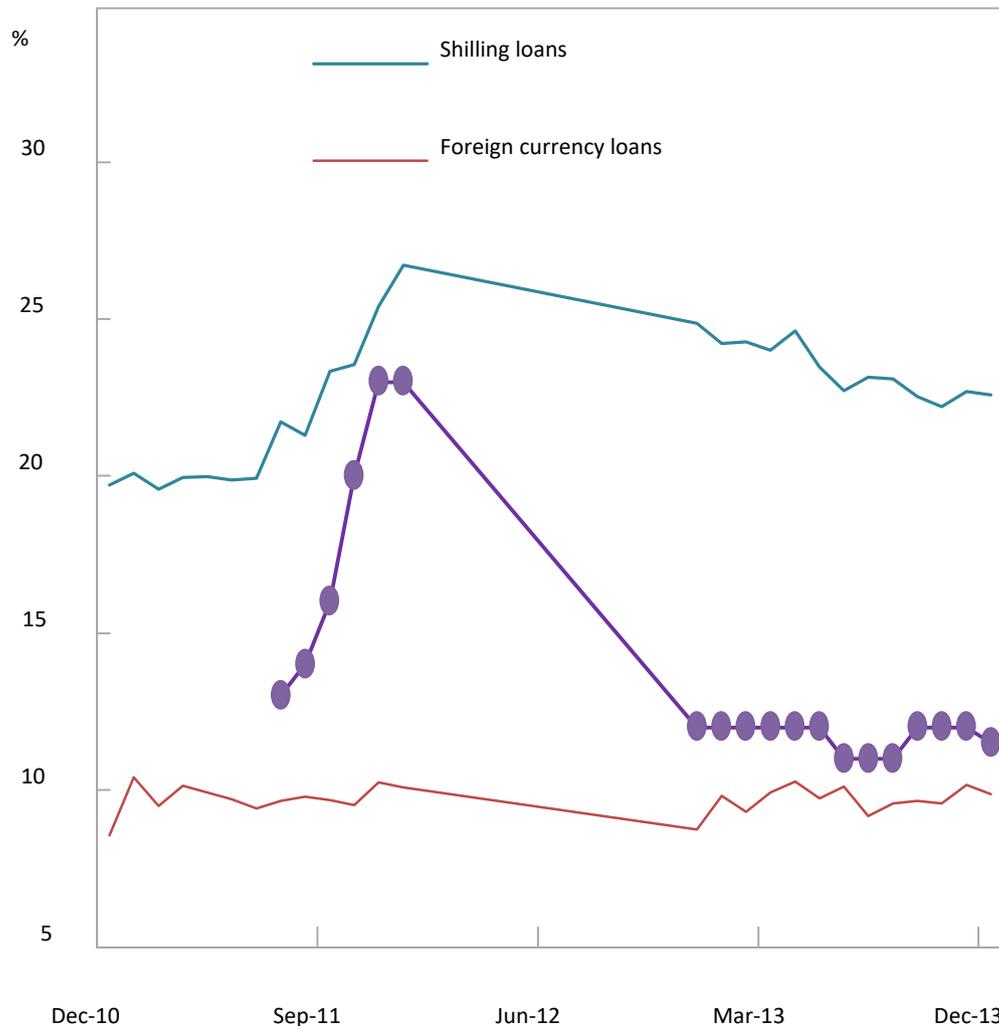
Sustainable development in commercial banks is when their financial capacity and operational reach certain efficiency to be able to survive, endure and resist the adverse impact of the external environment(Nguyen Thanh Phuong, 2016).

According to Nguyen, sustainable bank is a value system that the activities of commercial banks not only bring profits to employees and shareholders of the bank but also bring benefits to customers.

Commercial banks in Uganda have realized continuous increment and progress within the last two decades where some micro banks realized financial increase and upgraded to commercial banks. In 2013 Uganda Finance Trust upgraded to a commercial bank and changed its name to Finance Trust Bank (bank of Uganda, 2013). The strategy for Financial Literacy in Uganda, 2013, had it that by the end of 2012, there were 500 branches of commercial banks in Uganda, with most of them being situated in urban centers.

From the World Bank annual supervision report 2013, Commercial banks remained well capitalised with the ratio of core capital to risk-weighted assets increasing from 18.8 percent in 2012 to 19.9 percent in 2013, well above the regulatory minimum of 8 percent. The report also highlighted that the main challenge for banks during 2013 arose from credit risk with the ratio of nonperforming loans to total gross loans rising from 4.2 percent in December 2012 to 5.6 percent in December 2013, which affected bank profitability and declined to Ushs.414 billion in 2013 from Ushs.544.8 billion in 2012, reflecting the increase in provisions for nonperforming loans.

The commercial banks' weighted average lending rate stood at 22.6 percent for shilling loans and 9.9 percent for foreign currency loans at the end of December 2013 compared to 24.8 percent and 8.8 percent, respectively in the previous year(bank of Uganda, 2013), as illustrated in the figure below.



(Source: Bank of Uganda, 2013)

Figure 3: Weighted average lending rates for commercial

VI. CLOUD COMPUTING CONTRIBUTIONS TO THE COMMERCIAL BANKS OF UGANDA

Cloud computing represents a big change in the way computing is done in corporations as it encompasses all the optimizations that a company needs in order to succeed nowadays (Anca Apostu et al, 2012). It is increasingly seen as a reliable, and cost-effective, opportunity and solution for banks (Pinsent Masons LLP 2016). The following are benefits offered by cloud computing;

Cloud Computing can offer banks a number of benefits for example turning a large up front capital expenditure to a smaller on-going operational cost (Sriram, cited by Rashid James Mungai, 2012).

With the eruption of mobile applications together with support of Cloud computing-based that are providing a variety of financial services to customers

through mobile user's platform and these mobile cloud-based banking, the services have been put closer to the people through mobile money, e-payments amongst others.

Cloud computing principally facilitates the conversion of Capital Expenditure (CAPEX) to Operating Expenditure (OPEX) as resources are rented rather than bought, thereby reducing the corporate opportunity cost of investment decision in IT (KPMG, cited by Rashid James Mungai, 2012). Also the with cloud computing convenient working environment is guaranteed since less IT infrastructure is required hence no congestion in commercial work places.

Pinsent Masons LLP 2016 explained key drivers for adoption of cloud computing by banks as given below;

Agile innovation: This explains a bank's ability to innovate by enhancing agility, efficiency, and productivity by

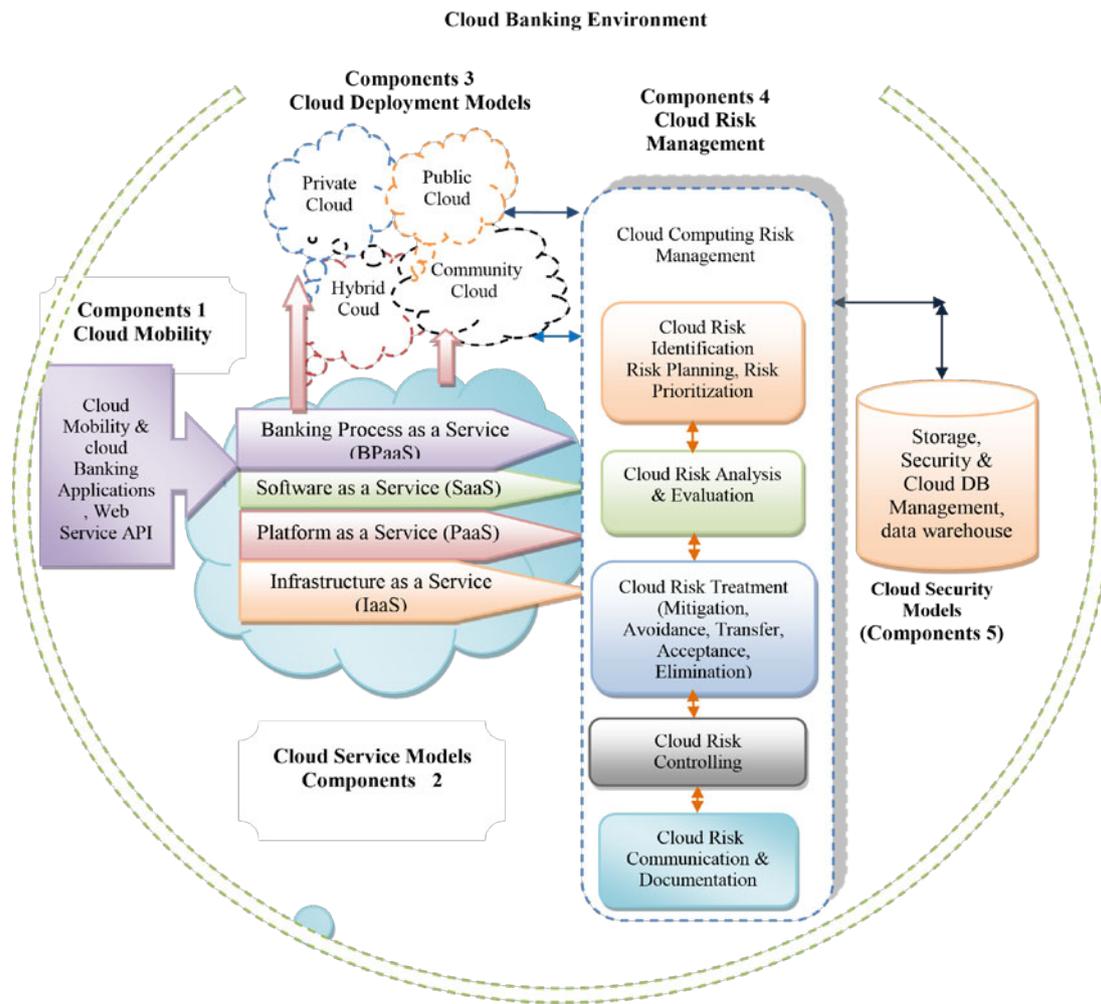
directing internal resources, previously focused on the administration of IT infrastructure, towards innovating and delivering new products and services to market more quickly.

Risk mitigation: Public cloud computing can provide banks with greater control in the management of variable IT demands, while offering new commercially viable methods to implement enhanced security controls.

Cost benefits: Cost efficiencies can be derived from reducing the initial capital expenditure investment required for traditional IT infrastructure, and through providing more efficient means for banks to manage

computing capacity necessary to satisfy customer demand across peak periods.

Cloud computing systems are designed in a such as away that the working environment is systematically arranged where alarge number of computers in different branches of banks are handled very fast and effectively without requiring a lot of space, and with limited number of infrastructure. Abdelrafe Elzamy et al, 2016 classified framework modelling of cloud banking environment into five stages and components as cloud mobility and cloud banking applications, cloud service models, cloud deployment models, cloud risk management models, and cloud security models as shown in Figure below;



Source: Abdelrafe Elzamy et al, 2016

Figure 4: Framework modelling of cloud banking environment

VII. CHALLENGES AFFECTING CLOUD COMPUTING ADOPTION/UTILISATION

It is very well known that cloud banking and implementation is very complex with very many pitfalls to trick the unwary and its being a new technology that has just come, many banking sectors are avoiding the

adoption fearing risks. These restrictions are attached to limited resources for example financial insufficiency, process Servers, very low memory savers, storage and bandwidth.

According to Rashid James Mungai, 2012, Cloud Computing has risks that banks are aware of that were categorized into security and policies and

procedures that need to be addressed before banks are able to adopt Cloud Computing technology. Lack of approved policies for cloud computing has contributed a lot to limit the interests of many countries and organizations to advance to cloud computing in fear of insecurity reasons.

Pinsent Masons LLP 2016 listed seven that limit the adoption rate of cloud computing by commercial banks as given below;

- Difficulties in understanding whether the use of a specific public cloud technology enables a critical or important operational function of a bank.
- Uncertainty as to what amounts to effective supervision and oversight of a public cloud service provider, and its supply chain.

- Practical constraints in enabling regulators to have effective oversight of regulated activities dependent on public cloud technology.
- Adapting internal risk frameworks to a new technology environment that accounts for additional risks that may arise in a public cloud context.
- Issues concerning the location of data including transferring data outside and access to data by law enforcement authorities.
- Issues concerning the management of data including security, data breach reporting and ensuring that new obligations soon to come into effect such as privacy by design and default can be effectively met in a public cloud environment.
- Difficulties in establishing a compliant termination and exit regime in a public cloud context.

VIII. PROPOSED SYSTEM FOR CLOUD COMPUTING DEPLOYMENT IN BANKING INSTITUTIONS

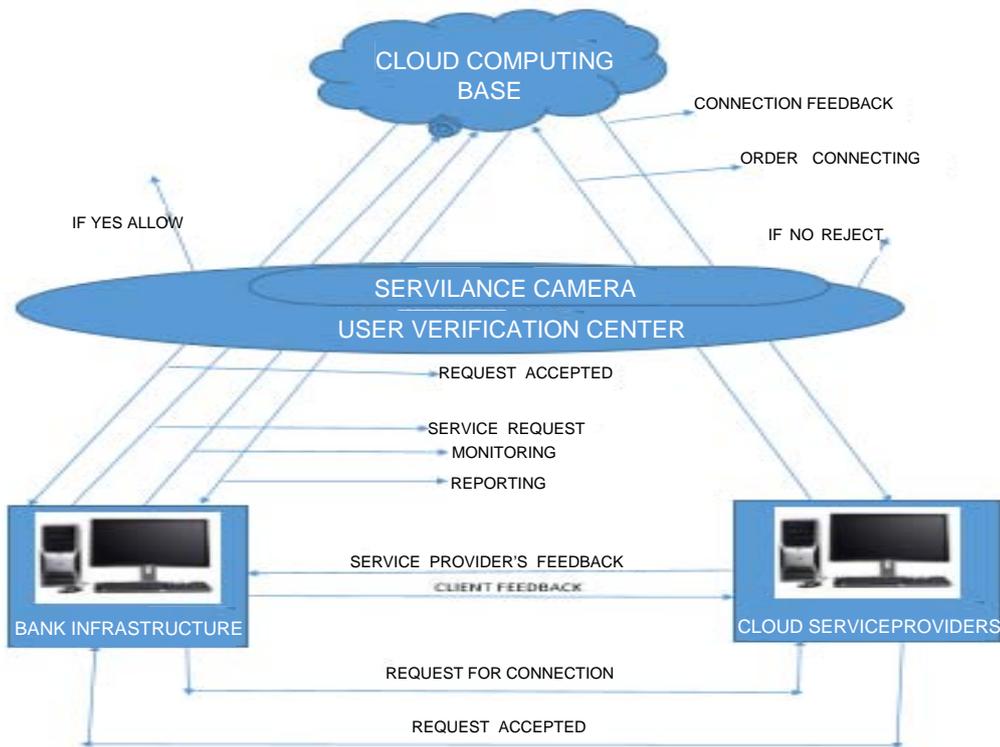


Figure 5: Deployed cloud computing system in banking institutions

IX. RECOMMENDATIONS

For commercial institutions in Uganda, advancing to a cloud-based banks model application would be a clear pathway to cost efficiency and effectiveness in this sector. Therefore, Commercial institutions should adopt a methodical and sustainable developmental process of cloud-based services so as

to achieve a functional and their targeted goal-oriented banking financial service delivery in the country.

The government of Uganda should consider development and implementation of policies to protect the operations of cloud computing so as to provide more encourage to commercial sector to adopt to cloud computing technology. The country should also support implementation of harmonized international framework

that utters more light on how to adopt and manage cloud computing in most effective manner.

More light on cloud computing utilisation and management should be given the first priority to answer challenges on how to meet needed requirements for adoption and sustainability of the systems without incurring losses. Commercial banks must consider deployment of professional experts to continuously monitor the performance of cloud servers and provide any solutions where necessary.

The government of Uganda should also encourage all institutions most especially those handling large data to integrate their operations with cloud computing systems to make more familiar with citizens and institutions hence improving the adoption level. The government should seek support from NGO, donors and other partners to facilitate the introduction of cloud computing as well as putting it to standardized operational level in the country.

All relevant information regarding operations of cloud computing in commercial banks including its benefits and challenges should be made clear to all stakeholders, clients and even interested public. This will improve institutions'/ societies' response to the system hence advancing to a more excellent regulatory framework for commercial bank' sustainable development

X. CONCLUSIONS

Cloud Computing being a more advanced computing technology, it ranks the newest technology that is in best position to solve the recurring challenges reported in commercial banks most especially those related to high expenditure costs on IT infrastructure, information insecurity, flexibility and space issues among other. Thus other expenses in line with infrastructure maintenance are considered a covered chapter in situations where cloud computing is put in use.

Cloud computing are considered the most reliable tactic that can be employed to organize and operate computerized activity in most cost effective manner since it is capable of handling all forms of commercial banking activities in a shortest period of time.

It is unfortunate that most of developing countries including Uganda have not yet realized the benefits provided by cloud computing systems and they have not yet adopted to it. Uganda has tried to adopt utilization of cloud computing in small and medium enterprises but the percentage of institutions currently using it is still very low, with the biggest percentage having no plans of adopting and using cloud computing. This range in percentage utilization is highly supported by lack of policies in place to govern the operations of cloud computing systems in the country.

REFERENCES RÉFÉRENCES REFERENCIAS

1. Zarandioon, Saman, 2012; Improving the security and usability of cloud services with user-centric security models.
2. Sunday A. Idowu, Adenike.O.Osofisan, 2012; Cloud Computing and Sustainable Development in Higher Education.
3. Rashid James Mungai, 2012; cloud computing in the Kenyan banking industry <http://ec.europa.eu/environment/archives/finserv/fitotal.pdf>
4. E. Mashandudze, B. Dwolatzky, 2015; Major Challenges Impeding the Fast Adoption of Cloud Computing: A Case Study of South African Organisations and Emerging Economics; open journal of mobile computing and cloud computing.
5. Fatuma Namisango et al, 2014; the use of cloud computing and storage virtualization for information storage in ugandan-based small businesses.
6. *Nathan Were*, 2016; will banks, MFIs in Uganda survive the Fin-tech disruption? <https://www.linkedin.com/pulse/banks-mfis-uganda-survive-fin-tech-disruption- were- pmp-sipm->
7. National Information Technology Authority (NITA-U), 2012; Uganda E-Government Readiness Assessment, Final Report.
8. Siddiqui M. A. and Shoab A. (2011). Measuring performance through capital structure: Evidence from banking sector of Pakistan. *African Journal of Business Management*, 5(1): 1871-1879.
9. Anca Apostu Emanuil Rednic, Florina Puican, 2012; ModelingCloud architecture in banking systems; *Emerging Markets Queries in Finance and Business*.
10. Meskerem Alemu, Abrehet Omer, 2014; Cloud Computing Conceptual Security Framework for Banking Industry.
11. Ahsan Khan, 2012; Role of commercial banks in economic development; <http://ahsankhaneco.blogspot.ug/2012/04/role-of-commercial-banks-in-economic.html>.
12. Ongore, V.O and Kusa, G.M (2013), Determinants of Financial Performance of Commercial Banks in Kenya, *International Journal of Economics and Financial Issues*, 3(1): 237252.
13. Charles B murerwa, 2015; Determinants of banks' financial performance in developing economies: evidence from kenyan commercial banks.
14. Nsambu Kijjambu Frederick, 2014; Factors Affecting Performance of Commercial Banks in Uganda; A Case for Domestic Commercial Banks.
15. Nguyen Thanh Phuong, 2016; Sustainable Development of Commercial Banks in Vietnam – Situation and Solutions
16. Strategy for Financial Literacy in Uganda, 2013, Simplify Money. Magnify Life; www.bou.or

.ug/.../Strategy-for-Financial-Literacy-in-Uganda_August-2013.pdf

17. Bank of Uganda, 2013; annual supervision report; [www.bou.or.ug/bou/bou-downloads/.../Annual Supervision-Report-2013](http://www.bou.or.ug/bou/bou-downloads/.../Annual-Supervision-Report-2013).
18. Pinsent Masons LLP2016; Banking on Cloud A discussion paper by the BBA and Pinsent Masons. www.bba.org.uk/wp.../BBA01-470474-v1-BBA_PM_-_Banking_on_Cloud.pdf
19. Sanya 2012; "Bank of Baroda Goes to Industrial Area". *New Vision*. Retrieved 19 April 2016.
20. Abdelrafe Elzamy1, Burairah Hussin, Samy Abu Naser, Khalid Khanfar, Mohamed Doheir, and Ali Selamat, and Abdullah Rashed, 2016: A New Conceptual Framework Modelling for Cloud Computing Risk Management in Banking Organizations; *International Journal of Grid and Distributed Computing* Vol. 9, No. 9 (2016), pp. 137-154 <http://dx.doi.org/10.14257/ijgdc>.

