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AN ENHANCED CLOUD ADOPTION FRAMEWORK FOR THE FINANCIAL SERVICES INDUSTRY: CASE OF FAMILY BANK IN NAIROBI COUNTY, KENYA

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ABSTRACT: *Despite potential commercial advantages of Cloud computing, institutions in the Financial Services industry are still hesitant to adopt the technology. The problem is that these institutions opt to put their IT services to cloud because of diverse requirements and concerns that are unique to their environment. Existing frameworks for cloud adoption are too general and though they seem to address some concerns, no single framework is entirely adequate by itself to be applied effectively in the Financial Services Industry. There is therefore an IT problem that exists due to lack of an integrated adoption framework that adequately addresses cloud computing concerns for institutions in the Financial Services Industry who are considering the cloud decision. It is on this basis that this research seeks to develop an enhanced cloud adoption framework that can guide cloud adoption in the Financial Services Sector. The study concluded that technology context, organizational context, IT skill level and cloud knowledge of non IT employees, environmental context and IT governance structure has a positive impact on the adoption of cloud computing in the financial services industry.*

KEY WORDS: cloud computing, enhanced cloud adoption framework,

INTRODUCTION

The use of Information Communication Technology (ICT) in the financial sector has witnessed positive adoption which has further been fueled by internet access and mobile applications. Presently, statistics indicate that Kenya leads the world in mobile money. In 2014, the internet penetration rate in Kenya was 53.3%. An aggressive approach to building infrastructure has yielded significant benefits for businesses bolstered by growth of mobile money platforms (Group, 2014).

The general objective of this study was to establish an integrated cloud adoption framework that best addresses the requirements, concerns and opportunities of cloud computing in the financial services industry. The study will be guided by the following specific objectives; To identify the determinants of cloud computing adoption in financial services sector in Nairobi County, Kenya; To critically examine the existing cloud adoption frameworks currently in use and identify gaps posed by these adoption frameworks; To develop a novel cloud adoption framework that can enhance the adoption of cloud computing in the financial services sector and to test the performance of the enhanced cloud model framework.

LITERATURE REVIEW

Cloud computing enables a business or establishment to consolidate diverse enterprise systems into one that can be seamlessly accessed by end users regardless of their location or changes in overall demand. It is a technology that makes use of the internet and central remote servers to maintain data and applications. The technology allows for more efficient computing by centralized storage, memory and processing (Magoueles, 2016).

Cloud computing is an emerging paradigm of distributed computing which uses the concept of software and hardware virtualization to provide dynamically scalable services. Based on demand, services can be accessed in any location as opposed to the traditional computing paradigms (Ray, 2016).

There are three forms of defined models which cloud computing offers. Software as a Service (SaaS) refers to a situation where the user uses the various applications but has no control over the hosting environment. The second is Platform as a Service (PaaS) offers a full or partial development environment that users can access and make use of either collectively or individually while online. It allows entities to deploy various applications without the cost and complexity of managing the underlying hardware and software and provisioning hosting capabilities. In this case, the model is an application framework. Lastly, for Infrastructure as a Service (IaaS), the service provider provides a variety of different resources in terms of processing power and storage capabilities. The user can use these resources to deploy their own applications and does not need to maintain the hardware. Ideally, these three models deliver scalability and flexibility where users can access and release resources based on their needs. The cloud basically acts as an intermediate between the real world and virtual applications hiding the complex functionality details (Sangaiah. A.K, 2017)

Many financial services institutions in Africa are starting to make significant investments in cloud computing, especially in the banking platform, where banks are now expected to enter the cloud computing arena cautiously recognizing the value of cloud services (Narter, 2012). (Bora, 2011) states that the rapid emergence of cloud computing in South Africa is transforming the way financial institutions think about how they consume their (Information Technology) IT resources. Until now, 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.

METHODOLOGY AND FINDINGS

This study employs a triangulation of explanatory and case study research designs that seek to gain an in-depth understanding on adoption of cloud computing in the financial services industry, and thereafter construct a suitable cloud adoption framework that can advise cloud adoption.The target population of this study was information officers, specifically information technology managers in selected firms in the financial services sector within Nairobi County. The area of the study was appropriate given that the researcher works in the same industry and had access to the respondents. The study employed use of questionnaire to collect primary data from information Technology managers. The study employed purposive sampling technique to arrive at the respondents to be included for this study (Denscombe, 2014). The researcher mainly used descriptive statistics to analyze data. This included frequency distribution, mean and standard deviation. The findings were presented in form of chart, tables and figures. Statistical Package for Social Sciences (SPSS) version 24 software was used to analyze the data.

Model Validation

After developing the model, the research went ahead to validate the model using a real-life scenario. The research identified Family Bank, a banking institution in Kenya which operates a mobile based virtual bank, as a viable candidate to validate the model. Each process was iteratively reviewed in ensuring consistency and compatibleness in meeting the study objective.

RESULTS AND DISCUSSION

The study targeted a total of 55 Information Technology officers in selected companies. 32 duly filled questionnaires were returned indicating a response rate of 58.18% which is adequate to represent the target population as it surpasses a response rate of 50% and above according to (Easterby-Smith, 2015). 56.3% of the respondents were information Technology officers followed by Information Technology managers and Chief Information Technology mangers each at 21.9%.

To identify the determinants of cloud adoption in financial services sector in Nairobi County, Kenya.

The study found out that Technology Context influence adoption of cloud computing to a very great extent as evidenced by the aggregate mean of (M=3.89, SD=0.304). This finding was similar to (Ray, 2016) who found out that technology, organizational factors, environmental factors and cost factors determine adoption of cloud computing. According to the findings, 93.8% of the respondents strongly agreed that the "organization's decision to adopt cloud is positively influenced by availability. Further, 93.8% of the respondents also strongly agreed that that the "organization's decision to adopt cloud is positively influenced by security and data control". In regard to compatibility, 90.6% of the respondents indicated that the bank's "decision to adopt cloud is positively influenced by compatibility i.e. the degree to which we perceive cloud as being consistent with the existing value, past experiences, and needs of receivers". In regard to reliability, 87.5% off the respondents indicated that the "organization's decision to adopt cloud is positively influenced by reliability of the platform". Lastly, 81.3% of the respondents indicated that the "organization's decision to adopt cloud is positively influenced by trialability i.e. ability to try the platform".

An aggregate mean score of (M=3.8, SD=0.438) indicates that the respondents strongly agreed that Organizational Context influences adoption of cloud computing. According to the study 93.8% of the respondents strongly agreed that adoption of cloud computing is influenced by "support by top management in terms of budget and resource allocation". Further, 84.4% of the respondents indicated that adoption of cloud computing is influenced by "the level of innovative culture within my organization has a positive influence on cloud adoption". The statements that "my firm is more willing to invest more on on-premise enterprise systems rather than public cloud systems" and "my organization has nurtured a high degree of innovative culture" were the least agreed on but the respondents strongly agreed that the two influence adoption of cloud computing as evidenced by 78.1% and 71.9% respectively.

The respondents strongly agreed that environmental context influences adoption of cloud computing as evidenced by the aggregate mean of (M=3.83, SD=0.413). The respondents strongly agreed that "supplier effort to deliver the cloud solution" and "availability of external computing support" influence adoption of cloud computing as evidenced by 96.9% and 93.8% of the respondents who strongly agreed. The respondents also strongly agreed (84.4%) that "the rate of adoption of cloud in my industry influences my firm's decision to adopt cloud computing". "the current regulatory environment has a positive influence on my firm's decision to adopt cloud computing" as supported by 78.1% of the respondents who were in support. Further, "intensity of competition in terms of affecting the rules of business which necessitates the need to adopt cloud technology" as evidenced by 75% of the respondents who strongly agreed.

On whether cost of adoption influences cloud adoption, 90.63 of respondents strongly agreed that this was the case. A further 9.38% simply agreed. From the results, respondents generally agreed that cost of the hosting platform influences cloud adoption.

On average, respondents agreed that risks affecting business value, organization function, confidentiality, integrity, availability, transparency impact adoption of cloud, evidenced by the mean of 3.46 out of 4. Respondents strongly agreed that risks affecting business value influence cloud adoption, represented by 59.38% who strongly agree and 34.38% who agree. 62.5% of respondents strongly agreed that risks affecting organizational function impact cloud computing while a further 34.38% agreed. Furthermore, 50 % of respondents strongly agreed that cloud is influenced by risks affecting integrity, and 43.75 % simply agreed. On availability, 56.25% strongly agreed, and 34.38% agreed, that risks affecting this migration goal influences cloud adoption. Finally, 46.88% of respondents strongly agreed that risks affecting transparency impact cloud adoption, while a further 40.63% simply agreed.

The existing cloud adoption frameworks currently in use and identify gaps posed by these adoption frameworks

The respondents were requested to indicate the type of cloud service model they would opt for given different requirements. Pairwise comparisons for SAAS, PAAS and IAAS were collected and analyzed using Analytical Hierachical Process (AHP) with the aim of deriving relative weights for each requirement. Each pairwise comparison was then tested by calculating the Consistency Index (CI) . Out of 32 responses, the research only focused on responses which were equal or below the consistency threshold of 0.57.

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Cloud Service Model used

Requirement	Consistent Responses (out of 32)	SAAS weight	PAAS_weight	IAAweight
Interoperability Interfaces	18	0.120	0.600	0.280
Internal Integration Degree	18	0.110	0.277	0.613
Compatibility	23	0.082	0.340	0.578
Transparency and Documentation	14	0.071	0.347	0.582
Portability of Data	20	0.075	0.353	0.572
Service Portability	22	0.090	0.573	0.337
Scalability	21	0.088	0.294	0.617
Contract Flexibility	20	0.131	0.342	0.527
Provisioning Time	16	0.676	0.220	0.104
Set Up Time	13	0.701	0.203	0.097
Automatic Resource Booking	17	0.132	0.207	0.661
Contract Renewal	18	0.434	0.331	0.235
Usage Limits	23	0.084	0.370	0.545
Price Transparency	22	0.099	0.227	0.674
Price Granularity	23	0.102	0.211	0.688
Price Stability	22	0.518	0.394	0.089
Time of Payment	16	0.453	0.297	0.250
Payment Method	14	0.456	0.343	0.201
Volume Based Costs	22	0.144	0.292	0.564
Account Based Costs	12	0.619	0.241	0.140
Time Based Costs	19	0.165	0.283	0.552
Booking Concept	19	0.460	0.298	0.243
Internal Building Safety	18	0.325	0.244	0.432
External Building Safety	14	0.253	0.201	0.546
Connection Opportunities	20	0.438	0.219	0.343
Communication Security	19	0.105	0.230	0.664
Application Access and Identity Mngt	18	0.652	0.229	0.118
Data Center Location	16	0.429	0.315	0.255
Data Protection	21	0.133	0.197	0.670
Functionality	14	0.726	0.188	0.086
Usability	13	0.712	0.186	0.102
Service Bundles	18	0.438	0.309	0.253
Customizability	16	0.078	0.293	0.629
Operating Platform	25	0.086	0.252	0.662
Add-On Services	25	0.103	0.348	0.550
Maintenance / Service Cycles	19	0.417	0.346	0.237
Continual Service Innovation	10	0.699	0.205	0.095

Customer Recommendation	12	0.606	0.251	0.143
Server Type	14	0.082	0.211	0.706
Processor Type	15	0.094	0.147	0.759
Additional Hardware Features	20	0.083	0.184	0.732
Network Access	16	0.084	0.209	0.707
Computing Quality	21	0.114	0.339	0.547
Connection Quality	14	0.120	0.193	0.687
Instance Capacity	18	0.127	0.219	0.654
Availability	15	0.073	0.332	0.595
Guarantees	16	0.080	0.311	0.610
Liability and compensation	16	0.644	0.253	0.103
Network Redundancy	21	0.084	0.324	0.592
Data Center Redundancy	13	0.071	0.348	0.581
Provider Profile	14	0.385	0.330	0.285
Reporting	19	0.115	0.275	0.610
Auditing	21	0.089	0.257	0.654
Support	18	0.143	0.339	0.518
Contact	16	0.445	0.311	0.243
Internationality	22	0.683	0.197	0.121
Monitoring	20	0.108	0.274	0.618
Operation and Controlling	26	0.138	0.308	0.554
Consulting Services	19	0.157	0.577	0.266
Implementation Support	13	0.134	0.601	0.265

Source: Research Data (2018)

The results indicates that users preferred SAAS cloud service type when faced with requirements / constrains based on Interoperability Interfaces, Provisioning Time , Set Up Time , Contract Renewal , Price Stability , Time of Payment , Payment Method , Account Based Costs , Booking Concept , Internal Building Safety , External Building Safety , Connection Opportunities , Application Access and Identity Mngt , Data Center Location , Functionality , Usability , Service Bundles , Maintenance / Service Cycles , Continual Service Innovation , Customer Recommendation , Liability and compensation , Provider Profile , Contact and Internationality. Users preferred PAAS mostly when the main requirements in question were Interoperability Interfaces, Service Portability, Consulting Services , Implementation Support. Lastly, the analysis shows that IAAS is preferred when the main requirements are Internal Integration Degree , Compatibility , Transparency and Documentation , Portability of Data , Scalability , Contract Flexibility , Automatic Resource Booking , Usage Limits , Price Transparency , Price Granularity , Volume Based Costs , Time Based Costs , Communication Security , Data Protection , Customizability , Operating Platform , Add-On Services , Server Type , Processor Type , Additional Hardware Features , Network Access , Computing Quality , Connection Quality , Instance Capacity , Availability , Guarantees , Network Redundancy , Data Center Redundancy , Reporting , Auditing , Support , Monitoring , Operation and Controlling. These findings were similar to what was proposed by (Yaser, 2012)and (Muthee, 2013)on selection of an optimal service delivery model

The research found that, although each of the four cloud adoption models was beneficial in cloud adoption to an extent, none of the models could be applied to give a wholistic decision that takes multiple perspectives into consideration. Secondly, the frameworks researched focus mostly on the international scene, and hence are too general. Lastly, most adoption frameworks lacked the ability to integrate the decision maker's evaluation of how important each perspective is to the project. These findings echo what was reported by (Barinder, 2014),This exposed a key research gap to craft an integrated model that incorporates the key features identified in the existing cloud models, is more responsive to the decision maker's requirements and is tailored to the financial services sector in Kenya.

Development of the Enhanced Cloud Adoption Model

From the research, it is evident that technological readiness, organizational readiness, environmental readiness, cost evaluation, cloud service selection and risk factors play a crucial role in cloud adoption as reported by (Ray, 2016). It is with this background that the researcher proposes an omnibus model that takes all these perspectives into consideration. The study was based on Decision model for selecting a cloud provider. This model was chosen as it can handle both quantitative and qualitative criteria and come up with the most optimal service model. This model puts into account a variety of technical factors that determine the cloud adoption decision. However, to determine the most optimal hosting option using trade-offs between technology, organization, environment and cost, The Tradeoffs Methodology for adoption of cloud based service model (TOPSIS) was employed to rank the hosting options (Marc, 2015)

The decision model gives management the option to allow the end users to chart their own individual cloud road based on the premise that business establishments are different and thus each solution that is adopted must enhance the efficiency of the strategy of the business based on the desired requirements and constrains posed by the environment.

For selection of cloud service model, weights derived from the research are fed into the decision module to determine the most optimal cloud service model to adopt. For technological, organizational and environmental evaluation, several setups (including on-premise and cloud) are analyzed in terms of their level of performance to the requirements of the cloud project. For cost readiness, total costs in adopting any setup are analyzed and compared. Finally, a risk management methodology is employed to identify and mitigate risks that emanate from the adoption of the adopted technology. The end objective of the model is to recommend the most beneficial decision when faced with an option to choose between investing in on-premise infrastructure or adopting cloud technology, and a risk management strategy for the chosen adoption path.

Steps in development of the enhanced model

Step 1: Cloud Service Type Selection

The objective of this step is to select the most optimal service type based on the requirements of the cloud project. Here, the previously calculated industry weights for SAAS, PAAS and IAAS are applied to the decision maker's requirements in order to determine the most optimal service type (Muthee, 2013)The evaluation can be expressed mathematically as follows:

$U_{ST} = 1/n \sum_{i=1}^{n} (R_i \times ST_i)$

Where:

ST represents the service type under evaluation e.g. SAAS, PAAS or IAAS

ST_i represents the industry weight for service type ST for factor i

U_{ST} represents the total calculated utility for service type ST

R_i represents the decision makers input on the degree to which factor i is important

The output of this stage is the most optimal service type which is determined by selecting the one with the highest utility value.

Step 2: Technology, Organization, Environment and Cost Evaluation

The objective of this step is to select the most beneficial hosting option at a trade-off between technology, organization, environment and cost.

The first activity involves determining the level of importance of technology, organization, environment and cost perspectives to the proposed cloud project(Ray, 2016). Here, the decision maker ranks the perspectives in a pair wise manner based on how important they are to the project. The scoring guide below is used:

Level of Importance of perspective	**Score**
Very High	5
High	4
Medium	3
Low	2
Very Low	1

Context weights are then calculated using AHP method.

Next, hosting alternatives are selected based on the service type identified in Step 1. In-house infrastructure is also identified to facilitate comparison with cloud hosting alternatives in the proceeding stages. An evaluation of the hosting alternatives is the undertaken to determine the performance level i.e. how well each hosting options conform to technological, organizational, environmental and cost requirements. Technological, organizational, environmental factors are scored as follows

Performance Level	**Score**
Very High	5
High	4
Medium	3
Low	2
Very Low	1

For cost evaluation, the performance level is derived from the total costs for adopting each hosting option over a given depreciation period (normally 3 years). The calculation is done as follows for on-premise and cloud options

(i) On-premise options: cost of servers, network cost, power cost, software cost, cooling cost, real estate cost, facility cost and support & maintenance costs are analyzed. If the project is to be run as part of already existing infrastructure, then the cost of running the actual project is estimated using the ratio of the number of servers required for the project vis a vis the total number of servers in operation.

(ii) Cloud options: total cost of running the project in the cloud over a given period is analyzed. These include costs for cloud server hours, bandwidth, storage, software and integration.

Once the performance level of each context factor is scored, TOPSIS is then employed to calculate the performance score of each hosting option (Marc H. , n.d)

Step 3: Risk Management

The last stage of the decision process is the risk management process. This ensures that during the decision-making process, project risks are identified and mitigated.

The risk management process begins by identifying the relative importance of each migration goal. The migration goals considered are business value, organization function, confidentiality, integrity, availability, transparency Islam, (Gonzalez, 2012)

The relative importance level is determined by the decision maker and tabulated using the criteria below.

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Importance Level	**Score**
Equal importance of two compared goals	1
Moderate importance/one goal slightly favoured over the other	3
Strong importance/one goal strongly favoured over the other	5
Very importance/one goal very strongly favoured over to the other	7
Extreme importance/one goal extremely favoured over the other	9
Intermediate values	2,4,6,8

AHP is then employed to calculate the relative weight of each migration goal.

Next, the risks affecting the selected hosting option are identified. The probability of occurrence of each risk and the impact are also scored as below

Probability

Likelihood of occurrence	**Score**
Very High	5
High	4
Medium	3
Low	2
Very Low	1

Degree of Impact

Degree of Impact	Score
Severe	5
Major	4
Moderate	3
Minor	2
Insignificant	1

Individual risk score is evaluated by calculating the product of the likelihood of occurrence and the degree of impact i.e.

ri = Pi x Ii

where ri is the individual risk score

Pi is the probability of occurrence of risk i

I is the impact of risk i

Net risk score for each risk is then calculated by calculating the product of the individual risk sore and the weight of the affected migration goals.

$Ri = (ri \times Gri_1) + (ri \times Gri_2) + \ldots + (ri \times Gri_n)$

Where $G_{ri1 \ldots rin}$ are the weights of the affected migration goals for risk i.

Finally, all the net risks for each option (on-premise vs cloud) are summed to arrive at the total net risk for each option.

$R_{tnet} = R_1 + R_2 + \ldots + R_n$

Where Rtnet is the total net risk

$R_{1..n}$ are the net risk scores for risk 1 to n

If total net risk is higher than the on-premise environment, then mitigation actions are proposed to reduce the risks and the total net risk is then re-evaluated.

The decision to adopt cloud is advised when the total net risk (Rtnet) in the cloud is lower than the total net risk in the on-premise platform.

The output of this stage is a determination whether the hosting option should be selected given the risks involved, and mitigation actions that should be addressed if the hosting option is to be adopted

Testing the performance of the enhanced cloud adoption framework

The fourth objective of the research was to validate the working of the enhanced cloud adoption framework. The key objective of the project was to determine whether adoption of public cloud hosting would be favorable in hosting the virtual banking platform.

Service Model Selection

The first step was to determine the optimal cloud service model for the project. Using the enhanced cloud model, the organization's requirements were collected and weighted using the industry weights derived from the research. The weights were then summed arriving at the following total utilities for each service model. The results were presented in table

Table: Cloud model selection

Service Model	Utility
SAAS	42.93
PAAS	58.58
IAAS	98.49

Decision: Infrastructure-As-A-Service (IAAS) had the highest utility, hence it was selected.

Technological, Organizational, Environmental and Cost Evaluation

This stage involved evaluation of the hosting alternatives in terms of the level of performance to each context (Technology, Organization, Environment and Cost). First, hosting options were selected by the evaluator. The options selected were as follows:

Option A:	On-premise Setup
Option B:	Cloud Setup on Amazon EC2

Next, the relative importance of each context was determined by the evaluator, and then weights were calculated using AHP method. The result was as follows:

Context	**Relative Weight**
Technology	0.355
Organization	0.131
Environment	0.068
Cost	0.44

Consistency Ratio: 8.9

Next, each hosting option was evaluated with regard to the level of performance to technological, organizational, environmental and cost factors. For cost evaluation, performance level was derived from the estimated hosting costs for each option.

TOPSIS was then applied to calculate the performance score both options. The performance scores were then ranked as follows:

Options	Performance Score	Rank
Option A	0.43316087	2
Option B	0.56683913	1

As from the ranking, Option B (Cloud Setup on Amazon EC2) emerged to be the most optimal hosting option.

Risk Management

Once the options were scored based on technological, organizational, environmental and cost factors and the most optimal option selected, a risk management process was undertaken to identify and mitigate risks arising from its adoption. This involved identification of project risks in adopting the chosen option and control measures to eliminate or reduce the impact of the risks.

The first procedure in this stage was to determine the relative weight of project goals. This was calculated using AHP and weights derived as follows: -

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Goal	**Initial**	**AHP Weight**
Business Value	B	0.349
Organization Function	O	0.054
Confidentiality	C	0.033
Integrity	I	0.337
Availability	A	0.132
Transparency	T	0.043

Next, the risks affecting each goal were identified and impact determined as follows: -

Risk	Affected Goals	Net Risk
Low system uptime affecting availability and reliability	BV,OF,A,T	0.34 (critical)
Lack of employee support and resistance to change	OF	0.03 (low risk)
Data access by unauthorized personnel	BV,C,I,A,T	0.68 (highly critical)
Theft of intellectual property	BV,C	0.16 (low risk)
Lack of compliance to local and international policy	BV,OF,C,I,T	0.35 (critical)
Risk of overspending in the cloud environment	BV,T	0.32 (critical)
Incompatibility of systems to the cloud environment	OF,C,I,A	0.3 (critical)
Continuing costs of managing on-premise infrastructure	BV	0.16 (low risk)

This risk identification and ranking process proposed the following mitigation actions for critical and high critical risks identified in the proceeding stage.

Risk	Net Risk	Mitigation Procedures	Probability after mitigation procedures	Impact after mitigation procedures	Net risk after mitigation procedures
Low system uptime affecting availability and reliability	0.34 (critical)	Ensure vendor provides real time monitoring of resource utilization Ensure vendor can provide alerts when platform is unavailable Use resource utilization metrics to fine tune resource provision among	0.5	0.2	0.06 (low)

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Data access by unauthorized personnel	0.68 (highly critical)	Enable password complexity on the cloud server i.e. expire passwords above 60 days, require a mix of upper case, lower case, numeric and complex characters in password Ensure effectiveness of security log Use encryption technology to encrypt all data between client and cloud system Train and sensitize users on security Enable remote login only from defined IPs	0.2	0.5	0.09
Lack of compliance to local and international regulations and policies	0.35 (critical)	Review and update local policies to ensure harmony with cloud environment. Ensure vendor meets applicable regulations			
Risk of overspending in the cloud environment	0.32 (critical)	Ensure vendor provides resource utilization reports for real time monitoring of resources provisioning and related costs Cap maximum resource utilization based on requirements Vendor to provide automatic alers when maximum limit is reached Finetune resource provisioning to prevent over-provisioning and avoid unnecessary costs	0.3	0.8	0.21(low)
Incompatibility of systems to the cloud environment		Request for a trial of the cloud platform to test compatibility with the system	0.2	0.8	0.09(low)

As per the analysis, the risk management stage identified cloud risks, proposed mitigation measures and verified assurance of control measures to be undertaken by the organization and the vendor to ensure the risks of adoption of the chosen platform were kept at a manageable level.

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Study rationale

The financial sector faces generic barriers to the use of cloud technologies. These barriers include trust and transaction security, Intellectual Property Rights (IPR) concerns, challenges in areas of management skills, technological capabilities, productivity and competitiveness (OECD, 2004)For these reasons, entities in the financial industry are still hesitant to adopt cloud, even though there are many benefits that can be derived from the use of the technology. Research conducted in 2013 indicates that 48% of Kenya's large and medium businesses were using cloud services as of compared to 50% in South Africa and 36% in Nigeria (Cisco, 2013). The principal reason for non-adoption is due to the lack of a clear model that can help these institutions make informed cloud decisions that effectively and optimally harness the advantages offered by cloud platforms.

A research opportunity therefore existed requiring the need to bridge the gap between the unique requirements and concerns of these financial sector institutions to what the cloud can deliver. This was founded on the premise that majority of the studies undertaken focused only on specific areas of study, and failed to address all concerns effectively. More so, previous research is too broad, in that it lacks a clear guideline for financial industry specific businesses such as banks and financial service providers. There is no particular framework developed to assist decision makers in the financial sector to adopt technological solutions such as cloud. The uniqueness of the industry requires a framework which addresses their requirements and concerns to promote easier adoption of cloud technologies.

Justification of the study

The findings of this study are beneficial to internet service providers, small and medium sized enterprises and researchers. Firstly, the findings were useful to internet service providers in Kenya to inform change in practice relating to utilization of cloud computing by financial services enterprises for profit maximization. Secondly, the study is relevant to financial services enterprises in finding effective ways of responding to challenges influencing the adoption of cloud computing. The study also provides an elaborate framework for business entities in the financial sector to adopt cloud computing. Finally, the findings are useful to scholars who wish to advance research in the direction this study has taken and more importantly to literature in the study area. Defining an appropriate adoption framework allows banks to realize competitive advantage through significant cost reductions, simplification of maintenance and management of applications, greater scalability, higher levels of availability and agility (Muthee, 2013); (Marc H. D., 2015)

CONTRIBUTION AND CONCLUSION

The researchers made the following conclusions from the findings of the study:

The study concluded that the determinants of cloud adoption can be figured out by evaluating six key contexts, i.e. cloud service selection, technological readiness, organizational readiness, environmental readiness, cost evaluation and risk management.

It was concluded that the existing cloud adoption frameworks in use are Software As A Service (SAAS) cloud service type, Platform As A Service (PAAS) and Infrastructure As A Service

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(IAAS). However, the study established that although each of the adoption models was beneficial in cloud adoption to an extent, none of the models could be applied to give a wholistic decision that takes multiple perspectives into consideration. Secondly, the frameworks studied focus mostly on the international scene, and hence are too general. Lastly, most adoption frameworks lacked the ability to integrate the decision maker's evaluation of how important each perspective is to the project.

The study concluded that an enhanced cloud adoption framework's predictive power can ensure that the most optimal hosting option (cloud or on-premise) is recommended considering the various perspectives of adoption of cloud (service type, technology, organization, environment, cost and risk).

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