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CLOUD COMPUTING MIGRATION FRAMEWORK FOR MICROFINANCE- A CASE OF BANKS IN ACCRA-GHANA

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Abstract: **Obliviousness about standard procedures or guidelines makes it harder to create effective and efficient frameworks to facilitate migration of applications and data to a different cloud environment. In every country, there are small financial institutions which cater for the local communities. If these small financial institutions decide to have their business solutions in house, it will require a lot of overhead cost and skilled man power to maintain these systems. The purpose of this study is to develop a cloud migration framework microfinance banks in Accra Ghana as a case study. Various decision frameworks have been developed for migrating enterprise-level data and applications to cloud solutions, however this comes at a huge cost in terms of initial capital outlay. A comprehensive review of the strengths and weaknesses of existing cloud computing models and frameworks was conducted. The outcome revealed that existing models and frameworks for migration to the cloud might be useful but require some huge cost and skilled personnel to maintain the systems. A new model or framework was developed to create the opportunities for microfinance banks and other related institutions to adopt the new cloud computing era to save cost and also gain greater part of the market share.**

Keywords: **Computing, Adoption, Framework, Migration, Micro Finance.**

I. INTRODUCTION

Unawareness about standard procedures or guidelines makes it harder to create effective and efficient frameworks to facilitate migration of applications and data to a different cloud environment. Various decision frameworks have been developed for migrating enterprise-level data and applications to cloud solutions. A number of these decision frameworks appear in current literature; the Cloudward framework by [1], for instance, was designed by a team of scholars and industry experts to facilitate migration of enterprise applications and systems to hybrid clouds. This framework takes into account cost savings, costs of communication, delays in transactions and security constraints but fails to clearly discuss mitigation or avoidance of the problem of cloud lock-in when systems are migrated to the cloud. Another decision framework is the Cloud Adoption Toolkit [2] who offers a framework that targets enterprise stakeholders. This framework proposes ways of carrying out tasks including analysis for technology suitability, energy consumption and cost modelling according to the enterprise's profile. The framework also provides responsibility modelling differentiating between operations, management and maintenance tasks for system components that have been migrated and those that have not been migrated. These activities are to be carried out sequentially establishing a procedure for decision-making. This work also fails to discuss how the provider lock-in problem should be handled during the process of migration. Similarly, the Cloudstep framework by [3] proposed a decision-making process comprising of nine undertakings including characterization of the organization, cloud provider and legacy application, identification and analysis of constraints, and

assessment and ranking of alternate migration scenarios. This approach considers constraints classifying them into seven scopes namely financial, security, organizational, communication, availability, suitability, and performance. [3] analysed existing methods of cloud migration and established challenges that hinder productive usage of cloud computing services. The aforementioned researcher concluded that every organization has different needs and each organization should determine the amount of transformation that is acceptable and the extent the organization should adopt cloud computing. Various studies have examined the decision-making process for cloud migration ([4]; [5]). These studies focus on creating decision-making frameworks to facilitate migration of applications to the cloud by taking into account cost and technical issues but fail to examine strategic and organizational aspects or focusing on a particular type of organization. [6] systematically analysed the risks associated with cloud computing from both the client's and cloud service provider's perspectives; [7] similarly outlined the key issues associated with security in a cloud environment; nevertheless, both studies failed to examine issues relating to detailed steps for cloud vendor selection. Very few studies have been conducted to analyse cloud migration. Furthermore, some empirical studies established factors influencing the adoption of cloud computing technology ([8]; [9]; [10]). Also, some vendor-specific studies have emerged to investigate various vendor migration strategies have been conducted; although they are usually based on vendor platforms, infrastructure, and systems. The Amazon study, for instance, is based on Amazon Web Services (AWS) platform [11], the one on Cisco is based on Cisco Cloud Computing infrastructures [12] while the one on IBM is based on IBM systems [3]. The aim of this study is to develop a cloud computing model for or framework for the adoption by micro-finance industry in Ghana and countries that have the similar characteristics.

II. LITERATURE

[13] proposed a seven-step high-level Cloud migration process based cloud best practices and experiences gained from moving legacy applications to service-oriented cloud computing architectures. After carrying out a literature review on moving applications to a cloud environment [14] described three classes of migration that is; standardized migration, component migration, and holistic migration. According to these researchers, current research approaches on cloud migration fail to look at the holistic perspective and instead concentrates on the standardized format migration to facilitate portability. To address this issue, the scholars recommended the Cloud Motion or CMotion framework to supplement and enhance current application models as well as facilitate migration of composite applications to the cloud and from one cloud provider to another. [15] developed a decision support framework aimed at helping IT managers determine the cloud solution that best meets the needs of their organizations and also assess the numerous supposed benefits of cloud computing. This framework assist managers make informed choices when allocating organization resources and evaluate cloud alternatives which appear to be in competition with internal data centers. However, this framework is not organization specific but generic. The paper will expand this study by developing a migration framework specifically to be used for migrating Microfinance Banks to the cloud.

Researchers have over the years gained interest on the challenges organizations experience migrating their systems and applications to cloud solutions ([16]; [17]). Again, various reports have emerged in the past few years about the migration of current applications and systems to cloud environments ([13]; [8]), demonstrating the multi-dimensional aspects of cloud migration. Some researchers provide case study reports on the process of moving existing systems and applications to cloud environments while others propose decision methods and frameworks to facilitate the adoption of cloud computing. Nonetheless, these published works failed to provide a comprehensive methodological framework that Cloud Service Providers (CSP) and consumers can use as a guideline to reduce the risks of vendor incompetence in an ordinary situation where an enterprise wants to move into the cloud or migrate to a different cloud provider. [18], for instance, analysed the most recent methodologies, procedures, support tools and research recommendations for cloud migration. From their review, the authors concluded that there is a lot that needs to be done in the cloud computing field as the field is still developing and that researchers should be also concerned with cross-cutting issues like security.

[19] in their study developed a migration framework for legacy-to-SOA evolution. The authors used method engineering which identified four different reengineering frameworks. These reengineering frameworks were categorized into six distinct phases. However, a validation framework which is an important part of any cloud migration was not provided. Again, they failed to consider proof of value which allowed stakeholders assess the feasibility of the planned migration. In the same vein, [20] developed a cloud migration procedure to migrate legacy systems to the cloud. This was done using

five processes. However, the framework had some limitations as it did not include decision mechanisms or any cloud vendor selection process. [21] contend that some of the related issues about cloud adoption in organizations that existing cloud migration frameworks focused on include application or system migration to cloud solutions, application load estimation and deployment costs. Again, these reviewed frameworks did not propose an organized way for consumers of cloud to logically assess their options for possible risks of not using a standardized process before migrating their applications to cloud solutions. There is demand for an ideal framework that includes guidelines and support tools to assist enterprises looking to either consume or move their applications to the cloud to make the right decisions. While cloud service providers attempt to meet this demand by providing white paper recommendations [11], IT consultants try to help decision makers make informed choices using decision frameworks [22]; [23] and evaluation tools [24]. These evaluation tools are used for marketing cloud providers and are usually not largely available since they are built on closed-source proprietary technologies which require consumers to engage in costly consulting service agreements [8]. Conversely, the focus of this paper is to provide a framework that can assist decision-makers to choose whether or not to move their system applications to the cloud and in what manner they can realize this transformation if they decide to do so. Current decision frameworks and support tools only consider Infrastructure as a Service (IaaS) solutions that offer a multiple criteria methodology for the migration of applications to cloud solutions. Even though some of the proposed frameworks and tools use various successful infrastructures virtualization solutions such as Google Apps and Amazon Web Services as it bases, those solutions however, fail to particularly address how the risks associated using a generic framework for smaller organisations can be avoided or minimized in a cloud environment. Additionally, as cloud-based Software as a Service (SaaS) solutions increasingly become dominant, current enterprise applications and systems may be forced to move to SaaS cloud solutions. Therefore, there is a need for proper decision frameworks and support tools to ensure that SaaS consumers are aware of the risk of selecting a vendor or opting for a generic cloud migration framework. The proposed frameworks and research undertakings in the domain of SaaS according [25] also revealed some inadequacies, hence the need for a detailed framework with tactical guidelines to assist organizations to make informed decisions when moving their applications to cloud solutions. To ensure consumers of SaaS services enjoy maximum benefits of cloud migration, the risk inherent in vendor selection or following a generic cloud migration problem should be addressed so that enterprises freely adopt cloud solutions and are able to move from one provider to another without restrictions. A good Cloud migration framework should minimize or eliminate the possibilities of single vendor lock-in and compatibility issues.

Unlike existing studies which focus only on a generic framework for cloud migration, this study addresses these risks by providing a cloud migration framework to be specifically used by Microfinance Banks in Accra-Ghana and for any other microfinance companies in West Africa sub region which may have same characteristics. This way, this paper will significantly contribute to the body of knowledge in the field of cloud computing in Ghana and West Africa. From the literature review, it is clear that even though numerous studies have been undertaken on various issues relating to cloud migration, it appears that none of the studies has proposed a detailed decision framework for Microfinance Banks. In summary, one solution cannot fit all when it comes to migration of systems to the cloud as each organization has different needs and the migration method depends on these needs, the resources available and duration of time required to finalize the initial process of moving systems and applications to the cloud [26]. Hence, for an enterprise to move to a SaaS cloud solution, a customized migration strategy is required based on the characteristics of its legacy system and the SaaS solution in existence. For instance, if the current SaaS solution and the legacy system have similar business functionality, the SaaS solution can replace the legacy system. While the existing SaaS can realize some business functionalities, the legacy system may also be restructured by reviewing it according to existing SaaS options [27].

III. PROPOSED CONCEPTUAL FRAMEWORK FOR CLOUD ADOPTION FOR MICROFINANCE

Introduction

This paper developed a proposed framework for moving or migrating data and application to cloud for Microfinance Bank in Accra, Ghana. It analyses the various steps to be followed, methodologies and techniques which can help microfinance businesses in Ghana and beyond take advantage of the cloud services. The new model in figure 1 below offers more flexible and airtight approach and aligns Cloud migration strategy to overall corporate or business strategy.

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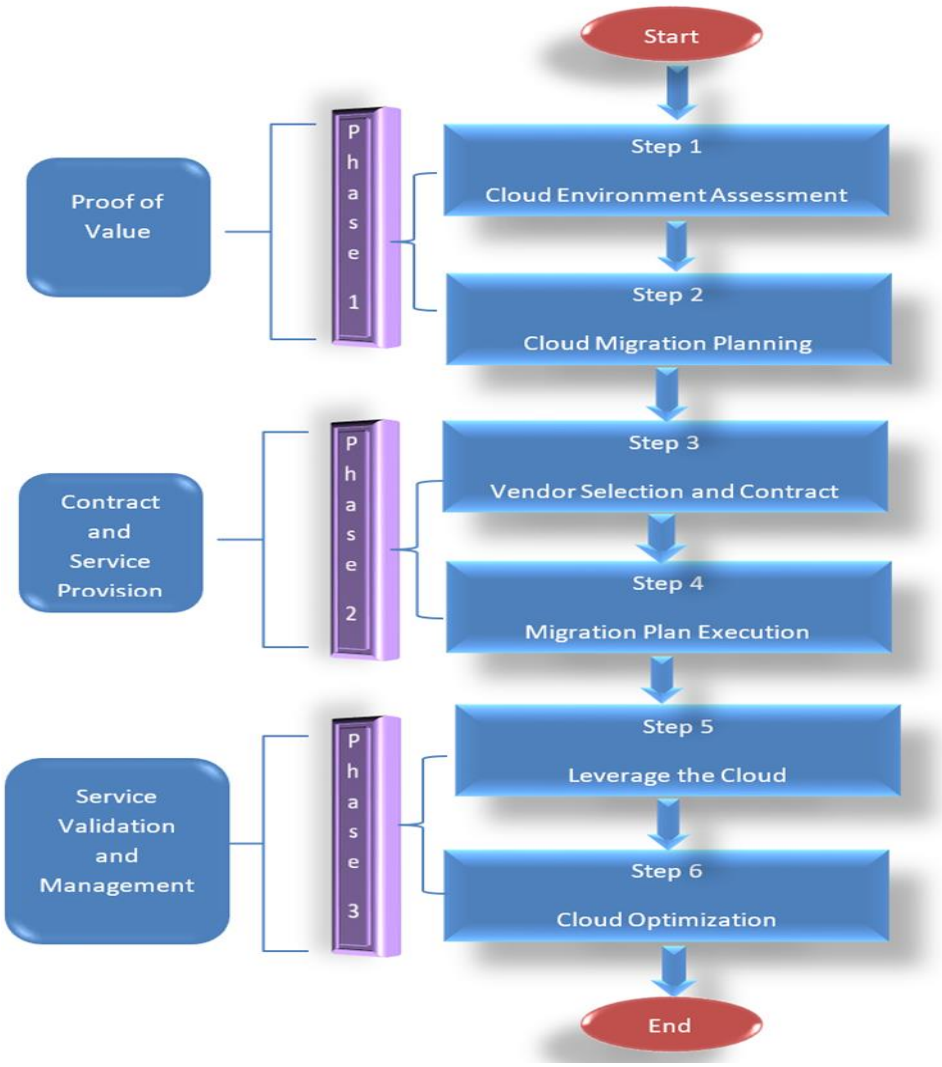

Figure 1: Cloud Migration Framework for Microfinance Banks Adopted from [18, 19]

Phase 1: Proof of Value Phase

The Proof of Value Phase is a merger of [11] Cloud Assessment phase and Proof of Concept Phase combined with the [28] cloud customer assessment phase. The Merger is necessary as every organization is unique and as such there is not a one cap fits all strategy for Cloud Migration. The proof of value phase covers the need to understand in details the current state of the organization. This phase helps to develop a detailed target plan for Microfinance Banks to migrate their systems to the cloud without affecting the normal day to day activities of the organization in a risk-free efficient manner whilst avoiding security breaches. The phase will enable a detailed goal setting as well as assist to create a proper work stream that will help Microfinance Banks to function properly in the cloud platform. [29] broke down the complicated cloud migration planning process into manageable perspectives such as Business Perspective, Platform Perspective, Maturity Perspective, People Perspective, Process Perspective, operational Perspective and Security Perspective.

STEP 1 - CLOUD ENVIRONMENT ASSESSMENT (BUSINESS PERSPECTIVE)

Cloud Environment Assessment is the first step on the proof of value phase. This step consists of various levels such as Cloud Readiness Assessment, Organizational Readiness Assessment and Risk Assessment as shown in figure 2. In this step, Business Objectives, Policy and Organization Risk among others are assessed. [30] also highlighted this step as a step where information pertaining to the cloud migration such as cost and other approaches to the cloud migration are considered and information collected. After a comprehensive review of the weaknesses and challenges inherent in the existing frameworks, this paper proposes the following to be considered at this stage: 1) Business Objectives and Model, 2) Consider your Customers 3) Know your Current Infrastructure 4) Know your Organisation's Logical Infrastructure and

4) Choose the Ideal Cloud Option. Figure 2. illustrates the cloud environment assessment breakdown. Furthermore, Organisation readiness is crucial as it demands that a feasibility study is conducted on cloud migration to ascertain if it makes business and technical sense to move database to the cloud [31]. Feasibility studies also includes thorough inspections of the existing hardware in order to ascertain the extra costs that may be incurred. Also, using feasibility tools such as business feasibility tool, maturity assessment tool or technical feasibility tools are highly recommended because they help to understand the business and technical viability of an organization, as well as help to appraise the energy and cost needed during the course of migrating to the cloud [31]. Depending on the impact areas, likely cloud risks have been characterized as follows by [31] as policy and organisational risk (Loss of Governance and Compliance), technical risks (Insider abuse or privilege risks, Data leakage when uploading or downloading data risk, Distribution denial of service (DDos), Economic denial of service (EDos) and data deletion risks) and legal risks (Risk associated with licensing in cloud, Court summons and E-discovery risk and Change of jurisdiction and data protection risks). Figure 2 below illustrates the Cloud Environment Assessment breakdown.

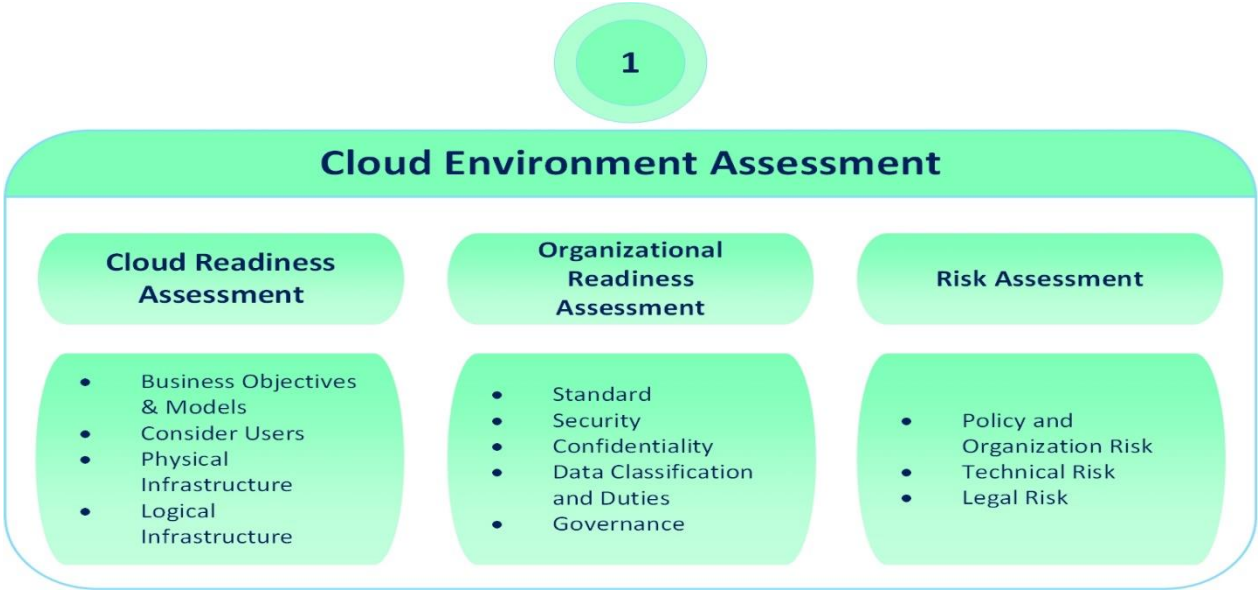

Figure 2: Cloud Environment Assessment

STEP 2 - CLOUD PLANNING

This step consists of 8 components namely: System Requirements, Cloud Service Model Assessment, Technical Feasibility Study, Capacity Management, Availability Management, Security Management and Disaster Recovery Management. System requirement is for organizations to get a well detailed comprehension of their business needs, and then classify them into separate requirements which are then well-defined, studied and approved by the organizations decision makers [32]. In the process of analysing system requirements, the outline for the system that is scheduled to migrate to the cloud is created. System requirements analysis provides a base for all development efforts and future designs as the efficacy of the requirements identification process affects the quality of the final products. The following are list of processes in this stage as stipulated by [30] which Microfinance Banks in Accra can adhere to as it is not industry specific: 1) Security Requirements, 2) Performance Requirements, 3) Reliability Requirements and 4) Usability Requirements. [28] described the cloud service models and the method of adopting the different cloud models. This is not industry specific and can be considered by Microfinance Banks as well. These methods include 1) Software as a Service SaaS, 2) Platform as a Service PaaS and 3) Infrastructure as a Service IaaS. Furthermore, conducting technical feasibility before selecting any cloud vendor is key as it looks at parameters which must be in place before systems are migrated to the cloud [33]. To conduct an effective technical feasibility study before migrating systems to the cloud, Microfinance banks can consider the following before making a choice of cloud service provider: 1) Security, 2) Network and 3) Internet. Also, capacity management aligns IT resources with the current and future demands [34] (CA Technologies, 2014). Capacity management has the flowing benefits: 1) Cost Reduction, 2) Effective service delivery and application deployments, 3) Keeping right Service Levels 3) Data Center and IT consolidation, and 4) Aiding business growth. In the same vein, it could be said that high availability is one of the key reasons for migrating to the cloud especially for small

organizations [35]. Even though the price for computing power have reduced constantly over the years, there has been a drastic increase in the cost of even the most basic system's computing power over the last 20 years. Resources like energy, storage, backup and knowledge are significantly high. Energy consumption and heat generation continue to increase as the demand for computing power or storage rise as a result of business requirements [35]. Furthermore, Security management is of utmost importance in any migration of systems to the cloud. It is a well-known fact that some cloud service provider companies do not have access to the physical security systems of some of the data centres that they manage, hence they usually rely on the cloud infrastructure providers to achieve full data security compliance [28]. The situation is not different for a Virtual private cloud provider where the cloud service provider does not even know if the security setting that was done remotely took effect. Thus, it is vital for Microfinance banks to conduct a good security assessment of cloud service providers providing software as a service to make sure that the security arrangement with their infrastructure provided is solid. Finally, Microfinance Banks need to make sure that their backup policies are running smoothly and that their backups are compatible with their cloud provider systems. There are a lot of advantages in checking out cloud service providers who have standard backup policies with some level of customization. This will help Microfinance Banks to access if they are perfect for their business before they become an obstacle. Attention must be paid to the backup type, the retention frequency and versioning. Figure 3 below illustrates the cloud planning breakdown.

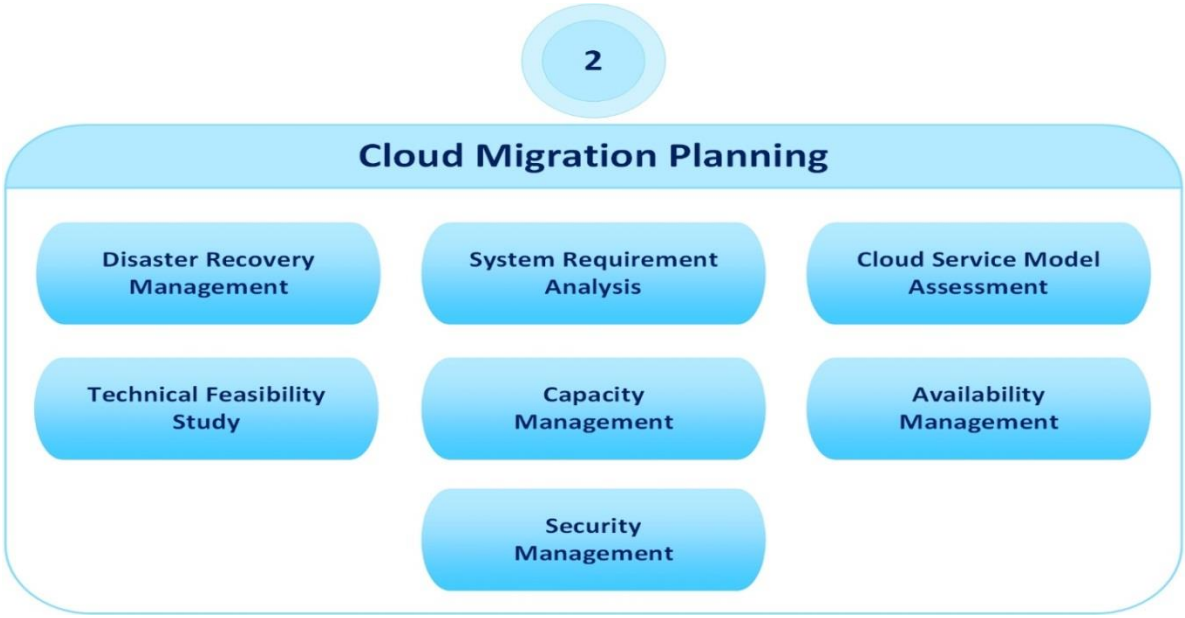

Figure 3: Cloud Planning

Phase 2: Contract and Service Provision

This phase is a very crucial phase in the framework development. Indeed, if the wrong vendor or a bad contract is signed by the Microfinance Banks, this may lead to loss of service and subsequently may also lead to loss of competitive advantage they may have. In this Phase, the paper discusses vendor selection and contract and migration plan execution in detail per the model in figure 1 above

VENDOR SELECTION AND CONTRACT

The vendor selection and contracting comprises of three phases which includes: definition of criteria, develop governance policies and SLAs and develop a proof of concept. Definition of criteria is an essential aspect of vendor selection and contracting. There are a lot of cloud providers each specializing in some or most areas, some have different pricing modes and different ways of maintained support and so on. Some of these clouds providers have a particular technology. Some only host basic facilities for as support. Sending out a request for information (RFI) by Microfinance Banks to likely clouds services providers is unarguably one of the best ways to choose a cloud service provider. The RFI should include organizations infrastructure perquisites, corporate goals, a list of your applications with the data base and should request that the CSP'S reply the question with the prices for difference cases. Doing this will enable organizations differentiate CSP'S and choose the best one that can meet your infrastructure needs and budget [36]. Finding the best cloud solutions for business should be the focal Point for IT managers of Microfinance Banks in Accra, Ghana as they need the right

processes to be put in place to make sure that the right CSP that suites their business model is selected. For Microfinance Banks in Accra who have decided to go for a cloud based solution, there are a couple of questions they need to ask their prospective CSPs to help them determine if a cloud solution is functionally and economically good for their business. These questions include but not limited to: 1) Are similar deployments easily demonstrable? 2) Do you have a trial program? 3) Do you offer price protection and contractual flexibility? 4) Do you have service-level Agreements and a strong history of service level performance? 5) Do you provide operational transparency? 6) Do you offer Multitenancy? 7) Do you have a detailed plan for Data Recovery? 8) Do you meet critical security and compliance requirements? 9) Can your solutions be configured to meet my needs? 10) Do you offer robust integration? These questions should guide the micro finance businesses to select the most appropriate vendor and will save them a great deal in the contract documentation. Developing Governance and Service Level Agreement forms another crucial part of vendor selection and contracting. Cloud computing service agreements should be analysed with the particular needs, governance possesses, expectations and other cultural considerations. Service agreements differ a lot according to the deployment models they support e.g. private, public, hybrid as well as the service models they support (SaaS, PaaS, laaS). There are currently no standard terminologies used by cloud vendors to define cloud service agreements [28]. Generally, cloud service agreements are used to secure cloud providers from law suits, instead of assuring the customers a high level of service. Public cloud service agreements are mostly non-negotiable, which makes it very difficult to read and understand them fully. Added to this, a lot of challenges regarding the accountability and governance of end-to-end cloud solutions occur as a result of cascading cloud service agreements. Generally, cloud service agreements are divided into three as highlighted by [28]: 1) Customer Agreement, 2) Terms and Condition and 3) Service Level Agreement. The differences between the cloud service agreements are not very clear and they can differ from provider to provider. Microfinance Banks should consider these dynamics before adapting to any of these. Microfinance Banks should consider the following when analysing cloud service agreements: a) Policies b) Culture c) Governance d) Objectives e) Metric/measures f) Terms & Conditions/Acceptable use policies g) Remediation/compensation. Develop a Proof of Concept before migrating to the cloud environment is very crucial and requires that system administrators and managers obtain a final decision from the senior management immediately the business case for cloud computing is finished and the business drives and Return on Investment (ROl) have been established. The final acceptance by the senior management should contain at least; a proposal review, the projected cost, timeline, possible risks and benefits that will be gotten. Once there is an agreement, the next path to take is assembling a proof-of-concept (POC) team as highlighted by [28] that contains the following category of personnel's: system administrators, senior developers, architects and help desk resources. Also the team needs to at least have a specific member within the organization who will manage the continuous association of cloud computing solutions with what the business user and major stakeholders expect during the POC. Microfinance Banks can either implement the POC on a public cloud service or in-house. Although, public cloud services have various advantages such as: quick scalability and positioning, it is very vital to Microfinance Banks that they conduct tests to make sure that their data is secure. Figure 4 below illustrates the vendor selection and contract breakdown.

Figure 4: Vendor Selection and Contract

MIGRATION PLAN EXECUTION

This stage is when the actual Cloud Migration is carried out. The IT team will have to establish some level of assurance that there will be no conflict that may erupt when the actual migration takes place. This stage includes Access Migration Complexity, Migration Scenario Selection and Conduct Cloud Migration. As soon as the Microfinance Organization applications are identified as potential candidates to migrate to the cloud, the next approach is to categorize these applications into simple and easily migrateable application, medium and not easily migrateable applications and very complex migrateable applications based on the previous knowledge of these applications. This categorization helps in easily understanding the migration process proper. This categorization of applications is based on a study by [36] who indicated that categorization of applications will help to simplify cloud migration strategy. Also, migration scenarios selection should be conducted. To migrate the data, the Bank may choose to use either forklift or hybrid migration strategy to move the systems to the cloud. Each of the two strategies has both advantages and disadvantages. Forklift migration is best used for the stateless applications or the self-contained applications. Hybrid migration strategy involves picking some portions of the application and moving them while leaving some other portions of the application in place. However as highlighted by [3] giving the fact that most cloud companies have not actually reached their maturity levels, the author recommended that organizations do this migration in a phase by phase manner with a pilot migration. Once all the requirements earlier highlighted have been met, application and databases can then be slowly migrated to the cloud and then tested. Before going live, it is very important that a backup of the system is made, the system is tested regularly with production data already moved. Parallel operational method must be used to avoid any unforeseen activity that could result to system. Figure 5 below illustrates the migration plan execution.

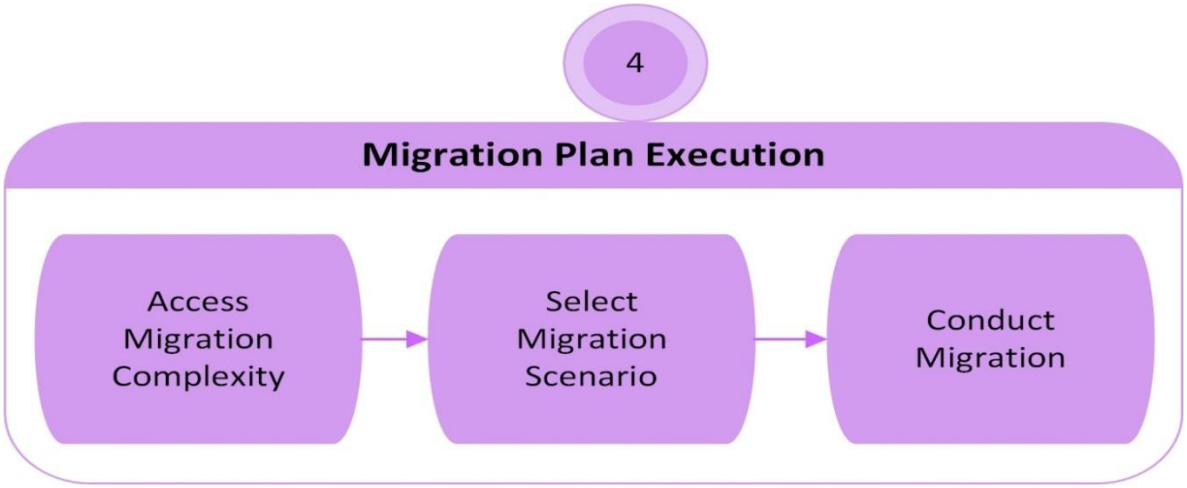

Figure 5: Migration Plan Execution

Phase 3: Service Validation and Management

The third and final stage includes leveraging the cloud phase and cloud optimisation phase. Upon migrating data to the cloud, the next step is to leverage the cloud. Leveraging the cloud is the fifth step of this framework model. It involves activities such as auto-scaling, automation, elasticity and high availability. Auto-scaling enables one to put up conditions necessary for scaling the usage of the system. Auto-scaling criteria should identify such as the utilization of the CPU, network I/O. Elasticity automation is another area of concern since it is the fundamental of the cloud. The system applications have to be decomposed in a way that they are scalable. Ensuring the application is elastic ensures that one can scale it horizontally or vertically when the need arises. After moving the applications to the cloud, they should be made available to use. Optimization is the last step of the framework model. The availability, monitoring, efficacy, security, performance and re-engineering of the data or application need to be monitored constantly. Cloud service providers provide various tools that aid the monitoring of SLA compliance and maintain the agreement signed by the cloud service provider and the customer [28]. The importance of optimizing the cloud-based applications is to increase the cost savings. It is advisable to optimize a system since the resources consumed are paid, one has to understand and master the usage patterns to devise ways of ensuring fewer resources are consumed by the cloud applications. Monitoring should be done, and the idle resources which are paid for but not utilized should be terminated to save the costs. Some of the components used may need to be re-engineered to ensure that they are optimal as they run in the cloud environment.

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LEVERAGE THE CLOUD

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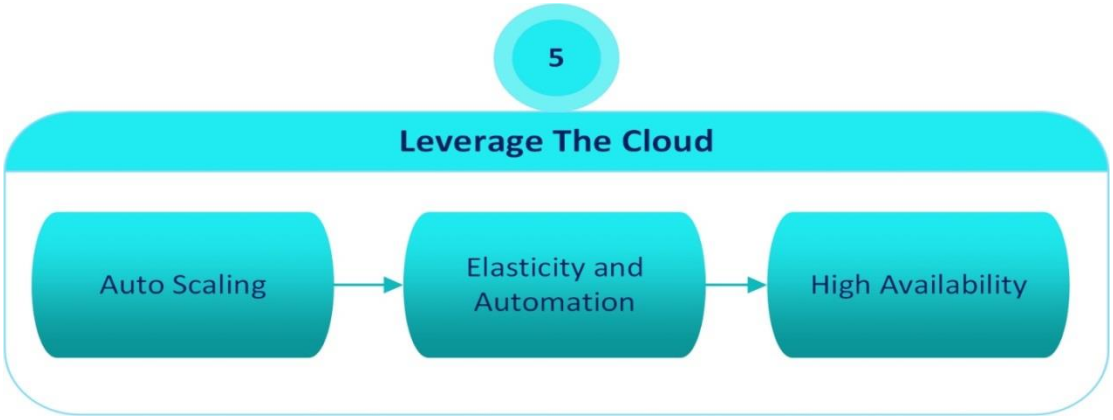

Figure 6: Leverage the Cloud

CLOUD OPTIMISATION

Optimization is the last step of the framework model. The availability, monitoring, efficacy, security, performance and re-engineering of the data or application need to be monitored constantly. Cloud service providers provide various tools that aid the monitoring of SLA compliance and maintain the agreement signed by the cloud service provider and the customer [28]. The importance of optimizing the cloud-based applications is to increase the cost savings. It is advisable to optimize a system since the resources consumed are paid, one has to understand and master the usage patterns to devise ways of ensuring fewer resources are consumed by the cloud applications. Figure 7 below illustrates the Cloud Optimisation stage.

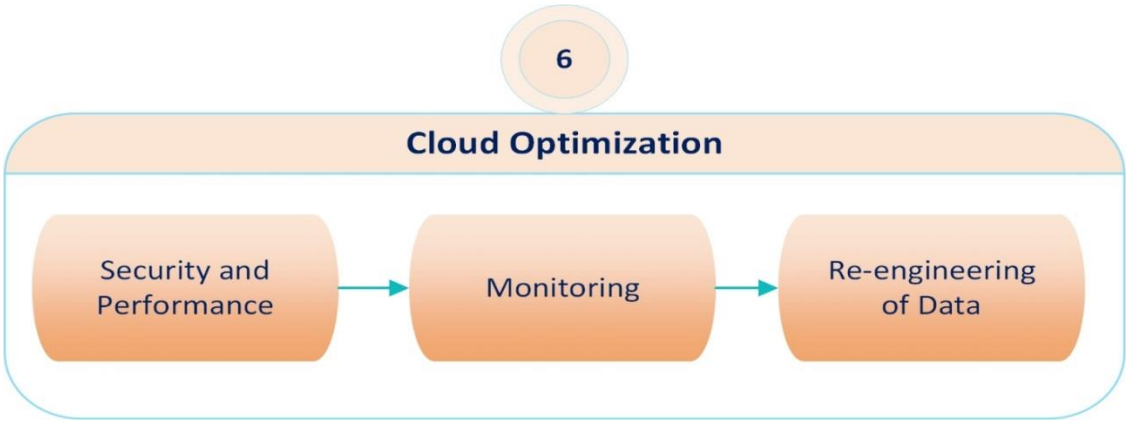

Figure 7: Cloud Optimisation

IV. FINDINGS AND CONCLUSIONS

The model is compressed into three phases and 6 steps which are tied with the phases to increase speed as well as reliability. The phases include: Proof of Value Phase, Contract and Service Provision Phase and Service Validation and Management Phase. The six steps are Cloud Environment Assessment, cloud Migration Planning, Vendor Selection and Contract, Migration Plan Execution, Leverage the Cloud and Cloud Optimization. It is worthy of note that the three phases and the corresponding six steps should be implemented as a work flow and none should be skipped. The work

flow is described with figures when explaining each step. The reason for this is that Microfinance Banks should commit time and money one step at a time so as not to waste resources when the migration fails due to omitting any of the steps. This reduces a lot of risks involved in cloud migration as Microfinance Banks are the backbones of the developed and developing countries as rightly stated by [37] that Microfinance Banks are considered as the driving force in economies of the world. Through use of cloud computing, firms are able to outsource IT services from the cloud and hence concentrate in their core business. There have however been difficulties for the organizations to adopt cloud technology due to challenges like security, cloud knowledge, contractual concerns and interoperability [37]. This newly developed framework tried to put these challenges into consideration after analysing questionnaires distributed to Technology Heads of some randomly selected Microfinance Banks in Accra Ghana.

It is important for Microfinance Banks to consider adopting cloud computing technology as it will help reduce the costs incurred in IT infrastructure. With this technology, they will not manage their IT resources but instead have it managed by experts offering cloud services. For a company to adopt cloud technology, it has to seek for adequate knowledge. However, small organizations who though have knowledge about cloud computing but are reluctant to embrace this new technology as they don't understand clearly what can the cloud technology offers for them and how it can increase their productivity in the long run need to reconsider [37].This Statement is true as from the survey earlier conducted, the IT managers of the Microfinance banks surveyed even though majority of them claim to understand the benefits of Cloud computing, most of them were reluctant to suggest cloud computing to their senior management as they are still comfortable using their old systems even though they agree that most of their systems need to be improved upon. This Framework offers a step by step approach for Microfinance Banks to follow to be able to migrate their systems to the cloud. It can also serve as a major stakeholder assessment procedure when deciding to move services to the cloud. This model therefore will offer enormous contributions to the micro finance industry in Ghana and beyond and also contribute literature to the body of knowledge.

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