Collaborative Innovation towards a unified computing system among emerging tech firms in Kenya

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Abstract: - The idea for collaborative innovation within emerging tech firms especially in country of Kenya has not been fully explored. The subject of consideration is how do these emerging tech firms collaborate innovatively towards a unified computing environment where aspects of shared resources such as computing, storage, networking exists. Information technology is in a state of constant change. For example, computing has evolved from distributed computing to grid computing, to utility computing to cloud computing and now we have the new emerging unified computing environments. Thus, unified cloud computing is emerging as a new computational method and service. A dramatic proliferation of research has recently emerged concerning Unified cloud computing, but there exists a gap in terms of looking at collaborative innovations within emerging firms especially in Kenya towards innovations that are geared towards unified computing systems. Increasingly more aspects of work and life are conducted online and the popularity of smart phones has resulted in using computing resources anywhere, or cloud computing utilization. Literature reviewed on global collaborative innovations towards unified computing environments have revealed existence of inadequate research done especially on emerging technology firms in African context. The study seeks to explore the architecture and framework of unified computing systems and explore some models of collaborative innovations that can be adopted among emerging tech firms towards developing a unified computing system (UCS). The study also compares this trend of collaboration especially among well renowned giant-tech firms such as Google, Cisco, Microsoft, and others on a global scale. This finding will therefore provide a framework to emerging tech firms in Kenya on how to collaborate innovatively towards coming up with an existing unified computing system that will enhance shared computing resources among them to provide Internet, software, computation, storage resources, networking and data access. Generally the UCS will enhance shared resources in three categories: software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS). Related literature was reviewed and selected for consideration in the study.

Key Words:— ***Tech firms, Innovation, Unified computing system (UCS), Kenya.***

I. INTRODUCTION

A. Background

Information computing system technology has an influence on our day to day activities. In countries across the globe, human beings are confronted daily with dozens of machines and hundreds of various technologies from all over the world: Our television sets and microwaves is made possible by semi-conductors from Korea which are built into plastic shells from Germany. On vacation we take photographs with a camera assembled in Sweden, whose lenses come from Japan and whose batteries are made in Vietnam. International standards provide worldwide equipment compatibility (Joensuu-Salo, Sorama, Viljamaa, & Varamäki, 2018). The more traditionally, innovation initiatives in software intensive systems companies are viewed in 3 dimensions that is either internal innovation, such that technology driven innovation are based on ideas generated within a departmental firm, or two as collaborative innovation where a couple of stakeholders co-create value, or lastly, external innovation in which firms adopt strategies to

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capture and expand on ideas created by other various stakeholders (Oladimeji, Ebodaghe, & Shobayo, 2017).

Many recent studies highlight the need to rethink the way we manage innovation. Traditional approaches, based on the assumption that the creation and pursuit of new ideas is best accomplished by a centralized and collocated R&D team, are rapidly becoming out-dated. Instead, innovations are increasingly brought to the market by networks of firms, selected for their unique capabilities, and operating in a coordinated manner (Adner, R., & Kapoor, R. 2010). This new model demands that firms develop different skills, in particular, the ability to collaborate with partners to achieve superior innovation performance. No company is an island. Instead, the industry structure and the ecosystems in which it is part play a critical role in a company's success. The management of innovation is changing. It is no longer the creation and pursuit of new ideas the bastion of robust central R&D departments within vertically integrated organizations. Instead, innovations are increasingly brought to the market by networks of firms, selected according to their comparative advantages, and operating in a coordinated manner (Ammar H. Alhusaini, V. Prasanna, C. Raghavendra, 1999)). In this new model, organizations de-construct the innovation value chain and source pieces from partners that possess, better skills and/or access to knowledge that can provide a source of differentiation as well as lower costs. The aim is to establish mutually beneficial relationships through which new products and services are developed. In the very essence, firms increasingly seek superior performance in innovation through innovative collaboration.

Recently, innovative changes in information technology (IT) trends, such as cloud computing have led IT companies to focus on collaboration for sustainable growth. This new model is being driven by a series of trends forcing firms to re-think traditional approaches to collaborative innovation. First, the complexity of products is increasing. It is well acknowledged that it is not possible for one firm to master all these skills and locate them under one's roof. Second, a supply of cheap skilled labor has emerged in developing countries, creating incentives to substitute these resources for higher-cost equivalents. Third, different organisations around the globe have developed unique skills and capabilities, of which leading firms are now exploiting for advantage through collaborative innovative. And finally, advances in development tools and technology combined with the rise of open architectures and standards have driven down the costs of coordinating distributed work. In sum, collaboration is no longer "nice to have." It is a competitive necessity. (Alexandra & Kassim, 2013; Yunis, Tarhini, & Kassar, 2018).

B. Brief discussion of the unified computing system technology

Information technology is in a state of constant change. For example, computing has evolved from distributed computing, grid computing, and utility computing to cloud computing (Aggerwal, R., 2012). Thus, unified cloud computing is emerging as a new computational method and service. A dramatic proliferation of research has recently emerged concerning Unified cloud computing. Increasingly more aspects of work and life are conducted online and the popularity of smart phones has resulted in using computing resources anywhere, or cloud computing. Cloud computing is not a product, it is a unified computing service. Unified computing provides Internet software, computation, storage resources, and data access, of which the user does not need to know any details of the computing infrastructure. Cloud computing generally involves three categories: software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS), which provide various services for daily life (Boschma, R., & Frenken, K., 2010).

II. REVIEW OF RELEVANT LITERATURE

The ideology of innovation refers to the creation of a new concept, and the process of translating this concept idea into goods, products or services that creates new value within the ecosystem and for which clients are willing to pay. Changes occur rapidly, and many entrepreneurs are left wondering whether to update or replace their old strategies (Kaplan, 2014). Information communication technology (ICT) is the new avenue for modernized employment creation, with networking sites enabling people to interact through innovations (Roztocki & Weistroffer Roland, 2011).

- Innovation is described in the European Commission document (2005) and its definition is as follows: "Innovation is the application of better solutions, new products and services that meet new requirements and associated market needs. It creates new methods of production, supply and distribution, changes in management, work organization, working conditions and qualification."

- *Innovation ecosystems*: In order to accelerate innovation, and to benefit from ideas and resources that reside outside the boundaries of a firm, companies increasingly engage in innovation ecosystems. Innovation ecosystems are about generating ideas, hypothesizing about future differentiating functionality and experimenting with new concepts to identify whether they add new value to customers typically, an innovation ecosystem involves networks of stakeholders (Bosch, J., 2016).
- *Innovation activities Ideation*: The first activity in the innovation process is the idea generation phase. Successful idea generation is fuelled both by the pressure to compete and by the freedom to explore. Typically, a balance between playfulness and need characterizes successful idea generation. In this phase, companies brainstorm, look at ideas in other industries, gather customer insights, perform market research and develop innovation competencies. This phase aims to develop core innovation competencies, and generate new and creative ideas as opines Barnett, H. G., 1973.
- *Concept creation*: This is where potential ideas are turned into more concrete concepts with the intention to evaluate these concepts to identify those that prove more promising and feasible than others (Chesbrough, H. W, 2003).
- *Customer validation*: This is where the idea is validated with potential customers. The development stage include alternate versions of the original idea along with enhanced features of the original product.

According to a Gartner Executive Programs worldwide survey 2011, defines cloud computing as a large-scale virtualized resource that combines several hardware resources to conduct parallel and distributed computing. Users can dynamically adjust computing resources for rapid deployment according to their needs. Unified cloud computing architecture a comparison of Microsoft, Trend Micro, and the proposed unified cisco cloud architecture.

Grid computing is a virtual supercomputer that combines many computers from different locations with the Internet. Each computer in the virtual supercomputer is a node. The computing method divides a large-scale computing problem into many small computing problems, which are assigned to different nodes to computer. Grid computing has two advantages: the full use of idle computing resources and having powerful computing capabilities. The Gartner research report released in January 2011 revealed that business-to-cloud will move toward developing a hybrid cloud that can help companies use internal and external IT resources flexibly to create a balance point of resource applications.

A. Innovation approaches

Traditionally, innovation initiatives in software-intensive systems companies are viewed as either internal innovation, such as technology-driven innovation based on ideas generated within a company that is to say internal innovation refers to a situation in which ideas are generated internally within a company, and in which these ideas are then validated and brought to the market either by the company itself or by a partner in the innovation ecosystem (Davis J., Foxall G. and Pallister J. ,2012). External innovation in which companies adopt strategies to capture and expand on ideas created by others. Companies adopt strategies that help them capture value that is produced by other stakeholders, and, or collaborative innovation where a number of stakeholders openly share and benefit from results within the network. Collaborative innovation is when companies create different alliances with external partners with whom they co-create value. In such partnerships, the intention is to establish close relationships to external innovation partners to have continuity in joint innovation activities and to over time involve them in development of differentiating functionality as part of the core product as opines ESW, Enterprise for a Sustainable World, 2013.

Towards a unified computing system technology through collaborative innovation:

Although presented as three different approaches to innovation, research shows that most innovation initiatives involve a mix of internal, collaborative and external elements. At some stage, an internal innovation needs to be validated with external customers in order to verify that the predicted value is indeed realized (Eileen Lamb, July 20, 2017). Similarly, a purely external innovation needs to be successfully integrated in the internal product or system before it can be fully validated and used by clients. The innovation process is non-linear which means that innovation is stimulated and influenced by many internal and external aspects and sources of information (Kaufmann et al., 2002). Innovation is also highly interactive and it is usually expensive. Some companies do not have sufficient capital to finance their research and innovations (Lendel, Varmus, 2013). This means that they have to look for other sources of capital. If a company management board

decides to use external finances it is necessary that they remember the following general principles (Kaufmann et al. 2002; Pitra 2006):– Company management needs to determine how to finance innovation (from own funds or/and external capital) from a long term point of view. The management also needs to make sure that processes within the company flow smoothly.

Paradigms of unified computing environment:

Unified computing systems will have compute resources with different capabilities, display devices, and data repositories all interconnected by heterogeneous local and wide area network, a unified framework for resource scheduling in computing systems. This framework considers compute resources as well as other resources such as the communication network and data repositories (Govindarajan et al.2001). The study compares Microsoft Azure, Trend Micro, and the proposed unified cisco cloud computing architecture to show that the proposed unified framework of the cloud computing service model is comprehensive and appropriate for the current complexities. By combining distributed computing resources into one large virtual computing resource, such as grid computing, users can access services such as SaaS, PaaS and IaaS at one point.

- Cloud computing is not a new technology, but has evolved from the old technology and ideas. In the 1980s, computing evolved from distributed computing to grid computing, which was used to solve large-scale computing problems. Grid computing is a virtual supercomputer that combines many computers from different locations with the Internet opines Govindarajan et al 2001.
- Each computer in the virtual supercomputer is a node. The computing method divides a large-scale computing problem into many small computing problems, which are assigned to different nodes to compute. Grid computing has two advantages: the full use of idle computing resources and having powerful computing capabilities.

Unified Cloud Computing Technology Architecture:

Unified Computing Services include the following:

- *Architecture Assessment*: Unified cloud computing service was first launched in 2006 by Amazon Web Service, which began by providing an Amazon IaaS to allow users to rent computing, storage, and other resources applicable to businesses of any size. The Amazon unified cloud computing architecture includes computing, content delivery, database, deployment and management, messaging, networking, payment and billing, storage, support, web traffic, and workforce (Hienerth, Christoph & Hippel, Eric & Baldwin, Carliss, 2006).

  In February 2010, Microsoft launched a cloud computing platform, Windows Azure. Microsoft also offers private cloud solutions for enterprises. Enterprises can import cloud computing using three applications: (1) move to the Cloud, an enterprise application system which transfers all data to the Microsoft data center; (2) use the Cloud, in which the user uses Microsoft cloud services without developing or importing; and (3) be a Cloud, in which the enterprise creates the company's own private cloud that both internal and external customers can use. Microsoft unified cloud computing architecture includes Windows Azure, SQL Azure, Windows Azure AppFabric, and Windows Azure Marketplace.
- *Optimization*: The Trend Micro cloud computing architecture in IaaS still uses the abstraction of several server virtualization technology resources for further management and configuration. The Hadoop technology in PaaS is used to construct the platform, using the HBase and Hadoop distributed file system (HDFS) as the database and file system architecture to achieve multi-tenant configuration through VM technology. The software development kit is used as a tool to create the application and execution environment (Hitt, M. A. ,2005). The MapReduce technology is used as the SaaS computing base to establish monitoring and analysis applications. The cloud technology architecture uses the core technology used in the cloud computing architecture created by Trend Micro, which is based on these core technologies in accordance with the services and solutions provided by the amplification of cloud application technology.
- *Security*: Trend Micro is the leading computer antivirus and network security vendor worldwide and has recently positioned itself as the cloud-network security expert. Their business purpose is to "develop, provide, and support the most flexible and powerful customized Internet security solutions to deal with the ever-changing security threats on the network." To develop the smart protection network through cloud computing, Trend Micro Investment established

TCloud computing in 2010. TCloud computing provides a cloud operating system, technical support, systems integration, a cloud computing platform, education training and consultancy, and other related services.

The innovative Unified Computing System data center technology was designed to address this issue. By unifying network, computing, solid state storage and virtualization resources into a single, preintegrated platform, the system provides the foundation for a broad spectrum of virtualization and performance optimization efforts. Whether you are seeking to create a stateless computing environment, deploy high performing VDI based solutions, enable just-in-time provisioning of resources, simplify the movement of virtual workloads, or reduce equipment and operating costs, the Unified Computing System provides a powerful solution.

To realize the full benefit of these innovations, you need to implement them quickly and accurately, in accordance with proven methodologies and industry best practices that is through the two aspects of;

- Planning, Design, and Implementation
- Support

B. Applications areas of unified computing environment

Unified Computing Services help sustain and optimize the performance of unified computing architecture after it has been deployed. Providing a unified view of all data center resources and interdependencies. A suite of services that can be customized to help achieve the specific goals set for data centers whether by adopting the UCS B-Series Blade Servers or the UCS C-Series Rack-Mount Servers with or without UCS Invicta Scaling System or Appliances.

- Litoiu offered a cloud computing architecture for optimized solutions of cloud computing. The IaaS layer used as the virtualization of hardware resources includes storage, computing power, and memory.
- The PaaS layer provides platform services such as the web, applications, and database environments, in which the user can deploy and test operations in this environment.
- The SaaS layer provides end users single or composite application services.

With the advent of unified computing systems then this will tend to;-

- Extend virtualization across data centre resources by increase of asset utilization.
- Reduce data center facility footprint and power and cooling costs by consolidating web and application servers.
- Address requirements for business continuity and disaster recovery process.

Architecture Assessment Service:

Unified Computing System provides a powerful platform for a broad range of computing infrastructure projects, from stateless computing to virtualizing resources to providing a flexible, secure cloud computing infrastructure. Data center assets, including blade servers, computing resources, applications, operating systems, virtualization, input/output (I/O), and system management (H. H. Olsson and J. Bosch, 2016). Unified computing can deliver significant advantages for business. Rapidly reaping the benefits of a new data center initiative and mitigating risks require expert guidance. To realize the full benefits of a planned information system project, one needs to account for the entire data center environment, including servers, storage, network, security (Kenya ICT Board, 2013).

Microsoft cloud computing services mainly focus on PaaS and SaaS. The PaaS is Windows Azure, which is designed to simplify the daily operations of developers and system administrators, rather than provide an in-house deployment environment. The application can have one or more role structures, such as web, background work, or virtual machine (VM) created through Windows Azure (Kilelu, C. W., Klerkx, L., et al, 2011). A web role is used to create the environment necessary for implementing web-based applications, by using various programming technologies such as PHP, Java, and ASP.net to create an application. The background work role is used to perform various codes to perform simulations, video processing, or other operations. The VM role can run the Windows Server 2008 R2 image, and allows users to move internal deployment of Windows Server applications to Windows Azure. SQL Azure is compatible with existing data access technologies and tools based on the existing Microsoft SQL Server. SQL Azure provides database management system (DBMS) to store data in the Microsoft server in the data center. SQL Azure also provides SQL server reporting services (SSRS) run in the cloud, for establishing and distributing the standard SSRS report (Limassol, Cyprus, 2016).

The SQL Azure database with the SQL server can synchronize data processing in Microsoft data centers at different locations. Each SQL Azure account has one or more logical servers used to organize account information and billing. Windows Azure AppFabric is based on Windows Azure, and the components include service bus, access control, and caching. Service bus is used to open the application on the Internet. Access control allows users to obtain digital identification, control the content of different users who can access caching by creating a cache to accelerate the application to access speed, and reduce applications to query the number of databases.

Windows Azure Marketplace allows users to find the applications and data they need and includes two components, AppMarket, and DataMarket. Users and applications can access information through DataMarket at a single location to make purchases and access various commercial data sets. AppMarket is a trading platform for cloud applications, virtualized architecture for a datacenter (Lee, S.M.; Hwang, T.; Choi, D, 2019). The Unified Computing Virtualization Assessment Service provides a clear, comprehensive analysis of the server consolidation opportunities within the physical IT. Unified Computing Server Virtualization Mobility and Management Service: This service provides in-depth planning and design for an end-to-end datacenter virtualization strategy and for enhanced provisioning and management of virtual machines (Madon, S., Reinhard, N., Roode, D., & Walsham, G. ,2009).

Unified Computing Management Systems Integration Service:

This was designed for UCS solutions that include the Unified Computing System Manager, this service provides for the creation of an interoperability interface between the unified computing platform and third-party management tools, using the available application programming interface (API) for ease of provisioning, monitoring, troubleshooting, and adaptability of the unified computing platform. The Unified Computing Management Systems Integration Service uses the advanced API of the Unified Computing System Manager to tightly integrate with a customer's existing Cisco network, storage, server, and provisioning management systems (Manikas K., and Hansen K.M. ,2013).

Unified Computing Migration and Transition Service:

The service accelerates the adoption and optimal implementation for most business applications on a Cisco Unified Computing System platform. Virtualization introduces profound changes in servers and data centers. Although these changes can be hugely beneficial, they may also present new potential attack vectors, as well as new opportunities for misconfiguration or error.

C. Technology evolution

Distributed Computing:

The concept of distributed computing has a close relationship with the development of a computer network. Various computers connected through the communication line that allow the terminal to access multiple computers that can also pass data to each other. In 1979, the U.S. Department of Defense established The Advanced Research Projects Agency Network (ARPANET) to connect to a remote computer, thus exhibiting the prototype of today's Internet. However, the computer network focused on connecting different computers and operating systems and therefore needed to develop a protocol. In 1983, ARPANET changed the network core protocol to TCP/IP, which was proposed by Bob Kahn and Vinton Gray Cerf in 1974. In the 1990s, the entire network was open to the public. In 1996, the term Internet became widespread, referring to the entire World Wide Web (WWW).

In 2004, Google released a new programming model, MapReduce, which is used to handle large amounts of data and applications in the Google search engine. The basic concept of MapReduce is to divide the work into two parts, Map and Reduce. Map is responsible for dividing the problem into several problems that are sent to different machines, and Reduce collects the results of each machine processing and combines them into a single answer that is distributed computing. In 2006, the Apache Software Foundation released the Hadoop project, which is an open source. Hadoop is a distributed computing programming tool developed by Apache, in which the content includes the HDFS and MapReduce. In 2008, Yahoo used 10000 microprocessor cores of the Linux computer clusters running Hadoop applications. Currently, Hadoop is often used to create a cloud computing platform environment opines Munford, M., 2013, March 26.

Virtualization:

The virtualization technology can be traced to Mainframe (1960–1970). Mainframe was expensive, because of the need to operate a single machine and provide time sharing, not only to allow different users to test the software in the same hardware platform but also to save costs. Strachey [25] first used the time-sharing concept to implement multi-programming in time sharing in large, fast computers. Using the underlying hardware architecture abstraction, the VM simulates underlying hardware resources, and implements the application on a VM. This

method is similar to implementation in a real hardware platform, and has an independent operating system. The virtualization technology of an operating system was invented by IBM, and includes many operating systems simultaneously used by Mainframe. In 1997, Connectix created PC virtualization on Macintosh, and the v4.0 of this product supported the Windows operating system in 2001.

Database:

The database can be regarded as an electronic file cabinet that is a computerized data storage system used to store electronics. Users can add, delete, modify, and query operations for filing data in the file. The database can be divided into two parts: database storage, that is, the organization of data and storage methods, and a database management system (DBMS). The DBMS typically includes storage, retrieval, security, backup, and other infrastructural functions. A database typically refers to the database management system. Before the invention of computers, data were incompatible to file management, and were archived through paper records.

Web Service:

Curbera opines that, the main Internet open technology constitutes a network service of four standards: XML, SOAP, WSDL, and UDDI. The Internet service is a software component, building on HTTP, XML, SOAP, WSDL, and other standard protocols, having openness and dispersion characteristics. Integrating different machines and heterogeneous platforms can work together through the Internet operations. UDDI (universal description discovery and integration) provides a standard for registration and for searching web service information. The WSDL (web service description language) is the mode of operation that describes a network service, indicating the interaction of client and web services. The SOAP (simple object access protocol) is a simple protocol for exchanging structured and type information on a network, jointly developed by IBM, Microsoft, and other vendors to provide a standard set of specifications for message encoding and writing(Noorani, I. ,2014).

Strength of the unified computing environment:

The primary purpose of technology is to understand and create. The ability to leverage the cloud computing technology to solve problems and adapt to new technological environments must derive from a macro viewpoint to understand the evolutionary history of cloud computing and to learn the necessary skills and knowledge for using the cloud computing technology efficiently.

- Optimization services to help maintain a high level of performance as your data center evolves.
- Efficiency and facilities services to help adopt a greener IT strategy and design and build out efficient data center facilities.

  Unified computing architectural approach provides a unified view of data center resources, empowering you to turn data center environment for optimal application performance and availability.
- Speed deployment and mitigate risks of virtualization and other data center projects by applying best practices and methodologies.
- Enhance agility by improving the mobility and manageability of traditional and virtual workloads and enabling just-in-time provisioning of resources.
- Lower operational costs by identifying opportunities to reduce data center complexity and simplify management.
- Optimize the uptime delivery performance, and efficiency of unified computing systems to help maximize the value of investment.
- Provision new applications more quickly.
- Strengthen in-house expertise and skill through knowledge transfer and mentoring.
- Improve application performance and availability to meet service-level agreements initiatives or allocated to other corporate functions, or it can flow to profits. Corporate management is in charge, instead of being bound by old-technology cost curves.

Agility and Opportunity With rare exceptions, business today depends on IT, and in some industries, IT is the business (Olsson Holmström, H., & Bosch, J., 2016). By providing an environment that allows rapid deployment and reconfiguration and enforces standardization.

Challenges of unified computing environment:

While on the other hand, unified computing offers a huge potential, at the same time UCS is facing the challenge of re-configuration of platforms, re-adressing of layers and protcols ,re-skilling, legal and ethical dilemmas regarding implementation of UCS infrastructure: When a new technology category is emerging, users often have difficulty determining the validity of seemingly conflicting claims from competing vendors within that sphere. Multiple vendors claim capabilities similar to those of the Unified Computing System: solutions that purport to offer an integrated environment that presents a

virtualized pool of resources to the data center with capabilities for flexible deployment. Incase many of these tools are quite capable within limited subdomains of the data center infrastructure, all suffer from one or more major shortcomings, including:

- *Multiple Products*: Most of these solutions are in fact a collection of products, with the appearance of integration provided by a common console from which the tools for the various products are invoked.
- *Old Code Bases*: A solution may offer a visually appealing interface with a good presentation of required functions, but the worst problems with some of these tools are not readily visible to the user at first glance, since they have to do with the provenance of the software code base. Some products on the market today are composed of major subsystems from multiple lineages and different code bases, some more than a decade old and most developed by different teams at different times, and sometimes in different companies.

This development history has significant repercussions for the solution's reliability and the speed with which the vendor can add new features to the solution. Poor Integration: Reflecting the varied origins of the technology base, integration of the various functional modules is often incomplete, resulting in such complexities as the need to switch between multiple subconsoles to perform specific management tasks, often those involving storage and networks and deployment. Perhaps the strongest indicator of the unintegrated nature of some products is that some components still have separate licensing. Another common practice is to extend the management scope beyond the core infrastructure and to include additional features that overlap the major hypervisor features.

Data centers are complex, siloed environments in which servers and storage equipment are under-utilized, cycle times for provisioning new applications are long, and operating costs --especially power and cooling costs --consume an ever-greater percentage of the IT budget. More and more organizations are turning to virtualization to address these issues. Unfortunately, many virtualization efforts do not deliver the expected results because they focus only on servers, failing to account for storage, network, and other critical resources. Even though virtualization has been around for several years, only a small portion of operating system workloads has been virtualized today(R. Freund and H. J. Siegel ,17,June 1993). Siloed organizations, with separate teams for applications, security, storage, servers, network, and facilities, present a complex environment for end-to-end approaches such as virtualization. Compounding the effects of organizational complexity, many customers struggle with understanding how virtualization will affect day-to-day operational and IT service management procedures.

Future development impact of unified computing environment:

Unified Computing System in Cisco; customers providing feedback about virtual machine management have unanimously favored retaining their vendor-specific management tools to manage their virtual machines, and they have no desire to add a less-functional, lower-performance management tool from another vendor to their portfolio.

This finding indicates that companies must start thinking of approaches for using UCS to improve company effectiveness because companies will want to learn about unified cloud computing and determine what type of cloud computing technology they can use. Currently, many cloud service providers can provide most computing services. However, a unified cloud framework/architecture does not exist; only an architecture that cloud service providers use for their own services currently exists.

- Weak Service Profile Equivalent: Some vendors can manage WWN and MAC addresses, but no product on the market today offers the equivalent of Cisco Unified Computing System service profiles, with their capability to span server, storage, and network configuration elements, and with their advanced policy features (Shiau, Wen-Lung & Hsiao, C.-M. ,2013). In almost all cases, the scope of the management domain stops at the server edge and does not extend to the surrounding network.
- No Converged Fabric Storage Integration: Cisco is unique in its management of converged fabric environments. Other vendors offer converged fabric capabilities in their system, but have gaps in the integration of these capabilities into their management stacks.

D. Issues arising from unified computing system technology

Some of the issues arising from UCS are discussed but not limited to;

- Security, privacy, accessibility and transparency: -how do we balance accessibility and transparency with privacy and security, especially when it comes to data and personalisation within unified computing environments.
- Control and ethical use: - how might UCS be used unethically-and how can we protect against this? How do we ensure UCS are control proof from interference from outside harm.

E. The Four Pillar's of Collaborative innovation Capabilities

Successful and productive collaboration doesn't just happen. It is a skill that must be learned. And of which by far rarely firms get it "right first time." Leading firms recognized this reality, and made investments to enhance their performance over time. Successful tech firms target investments in four areas: people, process, platforms and programs opines Robertson, T. S., 1997. We call these the "Four Pillars" of collaborative capability. Collaborative Capabilities which is an area separating leading firms from others was their willingness to invest in developing "collaborative capabilities." All too often, firms assumed that their existing employees, processes and infrastructure were capable of meeting the challenge of collaboration.

Developing People:

Superior and efficient performance in collaboration requires people with having multiplicity of different skills, given team members often lie outside the boundaries of the company, are located in far flung countries and have vastly different cultures. The "art" of management in such projects is in finding ways to exert influence over resources not under a firm's control. Rather than a focus on deep technical expertise, managers therefore require a much broader skill set, associated with the need to orchestrate and coordinate the work of distributed teams opines Rogers, E. M., 1995. Successful firms tackle this challenge through changes to their recruitment, training, evaluation and reward systems. For instance, apart from training in technical disciplines, these firms ensured that engineering staff were educated on how to partition work into parts that can be worked on by different teams and how to manage the multiple workflows that result. The emphasis was on "softer" skills, such as communication and motivation, as opposed to discipline-based content. The emphasis on developing new people skills is reinforced by a firm's evaluation and reward systems. (Rajagopal , 2014).

Designing Processes:

Most projects employ a formal product development methodology based upon a modified "stage-gate" or "waterfall" type process as Rajagopal, 2014 opines. These processes are increasingly popular ways to ensure greater control and consistency in the execution of projects. But these techniques, and others that share their roots, are often predicated on the assumption of single-site development (Siegwart, R. Y., & Hess, S., 2013). There is a need to re-think how they should operate when managing the distribution of work among a team of global partners. Distributed development requires a variety of additional activities as compared to singlesite projects, related to the division of tasks, the sharing of artifacts, the coordination of handoffs, as well as the integration of components. Leading firms designed processes to address these activities, taking into account the experiences and preferences of partners. The aim was to decide how much standardization was needed. For example, in one software project, one team can use a rigid "stage-gate" process to develop the core technology, and another an "agile" process for the user-interface. Weekly and monthly "builds" can be used to synchronize the work of both teams (Schumpeter, J. A., 2001).

Building Platforms:

Leading and successful firms develop technology "platforms" to improve the coordination of work. These platforms comprise of four main parts: First, development tools and technologies to improve the efficiency of distributed work; then secondly, technical standards and interfaces to ensure the seamless integration of partner outputs; third, rules to govern the sharing of intellectual property among partners; and fourth, knowledge management systems to capture the firm's experience on how distributed work is best performed. This collaboration "infrastructure" was leveraged across multiple projects over time. The goal is to promote a long-term view of the assets needed for effective collaboration (Swink, M., 2006).

III. METHODOLOGY

This section outlines the methods that was used for the analysis and collection of data from repositories. In carrying out this study, we followed the principles outlined in inductive categorization method (Dube & Pare, 2003). More specifically, we did the following: (1) carefully selected relevant journals, and those that are pertinent to the context of our study, (2) identified the articles published in those journals which are relevant to our study by using carefully selected keywords as unified computing systems, innovation, collaboration and a lot

more key words (3) categorized the selected (and short-listed) articles by drawing on different theoretically grounded categorization schemes, (4) assessed (and calculated) the number of articles in different categories and sub-categories, (5) analysed the trends and identified gaps. We had to select journals based on their reputation in the Information Technology discipline and also based on their relevance to our study topic which was collaborative innovation towards a unified computing environment. To decide on these journals, we reviewed 16 internationally recognized peer-reviewed journals owing to their topical relevance to the study that is collaborative innovations and unified technologies. Our assessment of journal articles thus allowed us to ensure that most high-quality papers on the topic were considered.

IV. Findings and Recommendations

Emerging IT firms especially in Kenya are at a crossroads of change and are seeking to collaborate with other firms through methods that differ from those they have used in the past. The study reveals the importance of focusing on collaboration to come up with a unified computing system that will enhance shared resources such as virtual computing resources, Internet and networking resources, as well as data storage resources which has not been implemented before by these tech firms in Kenya. By looking at the architect models, frameworks, strengths, weakness and future developments of UCS, the study addressed how these firms can collaborate effectively to bridge this gap. Unified Computing System technology has redefined the enterprise computing environment. By breaking the traditional data center model and redefining data center infrastructure as pools of virtualized server, storage, and network resources, the Unified Computing System tech firms like IBM, Cisco, Microsoft, Amazon, Suns and many others have delivered the new unified computing model with advantages in capital and operational cost, improving flexibility and availability, and reducing the amount of time needed for IT to respond to business changes. Kenya's emerging tech firms can innovatively collaborate to stage their own UCS. A key element in the power of Unified Computing System is the service profile, the fundamental mechanism by which the Unified Computing System models the necessary abstractions of server, storage, and networking. It is hoped that this study will help firms seek the appropriate collaborative innovative approaches in the future.

V. Conclusion

This study identified collaborative innovation among leading firms globally towards a unified computing system. This study presents a unified cloud computing architecture and explains the core technologies of Unified cloud computing framework. This work also reviews the evolution of cloud computing through a discussion on several key technologies such as grid computing to the emergence of Unified computing technology system. After comparing the proposed UCS architecture with the architectures of Microsoft- Trend Micro, Cisco and IBM the proposed collaborative innovation towards UCS is shown to be able to cover the core technologies of the architectures. These findings support the assertion that the proposed architecture is practical and can help emerging tech firms in Kenya develop and deploy unified computing systems. For innovators, this architecture can clearly define the scope of innovative collaboration towards UCS computing research focused on the core technology of unified cloud computing. For enterprises, the architecture can help businesses assess whether to import the unified cloud computing technology, or to determine the type of unified cloud computing services to use.

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