



## **THE ROLE OF INTERNET PROTOCOL TELEPHONY ADOPTION ON PERFORMANCE OF KCB BANK IN KENYA**

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### **Abstract**

*This study sought to investigate the Role of IP Telephony adoption in KCB Bank. The investigation was guided by several theories namely convergence theory, general system theory, graph theory and innovation theory. The study targeted KCB Bank and the unit of observation was staff in various departments. The study used descriptive survey with a Self-administered questionnaire with both structured and unstructured questions as the main instrument for data collection. Descriptive and inferential statistics were applied on collected data using SPSS 23. The study focused on four aspects- Scalability, Convergence, Interoperability and Mobility. The findings indicated IP telephony adoption by KCB Bank has a positive and significant influence on its performance. The Convergence and scalability aspects leads to enhanced security, lowered cost, system is able to handle growth and capacity, with ease of integration because multiple services are delivered on a single network infrastructure. Interoperability leads to ability to integrate with other systems and public Networks with ease. IP Telephony Mobility lead to user connection from any point in*

*the organization and service accessibility was made easier. This offers a business ways to become faster, smarter and leaner and hence improved customer satisfaction and business efficiency.*

*Keywords: Telephony, Performance, KCB Bank, Convergence, Adoption*

## **INTRODUCTION**

In today's enterprise network the demand is high in communication and the ability to communicate in all aspects, styles, text, voice and video is an essential part of the communication (Ismail, 2012). Until recently enterprise networks were divided by two main infrastructures one of which is data and the other the voice network. Maintaining data and a voice network is costly and resource wasting. Since the mid-1990s and after the internet established itself in every corner of large and small business, the thought of bringing IP Telephony (IPT) to make a voice call via the internet protocol was seen as an exciting technological development and highly possible by technology experts. IP Telephony was seen as an alternative method of communication to the existing telephone system (Pei-Chun & Mei-Hsin, 2011).

IP Telephony is not only a replacement of the legacy PBXs, but it is an enhancement to business communication. It is inherently designed based on the Internet global network, providing a borderless communications infrastructure of which no business can do without. It is clear as it is stated by many reports and whitepapers the IP telephony is the future (Zhang *et al.*, 2015).

Early providers of voice over IP services offered business models and technical solutions that mirrored the architecture of the legacy telephone network (Kayed *et al.*, 2013). Second generation providers, such as Skype; have built closed networks for private user bases, offering the benefit of free calls and convenience while potentially charging for access to other communication networks, such as the PSTN. This has limited the freedom of users to mix and match third party hardware and software. Third generation providers, such as Google Talk, have adopted the concept of federated VoIP which is a departure from the architecture of the legacy networks (Schmidt, S. & Mazurczyk, W. & Kulesza, R. & Keller, J. & Caviglione, L., 2018).

According to Ibrahim and Abdulghani (2012) one of the key drivers of converging voice and data networks is cost savings. Money can be saved, with the right IP telephony solution, in almost all areas from deployment and management time and costs to ongoing toll and lease charges (Mahani *et al.*, 2011). However, there are important considerations to analyze when deciding on a solution, including: equipment costs, which include the cost of the infrastructure

equipment and handsets; operational startup costs, including the time and resources it takes to plan, install and troubleshoot the solution once it is deployed; and finally, maintenance costs (Ismail, 2012).

Today the market for IP telephony is rapidly maturing. There has been widespread deployment and acceptance of IP telephony solutions in a broad range of market sectors, such as government, education, healthcare, finance, and manufacturing where competitive advantages depend on the ability to enhance productivity and increase mobility (Mahani *et al.*, 2011). Opportunities are not limited to these markets; in fact, new organizations have deployed IP Telephony solutions have reported a range of benefits that include cost savings, increased revenues, and new opportunities to drive business innovation. Even companies that had not been favorably disposed toward IP telephony now realize the advantages of introducing this technology into their own enterprises (Hickey, 2020).

### **Statement of the Problem**

The banking industry, in the recent past, has faced increasing competition and tremendous challenges due to industry globalization, privatization of government owned banks, entry of new competitors and narrowing profit margins (Bondi, 2012). This has prompted the industry players to adopt technologies that can reduce cost in service delivery while at the same time ensuring efficiency and customer satisfaction. IP telephony is one of these technologies (Githuku & Gituru, 2005). As compared to the previous technologies used in the banks in the past, IP telephony is scalable, interoperable, offers mobility and operates as the standard transport for transmitting all information.

In the last one decade, KCB Bank has been expanding in terms of market share, number of employees, number of branches and internationalization. This has therefore necessitated the adoption of a technology that is interoperable, scalable, mobile and that allows convergence. In the year 2015, KCB Bank announced its use of new fiber network technologies for both primary enterprise networking connectivity, as well as for back-up in branches to enhance broadband connectivity (KCB Bank, 2015). The MPLS network was integrated with KCB's communication network and provides immediate fast and scalable Wide Area network services to sites. However, despite the high first-time cost of adopting this technology, there is was no empirical evidence showing how it influenced performance in the banking industry. Various studies have been conducted on IP telephony both globally and locally (Ibrahim & Abdulghani, 2012; Ismail, 2012; Liao & Tseng, 2010; Oladipo *et al.*, 2015). For instance, Tobin and Bidoli (2006) conducted a study factors affecting the adoption of Voice over Internet Protocol (VoIP) and other converged IP services in South Africa and Ronoh (2012) conducted a

study on development and testing of a VOIP adoption framework for public organizations in Kenya by focusing on the university of Nairobi and Telkom Kenya Limited. However, there was little empirical evidence showing the role of internet protocol telephony adoption on performance. This study therefore sought to investigate on the role of internet protocol telephony adoption on performance of KCB Bank.

## LITERATURE REVIEW

### Convergence Theory

The convergence theory, in history and sociology, states that all industrial systems, whether capitalist or communist, would converge in their social, political and economic systems because of the determinant effects of technological development (Jäger, 2015). It is a view first put forward by Clark Kerr and colleagues in the 1960s. It is located in the tradition of functionalist analysis which assumes industrialism to be a particular type of society with specific needs for which like solutions will be found resulting in the development of similar types of society; it is a modern version of Max Weber's theory of the importance of bureaucratic structures in the management of production and distribution of services. It also suggests that it is the forms of technology to be found in a given society which determine the nature of that society (Franck *et al.*, 2015).

Technological convergence is the tendency for different technological systems to evolve towards performing similar tasks. Convergence can refer to previously separate technologies such as voices, data and videos that now share resources and interact with each other, synergistically creating new efficiencies (Eunhee *et al.*, 2014). The phenomenon of convergence occurs when innovations emerge at the intersection of established and clearly defined industry boundaries, thereby sparking off an evolutionary development with a much broader impact. Convergence in IP telephony involves using the Internet Protocol (IP) as the standard transport for transmitting all information (voice, data, music, video, TV, teleconferencing).

### General System Theory

The general system theory is used to explain the IP telephony *interoperability influence on performance of commercial banks*. General System Theory (GST) was originally proposed by Hungarian biologist Ludwig von Bertalanffy. From a biological point of view, an organism is an integrated system of interdependent structures and functions (Rousseau, 2015). An organism consists of cells and a cell consists of molecules which must work in harmony.

A system can either be open or closed. An open system interacts with its environment. All biological, human and social systems are open systems and many physical and mechanical

systems are closed systems (Rousseau, 2015). Traditional organization theorists regarded organization as closed systems while modern view is to treat it as an open system having constant interaction with its environment. In other words, an organization like a bank is an open system that interacts regularly with external forces such as government agencies, customers and suppliers (Caws, 2015).

The open system concept is the first part of the two parts of systems theory. The second part is the impact of changes within an organization. The changes in one part of the organization affect all other parts of the organization (Stoica *et al.*, 2015). The boundaries of open systems are permeable or penetrable, flexible and changeable depending upon its activities. The function of the management is to act as a boundary-linking pin among the various subsystems within the organizational system. An organization like a bank can be regarded as a system with components like customers, different departments, various branches as well as employees. It also comprises of independent parts like regulatory organizations such as Central bank of Kenya and Kenya Bankers Associations. For a bank to function efficiently, all components must effectively communicate (Alter, 2015). The adoption of IP telephony allows information systems and software applications to communicate, exchange data, and use the information that has been exchanged. This reduces cost communication and increases timeliness of communication, which in turn influence the performance of the bank.

### **Graph Theory**

The Hilbert graph is formed by the superposition of a Hilbert curve with an extended mesh (McClure, 2015). Nodes are placed along the middle of a segment in the Hilbert curve and the extended mesh is formed by joining nodes with the same horizontal or vertical position (Rodriguez, 2014). The Hilbert graph has a fixed degree of four, and exhibits a much better support for random communication patterns and an efficient two dimensional layout, while retaining the same cut width complexity of a two dimensional torus. Furthermore, it retains the incremental expandability found in the mesh and torus while supporting the increased traffic expected from such expansion much more efficiently.

Graph expandability seems to be the ability of the graph to accommodate new nodes while not significantly modifying its architecture (in terms of node degree, connections) or configuration (this is my term) (McClure, 2015). For example with a complete graph (all node pairs connected through one edge), adding one node more will not significantly affect the degree of the node it links to (because it is already high). And given the strong connectedness of the graph, its architecture seems to be preserved in the transformation (Rodriguez, 2014).

One of the key features of IP telephony is scalability, which is the capability of a system, network, or process to handle a growing amount of work, or its potential to be enlarged in order to accommodate that growth. IP telephony is expandable, it allows addition of new users and new components, without necessarily buying new gadgets.

### **Innovation Diffusion Theory**

IDT has been used since the 1950s to describe the innovation-decision process (Ratcliff & Doshi, 2015). According to the innovation-decision process, an individual or decision making unit, passes from first the knowledge of an innovation, then to forming an attitude toward the innovation to a decision to adopt or reject to implementation of the new idea and to confirmation of this decision. Waheed *et al.* (2015) show that the IDT is one of the most well known theories related to adoption of new technologies. Rogers transformed the model into five specific stages as follows: knowledge occurs when an individual is exposed to an innovation's existence and gains some understanding of how it functions; persuasion occurs when an individual forms a favourable or unfavourable attitude toward the innovation; decision occurs when an individual becomes involved in activities that lead to a decision to adopt or reject the innovation; implementation occurs when an individual puts an innovation into use; and confirmation occurs when an individual seeks reinforcement for an innovation-decision already made, or reverses a previous decision to adopt or reject the innovation if exposed to conflicting messages about the innovation (Ratcliff & Doshi, 2015). In the persuasion stage, five attributes that persuade an individual to adopt the innovation are: relative advantage, compatibility, complexity, trial ability and observability.

The relative advantage of IP telephony is its ability to transfer registration of an IP phone extension among local and remote devices. This allows users to use different computers in a bank by just using their login details (Pozzebon *et al.*, 2014). Unlike the old networks, IP telephony in commercial banks does not necessitate an employee to move with his or her computer to a different working station. In addition, a single working station can be used by different employees or staff at different times

## **METHODOLOGY**

### **Research Design**

This study employed a descriptive research design. A descriptive survey was deployed to attempt to picture or document current conditions or attitudes, that is, to describe what exists at the moment. Questionnaires were administered to a sample of individuals because it is suitable when collecting information on people's attitudes, opinions, habits or any variety of educational

or social issues. This study sought to examine the role of IP telephony adoption on performance of KCB Bank. This was achieved by seeking opinions from staff working in ICT department, finance department, credit department and operations department.

### The Target Population

The target population of this study constituted of all the staff working in the ICT department, finance department, credit department and operations department. The target population of this study was therefore 275 staff.

Table 1: Target Population

Department	Target Population
ICT	87
Finance	34
Credit	78
Operations	76
<b>Total</b>	<b>275</b>

Source: KCB Bank (2018)

### Sample Size and Sampling Technique

A sample size is an important concept in statistics, and refers to the number of individual pieces of data collected in a survey. The target population was 275 staff. The study applied stratified random sampling method, stratified random sampling is a method of sampling that involves taking samples of a population subdivided into smaller groups known as strata. Stratified random sampling involves taking random samples from stratified groups (for this case departments), in proportion to the population; in this way, stratified random sampling is a more precise metric (Nickolas, 2019). After identifying the departments, the researcher performed random sampling (simple random sampling) in each stratum to select participants.

Stratified random sampling was used to select 158 staff from the target population. Stratified random sampling produces estimates of overall population parameters with greater precision and ensures a more representative sample is derived from a relatively homogenous population. Stratification aims to reduce standard error by providing some control over variance (Creswell, 2011). The strata in this study was the four departments. The sample size of this study was therefore 158 respondents, the table below gives the breakdown of the sample.

Table 2: Sample Size

Department	Target Population	Proportion (%) of population	Sample Size
ICT	87	32%	51
Finance	34	12%	20
Credit	78	28%	44
Operations	76	28%	44
<b>Total</b>	<b>275</b>	<b>100%</b>	<b>158</b>

### Data Collection Instruments

The study used primary data, which was collected by use of self-administered questionnaires; the questionnaire includes structured and unstructured questions. Neuman (2013) observed that, a questionnaire defines the problem and the specific study objectives of a study. Questionnaires items were both closed ended and open ended type. As regards to the former, closed ended questions only allow specific types of responses while with respect to the open ended type, the respondents state responses as they wish (Creswell, 2011).

Self-administered questionnaires was preferred in this study because they are very economical in terms of time, energy and finances. The structured questions were used in an effort to conserve time and money as well as to facilitate an easier analysis as they are in immediate usable form; while the unstructured questions were used as they encourage the respondent to give an in-depth and felt response without feeling held back in revealing of any information.

### Data Collecting Procedures

The researcher obtained a letter of data collection from the school of human resource and development in Jomo Kenyatta University of agriculture and Technology. The researcher proceed to report to the management of the KCB Bank. Afterwards, individual questionnaires were dropped off at required positions where respondents were found and later picked up, a method commonly known as Drop-off/Pick-Up (DOPU).

The researcher took about 2 weeks to collect data from the respondents. The respondents were required to complete questionnaire as honestly and as completely as possible. The respondents were assured that strict confidentiality were maintained in dealing with their identities. The completed questionnaires were collected once filled out. However, before data collection, a pilot test was conducted.



## Data Analysis and Presentation

Data analysis process entails the process of packaging the collected data putting it in order and structuring its major elements in a way that the results can be easily and efficiently communicated (Bhattacharjee, 2012). The research instruments in this study generated both quantitative and qualitative data. Qualitative data was analyzed by use of thematic analysis. Thematic analysis is a data analysis method used in analyzing qualitative data. This method emphasizes on pinpointing, examining, and recording patterns within data. Thematic analysis was conducted in six phases, which include familiarization with data, generating initial codes, searching for themes among codes, reviewing themes, defining and naming themes, and producing the final report (Greener & Martelli, 2018). The results was then presented in a prose form.

Quantitative data was analyzed by use both descriptive and inferential statistics with the help of a statistical software known as the statistical package for social sciences (SPSS version 22). Descriptive statistics included frequency distribution, percentages, measures of central tendencies (mean) and measures of dispersion (standard deviation). This was then followed by inferential statistics such as correlation analysis and multivariate regression analysis. Inferential statistics helped the researcher to establish the relationship between the independent variables and the dependent variable. The results were then presented in tables and figures such as bar charts and pie charts. The study applied a 95% confidence interval. A 95% confidence interval indicates a significance level of 0.05 (Kathleen & Lapan, 2012). This implies that for an independent variable to have a significant consequence on the dependent variable, the p-value ought to be below the significance level (0.05).

The regression equation was;

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$$

Where:

Y = Organization performance (Dependent Variable)

$\beta_0$  = Constant Term

$\beta_1, \beta_2, \beta_3$  and  $\beta_4$ , = Beta coefficients

$X_1$ = Convergence

$X_2$ = Interoperability

$X_3$ = Mobility

$X_4$ = Scalability

$\varepsilon$  = Error term

The results from the descriptive statistics were presented in tables, bar charts and pie charts. On the other hand, the findings from the inferential statistics were presented in tables. The results of the qualitative data were presented in prose form.

## FINDINGS AND DISCUSSIONS

### The role of internet protocol telephony adoption on performance of KCB Bank

This presents the analysis to establish the role of internet protocol telephony adoption on performance of KCB Bank. The study sought to determine the influence of IP telephony convergence, IP telephony interoperability, IP telephony scalability and IP telephony mobility on performance of KCB Bank. The study sought to determine the influence of IP telephony convergence, IP telephony interoperability, IP telephony scalability and IP telephony mobility on performance of KCB Bank.

Table 3: Reliability Coefficients for the Major Variables

Variable	Number of Items	Cronbach's Alpha
Performance of KCB	7	0.79
IP telephony convergence	8	0.87
IP telephony interoperability	6	0.81
IP telephony scalability	8	0.89
IP Telephony Mobility	6	0.85

### Background Information

The study sought to establish the background information of the respondents and the respondents including respondents' gender, level of education, department they were working and finally the duration they had worked for the company.

### *Gender of respondents*

The study sought to find out the gender of the respondents in order to establish the distribution. The results were as presented in figure 1.

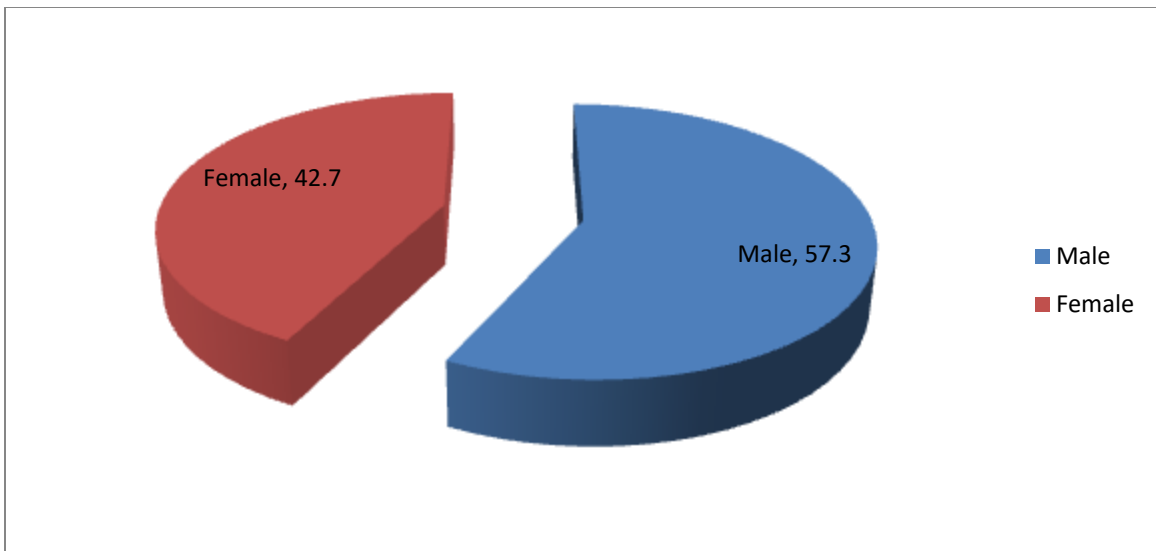


Figure 1: Gender of the Respondents

From the findings, there were 57.3% male and 42.7% female. This shows that most of the respondents in this study were male.

### Respondent's Level of Education

The respondents were asked to indicate their their highest level of education and the results were as captured in figure 2.

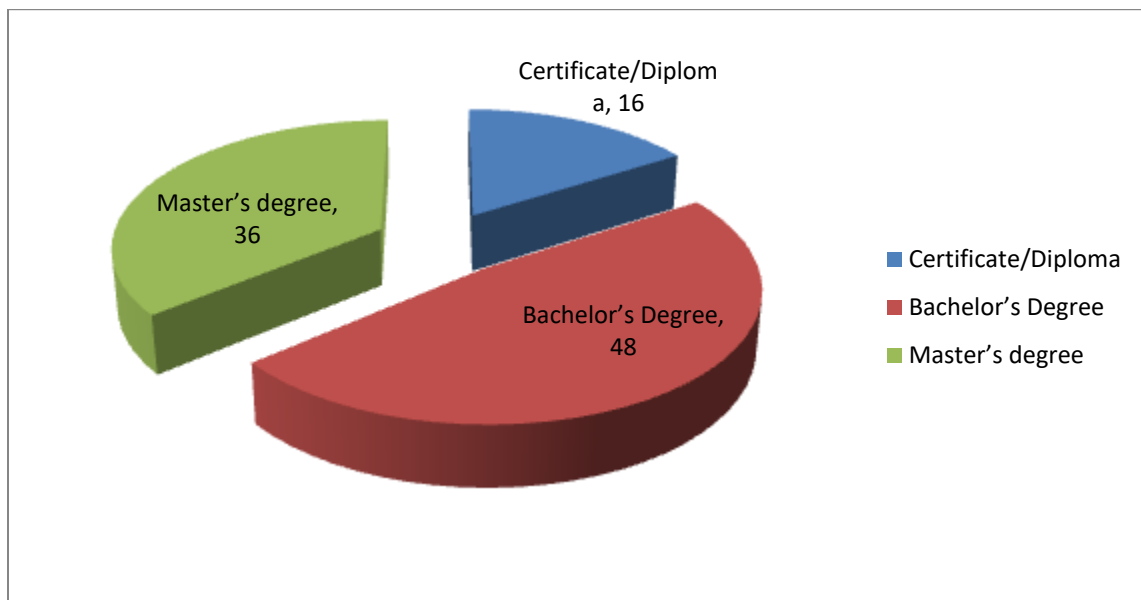


Figure 2: Education level of respondents

From the findings, 48% of the respondents indicated that they had bachelor's degree qualifications, 36% held master's degrees and 16% held certificate/diploma. The level of education qualification question was important in this study as it sought to establish whether the respondents had the prerequisite knowledge to understand the concept and strategy under research. The findings show that most of the respondents had bachelor's degrees and hence they had the prerequisite knowledge to understand the concept and strategy under research.

### Respondents' Departments

The study sought to find out the respondent's departments/section where they worked, which are captured in figure 3.

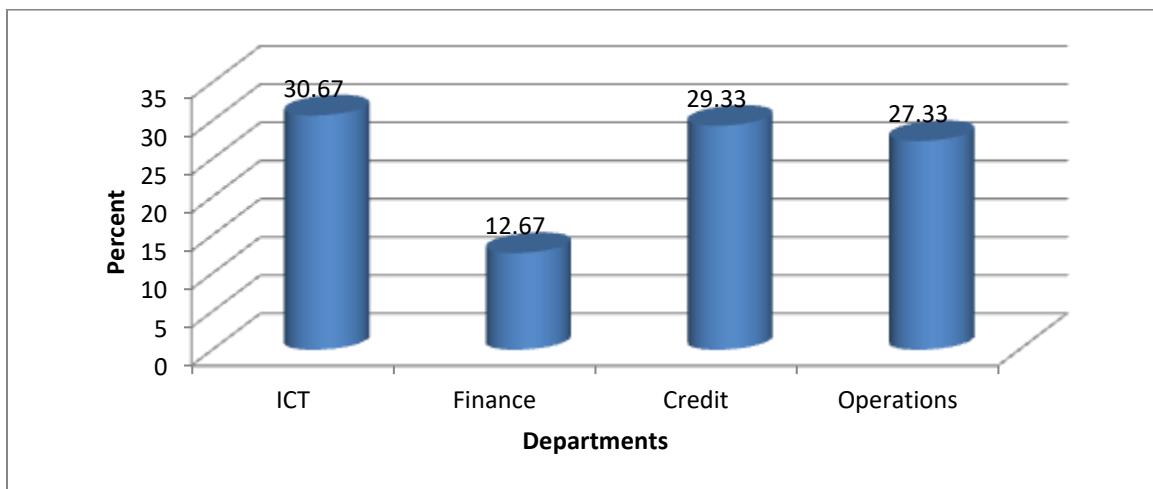


Figure 1: Department of the respondents

From the findings, majority of the respondents interviewed (30.67%) were from the ICT department, 29.33% were from Credit, 27.33% were from the operations department and 12.67% were from the finance department. The department worked information was sought to ensure all areas of the organization was covered to ensure findings were a true representation of the entire population.

### Work Experience

The study sought to find out how long the respondent had worked for KCB to ascertain whether the respondent had good knowledge of the IP telephony in relation to banking. This is presented in figure 4.

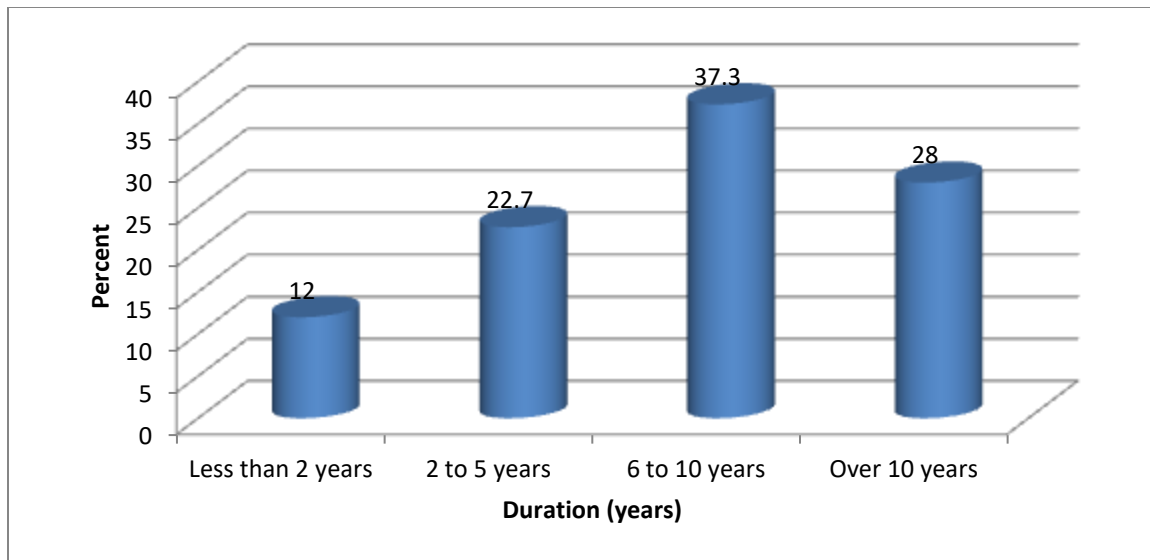


Figure 2: Duration respondents have worked

The findings reveal that, 37.30% of respondents had worked in KCB Bank for between 6 and 10 years, 28% had worked for over 10 years, 22.7% had worked for between 2 and 5 years and 12% had worked for less than 2 years. This shows that respondents have adequate experience in the banking industry and used IP telephony and thus can appreciate its contribution to performance and also give valid information for this study.

### IP Telephony Convergence

The first objective of the study was to examine the role of IP telephony convergence on performance of KCB Bank. The respondents were asked to indicate whether their organization used Internet Protocol (IP) as the standard transport for transmitting the following information. The results were as shown in table.

From the findings, all the respondents (100%) indicated that their organization used Internet Protocol (IP) as the standard transport for transmitting voice, data and video. In addition, 68% indicated that the organization was using teleconferencing, 29.3% indicated that they were using television and 17.3% indicated that they were using music. This implies that KCB Bank was mainly using Internet Protocol (IP) as the standard transport for transmitting voice, data and video. The respondents were asked to indicate the extent to which the use of the Internet Protocol (IP) as the standard transport for transmitting all information influence the performance of their organization.

Table 4: Use IP as the Standard Transport for Transmitting Information

	Frequency		Percent	
	Yes	No	Yes	No
Voice	150	0	100.0	0.0
Data	150	0	100.0	0.0
Music	26	124	17.3	82.7
Video	150	0	100.0	0.0
Television	44	106	29.3	70.7
Teleconferencing	102	48	68.0	32.0

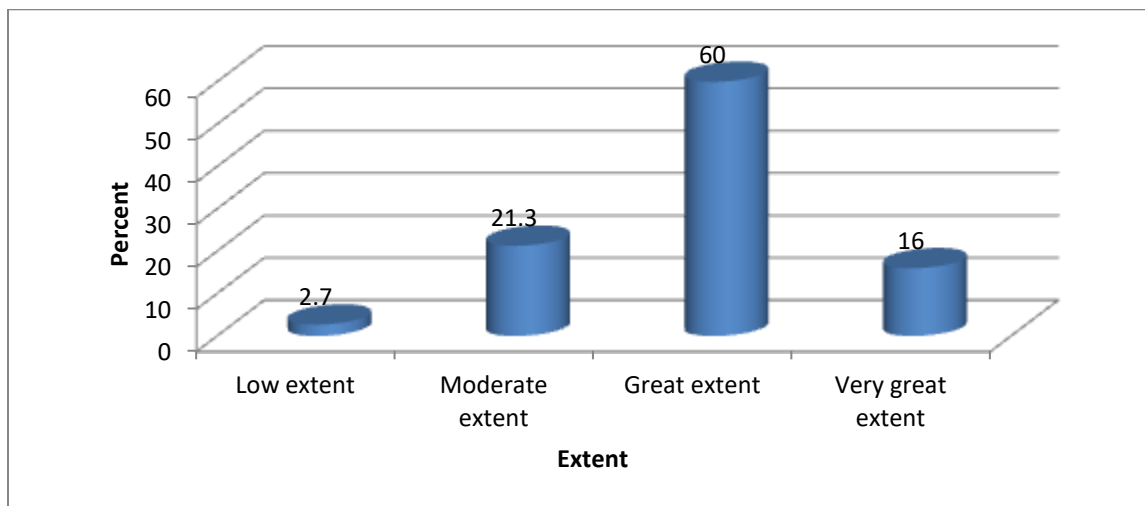


Figure 5: Extent of Using IP as the Standard Transport for Transmitting Information

According to the findings, 60% of the respondents indicated that the use of the Internet Protocol (IP) as the standard transport for transmitting all information influence the performance of their organization to a great extent, 21.3% indicated to a moderate extent, 16% indicated to a very great extent and 2.7% indicated to a low extent. These findings show that the use of the Internet Protocol (IP) as the standard transport for transmitting all information influence the performance of their organization to a great extent. These findings agree with Toshiba (2008) findings that converged communications removes these inefficiencies by delivering multiple services across a single IP network offering not just technology advantages, but real business benefits.

### **Influence of IP Telephony Convergence on Performance**

The respondents were asked to indicate the extent to which various characteristics of IP telephony convergence influence the performance of their bank. Where 1 represents no extent

at all, 2 represents low extent, 3 represents moderate extent, 4 represents great extent and 5 represents very great extent.

Table 5: Influence of IP Telephony Convergence on Performance

	Mean	Std. Deviation
Unified Communications solution	3.986	.794
Lower cabling costs in case of a new building	4.106	.686
Centralized management and call processing	4.213	.719
Integration with 3rd-party clients	4.213	.738
Personal directories on the phone	3.920	.690
Separate dedicated networks	4.053	.748
Proprietary hardware and software	4.053	.783
High-quality transmission	4.186	.846

According to the findings, the respondents indicated with a mean of 4.213 that centralized management and call processing through IP telephony influences the performance of the bank to a great extent. The respondents also indicated with a mean of 4.213 that integration with 3rd-party clients influences the performance of the bank to a great extent. The respondents further indicated with a mean of 4.186 that high-quality transmission from IP telephony influences the performance of the bank to a great extent.

In addition, the respondents indicated with a mean of 4.106 that lower cabling costs in case of a new building has an influence on the performance of the bank to a great extent. Further, the respondents indicated with a mean of 4.053 that separate dedicated network as well as proprietary hardware and software influence the performance of the bank to a great extent. With a mean of 3.986 and 3.920 the respondents indicated that unified communications solution and personal directories on the phone respectively influence the performance of the bank to a great extent.

This is in agreement with studies by Toshiba (2008) which established that converged communications removes these inefficiencies by delivering multiple services across a single IP network offering not just technology advantages, but real business benefits. Enterprises are deploying Internet Protocol (IP) telephony and unified communications (UC) solutions to improve collaboration, increase worker productivity, and contain telecommunications costs (IPT Networks, 2013). The study findings also agree with Government Technology (2012) argument that converged IP-enabled network as the backbone of all telecommunications provides ease of use, simplifies management and lowers costs because it consolidates data, voice and video

traffic on an IP-based transport and management network infrastructure. This study findings established that communication was easy and efficient within the bank across the region it was operating hence saving on the cost of international calls cost.

### IP Telephony Interoperability

The second objective of the study was to establish the influence of IP telephony interoperability on performance of KCB Bank.

### Influence of Information Exchanged on Performance

The respondents were asked to indicate the extent to which the ability of different information technology systems and software applications to communicate, exchange data, and use the information that has been exchanged influence the performance of their organization. The results were as shown in Figure 6.

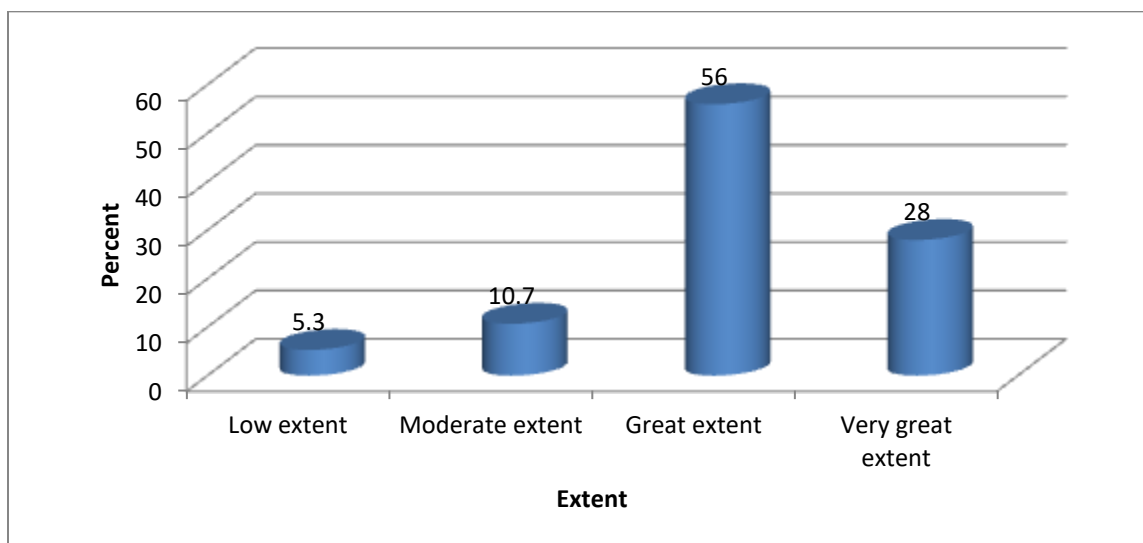


Figure 6: Influence of Information Exchanged on Performance

From the findings, 56% indicated that the ability of different information technology systems and software applications to communicate, exchange data, and use the information that has been exchanged influence the performance of their organization to a great extent, 28% indicated to a very great extent, 10.7% indicated to a moderate extent and 5.3% indicated to a low extent. This shows that the ability of different information technology systems and software applications to communicate, exchange data, and use the information that has been exchanged influence the performance of their organization to a great extent. These findings are in line with Cisco (2007)



argument that IP telephony solution adopts a unified carrier-class software and hardware platform, to ensure reliability, flexibility in deployment, and scalability.

### Characteristics of IP Telephony Interoperability and Performance

The respondents were asked to indicate the extent to which characteristics of IP telephony interoperability influence the performance of the bank. The results were as shown in table 6.

Table 6: Characteristics of IP Telephony Interoperability and Performance

	Mean	Std. Deviation
Ability to integrate telephony services with Corporate Directory without additional cost.	3.920	.847
Ability to integrate with cisco routers in remote sites for backup purposes	4.013	.874
Unified communications	4.146	.763
Exchange of data	4.120	.940
Information systems communication	4.013	.741
Real-time IP communications	3.973	.850

From the findings, the respondents indicated with a mean of 4.146 that unified communications through IP telephony influences the performance of the bank to a great extent. The respondents also indicated with a mean of 4.120 that exchange of data influences the performance of the bank to a great extent. The respondents further indicated with a mean of 4.013 that information systems communication and ability to integrate with cisco routers in remote sites for backup purposes influences the performance of the bank to a great extent. In addition, the respondents indicated with a mean of 3.973 that real-time IP communications influences the performance of the bank to a great extent. Further, the respondents indicated with a mean of 3.920 that ability to integrate telephony services with Corporate Directory without additional cost influences the performance of the bank to a great extent.

The challenge for IT managers is to leverage existing applications, user-training, and infrastructure investments while deploying new solutions that will meet their future needs. The truth is decisions are driven by how applications and capabilities match business needs while meeting IT requirements for reliability, security, interoperability, and manageability (Avaya, 2013). Vendors have implemented SIP and H.323 in various ways for different reasons, such as to gain operational efficiencies or competitive advantages. In addition, vendors frequently interpret protocols differently or implement a standard's features before they've been approved.

Standards also change over time to address market needs, leaving some users with older and different implementations. Researchers have worked on session border controllers (SBCs) to overcome Internet telephony's interoperability problems (Leavitt, 2012). Session controllers have helped resolve [these] problems and enabled Internet-telephony carriers to peer more easily and inexpensively (Cisco, 2009). Hence the study findings reveal the bank saved cost where they had old telephone system by interoperability capability of the IP system. This agrees with earlier findings on the subject.

### IP Telephony Scalability

The third objective of the study was to examine the role of IP telephony scalability on performance of KCB Bank.

### Capability of a System to Handle a Growing Amount of Work

The respondents were asked to indicate the extent to which the capability of a system to handle a growing amount of work, or its potential to be enlarged in order to accommodate that growth influence the performance of their organization. The results were as shown in figure 7.

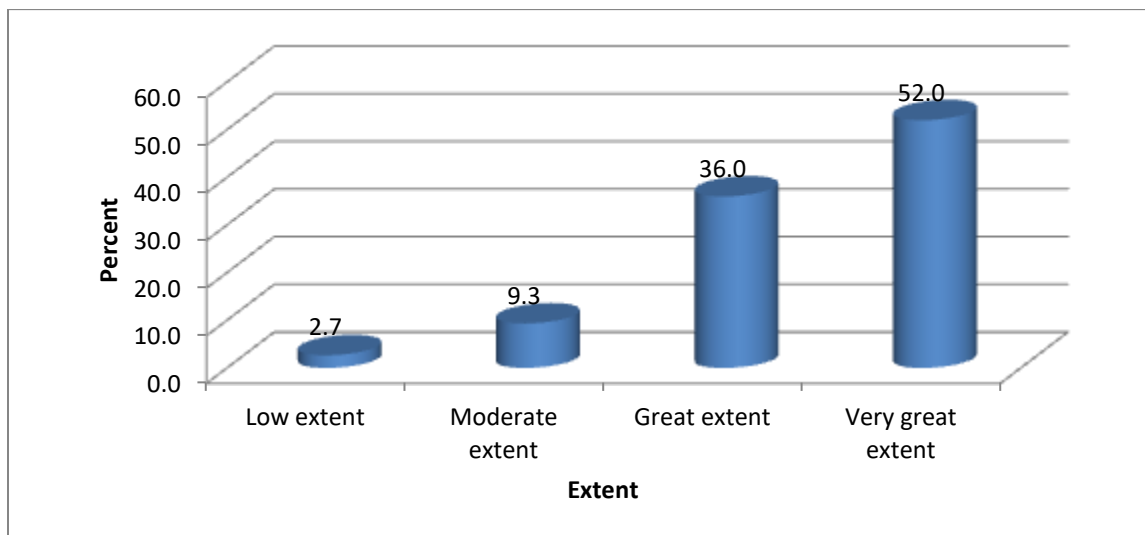


Figure 7: Capability of a System to Handle a Growing Amount of Work

According to the findings, the 52% of the respondents indicated that the capability of a system to handle a growing amount of work, or its potential to be enlarged in order to accommodate that growth influence the performance of their organization to a very great extent, 36% indicated to a great extent, 9.3% indicated to a moderate extent and 2.7% indicated to a low extent. This shows that the capability of a system to handle a growing amount of work, or its potential to be

enlarged in order to accommodate that growth influence the performance of their organization to a very great extent. These findings concur with Yu Cheng *et al.* (2005) argument that the Internet is evolving into a global all-service communication infrastructure, a key consideration is providing quality of service guarantees over IP with efficient resource utilization in a scalable, flexible, and automatic way. Poor scalability can result in poor system performance, necessitating the reengineering or duplication of systems.

The respondents were asked to indicate the extent to which characteristics of IP telephony scalability influence the performance of their bank. The results were as presented in table 7.

Table 7: Characteristics of IP Telephony Scalability and Performance

	Mean	Std. Deviation
Much easier to install and configure than a proprietary phone system	2.800	.819
Easier to manage because of web/GUI based configuration interface with centralized management	2.770	.828
Proprietary systems are easy to outgrow.	3.973	.926
Adding more phone lines or extensions often requires expensive hardware modules.	3.973	.818
Enlargement ability	3.800	1.049
Ability to handle growing number of customers	3.906	.884
Ability to handle growing number staffs	3.986	.777
Ability to handle growing number o products	4.093	.571

The respondents indicated with a mean of 4.093 and 3.986 that ability to handle growing number of products and ability to handle growing number staffs respectively influence the performance of their bank to a great extent. The respondents also indicated with a mean of 3.973 that proprietary systems are easy to outgrow and adding more phone lines or extensions often requires expensive hardware modules, which influences the performance of the bank to a great extent.

The respondents further indicated with a mean of 3.906 that the ability to handle growing number of customers influence the performance of the bank to a great extent. In addition, the respondents indicated with a mean of 3.800 that enlargement ability influences the performance of the bank to a great extent. In addition, the respondents indicated with a mean of 2.800 that the fact that IP telephony is much easier to install and configure than a proprietary phone system influences the performance of the bank to a moderate extent. Also, the respondents indicated with a mean of 2.770 that the fact that IP telephony is easier to manage because of

web/GUI based configuration interface with centralized management influences the performance of the bank to a moderate extent.

IP telephony has revolutionized this within KCB, you just need a headset and a network point and you plug and play. IP telephone system installations and upgrades take place in hours, not days and system administrators perform adds, moves, and changes easily without major training (ShoreTel, 2015). Abraxas (2014), indicates that IP Telephone System needs to be scalable and affordable integrated telephony system that offers a very wide spectrum of functionality and great reliability. IP Telephone System should fit a company of any size. You should be able to scale the system to have it fit your requirements and introduce a higher standard of reliability and efficiency to your company communications. This agrees with the findings that scalability has influenced performance of the bank by reducing on the cost of buying new PBX systems.

### IP Telephony Mobility

The fourth objective of the study was to determine the influence of IP telephony mobility on performance. The respondents were asked to indicate the extent to which the ability to transfer registration of an IP phone extension among local and remote devices influence the performance of their bank. The results were as shown in figure 8.

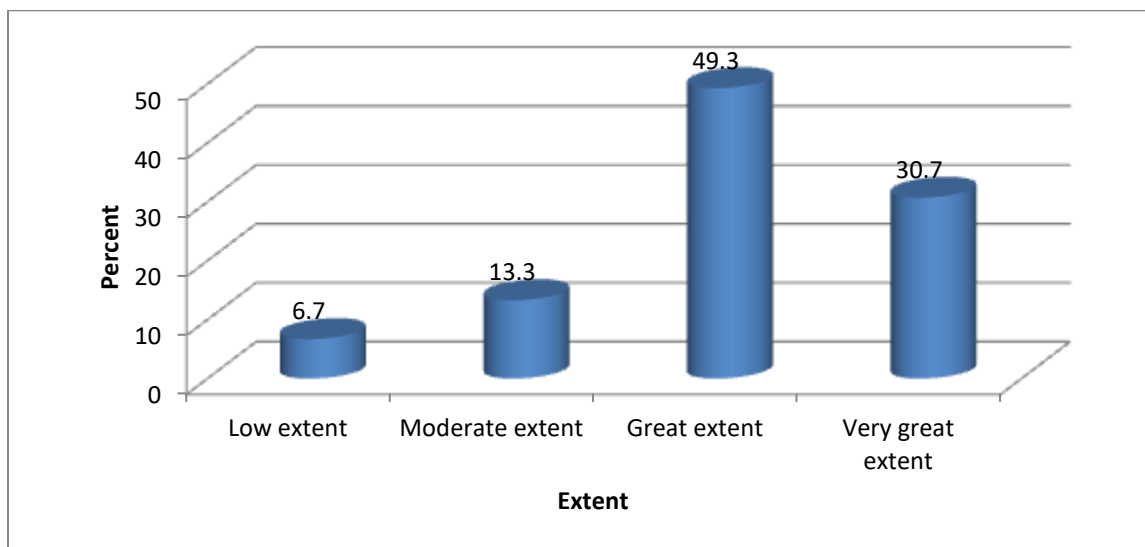


Figure 8: Ability to Transfer Registration of an IP Phone Extension among Local and Remote Devices

From the findings, 49.3% of the respondents indicated that the ability to transfer registration of an IP phone extension among local and remote devices influences the performance of the bank

to a great extent, 30.7% indicated to a very great extent, 13.3% indicated to a moderate extent and 6.7% indicated to a low extent. This shows that the ability to transfer registration of an IP phone extension among local and remote devices influences the performance of the bank to a great extent. these findings agree with Abing (2011) argument that IP telephone mobility improves the ability to transfer registration of an IP phone extension among local and remote devices with portability of all associated features, preferences and privileges can redefine the economics and productivity benefits of your business communications system.

### Characteristics of IP Telephony Mobility and Performance

The respondents were asked to indicate the extent to which various characteristics of IP telephony mobility influence the performance of the bank. The results were as shown in table 8.

Table 8: Characteristics of IP Telephony Mobility and Performance

	Mean	Std. Deviation
Extension Mobility	3.906	.771
Shared desk policy and mobile workers	3.786	1.040
Extension Mobility	3.853	.862
Accessibility from any point in an organization	3.920	.815
Use of a device by different users	4.093	.547
Connectivity of users	3.906	.884

According to the findings, the respondents indicated with a mean of 4.093 that the use of a device by different users influences the performance of the bank to a great extent. The respondents also indicated with a mean of 3.920 that accessibility of IP telephony from any point in an organization influences the performance of the bank to a great extent. The respondents further indicated with a mean of 3.906 that connectivity of users by IP telephony influences the performance of the organization to a great extent. In addition, the respondents indicated with a mean of 3.906 that extension mobility through IP telephony influences the performance of the organization to a great extent. Further, the respondents indicated with a mean of 3.786 that shared desk policy and mobile workers influences the performance of the organization to a great extent.

These findings agree with Hristea and Tobagi (2001) argument that with the solution has to be incrementally scalable to handle a large number of mobile users and wide geographical scopes, and well performing so as to support all application requirements including voice and video communications and a wide range of mobility speeds. These days, more and more

business is conducted out of the office, which means organizations need the tools to enable their employees to get the job done. But when it comes to accessing the integrated features now available in voice communications, employees have been chained to their desks, hampering productivity, cost-effectiveness, customer service and, ultimately, strategic advantage (Telstra, 2008).

Abduljalil and Bodhe (2007) had earlier revealed that IP Telephony offers your business ways to become faster, smarter and leaner. It can be implemented for maximum flexibility to leverage existing investments, while provisioning for the future (Alcatel, 2015). While the respondents appreciated the mobility functionally brought by IP telephony they felt they are yet to fully optimize on mobility especially in branches. Hence there is need for the business and IT to focus on the benefits of mobility and explore more possibilities to unlock the employee potential on the move.

### Performance of KCB Bank Group

The respondents were asked to rate the performance in the bank after the adoption of IP telephony. The results were as shown in figure 9.

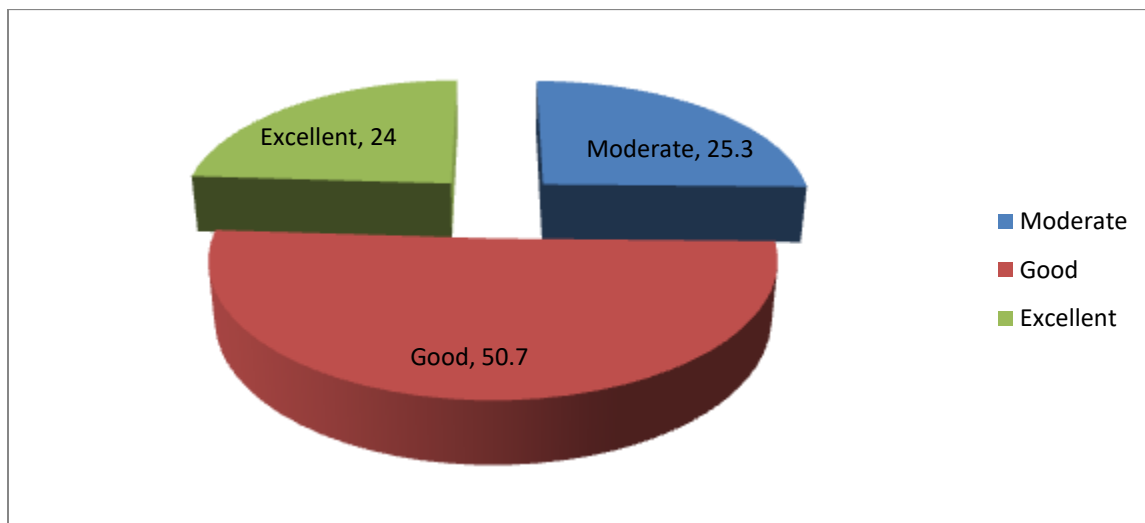


Figure 9: Performance in the Bank after the Adoption of IP telephony

According to the findings, 50.7% rated the performance in the bank after the adoption of IP telephony as good, 25.3% rated it as moderate and 25% rated it as excellent. This shows that the performance of KCB Bank after the adoption of IP telephony was good.

### Measures of Performance in the Bank and IP telephony Adoption

The respondents were also asked to rate the various measures of performance in the bank after the adoption of IP telephony. Where 1 represented poor, 2 represented bad, 3 represented moderate, 4 represented good and 5 represented excellent.

Table 9: Measures of Performance in the Bank and IP telephony Adoption

	Mean	Std. Deviation
Customer satisfaction	4.120	.654
Efficiency in service delivery	4.493	.642
Profitability	4.440	.549
Return on assets	4.173	.721
Return on equity	4.373	.690
Return on investment	4.040	.664
Growth	4.160	.786

From the findings, the respondents rated efficiency in service delivery and profitability after the adoption of IP telephony were good as indicated by means of 4.493 and 4.440 respectively. The respondents also indicated with a means of 4.373 and 4.173 that return on equity and return on assets after the adoption of IP telephony were good. Further the respondents indicated with means of 4.160 and 4.120 that growth and customer satisfaction in the organization after the adoption of IP telephony were good. The respondents also indicated a mean of 4.040 that return on investment after the adoption of IP telephony was good.

### Average Performance Before and After Adoption of IP telephony

From secondary data, the study sought to establish the average performance four years before and after adoption of IP telephony. The results were as shown in table 10.

Table 10: Average Performance Before and After Adoption of IP telephony

Year	Return on equity	Return on assets	Profitability (millions)	Net assets
2003-2006	17.67	1.77	5248	114920
2007-2010	24.66	3.71	6805	173083

From the findings, return on equity (24.66%) after the adoption of IP telephony (2007-2010) was greater than return on equity (17.67%) before the adoption of IP telephony (2003-2006). The results also show that return on assets (3.71%) after the adoption of IP telephony (2007-2010)

was greater than return on equity (1.77%) before the adoption of IP telephony (2003-2006). In addition, the study found that profitability of the bank (6805000) after the adoption of IP telephony (2007-2010) was greater than profitability (5248000) before the adoption of IP telephony (2003-2006). Further, the study found that net assets (173083000) after the adoption of IP telephony (2007-2010) was greater than the net assets (114920000) before the adoption of IP telephony (2003-2006). The findings show that return on equity, return on assets, profitability (millions), net assets had improved after the adoption of IP telephony.

### **Inferential Analysis**

In this study, regression analysis and correlation of variables were applied to determine the relationship of each of the four variables with respect to performance of KCB Bank (KCB).

### **Correlation analysis**

This study made use of Pearson product-moment correlation analysis to determine whether there is a relationship between the independent variables and the dependent variable. A correlation is defined as a number between -1 and +1 that measures the degree of association between two variables. A positive value for the correlation implies a positive association. A negative value for the correlation implies a negative or inverse association. A coefficient of zero means there is no relationship between the two items and that a change in the independent item will have no effect in the dependent item.

According to the findings, there is a positive association between IP telephony convergence and the performance of KCB Bank as shown by a correlation coefficient of 0.960 and a p-value of 0.000. The p-value is less than 0.05 and hence the association was significant. In addition, there is a positive and significant association between IP telephony interoperability and the performance of KCB Bank as shown by a correlation coefficient of 0.959 and a p-value of 0.000. Further, the findings show that there is a positive significant association between IP telephony scalability and the performance of KCB Bank. This is shown by a correlation coefficient of 0.934 and a p-value of 0.007. Lastly, the findings show that there is a positive association between IP Telephony mobility and the performance of KCB Bank as shown by a correlation coefficient of 0.930 and a p-value of 0.000, where the p-value was less than 0.05 and hence the association was significant.

### **Regression Analysis**

In this study, a multiple regression analysis was conducted to establish the role of IP Telephony adoption on the performance of KCB Bank.



The multiple regression equation was;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where: Y = Organization performance (Dependent Variable);  $\beta_0$  = Constant Term;  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$  and  $\beta_4$ , = Beta coefficients;  $X_1$ = Convergence;  $X_2$ = Interoperability;  $X_3$ = Mobility;  $X_4$ = Scalability and  $\varepsilon$  = Error term.

Table 11: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.869	0.755	0.738	0.15194

The R-Squared is the proportion of variance in the dependent variable which can be explained by the independent variables. From the findings, the R-squared in this study was 0.755, which shows that the four independent variables (IP telephony convergence, IP telephony interoperability, IP telephony scalability and IP telephony mobility) can explain 75.5% of the variation in the dependent variable. This clearly shows that other factors not considered in this study explain 24.5% of the variation in the dependent variable, performance of KCB Bank.

Table 12: Coefficients of Regression Equation

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
	(Constant)	.949	.085		
IP telephony convergence	.470	.082	.524	5.702	.000
IP telephony interoperability	.292	.077	.374	3.811	.000
IP telephony scalability	.255	.066	.317	3.833	.000
IP Telephony mobility	.186	.077	.234	2.414	.017

The established model for the study was:

$$Y = 0.949 + 0.470 X_1 + 0.292 X_3 + 0.255 X_2 + 0.186 X_4$$

From the table above, the findings show that there is a positive significant relationship between IP telephony convergence and the performance of KCB Bank with a regression coefficient of 0.470. This shows that a unit improvement in IP telephony convergence would lead to a 0.470 improvement in the performance of KCB Bank. The p-value (0.01) was less than the significance level (0.05), hence the relationship was significant.

The results also show that there is a positive significant relationship between IP telephony interoperability and the performance of KCB Bank with a regression coefficient of 0.292. This shows that a unit improvement in IP telephony interoperability would lead to a 0.292 improvement in the performance of KCB Bank. The relationship was significant as the p-value (0.000) was less than the significance level (0.05).

From the findings, the study found that there is a positive relationship between IP telephony scalability and the performance of KCB Bank with a regression coefficient of 0.255. This indicates that a unit improvement in IP telephony scalability would lead to a 0.255 improvement in the performance of KCB Bank. The relationship was found to be significant as the p-value (0.001) was less than the significance level (0.05).

Lastly, the study results show that there is a positive significant relationship between IP Telephony mobility and the performance of KCB Bank as shown by a regression coefficient of 0.186. This indicates that a unit improvement of IP Telephony mobility would lead to a 0.186 improvement in the performance of KCB Bank. This relationship was significant as the p-value (0.005) was less than that of the significance level (0.05).

## **SUMMARY**

### **IP Telephony Convergence**

The study found that IP telephony convergence has a positive and significant influence on the performance of KCB Bank. KCB Bank was mainly using Internet Protocol (IP) as the standard transport for transmitting voice, data and video. The study also revealed that the use of the Internet Protocol (IP) as the standard transport for transmitting all information influence the performance of their organization to a great extent. Converged communications removes these inefficiencies by delivering multiple services across a single IP network offering not just technology advantages, but real business benefits. The study established that centralized management and call processing through IP telephony influences the performance of the bank to a great extent. The study also found that integration with 3rd-party clients and high-quality transmission from IP telephony influences the performance of the bank to a great extent.

### **IP Telephony Interoperability**

From the findings the study established that IP telephony interoperability has a positive and significant influence on the performance of KCB Bank. The study found that the ability of different information technology systems and software applications to communicate, exchange data, and use the information that has been exchanged influence the performance of their organization to a great extent. The study revealed that unified communications, exchange of

data and information systems communication and ability to integrate with cisco routers in remote sites for backup purposes influences the performance of the bank to a great extent. In addition, the study found that real-time IP communications and ability to integrate telephony services with Corporate Directory without additional cost influences the performance of the bank to a great extent. IP telephony solution adopts a unified carrier-class software and hardware platform, to ensure reliability, flexibility in deployment, and scalability.

### **IP Telephony Scalability**

The study revealed that IP telephony scalability has a positive and significant influence on the performance of KCB Bank. The study found that the capability of a system to handle a growing amount of work, or it's potential to be enlarged in order to accommodate that growth influence the performance of their organization to a very great extent. Internet is evolving into a global all-service communication infrastructure, a key consideration is providing quality of service guarantees over IP with efficient resource utilization in a scalable, flexible, and automatic way. However, poor scalability can result in poor system performance, necessitating the reengineering or duplication of systems.

### **IP Telephony Mobility**

The study established that IP telephony mobility has a positive and significant influence on the performance of KCB Bank. The study also revealed that the ability to transfer registration of an IP phone extension among local and remote devices influences the performance of the bank to a great extent. IP telephone mobility improves the ability to transfer registration of an IP phone extension among local and remote devices with portability of all associated features, preferences and privileges can redefine the economics and productivity benefits of your business communications system.

## **CONCLUSION**

The study concludes that IP telephony convergence has a positive and significant influence on the performance of KCB Bank. This study found that centralized management, separate dedicated networks, proprietary hardware and software and separate dedicated networks influence the performance of KCB Bank. In addition, IP telephony convergence leads to enhanced security, lowering the cost of integration and network cabling. Also, converged communications deals with inefficiencies by delivering multiple services across a single IP network offering not just technology advantages, but real business benefits.

The study also concludes that IP telephony interoperability has a positive and significant influence on the performance of KCB Bank. The study established that unified communications, exchange of data, information systems communication and real-time IP communications influence the performance of KCB Bank. The ability to integrate with communication gateways in remote sites and seamlessly integrates the enterprise network with public networks. The truth is decisions are driven by how applications and capabilities match business needs while meeting IT requirements for reliability, security, interoperability, and manageability.

The study further concludes that IP telephony scalability has a positive and significant influence on the performance of KCB Bank. The study revealed that enlargement ability, ability to handle growing number of customers, ability to handle growing number staffs and the ability to handle growing number of products influence the performance of KCB Bank. IP Telephone System needs to be scalable and affordable integrated telephony system that offers a very wide spectrum of functionality and great reliability.

Lastly, the study concludes that IP Telephony mobility has a positive and significant influence on the performance of KCB Bank. The study found that extension mobility, use of a device by different users, connectivity of users and accessibility from any point in an organization influence the performance of KCB Bank. IP Telephony offers a business ways to become faster, smarter and leaner. IP telephony mobility leads to improved customer satisfaction, business efficiency and increased performance due to powerful functionality such as corporate directory access, text messaging and ability to schedule conference and meeting rooms from IP Phone.

## **RECOMMENDATIONS**

From the study findings and conclusions, the study recommends that IP telephony components must provide service with high-availability, comparable to traditional telephony systems. There is need for an efficient and scalable fault-tolerance mechanism for migrating calls to an alternate IP telephony call controller in the event of the failure of the call controller or network connectivity to it. Also an efficient algorithm for merging components of migrated calls needs to be in place, so that the same call features are available on these calls as the original calls. Some of these techniques have been incorporated in commercial products, resulting in improved fault-tolerance.

While the IP telephony has been in use and working well there is need to train users on all the functionality of the system. Users only use for normal calls yet they are able to conference call and collaborate across units or branches. This will increase productivity and help create seamless operation across branches which results in quality customer service. IP

telephony provides a way for you to extend highly secure, reliable, and consistent communications services to all your employees whether they are in main campus locations, at branch offices, working remotely, or are mobile. IP telephony transmits voice communications over the network using open-standards-based Internet Protocol, these values will only be achieved if users have a clear know how.

The study also recommends the bank consider moving to the cloud to low the cost of operation further by removing the need to invest in high end equipment's. With VoIP and the cloud acting as a tide that lifts all boats of business, no matter what the size, combining the two seemed like a forgone conclusion and it was. Businesses of every stripe now combine the versatility of VoIP with the convenience of the cloud. Cloud-based IP calling provides a reliable platform for unified communications, combining voice, messaging, video, chat and even fax into one entity. Free call forwarding services allow calls to be routed and redirected, even to mobile employees in the field. Software-based updates are passed on for free without any requirements or hardware upgrades. All of these features are available on traditional VoIP networks but with the cloud, businesses can have them without having to house, secure or maintain any of the complicated and expensive infrastructure on premise, leaving that responsibility instead to a third-party host.

## FURTHER STUDIES

The study found that the internet protocol telephony adoption explains 75.5% of the performance of KCB Bank. Therefore, further studies should be conducted to establish other factors affecting the performance of KCB Bank. Since the study was limited to KCB Bank, the findings cannot be generalized to other commercial banks in Kenya. Thus, further studies should be conducted on the role of internet protocol telephony adoption in the performance of other commercial banks in Kenya.

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