A STUDY OF THE USE OF THE INTERNET
BY THE QUANTITY SURVEYORS IN KENYA

Submitted By

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DECLARATION

I, Obaga Barrack Mokua, hereby declare that this project is my original work and has not been presented for examination for award of a degree in any other university.

Signed:..............................  Date:..............................

Obaga Barrack Mokua

DECLARATION OF THE SUPERVISOR

This research has been submitted for examination with my approval as a university supervisor.

Signed:..............................  Date:..............................

Dr. Njeri Wachira-Towey
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The Almighty God, for the opportunity and blessing of education.
DEDICATION

For JJ and RA Obaga ~ the finest parents I have ever known

For CM Mulehi ~ because you rock

Na zdrowie!
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LIST OF ACRONYMS

AAK- Architectural Association of Kenya
BORAQS- Board of Registration of Architects and Quantity Surveyors
CAD- Computer Aided Design
CCK- Communications Commission of Kenya
EDGE- Enhanced Data for Global Evolution/ Enhanced GPRS
EASSy- Eastern Africa Submarine Cable System
EDM- Electronic Document Management
ERP- Enterprise Resource Planning
GPRS- General Packet Radio Service
ICT- Information Communication Technologies
ISP- Internet Service Provider
IQSK- Institute of Quantity Surveyors of Kenya
KSHS- Kenya Shillings
LED- Light Emitting Diode
MISP- Mobile Internet Service Providers
OS- Operating System
QoS- Quality of Service
QS- Quantity Surveyor
RIM- Research In Motion
ROI- Return On Investment
TEAMS- The East African Marine System
UK- United Kingdom
USB- Universal Serial Bus
WPMS- Web-based Project Management System
ABSTRACT

The internet is barely two decades old in Kenya and yet it has changed how professional organizations in Kenya and the world over conduct their businesses. At the same time, about five decades since Quantity Surveying was formally introduced in Kenya, the profession has experienced both growth and challenges in utilizing the available information technologies. However, none of these technologies is going to have a more definitive and pronounced impact as the internet. The Internet is a litmus test for professions in our day and age as far as adaptability and agility is concerned in the consumption of technological products and services.

This research project examines the extent to which the Internet has impacted the Quantity Surveying practice in Kenya today. The objectives of this study include the investigation of the current state of internet usage among the QSs. It has evaluated the time and money allocation as well as experiences and perceptions right from individual practitioners to the larger organizations. It focuses on the time dimension where it assesses and describes the amount of time the professionals spend on the various internet devices and how they manage to distribute their time spent online on the various applications and activities. This study identified the benefits and barriers facing the adoption of the internet in the various aspects of professional practice of the Kenyan Quantity Surveyor.

The study was conducted using a field survey whereby a sample of Quantity Surveyors in a number of firms in Nairobi took part in. The data was presented using charts and tables and subsequently analyzed.

A key finding of this study is that most Quantity Surveyors in Kenya still prefer to connect to the internet using desktop computers; despite the emergence of tablets and smartphones. In fact, most QSs in Kenya use the internet to search for information on the building products they use or recommend for their projects. This is all against the backdrop of relatively inefficient services by the ISPs.

The study has established that more has to be done and, therefore, the professional institutions and professional organizations should look forward to the opportunities and the possible efficiencies of utilizing the Internet by the Quantity Surveyors. This should be aimed at harnessing the opportunities arising from the growing reliance and use of the internet.
CHAPTER 1 INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Kenya has experienced remarkable economic development over the period spanning the years between 2000 and 2012. Notable growth has been experienced in the building and construction sub-sectors as well as the Information and Communication Technology (ICT) sector. According to the annual report by World Bank, *Kenya Economic 2011* growth in the construction sector was at 8.1% in the first half of the year. This was compared against the 2.2% growth over the same period in the previous year, 2010. The annual economic survey Kenya National Bureau of Statistics (KNBS, 2012), indicated that the building and construction industry grew by 4.3% in the year 2011, a drop from 4.5% growth in the previous year. This report further highlighted a 55.8% growth in investment in form of various construction loans and advances to construction-from Kshs 32.6 billion in 2010 to Kshs 50.8 billion in 2011.

Additionally, there was a remarkable increase in value of construction developments that were completed. In 2010, the value of completed stood at Kshs 38.3 billion compared to 2011’s Kshs 43.1 billion. The data indicates increased and growing investment in the building and construction sub-sector of the Kenyan economy.

Over the same period, there has been increased investment in the ICT sector. According to World Bank’s report, *Kenya Economic Update 2010*, the sector has seen an average growth of 20% per year. The impact of growth was pivotal in the 3.7% economic growth for the year 2000. According to the report, without the ICT sector, the economy would have stagnated at a 2.8% growth rate. Over the period, there has been further investment in the ICT in terms of fibre optic cables that have revolutionized the connectivity between Kenya and the rest of the world. At least $700 million has gone into the installation of 2 main fibre optic cables in Kenya. The government and private internet and data services
providers injected at least $60 million in internet and data services. Over time, there has developed need for establishment of proper structures to exploit the data market in Kenya (World Bank, 2010).

1.2 PROBLEM STATEMENT

The construction sub-sector of the Kenyan economy is characterized by distinctive organizations, bodies and professionals. There is, therefore, a lot of data that is exchanged among these different stakeholders. For instance, there are professionals ranging from design team, consisting of architects, civil and structural engineers, mechanical and electrical engineers to those involved with implementation especially the contractor and the sub-contractors. There is also the client for any given project as well as statutory regulatory bodies that influence various aspects of any construction project, such as sanitation and environment.

The resultant fragmented nature has resulted to a comparatively poor performance of the sector (Latham, 1994). This is best illustrated by crippled inter and intra stakeholder communication in the project teams. Consequently, the project’s performance and output is compromised due to poor integration, collaboration and coordination of the stakeholders as a result of the poor communication systems (Faniran et al, 2001).

Cost information and cost data flow within project organizations and the construction industry have to be integrated in such a manner that relevant cost data is captured in order to address the increasing complexity of projects and client needs, demands and expectations (Sommerville et al, 2012). In Kenya, there is increasing demand for real-time data and information that has to be created, transferred or stored. This is important in managing the constantly fluctuating construction contracts as well as the vulnerability of construction personnel that is on the rise as far as data and information in projects is concerned.

One aspect of handling the cost data and cost is through collaboration among the professionals, right from a single small project level to the
industrial level. In one way or the other, the aforementioned stakeholders are controllers of data that flows throughout a project. There are professionals and industry players who play the role of information moderation or alternative can influence the procurement process or path that will be adopted (Sommerville et al, 2012). In Kenya, despite 60% growth in internet use in 2010 and the investments made in necessary infrastructure, the data-laden construction field has not yet adopted a centralized electronic data bank for the stakeholders to utilize. According to Xerox (2002), generally, there is only approximately 12% of data that can be found in shared environments, including those that are IT-enabled.

The presence and creation of an electronic building information system focused on the cost data is, therefore, essential in facilitating interdisciplinary interactions within construction project organizations and the industry as a whole. The databank would greatly facilitate smooth and open processes during the construction process and access and sharing of the construction information. One way could be starting at addressing the needs at the lowest level of the construction supply chain that are tailored to specifically address the needs of the Kenyan construction industry.

There is also an increasing volume of cost information that flows within a construction project’s environment. Some of the information flows outside the project while other information flows within the project itself.

Information that flows ‘outside’ the project includes information on tenders, labour (skilled, semi-skilled and unskilled), building materials, forecasts, prices based on building types and region, occupancy information and running costs of buildings. There is also information on procurement, construction trends and graphs as well as cost of buildings that can be expressed in terms such as unit rates, material prices or labour costs. This kind of information also incorporates matters regarding
financing of the building under construction e.g. mortgages, assets, advances, commitments and lending.

The information that flows ‘within’ a given project may include cost estimates, warranties, tests and certifications, photographs, invoices, requests for information and operations and maintenance manuals. This information may also include progress schedules for the project and fabrication drawings as well as safety inspection reports, daily reports, communication plans, quality control plans, insurance and manufacturers’ product data.

The internet infrastructure could possibly be one of the best avenues of relaying the cost data within the construction industry and specifically among the Quantity Surveyors. The pervasiveness of digital data on construction cost can be felt throughout the Kenyan economy, the QS organizations and practitioners, especially those who use the various internet-enabled technologies (McKinsey Global Institute, 2011). There are many possible ways through which the internet can be critical in the generation, communication, sharing and accessing of cost data within and between QS firms and other external entities in the construction process.

In Kenya, like in other similar economies, construction has experienced negative productivity growth. According to the McKinsey Global Institute report, this can be attributed to possible systemic barriers that hinder the uptake and utilization of the internet in sharing, among other forms of data and information, cost data (ibid).

There are potential opportunities and challenges that arise from increased use or the adoption of the internet as a channel for sharing and exchanging information involved in the construction process. One of the main challenges is privacy of data and willingness of QS firms and practitioners to evolve in terms of the technologies and platforms and their organization structures in order to benefit the most.
The internet has the potential of being a great source of data and information to the Quantity Surveying firms in Kenya. The QS firms can further exploit the internet resources and infrastructure that is already in place in the exchange of data and information pertinent to their day to day work. This study seeks to investigate the current usage of the internet by these firms, how the data and information can be harnessed and the potential challenges and pitfalls that the Kenyan QS firms are likely to face.

1.3 OBJECTIVES OF THE STUDY

a. To establish the current state of internet use by Quantity Surveyors in Kenya as a tool of data exchange and source of information

b. To study the potential benefits likely to be accrued with the integration of the internet by various Quantity Surveying firms and practitioners in the Kenyan construction industry

c. To establish the potential challenges and pitfalls likely to be encountered by the Quantity Surveyors in the uptake of internet resources

1.4 RESEARCH QUESTIONS

What internet-based tools, resources and applications are the Quantity Surveyors in Kenya utilizing in their consultancy work?

What hardware devices are used by the Quantity Surveyors in Kenya in accessing the internet? How much have the Quantity Surveyors invested in using the internet in terms of time and money?

To what extent are the Quantity Surveyors using the internet as a source of information and tool of data exchange today?

What online activities do the Quantity Surveyors engage in as part of their work?

What are the potential benefits that Quantity Surveyors can enjoy from the incorporation of various internet services in their day to day work?
What are the other available online applications available to the Kenyan Quantity Surveyors that will potentially give them an edge over their contemporaries, both locally and abroad? What are these benefits?

What challenges and impediments do the Quantity Surveyors in Kenya face in utilizing the Internet resource?

1.5 RESEARCH PROPOSITION

Based on the above, the following proposition was formulated:

The Quantity Surveyors in Kenya have not invested enough time and money in Internet resources resulting in its under-utilization as a source of information in the profession.

1.6 SIGNIFICANCE OF THE STUDY

This research seeks to highlight the urgent need to integrate the usage of the internet by the Quantity Surveyors in Kenya. This would enable the construction industry engage all the cost consultants in the construction industry on a real-time basis. In addition, it will provide grounds upon which other applications and uses of the internet would emerge, for example, the formation of cost databanks, construction information silos and the creation of primary and secondary sources of information.

The study also seeks to encourage the exploration of technologies that run on the internet that would facilitate the efficient running of projects, for example, use of internet-enabled mobile devices namely tablets, smartphones, mobile phones and laptops. The use of these devices coupled with the emerging ‘Generation Y’ of the Quantity Surveyors who rely a lot on online interactions could transform how the QS will carry out their work in Kenya. The profession ought to identify points where it will evolve with the emerging technological trends especially the internet.

The construction industry would also spur a wave of innovation through the adoption of the internet by the Quantity Surveyors. Potentially, QS packages and software suites can be run online by utilizing the Cloud Technologies. This would in turn raise a breed of consultants who will
analyse the data and information and relay the conclusions/evaluations back to the consultant Quantity Surveyors or institutions interested in the information.

1.7 SCOPE AND PURPOSE OF THE STUDY

The purpose of this study is to identify and assess the current levels of usage and investment by professional firms in internet services.

1.7.1 Limitations of the Study

It is expected that some respondents, especially the registered Quantity Surveyors, will not complete and return the survey questionnaires used in the study. However, it is anticipated that firms with at least two Quantity Surveyors will be more willing to fill the questionnaires than those with one, since the questionnaires can be given to one of them.

Time may be another limitation considering the potential population of Quantity Surveyors, the administration of the research study may experience inadequate time to satisfactorily conduct the study.

1.7.2 Delimitations of the Study

Despite there being a large number of Quantity Surveyors registered in Kenya, the research will focus on those who are based in the Nairobi area. This is because it will be easier to access a wider pool of respondents over a given area due to their possible high concentration.

1.7.3 Assumptions of the Study

a. The professional firms have invested in basic computing facilities
b. There are limited informational resources relevant to the Quantity Surveying available online
c. The amount of time and money invested in internet facilities are not channeled towards professional activities and uses by the Quantity Surveyors
1.8 Definition of Terms

Internet Modem Dongle: According to Webopedia (2013), these are USB connectivity dongles that are popular with mobile users who require broadband internet connectivity on-the-go.

Internet Service Provider (ISP): According to Wikipedia (2013), an ISP is an organization that provides access to the internet.

Quality of Service (QoS): A broad collection of networking technologies and techniques. The goal of QoS is to provide guarantees on the ability of a network to deliver predictable results. About (2003)


Tablet: A general-purpose computer contained in a single panel and it is distinguished by the use of a touchscreen PCMag (1996).

1.9 Organization of the Study

The study will be organized as follows:

Chapter 1 consists of the introduction, problem statement, the study hypotheses and questions, objectives of the study, research methodology and organization of the study.

Chapter 2 encompasses the literature review giving a detailed study of published works in the areas central to this study as well as an analysis of the researched work in this area of research so as to identify any resultant gaps in research.

Chapter 3 comprises the research methodology, that is, sample, instrumentation and data collection techniques as well as resulting limitations to the study will be outlined.

Chapter 4 covers the data analysis and presentation section where the data collected in the field will be analyzed to produce information from which conclusions and recommendations can be drawn. Finally, the data will be presented in this chapter.

Chapter 5 outlines conclusions and recommendations of the study as well as areas of further study.
CHAPTER 2 LITERATURE REVIEW

2.1 Nature of Construction Industry

The construction industry in Kenya, like in the UK and Singapore, can be considered to be highly fragmented. The culture among the professional firms and practitioners, contractors and clients can be said to be adversarial (Wong, 2012). The construction process has over the last two decades been broken down in such a way that different professionals have taken ownership and control of different processes and functions. The interests are pursued more at an individual basis as opposed to a team-based basis (Latham, 1994). The interrelationships between the large and increasing number of project participants has generated complexities that have resulted into inefficiencies in terms of communication and sharing of information (Grilo, 1998).

It is not uncommon to find that these groups and individuals participating in the execution of a construction project may have objectives and priorities that conflict with those of another group. This leads to poor communication between the teams and individuals during the project’s duration. Moreover, the construction industry is characterized by projects that are varied and are of a short duration. This means that the constitution of the project teams changes from one project to the next. When the fragmented nature is combined with the dynamic nature of the project teams, it becomes almost impossible to have the project teams to meet in one location. This can be attributed to the fact that each project is unique from another and each project is situated at a different location.

It is also worth noting that the construction industry in Kenya, like in other countries, is information intensive in nature (Chen et al., 1993). This can be attributed to the advancements made in the industry at both social and economic levels and the rise of a new breed of clients who demand thoroughness in the execution of the project. These clients are...
placing a lot more emphasis on quality, cost, time and value for money (Shen et al, 2003).

2.2 Current State of Internet Service Provision in Kenya

In Kenya, the internet can be accessed in a number of ways by the Quantity Surveyors and other professionals too. There are a number of devices that are common among the professionals in Kenya that are considered as internet-enabled devices. The most common ones are phones, smart-phones, tablets and laptops among the portable devices. The personal computers are still used especially in the office setting and can still provide access to the internet for the QS professional in Kenya today.

The Wi-Fi technology has particularly gained popular usage. It basically utilizes a 2.4GHz radio spectrum to transmit data. Users can connect to the internet as long as they are near ‘hotspots’ using the internet devices mentioned earlier. For instance, laptops that have wireless internet cards installed can provide access to the internet for such users. Alternatively, the portable devices such as smart-phones and tablets have data plans from various Mobile Internet Service Providers that enable users access the internet. They can also be used to access the Wi-Fi resource as in the case of the laptops. The Mobile Internet Service Providers also provide modems that enable users access the internet through the USB ports on their devices (CCK, 2012).

According to the Communications Commission of Kenya (CCK) Quarterly Sector Statistics Report for 2011/2012, there was an increase of 13.2% from the previous quarter to 6.15 million in the internet subscriptions. CCK particularly identified mobile internet subscriptions on the GPRS/EDGE and 3G as the largest contributors to the total subscription (CCK, 2012). CCK recorded a 66.97% growth in fixed fibre subscriptions for the same period and 337.4% growth compared to the same period the previous year. This was a clear indication that the fibre services were ‘rapidly gaining ground’. This contrasted sharply with satellite service
subscriptions that were experiencing a sharp decline in their subscriptions at 13.57% (CCK, 2012).

According to CCK, the main types of internet subscription include: Mobile data/internet, terrestrial wireless data/internet, Satellite data/internet, Fixed DSL data/internet, Fixed Fibre optic and fixed cable. Generally, there was a 21.55% increase in the number of internet users in Kenya.

The main mobile internet subscription operators at the time were; Safaricom Ltd, Essa Telecom (YU Mobile), Airtel Kenya Ltd and Telkom Orange. Safaricom Ltd had the largest share of subscriptions at 77.15% while Telkom Orange had the least at 1.82% as of December 2011. Kenya Data Networks (KDN) and Wananchi Telecom led the pack in fixed/terrestrial internet subscription at 33.48% and 23.55% respectively. The international bandwidth that was available in the country at the time stood at 5,261,919 Mbps. These were availed through: Seacom-International, TEAMS, Telkom Kenya’s EASSY and VSAT. CCK categorized these under two main categories: International Undersea internet connectivity and International Satellite internet connectivity (CCK, 2012).

Quantity Surveyors, and other professionals in the construction industry by extension, usually choose and utilize internet access facilities that are deemed as appropriate to the culture of the organization. The infrastructure that is eventually utilized by practicing Quantity Surveyors should be adapted to the needs of the firm or the practicing QS (Egibu, 2000).

2.3 Access to the Internet: Devices and Equipment

The introduction of mobile computing has been considered to bear potential to ensure increased data transfer on a real-time basis in construction projects (Chen, et al., 2008). However, interoperability still poses a great challenge. Interoperability is essentially the ability of information to move between devices seamlessly throughout the
construction project lifecycle. As a result, it is important that the various means through which the design teams use to access the internet and share documents and information on the internet be harmonized such that the different requirements for the different participants of the projects.

In Kenya, internet can be accessed through a growing pool of internet-enabled devices. From mobile phones to internet-enabled LED television sets, users can access internet from anywhere, anytime. The most common internet devices through which internet can be accessed in Kenya is GPRS/EDGE mobile phones. There are also smart-phones. The most common brands include iPhone, Blackberry and Nokia brands. There are also tablets such as the iPad and Samsung’s array of tablets such as Galaxy Note Series.

Internet users can still access the internet through Wi-Fi facilities, adjacent hot spots. Using devices such as Wi-Fi enabled laptops and smart-phones, users can access internet from offices or even coffee outlets. Alternatively, users can use internet modems to access internet provided by the local Mobile Internet Service Providers (MISP).

The smartphones and tablets that are becoming increasingly common run on operating systems/platforms. Most internet-enabled mobile phones operate using the Symbian operating system. The smartphones and tablets run on Blackberry, iOS [for iPhones and iPads], Windows Mobile operating system and Android operating system [for Samsung, HTC and other brands]. These platforms enable users to access the internet using default programs and applications, especially browsers.

The type of the operating system determines and influences heavily the services and kind of information sought by the internet users. Accenture (2012) has identified the following OS: Android, iOS (Apple), Microsoft Windows, Symbian (Nokia), RIM (Blackberry) and Bada (Samsung).
According to Accenture (2012), internet access through the mobile phone is on the rise. The most popular devices according to the survey are the smartphones. The use of the mobile devices for purposes of internet access has seen an upward growth due to increased usability. The other explanation for this rise is the availability of applications. The popularity in the use of the internet can also be attributed to the ‘significant improvements in network quality and coverage’ Accenture (2012).

The tablets and notebooks are preferred due to the innovative capabilities they possess. For instance, tablets possess superior image resolutions and features that facilitate faster internet access. Furthermore, these devices come with in-built applications that encompass social media and aspects of e-commerce.

Accenture (2012) has generally grouped the internet enabled devices into: mobile devices and stationary devices. The mobile devices include: smartphones, netbooks and tablets. The stationary devices include: computers, laptops, TVs and gaming consoles. Ultimately, the internet consumers are seeking unique features that will eventually connect to the internet on the ‘anywhere, anytime’ basis.

The Quantity Surveyors and other professionals in Kenya and specifically in the construction sector have the potential to be hyper-connected internet users. The smartphones can, for instance, be put to use for professional work purposes such as managing email correspondence. The tablets, netbooks and laptops can be utilized for more sophisticated professional tasks such as creation and generation of bills of quantities and drawings.

2.4 Types of Information Used in a Construction Project

The information that is used in a construction project varies from time to time in the life of the project. Information and data is generated and utilized at different points in the lifecycle. Some of the information that
has been identified as essential in the life of the project includes (JBIM, 2009):

- Cash flows in the project
- Procurement accounts
- Design Drawings
- Design Specifications
- Construction schedules
- Construction Cost Estimates
- Quality Control and Quality Assurance Records
- Construction Inspection Logs
- Legal contract documents
- Regulatory/Approval documents
- Project team correspondence files and memos

In the process of generating and handling all this information, control of the information is important. The collaborative nature of the construction projects means that the various professionals will have to rely on the information to make decisions and sharing the information.

The information takes many forms. This depends on whether the location of the project participants is on-site or off-site. It should be noted that the construction work site is the main production environment in the construction process. Consequently, a gap is created with respect to information communication between the professional team and the contractor on site. Furthermore, the construction sites are largely considered to be informal (Chen & Kamara, 2008). According to Bowden et al. (2004) the on-site staff rely on paper-based forms of communication such as drawings, progress information and specifications.

2.5 Nature of Information

Chen (2008) provided a breakdown of the forms in which construction information can take:

- Text
The information also originates from the main players in the project team, situated on and off the project site. They include but are not limited to: supervisors, client, architect/lead consultant, design team, contractors, subcontractors, suppliers, project manager and quantity surveyor.

2.6 TASKS AND FUNCTIONS OF THE QUANTITY SURVEYOR

The functions and tasks that can be done by Quantity Surveyors include (Shen et al, 2003):

- Cost Estimation
- Bills of Quantities (BQ) Measurement
- Bills of Quantities (BQ) Formatting
- Drawing Registration
- Tender Evaluation
- Financial Report
- Interim Payments
- Final Account
- Valuations of Variations
- Claims for loss/expense
- Contract Administration

These functions can be carried using desktop applications such as spreadsheets (e.g. MS Excel) or Word processing applications (e.g. MS Word). There are also more specialized software applications that are employed in the carrying out of these tasks such as VU360, WinQS32 and Masterbill.
The study also identified some of the factors which the respondent organizations used in selecting the various software applications for the above tasks. These include (Shen et al, 2003):

- User friendliness
- Compatibility
- Flexibility
- Cost
- Past Experience
- Advice from other users
- Company Policy
- Advice from consultants

The criteria above can still be used in selecting web-based applications and services for QS-related tasks.

2.7 BENEFITS OF INTERNET USAGE

The use of the internet by willing organizations may eventually prove to be the ideal technology in the simplification and standardization processes. This may extend to the collaborative aspect of working in the industry.

There are many possible applications that can be run on the internet that are relevant to the construction industry. However, it is important that the technical needs required are properly outlined in order to streamline the Internet to meet the specified user needs. Such decisions include the number of users, the level of real-time interaction anticipated and other technical information relevant to such systems.

Various studies on aspects of e-commerce have come up with various advantages of using the internet which may be applicable to the construction industry. These include:

- a. The internet can be utilized as a *communication channel* and hence applied in the organization and communication of
information (Kiang et al, 2000). Moreover, the internet can also ‘improve interactivity and perceptual experience’ (Peterson et al, 1997).

b. The internet can also be exploited as a transactional channel in the streamlining of the processes involved in transactions. Consequently, this will reduce the degree of task complexity and reduce costs associated with paperwork and transaction charges (Sandilands, 1997). As a transactional channel, the internet may also introduce flexibility in transactions (Hawn, 1996).

c. The other advantage that can be drawn from the use of the internet is its use as a distribution channel. This means there is an opportunity to reduce costs associated with delivery and operations (Edwards et al, 1998).

Other benefits and advantages of using the internet can be covered in terms of the applications that can be used: the Web-based Project Management Systems and the Enterprise Resource Planning solutions and applications.

2.7.1 Web-based Project Management Systems (WPMS): Benefits

A Web-based Project Management System (WPMS) is an electronic project management system operated through the internet. The system provides a centralized, commonly accessible, reliable means of transmitting and storing project information. Project information is stored on the server and standard Web browser is used as a gateway to exchange this information, eliminating geographic and hardware platforms boundary (Alshawi & Ingrige, 2002).

From the above, it can be said that the WPMS system has the potential of speeding up the ‘distribution of documents and the communication between clients, contractors and subcontractors’. In addition, it enables the project teams to ‘mark up and comment on drawings online’. This can be particularly essential in the processes involved in requesting for
information or approval. The WPMS also provides a platform upon which the project team can easily collaborate in an online environment.

According to the Construction Plus website, some of the WPMS software and applications used widely in the UK include: 4Projects, iProNet, Architec.net and Information Channel. The WPMS can be utilized in the management of construction projects as it enhances (Alshawi & Ingirige, 2002):

a. Information exchange
b. Information sharing
c. Information management throughout a project’s lifecycle.

The WPMS offers **Industrial Advantage** to the professional users. The main is improved ability to manage documents and personnel. Easy to monitor and track project’s progress to ensure it meets the set standards, quality and schedule requirements. It helps participants build experience when it comes to collaborative working. WPMS systems also present **Organization Advantages** i.e. small and medium entities in the industry can lease the use of a WPMS from the Application Service Providers hence cut the costs of installation and maintenance (Alshawi & Ingirige, 2002).

### 2.7.2 Enterprise Resource Planning (ERP): Benefits

ERP refers to systems that are packaged as business software that integrate and automate organization business processes: accounting, HR, manufacturing, etc. The systems also ‘connect the organization to its clients and suppliers throughout the project/product lifecycle’

The benefits of ERP systems include *(Ahmed, et al., 2003)*:

i. Creation of an integrated working environment
ii. The enabling of automation of many processes in construction projects, especially communication
iii. Integration of applications used in different departments
iv. The application of planning and program management practices throughout the project lifecycle

However, the limitations of ERP include the long time it takes to implement the system at a high cost. The Return On Investment (ROI) of such systems can be easily deduced and therefore it will be easier to assess the rate of success of the investment in the system to the organization.

The use of **Electronic Document Management (EDM)** systems has seen project teams reduce travelling times to and from construction sites. For projects that are large in scale and those that require a lot of documentation, the EDM systems can reduce the delivery times for these documents. The EDM systems also facilitate the possibility of a project team having a centralized electronic construction site diary. This in turn may be beneficial in the provision of support services by project team members working far away from the construction sites (Bjork, 2003).

### 2.7.3 Improved Productivity and Time-Saving

The Quantity Surveyors in Kenya can also increase their professional productivity and performance through significant reduction in the time taken to process the information for a given project. In most construction projects, information flows from one team member to another after ‘processing’. If the flow of such is entirely paper-based, it would be time-consuming to prepare the documents, print and present them to the next action to be undertaken. The internet provides applications and platforms upon which such communication can be made in a speedy fashion, subsequently resulting into ‘effective decision making and coordination’ among the project participants (Peansupap & Walker, 2005).

WinQS32, QSCAD, MasterBill and QS Plus are some of the desktop software applications used by the Kenyan Quantity Surveyors. These applications have transformed how QS tasks and functions are conducted from BQ Formatting to Contract Management and preparation of final
accounts. There is still room for research in the area of customizing and linking up these different applications over secure and reliable internet-based platforms to assist in collaboration among the QS's and other team members involved in construction projects.

2.7.4 Competitive Advantage

The Level of Competition between firms for construction projects both in the private and public sectors ought to be a motivation for collaboration. The level of this competition takes place at many levels: limited number of projects, available resources and talent. The Kenya QS fraternity should note that these competitions are taking place at the global level. The internet has many resources that can enable the local Quantity surveyors compete and fair well at the international level, especially where international developers are involved in new projects in Kenya (Russel, 2009).

In response to the changing construction environment, the QS should strive to possess and exhibit the ‘desirable knowledge, skills and attitudes’ to remain relevant in the information intensive construction environment and evolving QS profession. The internet has proved to offer some of the best resources that will enable the Kenyan QS carry out his professional functions and tasks a lot easier.

Moreover, construction projects are slowly by slowly traversing borders i.e. projects are located internationally. Project teams in such projects comprise of professionals situated all over the globe (Wong, 2012). Professional teams can be situated in different offices in different countries and only the contractor may be the only person located on the project site. The centralization of the construction data will facilitate the seamless flow of information among the project participants.

The competitive edge will also be realized from the ‘centralization’ of the correct versions of drawings. Designers, contractors and cost experts will
all find it easier to work from the same version of the drawings and other contract documents (Wong, 2012).

2.7.5 Facilitation of Decision Making
The other benefit to be accrued from the use of the internet by the professionals is the facilitation of decision-making. Collaborative decision making as opposed to shared decision making is regarded to be one of the ways through which professionals will come up with more equitable and favorable outcomes. Collaborative decision-making can be defined as ‘the process of engagement that seeks to devise an optimal plan of action’ (Jadad & O’Grady, 2010).

One of the ways in which the use of the Internet has revolutionized decision-making is through social media. Information in the social media networks traverses the internet at high velocity thanks to the enabling technologies. For example, professionals might tend to collaborate more outside their own organizations than within. Active users of such websites and technologies serve as very rich sources of information for the other users (DiMauro & Bulmer, 2010).

2.7.6 E-Tendering: Benefits
The tendering process forms the heart of the project lifecycle since it shapes ‘contractual and legislative agreements’ between the project team members. Tendering is generally information-intensive and characterized with a lot of paperwork such as: approvals, contract drawings, contract bills and other contractual documents. Some projects’ contract and tender documents are so much that portability poses a challenge. The expenses associated with the production may be considered to be prohibitive too.

A study conducted in the UK (Stephenson & Tindsley, 2008) identified reasons why full implementation of e-tendering would benefit their whole construction industry. One of the reasons was that e-tendering would reduce the time it takes to cover the tendering phase of projects.
The other benefit perceived as likely to come out of the implementation of e-tendering systems is improved handling of documentation. This includes reduction in paperwork. It would also ease the audit trails in the process. The audit trail can be conducted though the ‘systematic and progressive method of working’ (Lou & Alshawi, 2009).

The proponents of the introduction of the system further suggested that e-tendering would ultimately reduce the overall cost of construction projects due to lowered costs associated with paper-based tendering systems.

2.7.7 Traceability of Information

Construction information can range from little information covering only a few pages to enormous volumes of data and information. Web solutions and technologies have the capability of helping professionals sift through mountains of data to retrieve the parts that are needed. The search facilities are made easier given clear instructions (Wong, 2012).

2.7.8 Audit Trails

Systems such as those associated with e-tendering ought to have a comprehensive log of activities executed within the system by the users. Keeping track on activities facilitates the resolution and avoidance of issues that arise from incompleteness or unavailability of information.

Web-based applications can easily incorporate automated audit-trail functions that will facilitate the quick retrieval of traces in the systems (Wong, 2012). Activities of the users will be monitored closely too.

2.7.9 Improved Data and Information Security

The information on the web is constantly under threat of corruption and compromised security. Wong (2012) suggests that web-based systems such as extranets dedicated to document management offer better security infrastructures compared to simple local area networks common in most professional offices. The online document management services
provide much better security features than those offered by removable and portable data storage devices.

2.8 BARRIERS AND CHALLENGES
The adoption of and integration of the internet in the day to day work amongst professionals has not been made easy. Among the impediments encountered in the use of internet on work-related activities include: data security concerns, quality of network and the costs of setting up the facilities.

2.8.1 Data Security
The construction industry generates and utilizes a large volume of data, most of which can be regarded to be ‘private’ in nature. Therefore, the professionals tend to demand secure online environments wherein they can expose their data and information, especially concerning the projects they are handling.

According to Accenture’s survey (Accenture, 2012); some of the leading data security concerns are ‘loss of personal data, hacking of personal data and viruses’. The study revealed that these concerns affected those users who were using or intending to use cloud storage services. Consequently, there’s growing need for collaboration between the network service providers and the cloud service providers in order to come up with ‘adapted tariff plans and appropriate service policies’.

Users would need reassurance as far as the privacy of the project data is guaranteed. For instance, should there be internet-based applications designed to meet the needs of the Quantity Surveyors, they will require greater and more reliable technical capabilities in order to avoid the presence of any threats on the data and information being relayed.

2.8.2 Network Quality Issues
Since internet users want to access the services ‘anywhere, anytime’, there is growing need and calls for network that covers geographical places wherein they operate in. Construction sites are largely becoming
remote, being established further away from areas with facilities such as telecommunication facilities.

The speeds of these services also play a critical role in the use of the internet especially among the professionals. The speeds go hand in hand with the cost of data connection.

Other aspects include (Accenture, 2012):

- Quality of Customer Service
- Device Subsidy
- Devices on offer
- Content from service providers
- Special Offers

2.8.3 Privacy

The main challenge in the integration of the internet in the day-to-day work by the construction professionals calls for the protection of sensitive information from breaches of confidentiality. There is also the concern of protecting the information from corruption and the issue of validity of the information available via the internet. Therefore, it will be paramount for there to be the necessary policies and tools to validate the information sought by the construction professionals online. The pervasiveness of the internet is also critical in ensuring that the construction professionals can access the information wherever they are and whenever the information is needed.

2.8.4 Bandwidth

The professionals would also experience challenges in accessing sustainable bandwidth. The availability of predictable, sustainable and high bandwidth internet connections may be a big challenge (Echezona et al., 2010) in Kenya. The rural and other far-flung construction sites may present challenges when it comes to internet access.
The reliability of the network used by the professionals is also critical in ensuring reliable internet access.

2.8.5 Data and Information Standards

There is also the need to establish the standards for the exchange of the data. The standardization would make it easier for the users to easily access the information in a uniform manner.

The internet and associated web applications can utilize various information standards (Aouad & Ingirige, 2000). Introduction of standards would reduce the cases of duplication of data, that is, data would have to be introduced once into the systems but can be used by the project teams regardless of the applications they use that may be specific to their role in the project. For instance, the QS would not need to print out drawings or use a CAD application to scale off and obtain measurements, but will instead import the information using a given common standard.

Generally, standardization is essential in ensuring interoperability of applications used by the professionals in the construction project team. However, compatibility of both the software applications and the ever-changing computer hardware serve as serious obstructions to the standardization process. Data standardization (Aouad & Ingirige, 2010) also faces organizational challenges. The larger Quantity Surveying firms that are more likely to have many procedures might find it difficult to standardize their data and information compared to the smaller QS firms with relatively low volumes of procedures (Aouad & Ingirige, ibid). Some firms might also not have business processes that are so deeply entrenched to call for the need for standardization.

However, if successfully implemented, standardization will mark a great step in the need for online and virtual collaboration of design teams. The seamless exchange of data will enhance communication leading to improved quality of decisions made by the design teams. Standards
would also ensure improved flexibility even if tasks are added to the project at any point in the project’s life.

2.8.6 Management-Related Barriers
The management of professional firms involved in construction projects are expected to spearhead the use of internet-based technologies for professional tasks and functions. The level of commitment of the top management is reflected by the subordinates who work in the lower ranks in the firm or even involved in the construction project (Demian & Mitchell, 2005). The management should be at the forefront at advising the project client why the project team will need certain technologies that will eventually benefit the project.

The management can also hold meetings with their staff to discuss the use of the internet. Such internal meetings will also enable the management of firms to discuss critical concerns that arise from the use of the internet and related applications. The management can collaboratively discuss with their staff on how they would formulate internet policies for their professional firms.

The management of many firms are more likely to perceive training of the employees as lost man hours, especially when the systems are not user-friendly and the training days are solely aimed at making users to be familiar (Wong, 2012).

2.8.7 Staff-Related Challenges
The Internet has been introduced in various professional firms for varying reasons. These reasons range from increased productivity among the staff to collaboration of the staff with entities external to the firm or the project. However, the management of a number of firms are having a hard time restricting internet access to mitigate ‘counterproductive results’ by the staff (Zou & Seo, 2006).

Whereas the management aims at optimizing the human resource and the technology they have heavily invested in, some staff members might
engage in ‘unproductive web surfing activities’ (ibid). Different professional firms and project teams have resorted to restrictions of both websites that can be accessed and also the times when the staff can access the internet. Others have install internet firewall applications.

### 2.8.8 Training Programmes

Proper learning and training systems are essential in the implementation of internet-based systems in professional settings. It is recommended that professional firms ought to properly equip their staff members with the necessary technical skills through meaningful approaches, besides the traditional operation manuals and verbal trainings (ibid).

Professional firms should aim at making the most of the investment made: monetary resources, human resource and technological investment. Firms should also instill the culture that will eliminate the ‘internal competitions and reluctances of sharing knowledge and information’ (ibid).

The professional firms and construction project teams should also formulate ways through which they will train and equip staff who will be expected to carry out similar functions and tasks. In QS firms, for example, the members of the administrative staff are expected to perform operational tasks, which vary greatly from the technical functions carried out by the technical team. These firms should also establish ways and procedures that will be observed in equipping the permanent and contract employees. For example, the level of access of internet resources granted to a permanent employee will differ from that of a contract employee.

### 2.8.9 Software Compatibility Challenges

Increased activities in the ICT sector have resulted into more software applications for the QS profession than there were 10 years ago. The Quantity Surveyors have a challenge of selecting software that will ensure compatibility especially with applications used in the firms with whom they collaborate (Wong, 2012).
Some of the software outputs may also not allow the users to comment or even make corrections on the electronic copies.

2.8.10 Software Support Services Barriers
Long-term reliability of software service providers has been identified as another barrier (ibid). Support of the software applications is a critical aspect of the software applications used is important. Information back-up, for example, would be necessary when it comes to changes in the versions of systems used or even in cases where the systems fail.

2.8.11 IT Literacy on Construction Sites
The construction process is more intensive on the site than anywhere else since that is the point where the ultimate product of the whole design process takes shape. IT illiteracy on the sites has been identified as a major behavioral impediment in the implementation of ICT tools in project management (ibid). The norms that are prevalent on the construction sites dictate that the manual work and quality of the workmanship supersede the use of computerized tools.

2.8.12 Poor Implementation of Protocols
There is no longer emphasis on the adherence on discipline and strict protocol that has to be observed by all the users of the systems (ibid). This is with special emphasis and comparison with the earlier systems such as the fax. Access criteria are no longer adhered to as required. Neither does the level of information required to be relayed across the team sufficient.
CHAPTER 3 RESEARCH METHODOLOGY

3.1 INTRODUCTION
This chapter focuses on the research methods used in carrying out this scientific research to prepare the final data. It tackles this through outlining and discussing the research design, the population, sampling techniques and data collection methods that were used in this research. Data analysis is then used to test the hypothesis and fulfilling the objectives of the study.

3.2 RESEARCH DESIGN
Research design has been defined as a conceptual framework in which the research is conducted; and constitutes the blueprints and plans for collection, measurement and analysis of the data (Abwunza, 2006). This particular study used the quantitative method in the analysis of data collected. This means that it will include designs, measures and techniques that will yield quantifiable data (Mugenda & Mugenda, 2003). Furthermore, this method was used to analyse data that could be expressed in mathematical terms.

The quantitative method was used since it was the most suitable method to test the sample population being studied. It also categorizes and elicits responses into a more rigid but defined style through the questionnaires issued (Denzin et al, 2000). The quantitative method is preferred for these research studies as it incorporates the use of analytical tools that will enable the researcher describe comprehensively the characteristics of the population being studied and predict any form of causal relationship that may exist therein. Moreover it offers the flexibility in the study, from the beginning to the end. For instance, the responses from the participants do not influence how the researcher will ask the subsequent questions. The quantitative method may be subject to various statistical assumptions, minimizing the need to adjust questions or methods in the face of new discoveries in the field (Bernard HR, 1995).
This study also used the questionnaire method in data collection. This is because it made it easier to ask all the respondents similar questions in the same order, allowing the users to respond to either ‘close-ended’ or ‘fixed’ questions. Therefore, the questionnaire facilitated the ease of comparison of the responses among the respondents. Lastly, the questionnaire was the most preferred tool in asking the most critical questions and it provides a range of probable responses (Denzin et al, 2000).

3.3 DESCRIPTION OF THE STUDY AREA

The area of study covers mainly the Quantity Surveying professional firms and professionals within the Nairobi County. The Nairobi County covers an area of approximately 696 square kilometers. The 2009 National Census indicated that Nairobi had a population of 3,138,369 people, a stark comparison with the 1999’s population of 2,143,254 people, translating into a 46.4% increase in its population over a 10 year period (Mairura, 2011). The significant economic growth fuelled by the rural-urban migration has in turn, for example, led to an upsurge of demand for housing. Subsequently, this has spurred rapid growth in establishments for residential purposes. In addition, most multi-national companies are pitching camp in Nairobi, leading to increasing need for commercial office spaces.

From the aforementioned, it can be deduced that Nairobi has become a regional hub under pressure to meet the needs of the organizations and households within the county. Therefore, most professionals have opted to establish themselves and their practice in this area, leading to a high concentration of professionals such as Quantity Surveyors in Nairobi. According to the Board of Registration of Architects and Quantity Surveyors (BORAQS) list of registered Quantity Surveyors dated June 2010, there were 416 registered Quantity Surveyors, of whom 361 were based in Nairobi. Therefore, Nairobi serves a critical strategic function in the profession and distribution of the practitioners.
3.4 THE POPULATION

Population has been defined as ‘an entire group of individuals, events or objects having common observable characteristics’ (Mugenda and Mugenda, 2003). Target Population has been defined as ‘the population to which the researcher wants to generalize the result of a study’ (ibid).

In this particular study, the target population was the 46 Quantity Surveying firms listed in The Quantity Surveyor’s Directory of Consulting Quantity Surveying firms for the period between January and March 2013 (IQSK, 2013). It is from this target population that respondent firms were sampled and questionnaires administered.

Furthermore, 43 out of the listed 46 firms were based in Nairobi (IQSK, 2013) and it was found prudent to use the list to obtain the target population for ease of accessibility. Most of the firms are found in Westlands, Nairobi CBD and Milimani and Upper Hill areas and therefore this provided the significant advantage of reduced transport costs.

3.5 SAMPLING TECHNIQUES AND SAMPLE SIZE

The objective of sampling is to select elements from a population from which a researcher draws conclusions about the larger population being studied. A researcher is expected to identify the most representative sample in relation to the population. In addition, the sample should be comparable to the target population in terms of the characteristics that are deemed to be of relevance to the specific study (ibid). The size of the sample should be optimum to ensure the fulfillment of the efficiency, reliability, representativeness and flexibility requirements such that the sample should not be too big or too small (Kothari, 1990).

In the determination of the sample size, the study assumed a confidence level of 95% of the targeted population ergo a ± 5% error.

Using the selected target population of 46, the sample size for the study was computed as shown below (Chava & Nachimias, 1996):
\[
n = \frac{Z^2 pqN}{e^2(N - 1) + Z^2 pq}
\]

Where:

\(N\) = Population Size

\(n\) = Sample Size

\(p\) = Sample population estimated to have the characteristics being measured. Assume a 95% confidence level of the target population

\(q\) = \((1-p)\)

\(e\) = Acceptance error, \(e=0.05\), since the estimate should be 5% of the true value

\(Z\) = The standard normal deviate at the required confidence level i.e. 1.96

Therefore:

\[
n = \frac{1.96^2 \times 0.95 \times (1 - 0.95) \times 46}{0.05^2(46 - 1) + 1.96^2 \times 0.95 \times (1 - 0.95)}
\]

\[
n = \frac{8.394}{0.294976}
\]

\(n = 28\)

Therefore, 28 firms were chosen from the target population of this study. The researcher administered the questionnaires to Quantity Surveyors practicing in these firms.

### 3.6 Data Collection Instruments and Procedures

The main instrument used in this study is the survey questionnaire. These questionnaires were dropped off at the offices of the respondents. The respondents were asked to either scan and email to the researcher or call the researcher to collect via the contact details provided on the letter of introduction. These questionnaires were administered to Quantity
Surveyors face-to-face. Other respondents completed the questionnaires at a later date hence self-administered questionnaires. The face-to-face administration of the questionnaire enabled the respondents to seek clarification on complex questions from the researcher. The respondents probed the researcher at various points to ensure that they provided a proper response.

The self-administered option was particularly helpful to the respondents when it came to answering long questions. They managed to read through at their own pace. However, a number of questionnaires were never returned.

The questionnaire has questions that are aimed at enabling the collection of the variables sought by the study. Most questions have choices and a few were open ended and the latter were an extension of some of the multiple choice questions.

The multiple choice questions were widely used to ask the questions relating to factors that have already been identified by previous research work, for example the benefits and challenges that face internet users. The open ended questions sought to find out variables that have not yet been established by any recent research, for example, devices used to access the internet and the average budgetary and time allocation for internet access. Ultimately, the data collected through the returned filled survey questionnaires was used to address the specific objectives of this study.

3.7 Data Analysis

Data Entry

The data collected in this study was analysed using Microsoft Office 2010 Excel software. The results of the data analysis were compiled and organized to facilitate easy presentation and subsequent analysis.
Data

This study utilized both primary and secondary data so as to achieve the specific objectives. The primary data was collected from the field survey conducted using the questionnaire. Secondary data used was acquired from findings of similar studies conducted in other countries, such as Malaysia, Hong Kong and Nigeria on the use of the internet.

Variables

The objectives of this study provided the framework for primary data collection. As far as the status quo is concerned, the data collected included: the frequency of accessing the internet, the number of years the professionals have used the internet, the amount of time allocated to the internet per week, the approximate budgetary allocation for internet access and the devices they use currently to access the internet. Data on organization websites and the reasons behind having a website was also collected.

Regarding the benefits of using the internet, the data collected include: benefits to professional work and the possible ways it could change the professional practice.

Data collected also highlighted the possible barriers and challenges that the respondents faced. The variables that were being assessed were obtained from previous similar studies conducted among the Quantity Surveyors in other countries other than Kenya.

Measurement of Variables

Ordinal measurement has been used to specifically measure some independent variables such as the level to which the respondents agreed to some factors in the questions in the survey: Potential benefits of use of the internet by the professionals and challenges experienced in accessing the internet. There 1-5 Likert scale used was:
1- Strongly Disagree 4- Agree
2- Disagree 5- Strongly Agree
3- Neutral

The impediments encountered were measured using a 1-4 Likert scale where:

1- Slightly Affected 3- Affected
2- Fairly Affected 4- Not Affected

These variables have been dealt with in detail in Chapter 4 on data analysis and presentation.

Response Rate

Response rate has been defined as ‘the percentage of the subjects who respond to questionnaires’ (Mugenda & Mugenda, 2003). In a research, it is considered that ideally a response of at least 70% was to be considered as very good. A 60% response rate was to be deemed to be good while a 50% was regarded as adequate for the analysis and reporting of the data that was collected in this study.

The response rate is a quality criterion for the data (Gallup Europe, 2007) and therefore non-response should not be overlooked. According to Gallup Europe, loss of respondents reduces the sample size and consequently reduced precision of the estimates from the survey. Alternatively, non-response may introduce errors in the survey.

Descriptive Statistics

Descriptive statistical methods such as mean, frequencies and percentages were used to observe and describe the characteristics and the distribution of the collected data.

3.8 DATA PRESENTATION

The data that was analysed was presented in form of graphs and frequency tables.
CHAPTER 4 DATA PRESENTATION AND ANALYSIS

4.1 INTRODUCTION

In this chapter the presentation and the analysis of the data are done. The data collected based on the Research Methodology prescribed in Chapter 3 are a response to the problems outlined in Chapter 1. The objectives of the study were:

i. To establish the current state of internet use by the Quantity Surveyors in Kenya

ii. To study the potential benefits likely to be accrued from the integration of the internet by the QS firms and professionals in Kenya

iii. To identify the potential challenges and barriers that the QS in Kenya are likely to face as far as use of the internet is concerned

The above objectives were accomplished and the findings below illustrate the same.

4.2 QUESTIONNAIRE SURVEY RESPONSE

The questionnaire survey was conducted in April 2013. Respondents were administered with a copy of the questionnaire from the 28 Quantity Surveying firms sampled from the IQSK’s January-March 2013 Journal. A total of 45 respondents from these 28 firms were issued with the survey questionnaires but only 27 questionnaires were returned, representing a 60% response rate (Figure 1 below). This is considered adequate for the reporting and analysis of the collected data.
4.2.1 PROFILE OF SURVEY RESPONDENTS

The participants gave information on the organizations and QS firms within which they are working. The firms were classified in terms of the number of years they have been in operation. Most of the respondents worked for firms or organizations that were at least 25 years old. This means that most Quantity Surveying firms in the sample are well established (over 10 years) and they can therefore give credible information (Figure 2).
4.2.2 Use of Software

All, but one, of the respondents use software applications in their day-to-day tasks and functions conducted by Quantity Surveyors as depicted in Figure 3 below.

The respondents were asked to list the software applications they used for the different tasks. These functions are:

i. Project Management
ii. BQ Preparation
iii. Taking off
iv. Cost Estimation
v. Tender Evaluation
vi. Accounting
vii. Word Processing
viii. Presentation

Figure 3: Use of Software

This means that most Quantity Surveying organizations have currently integrated various software applications in both technical activities and administrative activities alike.
4.2.3 Current Time Allocation for Internet Activities
The respondents were asked to describe how often they utilized the internet in their work. This was investigated in 3 ways:

i. The frequency of accessing the internet (Figure 4)
ii. The amount of hours spent weekly on the internet (Figure 5)
iii. Use of the internet over the one month prior to this study (Figure 6)

**Figure 4: Frequency of Accessing the Internet**

![Frequency of Accessing the Internet](image)

It is worth noting that most of the respondents access the internet on a daily basis (70%). Over the month prior to this survey, most of the respondents (96%) had accessed the internet for QS-related activities. In line with this, 41% of the respondents spent an average of at most 5 hours per week on the internet.

This demonstrates that there is a great opportunity for the Quantity Surveyors in Kenya to be engaged more on the internet as per the frequency of and time spent on accessing the internet. This can be done through innovative internet-based products and services. The QS organizations should also formulate the much needed internet strategies and policies to both advance the growth of the entities while ensuring responsible use of the internet resource among the staff members.
4.2.4 Current Experience of Internet Use

The experience of the respondent Quantity Surveyors as far as internet use was addressed in 2 main ways:

a. Number of years they have used the internet as QS

b. Forms of training in the use of the internet

Most of the respondents (30%) had used the internet over the last 5 to 10 years of their professional practice. This demonstrates that the internet
has been playing a role in the professional experience in a significant number of Quantity Surveyors. In addition, the QS professionals have used the internet the most over the last 1-5 years (45%) as depicted in Figure 7 below. This suggests that the last 5 years have seen the most significant utilization of the internet amongst the Kenyan Quantity Surveyors. It also indicates that the period has experienced increased availability of internet-based technologies that are relevant to the practice of the profession.

**Figure 7: Number of Years Respondent used Internet for QS Work**

The survey also sought to find out whether the respondents had been equipped and trained to use the Internet in their professional work (Figure 8 below). This would demonstrate if the use of the internet in the QS profession was integrated in the various institutions charged with training and education of the Quantity Surveyors in Kenya. Most respondents used the internet without any prior training on how specifically the internet resource would be used to improve the practice of the profession and no respondent mentioned any form of guidance by the respective professional bodies or training institutions. The role and application of the internet in the professional practice should additionally

42
be incorporated in the various Continuous Professional Development (CPD) run by the IQSK and BORAQS institutions.

Of the respondents that had responded positively to this question, they mentioned 2 forms of training that they had undertaken:

i. User Manuals
ii. In-house training

As far as training is concerned, the role and application of the internet in the professional practice of the Quantity Surveyors in Kenya should be incorporated in the various Continuous Professional Development programs run by the professional institutions: IQSK and BORAQS. This can be realized from the fact that no respondent mentioned any form of guidance by the respective professional bodies or training institutions.

**4.2.5 Devices Currently Used to Access the Internet**

The respondents were asked to indicate the different devices with which they used to access the Internet. The most preferred device in terms of internet access was the desktop computer (66.7%) while the least preferred was the GPRS mobile phone (11.1%) as illustrated in Figure 9. However, the mobile devices generally are being used by the Quantity Surveyors. This demonstrates how the QS in Kenya has become techno-
savvy and can therefore be served with innovative relevant applications that can be internet-based and that can run on the various operating systems platforms. The use of mobile devices also demonstrates that the QS in Kenya can access the internet ‘on the go’, away from the office workstation or from a fixed home computer. This mobility has proven its viability and acceptability among the professionals.

Despite the use of portable tablets and smartphones, the QSs preferred to use the laptops Wi-Fi (51.9%) and Modem dongles (51.9%) in accessing the internet. These 2 are the most popular means of accessing the internet among the Quantity Surveyors in Kenya. This means that the QSs are taking advantage of the flexibility that comes with the use and availability of Wi-Fi installations and the ability of the modem to be used across a number of devices: laptops and desktops.

**Figure 9: Devices Used to Access the Internet**

![Devices Used to Access the Internet](image)

**Table: Devices Used to Access the Internet**

<table>
<thead>
<tr>
<th>Device</th>
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</thead>
<tbody>
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</tr>
<tr>
<td>Modem dongles</td>
<td>51.9%</td>
</tr>
<tr>
<td>Mobile Phones</td>
<td>10%</td>
</tr>
<tr>
<td>Satellite</td>
<td>5%</td>
</tr>
<tr>
<td>3G/4G</td>
<td>5%</td>
</tr>
<tr>
<td>No Response</td>
<td>2%</td>
</tr>
</tbody>
</table>

4.2.6 **Current Internet Activities**

The respondents were also asked to indicate the different activities they engaged in as they accessed the Internet as part of their work as shown in Figure 10.
All the respondents were involved in the sending or receiving of emails as part of their work. This suggests that communication among QSs and other stakeholders is largely based on email communication.

Only 25.9% of the respondents indicated that they took part in chat room activities as they accessed the internet. Also 25.9% of the respondents indicated that they were involved in instant messaging. These 2 activities indicate the Quantity Surveyors engage in real-time communication with each other or with the stakeholders of the projects they are involved in; an area which the QSs can explore and maximize on the underlying potential benefits.

The other activities on the internet the respondents took part in include:

i. Visiting social media websites: Twitter and Facebook
ii. Research Activities
iii. Looking up construction materials, sellers, prices and specifications

This demonstrates how social networking has revolutionized how communication takes place, even among the professional Quantity Surveyors in Kenya. It has become an acceptable form of internet communication. In line with the devices used to access the internet, social networking has gained popularity due to the increasing use of mobile internet. Some of the social networks have integrated instant messaging features such as private messages as well as chatrooms.
The more technical and professional-oriented activities the Quantity Surveyors have undertaken on the internet was also be evaluated. From the findings, it can be said that most Quantity Surveyors (96.3%) have gone to the internet over the last one year to search for information on building materials. This demonstrates information on materials can be accessed anywhere anytime as long as there is internet connection. From the response, it can be deduced that more information is provided by manufacturers and suppliers over the various internet-based platforms.

The search for Documents on Regulations is the next preferred activity carried out by the QSs in Kenya. This indicates that the various government agencies and relevant authorities are digitizing previously manual processes to speed up availability of documents to the professionals and the general public at the latter's convenience.

81.5% of the respondents indicated that they have Managed/Exchanged Project Information over the last one year on the internet. This demonstrates that the Kenyan QS is utilizing the various web-based applications and services to manage various construction projects. This may be due to the motivation arising from the fact that project teams can conduct meetings in virtual environments on a real-time basis without installing any software. There is also a reduction in costs of project
through collaboration in virtual environments. The interaction can take place across different systems and devices. Hence the schedule risk is reduced. This means that the QS can also manage project data and interactions well while using applications that run on mobile devices. The same data may be synchronized across the various devices discussed above.

The other activity that the Quantity Surveyors can carry out online is **exchanging photos of construction sites**. This indicates the ease with which photos can be captured and shared across devices and across networks over the internet on a real-time basis. Currently, most of the devices used to access the internet by the QS have inbuilt cameras, such as tablets and smartphones. They have applications that enable photos to be shared other than through the email. For example, smartphones and tablets that run on Android have an application called *Instagram* that enables photos to be shared seamlessly.

However, **videoconferencing** is the least explored area. This may be due to technical difficulties such as infrastructure that may not offer adequate and consistent broadband to support videoconferencing. The organizations may also not have invested towards securing the necessary infrastructure for the same.

Despite being able to access information from different countries, only 29.6% of the respondents mentioned that they **bid for online jobs** over the internet. This means that local projects are still bid on using traditional methods, especially using the mass media e.g. newspaper notices. The Kenyan QS has also not yet exploited the internet in identifying opportunities through online channels where they can gauge their competitiveness at a global level.
4.2.7 Regularly Visited Websites
The survey was also concerned with whether there were any particular websites that the respondents visited as part of their work as Quantity Surveyors. 17 respondents (63%) indicated that they had websites they frequented whenever they were online. This is in line with the online activities the QSs undertook as discussed in the previous section.

The respondents were also asked to list some of the websites they frequented whenever they accessed the Internet. These were grouped as follows:

a. Manufacturers’ Websites
   - Durant
   - Masterbill
   - Estate Manager
   - Kenya Association of Manufacturers (KAM)
   - Ideal Ceramics
   - Twyfords
   - Union Locks
   - Ramco
   - Kenya Builders

b. Professionals’ Forums
   - Architectural Association of Kenya (AAK) Website
   - Institute of Quantity Surveyors of Kenya (IQSK) Website
   - Board of Registration of Architects and Quantity Surveyors (BORAQS)
   - Royal Institute of Chartered Surveyors (RICS) Website
   - Yellow Pages
   - Construction Review
   - ASAQS LinkedIn
c. Social Media Groups
   - ProjectPro
   - ASAQS Facebook Group
   - Professional Facebook Groups

d. Data/Document Storage/Sharing Websites
   - Institute of Cost Engineers Website
   - G-Drive
   - Dropbox

This demonstrates that besides formal, professional websites, the Quantity Surveyors in Kenya still engage and interact in the fairly informal yet professional online communities. Websites such as LinkedIn and Facebook have enabled them to create groups within which discussions can take place on matters regarding the profession. These virtual groups are more up-to-date than websites such as professional websites and manufacturers’ websites. Therefore, it can be said that the QS in Kenya is in need of constant, up-to-date information in order to make them relevant in the prevailing professional practice.

Figure 12: Regularly Visit Particular Websites

4.2.8 Monthly Internet Budget
The survey sought to find out how much on average the respondents spent on the Internet per month. Most of the respondents (29.6%) indicated that they spent an average of between Kshs 2,000 and Kshs 5,000 on Internet services per month. This shows that individual Quantity Surveyors have been able to allocate part of their income to internet services. This is mostly spent on buying airtime used to purchase
internet bundles for their mobile devices and modem dongles. This may extend to the 25.9% of the users who spend an average of between Kshs 5000 and Kshs 10,000 per month.

It is also worth noting that 11.1% of the respondents spend an average of at least Kshs 20,000 per month. These may be considered to be heavy internet users since their budgets translate into higher broadband limits or improved office internet infrastructure.

This demonstrates that the average internet budgetary allocation can range from as little as Kshs 2,000 to large sums of Kshs 50,000. The internet service providers have tailored services for both individuals and organizations.

The cost also varies depending on the internet speeds. The high speed connections, wireless or cabled, tend to cost a lot more as they are deemed to be more convenient than the slower options or service packages. The high cost options include mobile broadband and cable fiber optic services that are relatively new to the market.

**Figure 13: Average Monthly Budget for Internet Services**

4.2.9 Internet Access Technology

The survey went further to establish the different modes of connection to the internet used by the respondents. Most of the respondents (74.1%)
indicated that they accessed their internet services through a *cable connection*. This illustrates that many QSs in Kenya have embraced the latest technology as far as connection to the internet is concerned. They have done so indirectly, through Internet Service Providers that have the infrastructure and facilities especially for businesses and the office premises within which the QSs are based. It may be expensive but it is selected as it is perceived to be economical through the convenience it offers the users in terms of speed.

The next most preferred form of connection to the internet was the *wireless connection*, being preferred by 59.3% of the respondents. This encompasses the use of modem dongles and Wi-Fi technologies in tapping into the internet. It also includes the use of most of the mobile devices, with rare exceptions of tablets and a few new smartphones. The comparatively lower uptake may be attributed to the limited capabilities of the devices in enabling the QSs to carry out their tasks directly from the devices. For example, smaller screens that utilize touch-screen technology may not offer them the convenience they derive from laptops or desktop computers.

*Satellite connection* and *telephone lines* ranked lowest since they are becoming obsolete in the access of the internet. Many firms have phased them out since there are fewer firms that also provide such services.

### 4.2.10 Organization Website and Its Benefits

The survey tried to obtain the number of respondents who worked in organizations that had websites. Most respondents (77.8%) indicated that they had a website. This demonstrates that the professionals belong or own firms that are striving to create their online presence felt across the internet.
When the respondents were asked on why their organizations had a website:

i. 33.3% of the respondents indicated that the website was a tool of *advertisement* for their firm

ii. 33.3% of the respondents responded that the website was instrumental in *creating a status* for the company
iii. 44.4% of the respondents indicated that the website was an important tool in providing information to the organization’s employees, both current and prospective employees.

iv. 33.3% indicated that the website enabled them to get feedback from clients.

v. 48.1% of the respondents indicated that the website was a crucial tool in sharing information with their clients.

From the reasons it is evident that the website is a critical interactive tool between the QS firm/organization and the external entities. It is a channel through which information flows to and from the organization and the consumers of the professional services.

The largest pools of such external entities with whom the entities are in constant communication with are mainly clients (48.1%) and employees (44.4%).

4.2.11 Benefits of Using the Internet in Professional Work

The respondents were asked to indicate the benefits they had realized from the use of the internet in the course of their professional work.

Figure 16: Benefits of the Internet to QS Professionals
i. 81.5% of the respondents indicated that the internet has made their professional work easier.

ii. 81.5% also indicated that the internet and its associated technologies saved them a lot of time in their work.

The above demonstrates that the Internet is a tool that can be employed and exploited further in the automation and management of construction information within and between QS firms for some of the most critical and time consuming activities in a QS firm. Most of the respondents agreed that the internet has transformed the way work is done.

iii. 59.3% of the respondents indicated that their productivity was enhanced from using the internet.

This demonstrates that the output from the QS activities, especially information management resulted into better results by the respondents.

iv. 55.6% of the respondents indicated that the internet enabled them save on operational costs associated with their professional work.

This demonstrated that the respondents spent less on office operation costs, especially communication. For example, phone calls are billed per second or respective time unit. Emails are not charged per correspondence since the services come with a lot more aspects and services than can be utilized by the same organizations. Therefore, reduced calls and more consumption of the internet have seen reduced costs.

v. 51.9% of the respondents said that the internet had improved their clients’ responsiveness.

vi. It is not uncommon to find clients who insist on the use of emails in communication. They tend to provide answers more readily through chat rooms or emails since they can trail the flow of the correspondence and keep track of changes.
vii. 48.1% indicated that their document presentation and quality of work had improved

This arises from the fact that a softcopy version of a document can be presented as draft until it undergoes the necessary editing to ensure it meets the set organizational presentation and communication standards.

The internet also offers resources that provide information on how the QSs can present their documents. Some have gone to extents of providing downloadable templates for standard documents.

viii. 44.4% cited improvement in flexibility in their organization as one of the benefits they had realized from the use of the internet

Some of the organizations have allowed their employees to work from the comfort of places they feel they can work best besides the office spaces, as long as they are in constant communication with the head office. This kind of flexibility can be attested to the fact that organizations have intranet systems where the employees can sign in and submit various forms of reports and documents as long as they are connected to the internet. However, this hinges heavily on the organizational culture, which in turn affects the degree of this flexibility.

ix. 40.7% indicated that the internet influenced their decision making

In line with the activities the QSs carry out when online, the unlimited information available online from websites to catalogs and insights on the economy influence the decisions made by the QSs.

4.2.12 Potential Benefits to Quantity Surveying Profession

The respondents were also asked to rate the extent to which they felt the internet could transform the Quantity Surveying profession.
i. **Reduced Time in the Provision of QS Services:** Generally, 77.7% of the respondents agreed with this. This demonstrates that the internet has the potential to impact on the time constraint of construction projects. From previous discussions, a lot of this time can be saved in terms of communication between the QS organization, its external partners and its employees. This is despite the 3.7% of the respondents who disagreed.

   ![Figure 17: Potential Benefits to QS Services](image)

ii. **Improved QS Services:** 51.9% of the respondents agreed that the use of Internet could lead to the improvement of the professional services. This illustrates the optimism which the respondents had in the embracing of the internet in their day-to-day work as QSs.

iii. **Reduction in the Cost of QS services:** 48.1% of the respondents generally agreed with this. This is slightly less than half of the respondents. This shows that technology, especially the internet may not really have a big difference in the professional fees paid by the clients to the QS given that the fees are already fixed in the Act governing the professional practice.
iv. **Redefined role of the QS in the Information Age:** 37% of the respondents agreed while 33.3% strongly agreed with this. 14.8% of the respondents disagreed. This shows that information available on the internet for use by the QSs influences or alters the way in which the QS works in the current day and age where information is critical in the execution of their work.

4.2.13 **Challenges Experienced in Accessing the Internet for Work-related purposes**

The respondents in the survey were asked to gauge the extent to which they dis/agreed with the following challenges facing access to the internet.

i. **High Frequency of Internet Service Disconnections:** 44.4% of the respondents agreed that disconnections and inconsistencies in the connections presented great challenges. This contrasts sharply with the 15.9% who did not perceive this is a challenge to accessing the internet. This implies that the cost of the service escalates since they pay for services they’ll not have consumed; hence the productivity of the QSs is curtailed. Poor services also affect the operation costs since a breakdown in connection compels them to resort to more costly options. This also demonstrates that there’s a problem in the reliability of the services provided by the local ISP firms.

ii. **Cost of Equipment and Service:** Of the respondents 40.7% generally agreed with this factor against the 33.3% who disagreed. This shows that the gadgets and necessary hardware required to access the internet are still relatively expensive to both the individual QSs and the QS organizations. The cost of disposing obsolete hardware and acquiring up-to-date equipment is also expensive. However, as technology advances
and the numbers of users increase, these costs are likely to go down.

The cost of the adequate and reliable internet services is also high. The cost may tend to be even higher in cases where there’s inconsistency in the quality of service. This too, is likely to change with improved technology.

iii. **Limitations by the office/Management:** 51.8% of the respondents disagreed with this. This means that the QS firms have embraced the use of the internet in the offices among the employees. This means that the culture of the QS organizations is evolving gradually to accommodate changes in the technological world. However, the 33.3% of the respondents who agreed demonstrate that some organizations are yet to integrate the use of the internet in their culture. Some organizations might be having policies that may act as a hindrance in the utilization of the internet resource.

iv. **Internet Security Concerns:** 33.3% of the respondents agreed that there were great concerns regarding the security of their data over the internet. This is in comparison with the 29.6% who disagreed with this. This means that the integrity of the data and channels over which they are relayed is of paramount concern to the QSs.

This also means that the ISPs need to guarantee the internet users in the construction industry that adequate data security measures are put in place to protect the information. This applies to the online file sharing and cloud storage services.

v. **Available resources cannot meet our needs:** Most of the respondents (48.1%) agreed that what they had or they can access could not give them what they needed. This implies that the resources at the disposal of the QSs had not been tailored to
meet the data needs of the QSs. The websites that are present hardly provide up-to-date data and information to the QSs. This also includes certain hardware such as tablets and smartphones which lack the necessary applications that can be used on the go e.g. applications to prepare Bills of Quantities.

vi. **Unavailability of Internet Ready Devices:** 48.1% of the respondents disagreed with this. This therefore means that the devices that are available to the QSs are capable of providing them with the necessary access to the internet and help them carry out the various online activities specific to the construction industry and Quantity Surveying as a profession.

vii. **Can Access the Internet Elsewhere:** There was a tie between respondents who agreed (25.9%) and those who disagreed (at 25.9%) with this. This means that inasmuch as the internet can be accessed anywhere anytime, accessing the internet away from their workstations provided challenges such as unavailability of network coverage or lack of power outlets. At the same time, accessing the internet from the workstations presented specific challenges to the respondents such as limited number of computers that can actually access the internet and unavailability of internet ports. Therefore, there ought to be a balance in deriving maximum benefits possible from either case of accessing the internet.

viii. **Inadequate Skills/Knowledge:** 59.2% of the respondents disagreed with this. Only 18.5% agreed that this was a challenge in accessing the internet.

This means that the necessary professional bodies and respective professional QS firms should exploit the points where knowledge of the internet intersects with the QS tasks and duties. Innovative ways of doing work over the internet should be further explored and shared.
This may involve studying what other QSs in other countries are doing in areas such as collaboration over social media networks and videoconferencing. New online resources have the capacity to be established in the online environment that will in turn benefit the Kenyan QS.

ix. *Lack of Interest:* Most of the respondents (66.6%) generally disagreed that lack of interest was a challenge in accessing the internet for work-related purposes in the organizations they worked in. This shows that there’s enthusiasm among the Quantity Surveyors in using the internet in their daily work. This interest extends to the use of the various technologies for access of the internet.

x. *Physical Disability:* Majority of the respondents (77.8%) disagreed with this. Therefore, the internet can be accessed by all regardless of any physical disability, with the exception of blindness.

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<th>CHALLENGES</th>
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<th>Disagree</th>
<th>Neutral</th>
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<tr>
<td>Cost Equipment/Service</td>
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<td>18.5%</td>
<td>18.5%</td>
<td>14.8%</td>
<td>25.9%</td>
<td>7.4%</td>
</tr>
<tr>
<td>Can Access Internet Elsewhere</td>
<td>11.1%</td>
<td>14.8%</td>
<td>48.1%</td>
<td>11.1%</td>
<td>14.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Available Resources cannot meet our needs</td>
<td>25.9%</td>
<td>22.2%</td>
<td>18.5%</td>
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<td>11.1%</td>
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<td>14.8%</td>
<td>29.6%</td>
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<td>7.4%</td>
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<td>Inadequate Skills/ Knowledge</td>
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<td>18.5%</td>
<td>3.7%</td>
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<td>Physical Disability</td>
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<td>High rate of Disconnections</td>
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<td>Limitations by the Office/Employer</td>
<td>25.9%</td>
<td>25.9%</td>
<td>11.1%</td>
<td>11.1%</td>
<td>22.2%</td>
<td>3.7%</td>
</tr>
</tbody>
</table>

Source: Field Survey, April 2013
4.2.14 Impediments in the Adoption of the Internet by Organizations

The respondents were asked to gauge the extent to which the following factors acted as impediments in the adoption of the internet by their organizations.

i. **Unreliable Internet Service Providers:** 66.6% of the respondents indicated that this was one of the major impediments in the access to the internet for work purposes. This means that QS firms ought to pay for reliability of the services: both initial costs and after sales support service. QS firms should, therefore, establish strong list of criteria to use in the selection of the internet service providers.

ii. **Abuse of the Internet resource by the staff Members:** 55.5% of the respondents indicated that the internet resource was abused a lot by members of staff. This means that either the QS firms didn’t have a strong internet access policy or there was indiscipline among the staff. This may have resulted into the management adopting strategies or implement decisions that curtailed free access to the resource.

iii. **Unreliable Power Supply:** 51.8% of the respondents indicated that they were affected in one way or the other. This demonstrates that productive use of the internet is pegged on the reliability and cost of energy supply.

iv. **Obsolescence of Internet Devices:** 62.9% of the respondents indicated that they were not affected by the out-datedness of the equipment they were using to access the internet. This means that the internet experience varies minimally across devices. For example, one can still send email from a desktop computer as they would from the latest tablet.

v. **Low return on investment on internet devices/equipment:** 70.4% of the respondents indicated that they were not affected by this. This means that despite the internet being an investment, very
few could not relate the benefits to the investment made in the resource.

vi. **Lack of/inadequate desire and appreciation of the role of the Internet by the Management:** 59.3% of the respondents indicated that they were not affected by this factor within their organization. This means that the organizations are no longer acting as barriers towards use of the internet in the QS activities. However, they can do better with time through the evolution of their organization culture and creation of employee-friendly internet policies and strategies.

**Figure 18: Impediments in the Integration of the Internet**

![Bar chart showing impediments in the integration of the Internet](chart.png)

Source: Field Survey, April 2013

### 4.3 PROPOSITION TESTING

The proposition stated in this study was:

The Quantity Surveyors in Kenya have not invested enough time and money in Internet resources resulting in its under-utilization as a source of information in the profession.
The internet usage among the Quantity Surveyors in Kenya has been viewed in line with the three objectives of the study that revolve around:

a. The current state of internet use  
b. The benefits  
c. The barriers and challenges

From the presentation and the analysis of the data it is evident that despite the challenges facing the QSs in accessing and utilizing the internet resource, the Quantity Surveyors are still using it and hope to overcome the challenges in order to maximize on the benefits that come with the use of the internet. The respondents indicated the amount of money and time they allocated to the internet for purposes of their work.

From the above, the proposition of the study was rejected.
CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction
This chapter presents the findings of the study of the utilization of the internet by the Quantity Surveyors in Kenya. The conclusion is based on the findings from the field study and interactions with the respondents regarding this topic.

The objectives of this study were to:

a. To establish the current state of internet use by Quantity Surveyors in Kenya as a tool of data exchange and source of information
b. To study the potential benefits likely to be accrued with the integration of the internet by various Quantity Surveying firms and practitioners in the Kenyan construction industry
c. To establish the potential challenges and pitfalls likely to be encountered by the Quantity Surveyors in the uptake of internet resources

Against these objectives, the hypothesis of the research study that the internet was a reliable source of information was put to the test. The hypothesis of this study sought to establish the role the internet played in providing information to the construction professionals in Kenya, particularly the Quantity Surveyors.

5.2 Summary of Findings and Conclusions
The study identified particular parameters which it used to highlight the current utilization of information technologies among the Quantity Surveyors. These included the frequency of using the internet, the amount of time spent on the internet and the activities they carried out in utilizing the information resource. The study also went to identify
organizations which have websites and the effectiveness of the website to the organizations.

**Budget**

Most of the respondents (29.6%) spent an average of between Kshs 2000 and Kshs 5000 per month for internet services. It can be concluded that professional firms and individuals are increasingly allocating funds to the necessary tools and infrastructure. This is because access to information is an investment and therefore better facilities lead to better access to the information. The facilities include hardware, the software and the internet-related services and support systems.

**Time/Frequency**

Among the respondents, 70% indicated that they accessed the internet on a daily basis. There were 22.2% who indicated that they accessed the internet several times a day for QS-related activities. Among the respondents, 29.6% indicated that they had used the internet for a period of between 5-10 years as Quantity Surveyors. From these findings we can conclude that the Quantity Surveying professionals in Kenya are also allocating more time to the internet. This is because the services have improved a great deal through high speed connections such as the fibre optic cable connections rolled out by the government and its investment partners in the region and within the country. The QSs in Kenya frequent the internet at an increasing rate due to the availability of information on products they are using for the projects they are handling and also for the purposes of communication both within and outside the organizations within which they work.

**Websites**

63% of the respondents indicated that they had websites they frequently visited for purposes of QS-related work. 77.8% indicated that their organizations had websites, which most of them indicated they mainly
used to share information with their clients (48.1%) and their employees (44.4%). Therefore, we can conclude that the Quantity Surveyors have also invested in organizational websites that mainly act as a communication platform to the ‘outside’ world of potential clients and employees.

**Current Online Activities**

Most (96.3%) of the respondents used the internet over the last one year to search for information on building products. The next common activity (85.2%) was the search for regulation documents, which was followed by the management and exchange of project information (81.5%). The exchange of project sites photos (77.8%) ranked highly as one of the activities that QSs are exploiting in terms of using the internet.

These activities took various forms such as emails, which all the respondents use. Chat-rooms and instant messaging services are also used on the internet. Moreover, the professionals also access websites that have proven to be of relevant and proactive engagement in the online communities. The social media platforms and professional online communities have become popular platforms of engagement among professionals in the construction industry. Other popular websites are those of manufacturers or suppliers of construction products and services.

**Devices and Access Technology**

Most of the respondents used the desktop computer (66.7%) to access the internet. Laptops and internet modem dongles are the 2nd most preferred way of connecting to the internet. The main technology used is cable technology to access the internet. We can then conclude that the QS professionals in Kenya still rely heavily on desktop computers to access the internet today. The absorption and use of portable internet-enabled devices is yet to take root in the profession. This is due to lack of applications that can run on these devices that will help the professionals in their tasks. This can also be attributed to the introduction of the
portable internet-enabled devices much later after the desktop had become the most preferred device in the typical professional office. In line with this, the internet dongles are also used with the desktops and laptops hence their popularity among the professionals.

The benefits of using the internet were also studied. These included both the current and potential benefits. Most respondents (81.5%) indicated that using the internet made their work easier and saved a lot of time. Savings in operation costs also ranked highly in benefits from using the internet while enhanced productivity (59.3%) and improved client responsiveness (51.9%) are some of the benefits currently being enjoyed by the respondents.

Therefore it can be concluded that the use of the internet can, therefore, be a great contributor to increased productivity among the professions in the various firms. This may stem from increased and timely communication with the necessary audit trails between professional teams and their clients. This is with particular focus on the new construction client who can access the information from myriad sources besides the actual professionals as it was in the earlier days. The new client is also exposed to new ideas, usually from the internet and they expect sterling performance from the local professionals in the delivery of their desired product.

The potential benefits were also analysed. Most respondents (85.2%) believed that the internet has the potential to improve the quality of services offered by the QSs. The respondents (77.7%) also indicated that the use of the internet reduced project times.

The challenges affecting the implementation of internet strategies were also analysed. The high rate of disconnections of internet services has been the biggest challenge in accessing the internet (44.4%). The cost of equipment and services has also proven to be a challenge. Internet
security concerns and limitations by the management of firms has also been a challenge in QS firms in accessing the internet.

Therefore, internet services providers should also focus on improving their reliability in offering their internet data services. Unreliability and inconsistencies in the services has been the greatest concern among the QS professionals. Inasmuch as they have alternative ways of accessing data services, the inconsistencies have plagued most of the options that are available to them. They view money spent on the gadgets and services as an investment and therefore desire to get value for their money.

Additionally, the internet services providers should also focus on improving their reliability in offering their internet data services. Unreliability and inconsistencies in the services has been the greatest concern among the QS professionals. Inasmuch as they have alternative ways of accessing data services, the inconsistencies have plagued most of the options that are available to them. They view money spent on the gadgets and services as an investment and therefore desire to get value for their money.

The main impediments in accessing and implementing internet and data strategies in firms were also analysed. The unreliability of the internet service providers stood out. Unreliable power supply (55.5%) and abuse of internet resource by employees (55.5%) have also been some of the main barriers in implementing internet policies. It can be concluded that some of the impediments lie within the organizations themselves in the implementation and execution of stringent yet realistic internet access policies.

5.3 Recommendations

The professional bodies, The Institute of Quantity Surveyors of Kenya (IQSK) and The Board of Registration of Architects and Quantity Surveyors (BORAQS) should integrate the necessary ICT-related components in the Continuous Professional Development (CPD) programs
for their members. Making it mandatory to use various QS software applications will be a milestone in integrating IT into the professional activities.

The IQSK and BORAQS boards should also encourage the innovative generation of local content in terms of construction information. Currently, all the sources of information required by the professionals are still disseminated in the traditional print format. They are not issued on a real-time basis. The creation of relevant and real-time information centres that are based online will be a great start in making the internet more relevant and applicable to the construction professionals in Kenya.

The QS professional firms should also formulate internet access policies that will foster productive and responsible use of the internet among their employees. The same policies should also spell out the measures taken to ensure that only the necessary and relevant websites and resources are accessed, with special restrictions for social media websites. These firms can also incorporate IT departments in the setting up and maintaining of the internet facilities in order for them to focus and increase their productivity in QS-related work.

The use of the software should also be introduced at the formative learning stages of the QS courses. When the students are familiarized with the software applications at the undergraduate levels, they will easy fit in the industry. This includes the use of the various internet-based resources and applications essential in aiding the QS work.

The IQSK and BORAQS should also come up with criteria with which their members will use in the selection of the internet service providers for their firms. This will be important and applicable in setting and establishing minimum requirements that will ensure reliability and best possible quality of internet services for the QSs.
5.4 Areas of Further Studies

Further studies can be done on:

1. The role of effective communications policy in QS firms in balancing the benefits and risks of social media
2. The business potential underlying business-to-business platforms in social media among the QSs in Kenya
3. How professional QS firms can get value for their investments in online presence
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QUESTIONNAIRE TO RESPONDENTS

OBAGA BARRACK MOKUA,
DEPT OF REAL ESTATE AND CONSTRUCTION MANAGEMENT,
UNIVERSITY OF NAIROBI,
P.O. BOX 30197,
NAIROBI
00100
10th APRIL 2013

Dear Sir/Madam,

I am a fourth year student at the Department of Real Estate and Construction Management at the University of Nairobi. I am conducting a research study on “A Study of the Use of the Internet by the Quantity Surveyors in Kenya” as a part fulfillment for the award of Bachelor of Quantity Surveying.

I am writing to request you to spare some time to complete the attached questionnaire. The information collected through this questionnaire as well as your identity shall be treated as confidential and shall only be used for this research only.

Your assistance will be highly appreciated.

Yours faithfully

Obaga Barrack Mokua
QUESTIONNAIRE

INSTRUCTIONS: Please tick [✓] in the appropriate boxes. Alternatively you can provide your response in the spaces provided.

1. How many years has your firm been incorporated?
   - Less than 10 Years
   - 10-15 Years
   - 16-20 Years
   - 21-25 Years
   - 25+ Years

2. In which year were you registered as a Quantity Surveyor? [Specify] YEAR: _______

3. Do you use any computer software application to carry out your Quantity Surveying tasks and functions as well as for general use?
   - YES
   - NO

4. If yes to 3 above, what computer software do you use for the following functions and tasks [Specify where applicable]:

<table>
<thead>
<tr>
<th>Function</th>
<th>Software I</th>
<th>Software II [Other]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BQ Preparation</td>
<td></td>
<td></td>
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<tr>
<td>Taking off</td>
<td></td>
<td></td>
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<tr>
<td>Cost Estimation</td>
<td></td>
<td></td>
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<tr>
<td>Tender Evaluation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Accounting purposes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word Processing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. How often do you access the internet?
   - Once a month or less
   - Once a week
Several times a week
Everyday
Several times a day

6. Did you use the internet in the past one month for construction related work?
   □ YES
   □ NO

7. How many years have you used the internet for Quantity Surveying work?
   □ Less than 1 Year
   □ 1-2 Years
   □ 2-5 Years
   □ 5-10 Years
   □ 10+ Years

8. Have you undergone any training on how to use the internet for professional QS services/purposes?
   □ Yes
   □ No

9. If yes, please specify the type of training undertaken:
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

10. Approximately how many hours PER WEEK do you spend online for work related use?
    □ Less than 5 hours
    □ 5-9 hours
    □ 10-19 hours
    □ 20-29 hours
    □ 30-39 hours
    □ 40+ hours

11. What devices do you use to access the internet?
    □ GPRS/EDGE Mobile Phone
    □ Smart-phones: Blackberry, iPhone
    □ Tablets: iPad, Samsung Tablets etc
    □ Laptop Wi-Fi
    □ Internet Modem
    □ Desktop Computer
    □ Other [Please State]__________________________
12. How do you access the internet for purposes of your construction related work?
   - Telephone Line
   - Cable Connection
   - Satellite Connection
   - Wireless Connection (such as fixed wireless connection, modem)
   - Other [Please State] ________________________________

13. When you access the internet which of the following do you usually do?
   - Send/Receive Email
   - Use chat rooms
   - Instant Messaging
   - Other [Please State] ________________________________

14. Do you have certain websites that you visit regularly?
   - YES
   - NO

15. If YES list some of the most popular websites you access

<table>
<thead>
<tr>
<th>Manufacturers’ Websites</th>
<th>Professionals Forums</th>
<th>Social Media (Facebook Groups for QS)</th>
<th>Data/Documents Storage/Sharing Websites</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

16. What is the estimated monthly cost of internet access?
   - Ranges
     - Ksh 0 - Ksh 2000
     - Ksh 2001 - Ksh 5000
     - Ksh 5001 – Ksh 10,000
     - Ksh 10,001 – Ksh 20,000
     - Ksh 20,000 and above

USES

17. During the past one (1) year, have you used the internet to:________

<table>
<thead>
<tr>
<th>Uses</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search for information on building products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exchange photos of the construction site of an ongoing project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bid for online jobs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Videoconferencing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Search for information on economic conditions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
18. **Do you/your company have a website?**
   - YES
   - NO

19. **If YES, why do you have a website?**
   - Advertising
   - To create a status for the company
   - To provide information to the employees: current and prospective
   - To receive feedback from clients
   - To share information with clients
   - Other [Please State]__________________________

20. **What benefits have you realized from the use of the internet in your professional work?**
   - Makes professional work easier
   - Aids in decision-making
   - Saves on operational costs
   - Improves on the image of the practice/company
   - Gives us a competitive edge over the rest
   - Enhances our productivity
   - Time-saving
   - Improves quality of document and information presentation
   - Improved responsiveness in relation to the clients
   - Reinforced linkages within the supply chain
   - Improved flexibility as a professional organization
   - Reduced construction project time
   - Other [Please State]____________________________

21. **To what extent do you agree that the use of internet can help the Quantity Surveying profession in Kenya?**

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement in the quality of Quantity Surveying services</td>
<td></td>
<td></td>
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<tr>
<td>Reduced time in the provision of Quantity Surveying services</td>
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<tr>
<td>Reduction in the cost of Quantity Surveying services</td>
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<tr>
<td>Innovation in handling information and data required in the provision of QS services</td>
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<tr>
<td>Redefine the roles of the Quantity Surveyor in this information age</td>
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</tr>
</tbody>
</table>

**BARRIERS**
22. **What challenges do you experience accessing the internet for work purposes?**

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Interest</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Cost of Equipment and Service</td>
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<tr>
<td>Can access internet elsewhere</td>
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<tr>
<td>The available internet services do not meet our needs</td>
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<tr>
<td>Internet Security Concerns</td>
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<tr>
<td>Inadequate Skills/Knowledge</td>
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<tr>
<td>Unavailability of Internet-ready devices</td>
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<tr>
<td>Physical disability</td>
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<tr>
<td>Health reasons</td>
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<tr>
<td>High frequency of internet service disconnections</td>
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<tr>
<td>Limitations by the office/employer</td>
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</tbody>
</table>

23. **To what extent have the following acted as impediments in the adoption of the internet in your organization/practice?**

<table>
<thead>
<tr>
<th>Impediment</th>
<th>Slightly Affected</th>
<th>Fairly Affected</th>
<th>Affected</th>
<th>Not Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unreliable Power supply</td>
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<tr>
<td>High rate of obsolescence of internet enabled devices</td>
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<tr>
<td>Lack of/Inadequate desire and appreciation of the role of internet by the management</td>
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<tr>
<td>Low return on investment on internet equipment</td>
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<tr>
<td>Abuse of internet by staff</td>
<td></td>
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</tr>
<tr>
<td>Unreliable internet service providers</td>
<td></td>
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</tbody>
</table>
APPENDIX 2

Smartphones

Figure 19: Smartphones Available in the Kenyan Market

Source: www.pcadvisor.co.uk

Tablets

Figure 20: A SONY-Xperia Tablet Computer

Source: www.arstechnica.com
Figure 21: Tablet Computers

Source: www.allthingsd.com

Desktop Computer

Figure 22: Desktop Computer

Source: www.hp.com
Internet Modem Dongles

Figure 23: Safaricom and Orange Internet Modems

Source: www.tumblr.com

EASSy Fibre Optic Network

Figure 24: Map Depicting Coverage of EASSy Network

Source: www.submarinecablemap.com
TEAMS Cable Network

Figure 25: Map Depicting Coverage of TEAMS Network

Source: www.submarinecablemap.com