

**THE APPLICATION OF INFORMATION TECHNOLOGY IN REAL  
ESTATE FIRMS IN KENYA**

**BY**

**GITAU SAMUEL WAINAINA**

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UNIVERSITY OF NAIROBI**

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**DECLARATION**

I, Samuel Wainaina Gitau, do hereby declare that this project is my original work and has not been submitted for examination in any other university or published in any form.

Signature ..... Date .....  
Samuel Wainaina Gitau  
B92/63870/2010

**Supervisor,**

This project has been submitted with my approval as a university supervisor

Signature ..... Date .....  
Mrs. Catherine Kariuki

## **ABSTRACT**

Information Technology is now being viewed as an organizational core competency that is necessary for organizations to survive and prosper in rapidly-changing, competitive, business environments. Today, the real estate sector is grappling with a number of challenges such as shortage of skilled manpower, escalating project cost, prolonged construction period, lack of proper record keeping strategies, competition, loss of files, duplication of data, slow access to information and use of outdated ways of analyzing and storing data. Technology holds the key to not only address some of these issues, but also a promise for the sector to react to the changing market conditions more effectively and efficiently.

This study aims to examine variations in firms' responses, and how increasing use of Information, Communication & Technology (ICT) impact on firms' operational and activities that include productivity, staffing structure and requirements, adoption of working practices, quality of customer service, and sales. The primary data were collected in a questionnaire survey conducted which involved a sample of 153 firms randomly selected from office buildings located in the Central Business District (CBD) and other key submarkets in the fringe of CBD in Nairobi. The firms' perception of ICT impact on real estate needs was asked in the survey, and the variations in their responses were analyzed with respect to factors like business types, firms' attitude towards ICT use, and their ICT strategies.

Utilizing data from 96 real estate companies, this study examines the impact of information technology in real estate and the extent of applications implementation within an organization. The findings from the analysis of data provide evidence that Information Technology has a significant, positive impact on the way real estate firms carry out their activities. Also, Kileleshwa, which is a part of Nairobi city, has been selected as study area in developing Real Estate Information Management System (RIMS). The Geographic Information Systems (GIS) technology was implemented in the development of RIMS to pose the geographic questions made by the user in house hunting. The study reinforces the importance of Information Technology infrastructure to organizations as one source for sustainable competitive advantage.

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To you all, I wish you God’s blessings and happiness all the days of your life.

## **DEDICATION**

To my family, “You are the wind beneath my wings.”

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## CHAPTER ONE

### 1.0 Introduction

Information technology (IT) has become a potent force in transforming social, economic, and political life globally. Without its incorporation into the information age, there is little chance for countries or regions to develop. More and more concern is being shown about the impact of those left on the other side of the digital divide - the division between the information "haves" and "have nots" (Hafkin et al, 2001). Information access and information sharing are getting more involved in human life by the increasing of information and communication technologies. Within the new era, called the information age or information area (Handzic, 2004), computers have integrated in our lives and so, deficiencies of industrial age, such as limited communication based on face-to-face or paper based interactions, and tangible and immediate knowledge (Miller, 2002) have been eliminated.

Globalization based on competition, virtualization, or digitalization facilitated by information technology, as well as the transformation to a knowledge-based economy has formed the information age, and all organizations are trying to keep up with information area for becoming knowledge based organization. However, to achieve this goal depends on the number of successful knowledge workers in the organization and the use of successful, productive and efficient knowledge throughout the organization. This leads to using of knowledge in different ways in order to achieve organizational goals (Handzic, 2004).

In essence, continued improvements in technology have significantly revolutionized the way real estate companies operate in the current business environment. However, the impact on the performance of the real estate sector with the deployment of technology is largely dependent upon the depth of its involvement across the various facets of the operational processes. How real estate players innovate and respond to technological advances will undoubtedly play a major role in differentiating the companies, their projects and offerings in the minds of consumers.

In the long run, the advent of technology exposes the players to numerous challenges, as well as renders new opportunities to improve innovation, product development and customer support. The key to driving growth in such a scenario will nevertheless be dependent upon the willingness of real estate players to accept sophisticated technologies and seamlessly integrate them within their business operations.

## **1.1 Problem Statement**

Operating in a dynamic environment, the success of real estate companies' hinges, to a large extent, on their ability to deliver innovative, user-accepted products and services in a timely, seamless manner. With so much riding on the prosperity and future of their companies, more and more developers are turning to advanced technology as a tool for optimizing the value of their businesses in the marketplace. Emerging technological trends are redefining the real estate space and taking it to the next level, for both now and in the future. Technology is emerging as a catalyst of change for the real estate companies – be it construction, project management, marketing, business management or customer service. Today, the real estate sector is grappling with a number of challenges such as shortage of skilled manpower, escalating project cost and prolonged construction period (Confederation of Indian Industry, 2012). Technology holds the key to not only address some of these issues, but also a promise for the sector to react to the changing market conditions more effectively and efficiently.

Information is vital if an organization is to function effectively. Collected data relating to real estate and land has to be stored, analyzed and geo-referenced. Processed data from these processes is used in decision making, production of maps and developing plans, laws and policies. For these activities to be done effectively, the land information must be stored in a computerized database (Macoco, 1999). The success of the organization in meeting its objectives depends to a large extent on sound information management principles. Developments in computer technology have aided firms and organizations in sound management of their information for effective decision-making (Brandin and Harrison, 1987). According to Bernhardsen (2002), the use of GIS has been in vogue primarily due to its advantages in planning projects, ease of making decisions, office integration and visualization capabilities.

Kenya's rapid development and economic expansion has created a need for detailed and regular information as to the prevailing state of the property market. The involvement however in this market is dominated by the middle-class who comprise a small section of Kenya's total population. Majority of the Kenyan population wants to somehow, directly or indirectly be involved with property (Real Estate). Even a squatter is involved since he is seeking an interest in land just like the middle class. There is a desire to maximize the benefits from this interest and this requires the help of a professional with enough

information to form the basis of good decision making. The only way to avail this information to all, indiscriminately, is by use of the internet and GIS based applications.

Information in our land markets is hard to come by. Land markets in East Africa are generally informal (Syagga, 2010). that is, from how you get to know there is a piece of land for sale (neighbours, family networks), to how it is demarcated (by the sellers who might not be qualified surveyors), to how a 'registration' is done and bundle of rights conveyed (through the chief, political bigwigs a 'letter of agreement' or a signed piece of paper with the chief's stamp is given to the buyer). If all these information on land can be held in a computerized database or Geographic Information System, it would be easy for the estate agent to find buyers for properties they have been mandated to sell and tenants for properties that they have been mandated to let. Although the advantages of GIS are many, the cost of implementing it and building capacity would be prohibitive for many firms.

It's not unusual to hear of missing files and misplaced records in our companies and government offices (Konyimbi, 1996). This in turn leads to corruption and malpractices. Property administration and management, which are core areas for an estate agent, should be efficient and effective and this can only be brought by proper record keeping and management. Proper record keeping and management of any kind must be based on knowledge, which depends on information. On the other hand, information depends on data collected and manner in which the results are communicated. Automated databases enable faster retrieval and communication of information for sound decision making and sustainable development of the property information resource.

Buying a house to any individual may represent the largest private transaction and might obviously (in most cases) amount to his/her largest single asset. This is not an easy task and a person well versed in the technicalities and has experience in real estate is indispensable. Today's buyer/renter is not only concerned with the size of the house, number of bedrooms and price but also how far is the police station, are there nearby schools, access to roads, signs of any sources of noises e.g. nearby bus-stops, pubs, blacksmith workshops etc. Today's buyer wants to know the environment he is getting himself into and since buying a house might be the most expensive venture he undertakes in his lifetime, he does not want to get it wrong. Most people do not know that there exists a tool that can help them find property that meets their needs. Geographic Information System can help people analyse all the relevant information to make the right decision.

Land related information, including property, is an important and expensive resource that must be managed efficiently in order to maximize its potential benefits (Chang, 2004). ArcGis software maker, ESRI, defines Geographic Information System (GIS) as a tool that “lets us visualize, question, analyze, interpret, and understand data to reveal relationships, patterns, and trends”. It consists of a database that has both spatial and aspatial data and procedures for systematic collection, updating, processing and dissemination of data. For professionals dealing with matters of land and landed property, having information on a particular property on paper records or Microsoft excel worksheet should not be enough. Their goal should be to have geo-referenced data of a property complete with information about it surrounding that clients can visualize, query and interpret to make an informed decision. An estate agency that embraces GIS could lead to faster retrieval of data, better management of information, increased sale and in turn increased commission.

According to the website, <http://www.indianrealestateforum.com/pune/t-problems-faced-during-property-search-44682.html>, two of the major challenges that people looking for their ‘dream’ homes go through are:

1. Finding the projects in specific area since newspapers and portals can only help to some extent.
2. Visiting every project and finding out the price and the fact that they cannot visit all the projects. Not every project is as per their price and concept. Visiting multiple projects consumes lot of time, sometimes few months and multiple weekends.

An estate agency using GIS can greatly help the home buyers. GIS capabilities of visualization and dealing with different kinds of data in different locations will help home buyers make decisions that they are confident in (Chang, 2004).

The Njonjo Commission of Inquiry into the Land Law System of Kenya on Principles of a National Land Policy Framework (2002) states that an efficient system of land delivery requires that capability should exist for the preparation and maintenance of a comprehensive land information system. The land information system should indicate not merely who owns what interest in what land but other details such as land capability, uses, size, distribution and topographical characteristics. The National Land Policy, Sessional Paper No. 3 of 2009, lists its principles among them access to land information and efficient land management. A comprehensive land information system incorporates both geographical (spatial) and socio-

economic (non-spatial) data in one easily accessible database. This ease of accessibility necessitates the use of information technology.

The Ministry of Lands, Housing and Urban Development, which is the custodian of all land records, keeps large volumes of information needed in the administration of the land resource. However, most of these records are kept in manual form, and are susceptible to damage and destruction as a result of accidents such as flooding, bombing, fires and human errors. The manual system of record keeping is also very costly in terms of time taken to retrieve documents, staff employed to manually retrieve these documents and space taken by the files and cabinets used for storage.

Efficient use of land related information is an area of global concern as indicated by the Barthurst declaration. The United Nations, land administration guidelines outline the need for efficient management of land information as a resource. A study done in 1999 by Habitat on LIS noted that Ministry of Lands, Housing and Urban Development encounters a large problem as regards to the updating of land rent records. According to Konyimbi (1996), land cadastres and information systems are not well developed at the moment in Kenya. There are numerous complaints by members of the public regarding the time taken to carry out any transactions at the Ministry of Lands, Housing and Urban Development.

## **1.2 Research Question**

How do new technology and organizational change interact, and what is the impact of their interaction on working practices and quality of services offered?



## **1.3 Objectives**

### **1.3.1 Main Objective**

The overall objective of this project is to show how new technology (i.e. information and communications technology (ICT) is impacting on the shape and form of real estate practice in Nairobi.

### **1.3.2 Specific Objectives**

1. To assess to what extent real estate firms have accepted and implemented technology in their day to day activities.
2. To examine how new technologies are affecting working practices in a real estate office.
3. To demonstrate a GIS application that can be used in real estate practice for sales and letting of property.

## **1.4 Study Hypothesis**

The application of technology in Real Estate Agency does not lead to better data management.

## **1.5 Significance of the Study**

Land commonly known in law and commerce as real estate or real property is a complex of physical features and institutional rights. It includes the physical appearance of an area or the soil, all developments undertaken, what lies beneath as well as institutional rights that go with it. Equally important is the entire environment in which the site is located as this has implications on its use. Existing infrastructure such as roads and bridges cannot be separated from land. When people are purchasing property, they want to know what tenure system exists, what encumbrances are there, what kind of facilities are passing below their land, does it encroach on road reserves or neighboring parcels and will later cause problems etc. Only technology, e.g. GIS, can enable you get this holistic view of property since data is geo-referenced (ESRI, 2010).

According to the national development plan (2002-2008), the government plans to increase efficiency in revenue collection by the review of land rent and rates by the implementation of a national Geospatial Information System. Recently, the Kenya Revenue Authority declared its intention of mapping out all property with the aim of sealing all loopholes used by tax

evading landlords. Geospatial Information Systems is their tool of choice in this undertaking. The computerization of the functions of the Ministry of Lands is currently an issue of priority both for the government and the ministry. It is also clear that other sectors of the economy are embracing this new technology of Geospatial information Systems to aid them in their day to day activities. It would also be important for estate agency to tap into this technology and benefit from its ingenuity.

Information technology will also speed up the service delivery such that for every inquiry on a parcel of land or landed property, the answer will be obtained faster and customer relations will improve. Accessibility of land and property information by all stakeholders will result in economic growth and development will be much faster. Potential property owners would also benefit from being able to know where available property is located and its attributes accelerating the process of exchange. The lack of adequate, timely and quality information has posed quite a challenge to purchasers and developers of land (Syagga, 2010).

There is a need to eliminate incidences of duplication of resources by examining how land is held in the estate agency office. It's common to find different departments of the same agency having used resources to acquire similar information at different times. An effective system of Land Information System will prevent wastage of scarce resources and tap the full potential of the information they have to increase their revenue. A real estate profession using a computerized database or Geospatial Information System will find that he is working more efficiently and effectively.

“No land is an island” (Guy, 1990). Whatever happens in a particular piece of land eventually will affect surrounding parcels. Today's property buyer is not only interested in the property he is buying but also in the kind of neighbourhood he is buying into. Environmental factors, cultural factors and physical factors all play a critical role in his decision making process. It's only with the use of Geospatial Information System that one can analyse all these information at one sitting and see how they all relate with respect to each other to produce the 'perfect' mix.

Land is the source of all material wealth (Simpson, 1976) and as such it might be expected that rigorous efforts would be made to use ICT to aid the development, management and appraisal of real estate. Unfortunately, the evidence shows that in general within Kenya, the sector has been slow to innovate compared with other areas. Much of the innovation that has

occurred has been driven by those operating on the fringe of the sector, such as property software companies and academics. It seems paradoxical that a sector that appears to be quintessentially an information-based industry should be so resistant to the opportunities provided by the Information Revolution.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

The real estate sector in Kenya has come a long way from being dominated by a handful of players in the 90s to an expanding base of developers, investors and global stakeholders buoyed by the growing construction industry in the country. The sector has been undergoing corporatization and professionalization and recognized as a key sector contributing to the economic development of the country. Urbanization is inevitable and this will bring significant demand for real estate, and therefore there is a lot of optimism about the sectors growth prospects. The government is also committed to introducing changes in the existing policy dealing with real estate and banking to resurrect developer interest and expand the role of the private sector in infrastructure development. Implementation of key economic reforms is likely to result in a gradual improvement in macro-economic conditions in the coming few months. This, coupled with a slow and gradual economic recovery in the Eurozone, is likely to boost demand in the real estate market (Confederation of Indian Industry, 2012). With all this prospects of growth comes the new challenge of how to handle them.

The use of computers in almost all economic activities has been accepted. Information Technology (IT) which is defined as computer based information systems is the fastest growing and most important industry in the world today. The residential real estate industry has been a revelatory setting (Yin 1984) for several reasons. The main reason it states is that real estate professionals are rapidly adopting new ICT. For instance, the penetration of computer usage reported grew from 5% of licensed agents in 1995, to nearly 95% in 1999 (National Association of Realtors 2000). IT is the convergence of office automation, data communication and data processing (Brandin and Harrison, 1987). According to Macoco (1999), "this is the information age. Wealth and development will therefore be found on those who have information, those who control its processing and those who control its disposal and dissemination." For any professional dealing with matters of land and landed property, having computerized your office is not enough. The use of other softwares and IT innovations (e.g. GIS) will determine whether a real estate professional will succeed in this era. The ability of GIS to handle and process geographically referenced data distinguishes it from other information systems (Chang, 2004).

Employees of real estate companies are wearing more hats than ever. Corporate real estate executives serve as directors and integrators of information. The traditional lines between

departments such as sales, human resources, information technology, finance and others have blurred as departments have a need to share the same information. “Investing” in the IT integration of corporate wide information is essential in order to build a foundation to allow a company to achieve higher level, long-term goals. Effective use of IT is quickly becoming a necessity, even in an industry as conservative as real estate (<http://www.altiusit.com/files/articles/articlewptreal.htm>). Corporate real estate executives must play a leadership role in the integration of resources and IT; thus easing the transition as the lines blur. This requires a blending of people, technology, and connectivity. In this new era, the role of the corporate real estate executive is one of a strategist, where timely and correct information is vital.

Normally, uses of ICT are enacted by individuals who, through their actions, change the conduct of their work in response to the availability of these technologies. Individual-level uses of ICT lead in turn to changes in the organizations in which the work is done. These effects manifest themselves as changes to organizational processes and eventually to changes in organizational structures. Organizational structures include how people are organized for reporting and dissemination of information. Organizational processes reflect the choice and sequencing of tasks to accomplish intended outcomes. Changes in process also have implications for industrial structures and value-chains (Baker, 1990). Industrial structure includes the division of work among companies (i.e., the position of firm boundaries). The industrial value chain can be seen as a process extended across multiple firms. In other words, as individual workers use various forms of ICT in their work, they alter both how they conduct their work and how they participate in the organization’s processes and structure, and thus indirectly how their organizations participate in the industry-wide value-chain (Crowston et al, 2001).

For example, the real estate sales process imposes certain requirements for information sharing, dissemination, and use, with implications for individual work and use of ICT. The interaction of these forces shapes the uses of ICT, new forms of work and new ways of organizing (Kling and Scacchi, 1982; Markus and Robey, 1988; Orlikowski and Robey, 1991; Wigand et al, 1997). Finally, changes to organizational processes and industrial structures, arising in part from how individual workers use ICT in their work, lead to changes in organizational and industrial outcomes such as productivity or performance. One implication of this set of relations is that the uses of ICT are not directly related to changes in outcomes, nor mediated in a simple way. Consequently, the eventual outcomes are

impossible to predict in general. Instead, to understand the ways ICT can change work, more research has to be done so as to understand the individual, organizational, and industrial levels, and the underlying processes, simultaneously.

## **2.2 Information Technology**

Information technology (IT) has become a potent force in transforming social, economic, and political life globally. Without its incorporation into the information age, there is little chance for countries or regions to develop. More and more concern is being shown about the impact of those left on the other side of the digital divide-the division between the information "haves" and "have nots" (Hafkin et al, 2001). Hafkin et al (2001) continues to state that most women within developing countries are in the deepest part of the divide further removed from the information age than the men whose poverty they share. If access to and use of these technologies is directly linked to social and economic development, then it is imperative to ensure that women in developing countries understand the significance of these technologies and use them. If not, they will become further marginalized from the mainstream of their countries and of the world. It is essential that gender issues be considered early in the process of the introduction of information technology in developing countries so that gender concerns can be incorporated from the beginning and not as a corrective afterwards.

Many people dismiss the concern for gender and IT in developing countries on the basis that development should deal with basic needs first. However, it is not a choice between one and the other. IT can be an important tool in meeting women's basic needs and can provide the access to many opportunities. According to United States Agency for International Development, in many developing countries, less than one percent of the population male or female has Internet access. By regions, women are 22 percent of all Internet users in Asia, 38 percent of those in Latin America, and six percent of Middle Eastern users. No regional figures by sex are available for Africa.

IT is a driving factor in the process of globalization. Globalization accelerates the change of technology. Every day it seems that a new technological innovation is being created. The pace of change occurs so rapidly many people are always playing catch up, trying to purchase or update their new devices. Technology is now the forefront of the modern world creating new jobs, innovations, and networking sites to allow individuals to connect globally. The

timeline below shows the rapid transformation of how technology has accelerated within the last 20 years to 2012 (<http://www.globalization101.org/information-technology/>):

**Table 2.1: Timeline of How Technology has changed**

<b>TIME</b>	<b>INVENTION</b>
18 years ago	Internet commercialized
17 years ago	First mobile phone with Internet connectivity
15 years ago	Google named the search engine of choice by PC magazine
12 years ago	Blackberry launched
9 years ago	Facebook launched
7 years ago	Twitter launched
6 years ago	iphone, the first of the smart phones, introduced
5 years ago	Groupon introduced
2 years ago	17 million smart tablets sold — estimated that 100 + million by 2014
Every 60 seconds (so it seems)	New apps, tailored to users' specific needs created

**Source: Field Survey, 2012**

### **2.3 Information Technology and Real Estate**

Innovation brought about by new technology disrupts existing processes, practices and roles and produces either conscious or unconscious resistance by those who feel threatened. The introduction of a computerized national land information system, for example, impacts on the roles of professionals involved in real estate convincing, reveals information about land ownership that certain groups may prefer to remain secret, and requires government to devote limited resources to changes in legislation. Progress in all spheres of human activity necessitates change. It is impossible for either an individual or an organisation to improve by staying the same. No change may be an option but it involves risk because others may change and, in a competitive sense, move ahead. It has been suggested that continuous innovation is a pre-condition for sustaining competitive advantage (Porter, 1995) a view that is reinforced by the performance of high-technology companies, nourished by new ideas and their implementation (Manseau, 2001).

According to Erik Qualman, Forbes Top 50 Digital Influencer, 82% of all purchases have some form of online interaction. Technology is widely accepted as a major stimulus for change in society (Twiss, 1992) and in the second half of the 1980s information and

communications technology (ICT) has provided more than just a new competitive weapon for commerce (Willcocks, 1997), it has led to the transformation of our material culture (Castells, 1996). As Freeman (1988) states: “The contemporary change of paradigm may be seen as a shift from a technology based primarily on cheap inputs of energy to one predominantly based on cheap inputs of information derived from advances in microelectronic and telecommunications technology.” Since the development of microelectronics in the 1970s, some spectacular predictions have been made about the impact on society of the technologies of information processing and communication, with the terms Information Revolution and Information Society being commonplace (Negroponte, 1995; Leer, 2000).

Today, the real estate sector is grappling with a number of challenges such as shortage of skilled manpower, escalating project cost and prolonged construction period. Technology holds the key to not only address some of these issues, but also a promise for the sector to react to the changing market conditions more effectively and efficiently (Confederation of Indian Industry, 2012). The widespread deployment of technology across the various operational phases is expected to enable the sector to rationalise construction-related processes and improve the quality, cost-effectiveness and timeliness of project delivery, while also ensuring that the projects are developed and completed in consideration of long-term sustainability and environment-related concerns.

In countless industries, deployment of technology has contributed to enhanced productivity and better business performance. Even in the real estate sector, increased usage of technology has permitted real estate players to markedly improve the construction efficiency, while also inculcating sustainable practices across the construction cycle. Research proves that the implementation of advanced technology has permitted the sector to significantly reduce the time wasted in coordinating activities and in managing, moving, and installing materials for construction (Confederation of Indian Industry, 2012). From the commercial perspective, technology has enabled the sector to reduce the losses arising due to lack of interoperability, as well as the transactional costs required to resolve disputes and claims associated with construction projects.

There is evidence all around us and throughout modern history that the impact of technology is often patchy and unpredictable. As Braudel (1979) has put it, “first the accelerator, then the brake”. And this is particularly so within the real estate sector in the United Kingdom, where the responses to the opportunities offered by ICT have been very mixed. The real estate



sector in the UK has adopted information and communications technology (ICT) more slowly than other sectors of the economy (Dixon, 1995; Cash, 1999). Many commentators view technology as a driving force, its progress impeded only by the ignorance and stupidity of those unable to envision or adapt to the brave new world. The assumption behind this technological determinism is that new technology emerges from scientific study and then inevitably changes society, with most of us behaving like spectators (Williams, 1974). As Winston (1996) states: “The state of the market, or better, of society is the crucial factor in enabling the development and diffusion of any communications technology or in hindering it.”

This is not to suggest that technology does not have an impact on how we live. Since the first Industrial Revolution in the last third of the eighteenth century technology has completely transformed the nature of society. But the rate of change in different geographical, economic and social sectors varies enormously. As Castells (1996) argues: “The interactivity of systems of technological innovation and their dependence on certain ‘milieux’ of exchange of ideas, problems, and solutions are critical features that can be generalised from the experience of past revolutions to the current one.” In the case of technological innovation in real estate, an improved understanding of the social, cultural, economic and educational factors would permit a more accurate analysis of the rate of diffusion of information systems which may justify some positions in addition to identifying the barriers to change.

The efficiency of the property market is dependent on good quality, accurate information that is available as conveniently as possible. Obviously a comprehensive, computerised system available throughout the country would be preferable to a collection of locally held, land registers or even a national system that is paper-based. The technology to accomplish the former has been available for a considerable length of time but National Land Information System (NLIS) is only just coming into being in Kenya. In other countries e.g. Scotland, much more progress has been achieved, not because they know more about the technology, but because of a different legislative framework, and an alternative view of access to information (Dale, 1997).

Another area of progress is the recent decision to establish an automated land information system for the Russian Federation (Corbley, 2002). The Land Reform Implementation Support programme (LARIS) is jointly funded by the World Bank and Russian government and is run by the Federal Land Cadastre Service (FLCS). As a preliminary to establishing the

land information system it was recognized that reform of property rights and land transactions was fundamental to establishing a market economy, which itself depended on comprehensive political reform. The innovation is being driven by political, social and economic imperatives not technological development, although the latter forms an integral part of the mix.

## **2.4 Real Estate Information Systems**

The importance and significance of property has been recognised throughout history. It has been explained, for instance, that Sir John Fortescue demonstrated to Henry VI that his political stability and his capacity to maintain his estate were linked (Guy, 1988). As Denman (1978) has stated: "Property is a social and juridical institution, a commonplace in the anatomy of all civilised societies. In human relationships it is a vehicle of power and in the land context a determinant of the occupation, possession and ownership of land." It has been estimated that real estate is the second or third largest contributor to overheads for most businesses (Roythorn, 1997). Another study reveals that more than half of the organisations interviewed claimed to have property assets worth 30% or more of their total asset value (Avis, 1989).

Land is the source of all material wealth (Simpson, 1976) and as such it might be expected that rigorous efforts would be made to use ICT to aid the development, management and appraisal of real estate. Unfortunately, the evidence shows that in general within UK the sector has been slow to innovate compared with other areas (Guy, 1988). Also, much of the innovation that has occurred has been driven by those operating on the fringe of the sector, such as property software companies and academics. It seems paradoxical that a sector that appears to be quintessentially an information-based industry should be so resistant to the opportunities provided by the Information Revolution. Understanding why this is so is not straightforward because of the complexities the real estate industry - with its diversity of functionality and wide range of organizational type.

From the general literature on innovation it is reasonable to surmise that the suppression of the radical potential of ICT within real estate is caused by a combination of influences, including political, cultural, economic, financial and educational. In addition, there are issues related to balancing access to information and privacy, the application of standards (e.g. for

data transfer) and the degree of disruption caused by any new technology. The researcher is cognizant of the need for further research aimed at removing barriers to innovation.

This lack of innovation is not unique to the UK. It has been reported (Han, 2001) that in Singapore's property management companies, computer applications are lagging behind the advancement of computer hardware and software. Even in the US - seen by some as the originator of the Information Revolution (Castells, 1996) - it has been observed that resistance to technological advances penetrates the entire real estate sector (Sherwood, 2001). Another opinion is that far too many realtors view the technology as a threat, in much the same way as the Luddites of the first Industrial Revolution (Tuccillo, 2000).

There have been some notable successes using ICT within the real estate sector, both for industry-specific applications and for general-purpose office automation. Property management systems are now widespread, and there are numerous specialist computer packages for investment valuation, development appraisal and commercial and residential agency. Also, on-line, market intelligence systems, such as Estates Gazette Interactive and FOCUS, have emerged to exploit the power of the Internet. Similarly, the use of office automation tools, like word processing, spreadsheets and e-mail, is routine in real estate offices. But these "successes" have essentially been based upon the automation of mundane tasks rather than a genuinely innovative approach to real estate practice. There is evidence of a lack of a strategic vision within the sector (Dixon, 1998) and it has been shown that many organisations are a long way from realising the full potential of ICT (Waller, 2000).

There is a parallel lack of emphasis on training and education to meet the demands of this new commercial environment. A survey conducted on behalf of the Property Computer Show in 1999 (Cash, 1999) revealed that 51% of the property firms interviewed had not spent a single day on ICT training during the previous 12 months. When National Association of Realtors (from USA) did their technology survey, more than half of the agents stated that they wanted more in the way of technology help and services from their brokers ([http://realestate.about.com/od/technology\\_forrealestate/a/tech\\_franchises\\_3.htm](http://realestate.about.com/od/technology_forrealestate/a/tech_franchises_3.htm)).

## **2.5 Incremental and Disruptive Technologies**

It is useful to make a distinction between incremental technological change and disruptive technological change (Norman, 1999). The adoption of the mobile telephone is an example of the former. Although real estate professionals have enthusiastically adopted the new

technology they have continued to work within the traditional paradigm. In contrast, the use of ICT for the production of printed material (e.g. reports, brochures, journals) has fundamentally changed the process and significantly reduced the number of personnel required to undertake it (e.g. copy typists and printers). For example, when the first computerised composition system was introduced into the Estates Gazette offices in the early 1980s the workforce of printers needed to produce the journal was reduced from sixty to fifteen. Later the process of page composition was shifted from the print room to the desktop.

The nature of this distinction requires further analysis. In the example cited the mobile telephone is used to facilitate, rather than replace, the activity being undertaken. The complex interaction that takes place between individuals in a business context (e.g. negotiations) is simply undertaken using a more convenient communications device – one that releases the parties from the restriction of specific locations. In the case of document production a completely new technological solution – desktop publishing - has virtually replaced a traditional industry – printing.

E-mail is another example of an incremental, non-disruptive technology that has been readily adopted by real estate professionals. Mercedes-Benz installed Verimation's Memo office automation package as early as 1988 (Kirkwood, 1997) but it was not until the beginning of 2000 that e-mail was being used widely by UK real estate professionals, as reflected in an Estates Gazette survey (Kirkwood, 2000). The survey, undertaken in the form of a questionnaire faxed to 170 industry professionals, was designed to identify the level of e-mail use, the competence of users and their perception of this form of communication. The results demonstrated widespread commitment to the technology and an appreciation of its ease and convenience. However, at that date, 68% of respondents still did not access their e-mail away from the office, thus failing to exploit the 'store and forward' concept that is one of e-mail's most valuable features.

This reluctance to embrace the benefits of e-mail fully could be explained by a number of factors. First, lack of awareness of all its features and potential was evidenced by many of the replies. Second, it takes time to establish a robust infrastructure to support remote working. And finally, and most significantly, follow-up interviews indicated a reluctance on the part of senior managers to give staff the opportunity not to be tied to the central office – a clear example of suppressing technological change for perceived business benefits.

## **2.6 Real Estate Applications**

The principal application areas for ICT within real estate are property management, property maintenance, commercial and residential agency, valuation, marketing, quality of service offered to customers, building development and appraisal and property portfolio management. Cutting across all these areas are the technologies of geographic information systems (GIS), which has become established as a distinct field of academic study (Chang, 2004).

### **2.6.1 Technology in Property Management**

Many of the basic processes involved in property management are ideally suited to computerization: the establishment and maintenance of property databases; the preparation of estate accounts; the monitoring of diary dates; and, service charge management and accounting. Consequently, this was one of the first areas of real estate to attract the early attention of systems developers. For example, Jones Land Wootton introduced a computerised accounts system in the early 1970s (Stapleton, 1981). It is also the sub-sector that contains the largest number of systems at the annual Property Computer Show (PCS) in London.

Property management systems are essentially property databases linked to accounting procedures, with real estate professionals being responsible for the maintenance of the former and accounts staff taking control of the latter. As the purchase of systems must inevitably be justified on financial grounds it is not unusual for the accounting functions to dominate and for property information, particularly of a non-financial nature, to be peripheral. Real estate professionals may lose influence because accountants control the financial engines of such systems. Unlike accounts staff, who are obliged to enter data in advance of regular accounting functions (e.g. quarterly reports) much of the data entered by real estate professionals is optional (e.g. lease terms, areas). A pattern can emerge of failing to update data, which creates uncertainty about the validity of the database that in turn leads to a lack of commitment to update.

Consequently, the innovative use of such systems to aid the strategic management of portfolios is probably the exception rather than the rule. In this case the suppression of the radical application of ICT results from a combination of an anti-technology culture and an

absence of appropriate education and training. As Dixon (1995) states, there is a need to: “Promote the education of senior managers in matters relating to the strategic use and value of IT.”

### **2.6.2 Technology in Property Maintenance**

Property maintenance, which functionally forms part of property management but in practice is frequently regarded as a separate, technically based activity, has attracted attention from property software companies in the recent past. The majority of maintenance systems are developed in-house to suit local requirements and there is a lack of standardisation. The maintenance of the built environment is important to everyone and contributes significantly to the economy directly through employment in the building industry and indirectly in the impact it has on our homes, offices and factories (Seeley, 1976). But innovation in this field is influenced more by political will and the establishment of standards and improvements in the education of maintenance managers than by technological capability.

All the technical elements needed to establish comprehensive maintenance management systems are currently available – computer networks, database systems, remote data capture devices and digital photography. But innovation in this field is suppressed by an absence of appropriate political leadership, a lack of strategic vision by managers and the need for universal standards for data capture, storage and exchange.

### **2.6.3 Technology in Estate Agency**

The field of commercial and residential agency presents a contrasting example of the suppression of radical innovation, dominated as it is by the vested interests of the professionals involved.

Agents are categorised as intermediaries and it has been observed that they may have a significant effect on economic activity, accounting for over one quarter of US gross domestic product (GDP) (Spulber, 1999). Essentially this brokerage function helps to facilitate the relationship between buyers and sellers. Typical agency software provides database structures for storing details about properties, companies, agents, applicants, clients, tenants and landlords. Functions include the creation of requirement files, a diary of events, mailing lists, archiving and the storage of comparables. Systems are sold on their capacity to undertake applicant and property matching, and to generate property particulars automatically.

In addition, listing services on the Internet have emerged, which have become highly developed in the US but are still rather fragmented in the UK. The technology allows prospective purchasers to search on-line and even undertaken virtual tours of properties. It has been observed that ICT significantly reduces the matchmaking role of agents, and forces them to develop other professional services (such as expert appraisal) critical to real estate transactions (Wimmer, 2000). But it appears that these changes are forced upon agents by the demands of more enlightened clients. As the Internet spreads, people become more aware of its potential from a range of non-property applications and then demand the same level of service from the real estate industry.

There is very little evidence that the majority of agents have proactively investigated the use of ICT to improve either efficiency or quality of service. Many agents have in the past viewed these developments as threatening and disruptive and have instead sought justification for suppressing the technology. A combination of enlightened clients and the standards set by other industries, such as banking, has forced them to change.

#### **2.6.4 Technology in Valuation**

The valuation and appraisal of real estate is undertaken for a wide variety of reasons including sales, purchases, development and taxation. This activity in practice consists of a blending of art and science. Valuers, or appraisers as they are known in the US, use their market knowledge and their judgment to supply the inputs for variety of mathematical models, such as discounted cash flow techniques.

Computer systems have been developed both in-house and as packages to support this activity. The models used range from traditional, rather discredited techniques (e.g. Term and Reversion) to advanced systems, such as multiple regression analysis (MRA) and Monte Carlo risk analysis.

However, in general there is an antipathy towards more sophisticated methods of appraisal in the UK, with most practitioners characterising the process as more art than science. Consequently, although the use of software for valuations is now widespread throughout the profession, there is little evidence of the innovative use of ICT. This conservative culture has led to some suspect methods being enshrined within computer software.

The suppression of innovation within this sector results partly from the professional culture, partly from a misunderstanding of methods and outputs (Sykes, 1990) and partly from secrecy about data. Increased access to data, for example, would enable computer-assisted mass appraisal to be undertaken by MRA.

#### **2.6.5 Technology in Property Portfolio Management**

Active property portfolio management involves the re-structuring of portfolios of properties using a combination of buying, selling, lease restructuring, development, redevelopment and refurbishment (McIntosh, 1985). The portfolio manager's objective is to optimise the financial returns from the property and, hence, some measure of these returns, no matter how crude or naive, is required. The complexity of property combined with the intricacy of many of the valuation models and the detailed data used necessitates the use of computers for processing purposes. Portfolio managers would be severely limited if their decisions had to be based on computations undertaken by hand. It could reasonably be argued that this specialist activity has only emerged because of the availability of cheap processing power and purpose-designed software.



Nevertheless, only a handful of property portfolio systems have been developed for sale since Stephen Sykes designed one of the first, COMPAS, for chartered surveyors St Quintin in London in 1982 (Kirkwood, 1984). Currently there are less than five fully comprehensive portfolio packages available in the UK, plus some systems developed in-house by financial institutions.

One of the major constraints to innovation in this highly-specialist sub-sector is the combination of high development costs and very limited market opportunities. Such systems are only purchased by organisations with multi-million pound portfolios to manage and are of little or no use to the large number of small to medium sized real estate practices. In addition, these are systems that require high levels of competence in both investment valuations and systems use.

### **2.6.6 Technology in Marketing**

Increasing competition, trimming marketing budgets and need to identify and target potential customers cost-effectively is compelling real estate players to explore new and innovative strategies and technologies for marketing their projects. Deploying technology for marketing projects helps marketing teams to design and deliver innovative marketing programmes that are much more efficient. The traditional methods of marketing construction projects have proved to be extremely time-consuming and ineffective at offering useful information of buildings such as design and planning to potential customers (Confederation of Indian Industries, 2012). With customers seeking more information for making informed decisions while making purchases, deployment of technology provides an opportunity to savvy developers to differentiate their marketing efforts from that of their competitors. Across the sector, developers are investing in providing virtual tours of their projects to their potential customers to effectively market their projects while saving both time and cost

Providing a virtual tour of a property to a potential customer is fast emerging as a preferred tool for realtors and buyers alike. Housing projects are increasingly being shortlisted by customers and often also selected on the basis of a virtual tour of the property.

### **2.6.7 Technology in Customer Service**

For the new age consumer, customer service forms an extension of the overall marketing process. This provides an immense opportunity to real estate developers to tap this facet of

marketing to differentiate themselves from their competitors. By effectively leveraging technology solutions in the context of customer service, real estate players can transform the experience of end-users (Confederation of Indian Industries, 2012). Technological platforms, including web portals, social media, online forums and mobile applications, are increasingly being tapped by real estate developers to enhance the efficiency of their customer service processes. Further, technology also empowers marketing teams of real estate companies to gather deep understanding of evolving customer needs and expectations.

This understanding permits them to integrate relevant information into traditional marketing channels to build successful customer service models. Despite the efficiency of technology in providing rapid access to marketing teams to specific customer information, the widespread implementation of technology to markedly improve customer service productivity is still at a nascent stage.

#### **2.6.8 Technology in Project Management**

Project management in real estate sector is extremely complex, owing largely due to the long lifecycle of projects, multi-units involvement in executing projects, unorganised nature of the sector, etc. Technology including project management, material management and sales and marketing tools is widely being considered as the solution to integrate the various phases of the construction projects. Advances in technology have largely overtaken the design and construction phase of real estate projects and have created value for countless real estate companies by increasing the efficiency of their operational processes markedly.

IP surveillance system permits builders to monitor and supervise the progress of their projects and address delays in project completion by taking timely measures. Besides remote monitoring, video conferencing solutions, installation of Closed-circuit television (CCTV) cameras at the project site and Geographic Information Systems (GIS) tools also permit builders to keep a close eye at the progress of their projects. Witnessing the vast potential of tapping technological advances to markedly improve project management, several real estate players are also exploring and evaluating solutions for connecting their managers, operating at remote sites, to update their project status, send bills for payment, etc.

### **2.6.9 Technology in Construction and Design**

The rapid advances in technology present promising opportunities for real estate developers to make informed decisions in the context of schematic phases of building design. Through the integrated and concurrent implementation of multiple simulation tools and technologies, developers can gain insights for improving the efficiency of the building over its entire lifecycle, from design, through construction and commissioning, to operation and demolition. Technological advances including computer-aided design and drafting (CADD), laser scanning, cost-estimating and scheduling tools, and three- and four-dimensional (3D and 4D) visualisation and modelling programs permit real estate developers to design buildings which are able to fulfil the continuous demand for better structures - with respect to a variety of performance considerations, such as environmental impact, comfort, cost, etc. 3D and 4D model is another widely implemented technology in the design phase of the construction cycle.

The performance of the building over its entire lifecycle is assigned to performance indices. Deployment of modelling techniques permits architects and design engineers to determine the values of performance indices, and hence, predict the performance of the building over its entire lifecycle. The traditional techniques of sketching and drawing building plans, sections, elevations, etc. have currently been overtaken by new simulation techniques, largely due to the emerging need for architects and design engineers to have more accurate performance information of the building.

In some countries, simulation models have been applied for developing lighting, energy and environmental impact analyses of buildings over their entire lifecycle. Once the performance of the building has been predicted, technology is also applied to compare the possible solutions for improving the performance considerations. The understanding, quantification and evaluation of the performance considerations permits real estate developers to design strategies and deploy technologies that can strike a balance between the various specific performance criteria by comparing all the available options.

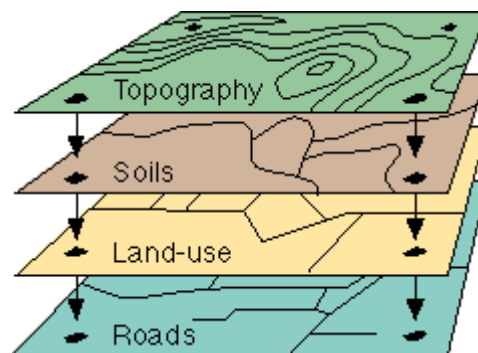
Understanding how ICT use is changing the real estate industry cannot be complete without looking at Geographic Information System (GIS).

## 2.7 Geographic Information System

Geographic Information System (GIS) is a computer based information system used to digitally represent and analyse the geographic features present on the Earth' surface and the events (non-spatial attributes linked to the geography under study) that taking place on it (Bernhardsen, 2002).The meaning to represent digitally is to convert analog (smooth line) into a digital form. "Every object present on the Earth can be geo-referenced", is the fundamental key of associating any database to GIS (ESRI, 2009). Here, term 'database' is a collection of information about things and their relationship to each other and 'geo-referencing' refers to the location of a layer or coverage in space defined by the co-ordinate referencing system (Bernhardsen, 2002).

Conceptually, a GIS can be envisioned as a stacked set of map layers, where each layer is aligned or registered to all other layers. Typically, each layer will contain a unique geographic theme or data type. These themes might include, for example, topography, soils, land-use, cadastral (land ownership) information, or infrastructure such as roads, pipelines, power lines, or sewer networks. This image of GIS is shown in Figure 1. By sharing mutual geography, all layers in the GIS can be combined or overlaid in any user-specified combination. In some cases the GIS may be defined by the type of data that the system is designed to handle. For example, the term "Land Information System" or "LIS" is often applied to a type of GIS used by counties, cities, and municipalities to manage land parcel information. (Duecker and Kjerne, 1989)

**Figure 2.1: GIS Layers**



**Source: Field Survey, 2012**

A geographic information system (GIS) links a computerised map, in digital form, to underlying information about objects shown on the map, held in a relational or object-oriented database (Clegg, 1992). This form of technology potentially cuts across all real estate applications and offers a wide range of functionality from simple map production and information retrieval (e.g. terrier data) to spatial analysis (e.g. site finding and valuation). The following examples illustrate this diversity.

Increasingly, the GIS is being used in several countries to inform real estate related decision making and to design development strategies at different levels of operation. As customers more frequently want to get access to data via the internet, web-based GIS solutions are increasingly becoming popular. An example of an existing application is the Real Estate Information System developed by the urban redevelopment authority of Singapore. It enables users to search by location (planning areas, postal codes, street names), contract date, type of property, transacted prices, etc. The stock database contains information on vacancy rate, available floor space, occupied floor space, and median rental rate by location for commercial and industrial properties (<https://spring.ura.gov.sg/lad/ore/login/findOutMore.cfm>).

Other examples include the Real Estate Information System of Jinan City, China (Huiwu et al., 2001); the urban real estate valuation model, which incorporates a GIS that enables a spatial distribution analysis of urban industrial real estate asset values for Singapore, developed by Ming and Hin (2006); Trippi's (1989) examination of industry factors, design goals and functions of a decision support system used to improve major real property asset acquisition, improvement and divestment decisions; Fang et al.'s (2009) integrated information system for real estate agencies based on service-oriented architecture; and the Imapp system, which integrates a variety of real property information including property lines, tax roll data, area demographics, aerials, mortgage, and deed recordings and foreclosure information, with a specific focus on the real estate industry (<http://www.imapp.com/>).

Sanderson, Townend and Gilbert, of Newcastle-upon-Tyne, have successfully used GIS to identify sites for retail clients (Kirkwood, 1998). Data were sourced for postcode boundaries (Geoplan), raster mapping (Bartholomew), digital mapping (Goad), demographic data (CACI) and business information ([www.yell.co.uk](http://www.yell.co.uk)). Targeted analysis was used to identify potential sites for business operation. This approach, however, depended on the specific skills of a limited number of users and, possibly for that reason, was not replicated across the

profession. There may also be a perceived threat that the technology replaces traditional functions.

In 1999 Staffordshire county council's property and estates division pioneered the use of a geospatial data management system developed by Laser-Scan of Cambridge. This employed object-oriented (OO) technology in a way that was particularly appropriate for property applications. The property and estates division needed a system based on real-world objects, which could automatically apply updates throughout the entire database. In essence, this involved creating a model of the world, rather than just a record of it. This approach has been adopted by other authorities, possibly because there is a wider skills base to draw upon than small and medium-sized surveying practices. Nevertheless, progress is slow because of the complexity of the technology, the capital investment required and the disruption to existing practices.

In contrast, simple technologies are adopted quickly. Promap, for instance, originally consisted of 12 CDs containing Ordnance Survey (OS) large-scale, digital mapping and small-scale AA mapping (1:200,000) for Great Britain (Kirkwood, 1999). The system, which is now available via the Internet, provides a powerful, flexible tool for locating, customising and printing maps. It was adopted quickly throughout the real estate sector in the UK. The reasons for this are a combination of simplicity and ease of use, targeting of a limited but important functionality and lack of threat to existing roles and responsibilities.

## **2.8 Conceptual Framework**

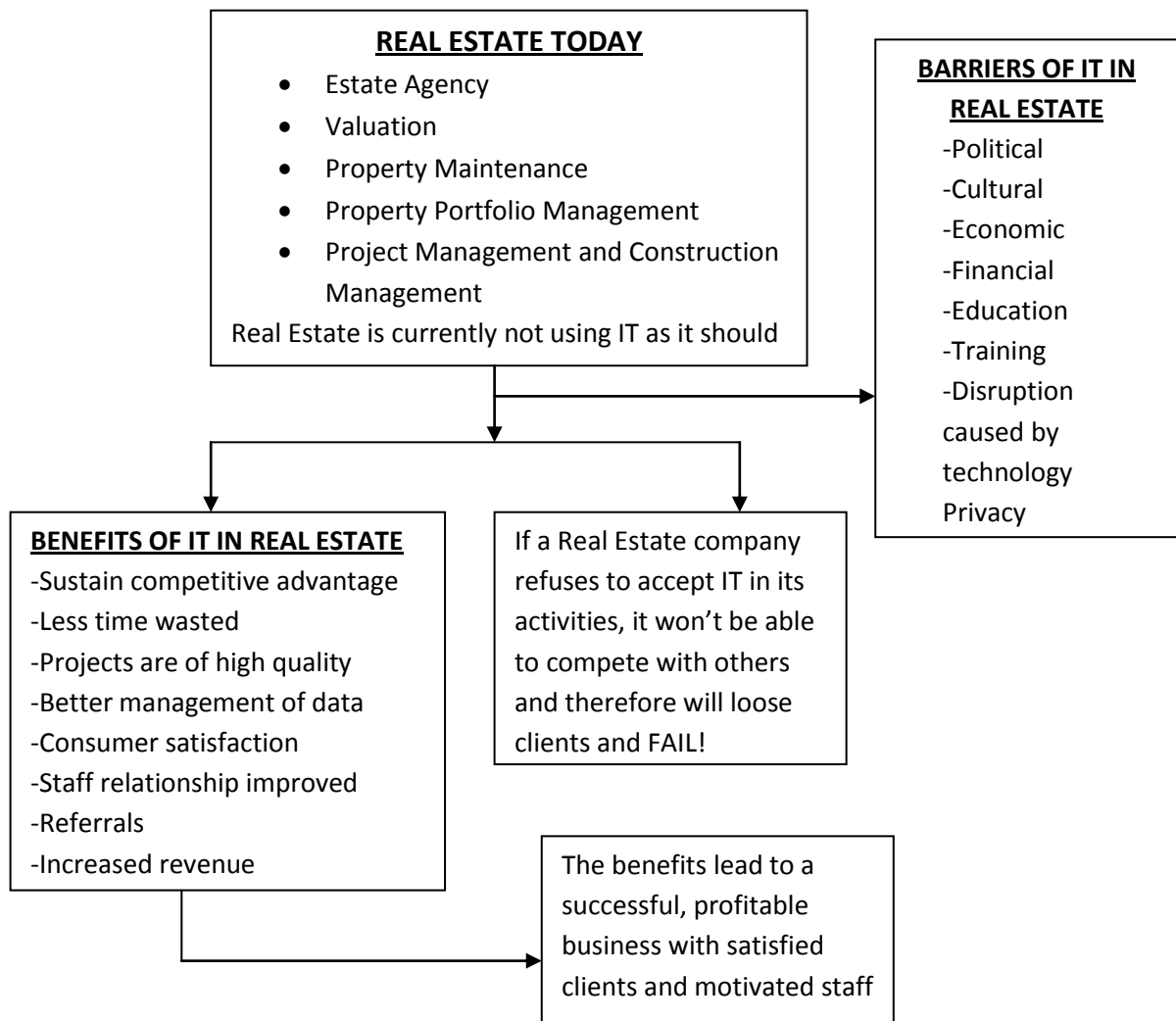
From the literature reviewed, it's evident that Land is source of all material wealth and as such it may be expected that rigorous efforts would be made to use ICT to aid the development, management and appraisal of real estate. Sadly, this is not true. Research shows that in countries like UK, Singapore and US, resistance to technological advances penetrates the entire real estate (Han, 2001; Sherwood, 2001; Guy, 1988). From general literature, suppression of ICT within real estate is caused by a combination of influences including: political, cultural, economic, financial, educational, balancing access to information & privacy, application of standards and degree of disruption caused by any new technology. There is also parallel lack of emphasis on training and education to meet the demands of this new commercial environment (Cash, 1999).

Innovation brought about by new technology disrupts existing processes, practices & roles and produces either conscious or unconscious resistance by those who feel threatened. No change might be an option but it involves risks because others may change and in competitive sense move ahead. It has been suggested that continuous innovation is a pre-condition for sustaining competitive advantage (Porter, 1995). Companies that are quick to adopt will survive and those that delay will find it harder than ever to survive against IT savvy companies.

Technology is widely accepted as a major stimulus for change in society (Twiss, 1992). ICT systems are center to all sectors of the economy (Omogbadegun, 2010). There has been some notable success using ICT within the real estate sector, both for industry specific applications and for general purpose office automation. Areas that IT has been applied are: property management, property maintenance, estate agency, valuation, property portfolio management, project management and construction and design. Research has proved that the implementation of advanced technology has permitted the sector to significantly reduce the time wasted in coordinating activities and in managing, moving and installing materials for construction (Confederation of Indian Industry, 2012). It has also been found that IT adds value in the following areas: projects offered are of high quality, consumer satisfaction, relationships within departments and staff improved, leads to referrals and increased revenue.

A key question is what role IT plays in helping a company become more effective, improve service and measure performance while adding value to the business. IT is critical in the linkage between the parts of a company that previously had not been linked. IT also provides the opportunity for saving through the integrating transactional and reference information. In essence, continued improvements in technology have significantly revolutionised the way real estate companies operate in the current business environment (Confederation of Indian Industry, 2012).

**Figure 2.2: Conceptual Framework**



**Source: Field Survey, 2012**

## 2.9 Conclusion

ICT systems are central to all sectors of the economy (Omogbadegun, 2010). IT is becoming a driving force necessitating change in the way real estate companies market to their clients. According to a 2005 California Housing Finance Survey, published by the California Association of Realtors, one-third of the Californians who bought houses the first quarter of 2005, and one-fourth of those who sold houses, used the Internet in some way. Companies that are quick to adapt will survive and those that delay will find it harder than ever to survive against IT savvy competitors (<http://www.altiusit.com/files/articles/articlewpitreal.htm>). A 2005 Orange County Executive Survey confirmed the growth of the Internet and showed that 90 percent of surveyed businesses now have a web site compared to 79 percent in 1998 and 59 percent in 1997. The Internet may be the most important technological innovation to impact real estate since the invention of the automobile and the elevator (Vandell et al, 2001).



According to <http://www.altiusit.com/files/articles/articlewpitreal.htm>, IT is a key reason for the quickening pace of the corporate real estate evolution. IT is critical in the linkage between the parts of a company that previously had not been linked. This has become even more important in the context of corporate alliances and support of long-term company goals. Corporate real estate executives are evaluating new information technologies and the impact upon their organizations. A key question is what role IT plays in helping a company become more effective, improve service and measure performance while adding value to their business. Implementing more efficient work processes throughout the organization allows a company to grow revenue. If a company isn't growing revenue, it must reduce expenses. Also, consolidations will continue to occur in the real estate industry. IT provides the opportunity for savings through the integrating transactional and reference information.

<http://www.businessinsider.com/how-technology-is-changing-how-we-rent-buy-and-sell-real-estate-2013-4> states that many real estate companies will need to rely on IT to allow them to expand their businesses over the next five years during a time when many are predicting a slowdown in the United States economy. Most agents and consumers have access to all of this technology. "The real challenge now facing the industry is getting all of these tools to work together in a seamless way for the consumer. Real estate technology is making deals happen more smoothly, making customers' lives easier and driving more business in the form of referrals. But real estate is and always will be a 'people' game." As the real estate industry takes advantage of today's best technologies, its greatest purpose is delivering the information customers need, exactly when they need it-bringing agents closer to their clients and improving the real estate process overall (<http://www.businessinsider.com/how-technology-is-changing-how-we-rent-buy-and-sell-real-estate-2013-4>).

In essence, continued improvements in technology have significantly revolutionised the way real estate companies operate in the current business environment (Confederation of Indian Industry, 2012). However, the impact on the performance of the real estate sector with the deployment of technology is largely dependent upon the depth of its involvement across the various facets of the operational processes. How real estate players innovate and respond to technological advances will undoubtedly play a major role in differentiating the companies, their projects and offerings in the minds of consumers.

In the long-run, the advent of technology exposes the players to numerous challenges, as well as renders new opportunities to improve innovation, product development and customer

support. The key to driving growth in such a scenario will nevertheless be dependent upon the willingness of real estate players to accept sophisticated technologies and seamlessly integrate them within their business operations.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Overview of the Chapter**

The study was conducted in order to assess the challenges posed by the new technologies and practices in Nairobi with regards to real estate industry and reasons why some players in the industry do not use technology. To be able to gather the necessary data, the researcher utilized the descriptive method, using both qualitative and quantitative approaches. The chosen responders were randomly selected from various firms dealing in real estate in Nairobi. The survey method was the research instrument used for the data-gathering.

The employees of real estate who were chosen for this study were required to complete a survey questionnaire to evaluate the challenges facing the real estate industry in Nairobi. The results of the survey were then processed by computing the weighted mean of each survey item. The computed values were compared for data interpretation. Relevant literature was also used to support the gathered findings.

The credibility of findings and conclusions extensively depend on the quality of the research design, data collection, data management, and data analysis. This chapter is dedicated to the description of the methods and procedures done in order to obtain the data, how they were analysed, interpreted, and how the conclusion were met. This section is to justify the means in which the study was obtained and will help in giving it purpose and strength as it will then be truthful and analytical. All these will help in the processing of the data and the formulation of conclusions.

Specifically, this chapter will cover the following: the research design and method, the respondents or subjects to be studied (which will include the sampling method), the data collection instrument, and the data analysis. These will be presented below.

#### **3.2 Research Methods**

This study utilized the descriptive method of research. As widely accepted, the descriptive method of research is a fact-finding study that involves adequate and accurate interpretation of findings. Descriptive research describes a certain present condition. Relatively, the method was appropriate to this study since it aimed to describe the present condition of offices dealing in real estate. The technique that was used under descriptive method was the

normative survey approach and evaluation, which is commonly used to explore opinions according to respondents that can represent a whole population. The survey was appropriate in this study because it enables the researcher in formulation of generalizations. Specifically, two types of direct-data survey was included in this study. These were questionnaire survey and interviews. Interviews with estate agents, land valuers, land developers and other professionals in real estate were conducted to provide further insight about the results of the survey. The direct-data type of survey was a reliable source of first-hand information because the researcher directly interacts with the participants. The questionnaire survey respondents were given ample time to assess the challenges facing the real estate in Nairobi. Their own experiences with real estate in practice were necessary in identifying its strengths and limitations.

The purpose of employing the descriptive method was to describe the nature of a condition, as it takes place during the time of the study and to explore the cause or causes of a particular condition. The researcher opted to use this kind of research considering the desire to acquire first hand data from the respondents so as to formulate rational and sound conclusions and recommendations for the study. According to Creswell (1994), the descriptive method of research is to gather information about the present existing condition. Since this study is focused on the perception or evaluation of the consultancy firm's effective service delivery and organizational structure, the descriptive method was the most appropriate method to use.

Two types of data were used: the primary and the secondary data. The primary data was derived from the answers respondents gave in the self-administered questionnaire prepared by the researcher. In addition, the information obtained from the interview also provided primary research data that supports the study. The secondary data on the other hand, was derived from the findings stated in published documents and literatures related to the research problem. These were based from recent literature related to real estate and the factors that challenge it and the rules and practices in the offices and the concepts cited by the respondents.

In terms of approach, the study employed both qualitative and quantitative approaches. The quantitative approach focused on obtaining numerical findings from the survey method. The interview on the other hand, made up the qualitative approach of the study as this focused on personal accounts, observations, description and individual insights of the respondents. This study employed the combined approach so as to overcome the limitations of both approaches.

### **3.3 Direct-data Survey**

Direct-data survey aims on collecting pertinent data about technical analysis. Accordingly, direct-data survey is used to reveal the status of some phenomenon within an identified class of people, organisations, or regions at a particular time through questionnaire and interview to directly collect information (Brubaker & Thomas, 2000).

The aim of the survey was to obtain pertinent data to achieve the research objective. The site of the study was the prime real estate firms. Representative samples were taken using a random sampling approach. In this research study, the critical examination of organizational structure in firms and technology was made. The responses, observation and approval of the respondents towards these were gathered.

In this study, the chosen respondents were selected from firms and other people who are related to real estate and decision-making. Interview questions focused on the research problems and questions. The project used self-administered questionnaire as the main tool in collecting data from a large number of respondents.

### **3.4 Respondents of the Study**

The study had respondents directly from the chosen private real estate firms in Nairobi. This included managers, accountants and other knowledgeable employees. All of these participants were selected through random sampling. This sampling method is conducted where each member of a population has an equal opportunity to become part of the sample. As all members of the population have an equal chance of becoming a research participant, this is said to be the most efficient sampling procedure. In order to conduct this sampling strategy, the researcher defined the population first, which was all real estate firms in Nairobi and its surroundings. Then, listed down all the members of the population and selected members to make the sample. For this purpose, a self-administered survey questionnaire in MS Word format was given to the respondents to answer.

There were 150 participants for the questionnaire survey. The respondents were given less than 20 minutes to complete the survey questionnaire upon request. After collecting the questionnaires, the responses were tallied, computed, analysed, and recorded.

### **3.5 Instrumentation**

#### **3.5.1 Content analysis**

Content analysis was done to analyse communications in order to answer two levels of questions i.e the descriptive and the interpretive. Descriptive questions focus on what the communication contains. Interpretative questions focus on what the contents is likely to mean. The process entails searching through one or more communication to answer questions that an investigator brings to the search (Brubaker & Thomas, 2000). Content Analysis was used to analyse and interpret the interviews.

#### **3.5.2 Statistical Treatment**

The software MS excel was used to interpret items in the questionnaire. These responses were based on the respondents' assessment of Real Estate in its current form and application of technology.

### **3.6 Ethical Considerations**

As this study utilized human participants and investigations on real estate and practices and its application of technology, certain issues had to be addressed. The consideration of these issues was necessary for the purpose of ensuring the privacy as well as the security of the participants. These issues were identified in advance so as to prevent future problems that could rise during the research process. Among the significant issues that were considered include consent, confidentiality and data protection.

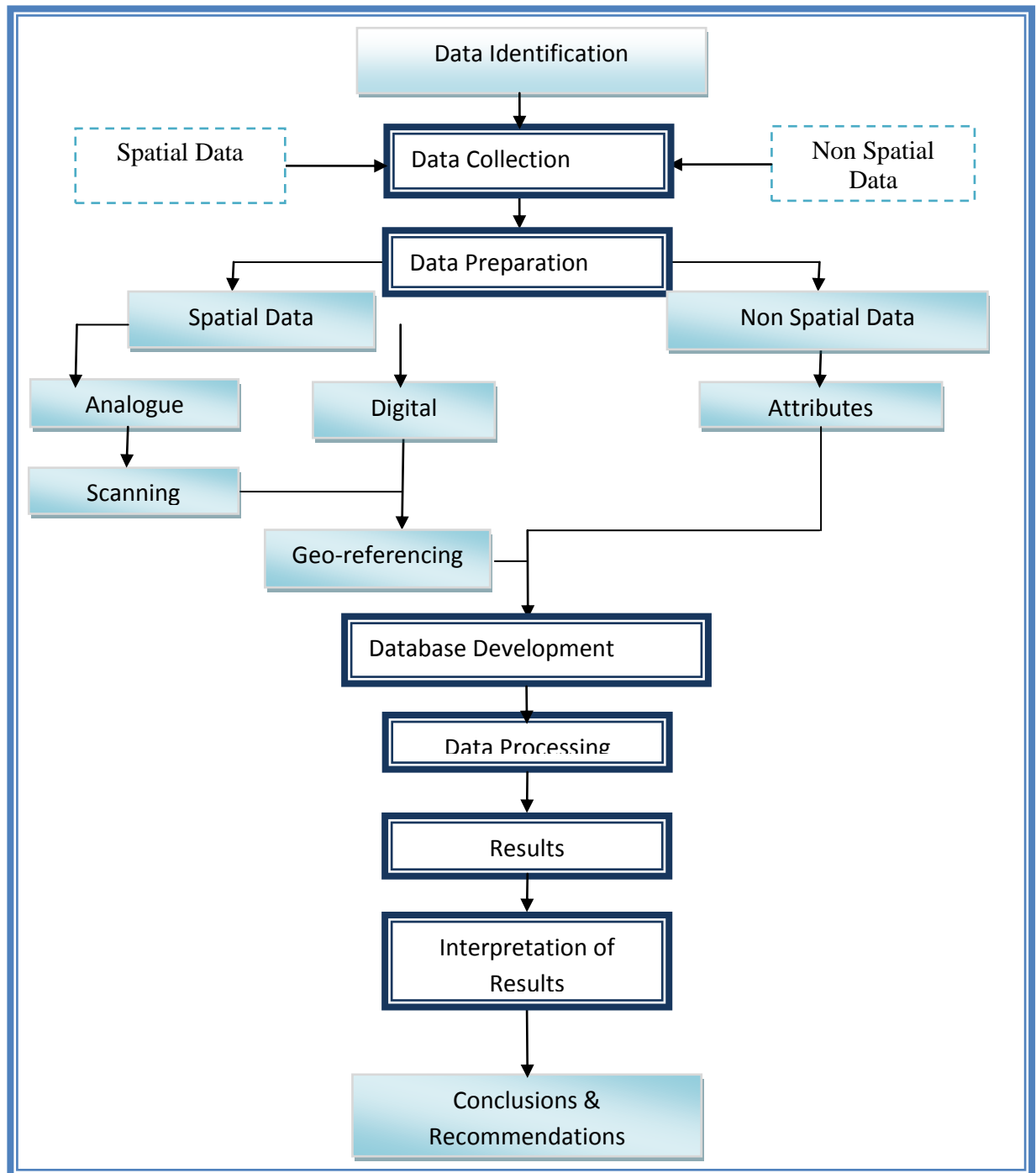
In the conduct of the research, the survey forms and interview methods were drafted in a very clear and concise manner to prevent conflicts among respondents. People who participated in the research were given an ample time to respond to the questions posed on them to avoid errors and inaccuracies in their answers. The respondents were given a waiver regarding the confidentiality of their identity and the information that they do not wish to disclose. The respondents' cooperation was eagerly sought after, and they were assured that the data gathered from them would be treated with the strictest confidence, so that they would be more open. This was done with the hope that this would promote trust between the researcher and the respondents.

## **3.7 Creation of a GIS Application**

### **3.7.1 Introduction**

A summary of the approach used in this study is illustrated in the figure below. The first step was identification of the data to be used and this was determined by the objectives set to be achieved. The datasets were collected from various organizations. The second step was data preparation, the development of a spatial database for efficient data management, data harmonization and lastly an analysis was carried out using the results.

**Figure 3.1: Overview of the Methodology**



Source: Field Survey, 2012



### 3.7.2 Materials

The materials to be used in this study include data, software, computer and scanner.

### 3.7.3 Data Sources and Tools

#### 3.7.3.1 Data

Data to be used in the project was sourced from different organisations. The table below shows the data used and its sources.

**Table 3.1: Data used in the project and its sources**

Data	Source	Characteristics
Orthophotographs	Geo-Maps Africa	Digital, taken in 2012, projection UTM 37s Arc1960, 10cm
Land parcel maps	Survey of Kenya	Hardcopy, Lavington area parcel boundaries
Administrative boundaries	Survey of Kenya	Shapefiles
Building data	Author	Digital sample data of building characteristics
Road Network	Survey of Kenya	Shapefiles

**Source: Field Survey, 2012**

#### Orthophotographs

These photographs were taken in 2012 covering the whole of Nairobi. A boundary shapefile of Kileleshwa sub-location was used to clip the orthophotos to the area of interest.

#### Survey Plans

The parcel boundaries used in this study were drawn based on several hardcopy survey plans and registry index maps obtained from the Survey of Kenya. These plans depict the land parcel boundaries.

### **Administrative Boundaries**

This was a shapefile obtained from Survey of Kenya. It covered Nairobi County and depicted the administrative boundaries; locations and sub-locations.

### **Building data**

This was created in excel. It was data on buildings and their characteristics, user type, number of floors, size of units, owners, and amenities among other attributes.

### **Road Network**

The road network was obtained from Survey of Kenya, prepared by the Kenya National Highways Authority, Kenya. It was obtained in softcopy covering the whole of Nairobi and the sub-location boundary used to clip it to the area of interest.

#### **3.7.3.2 Tools**

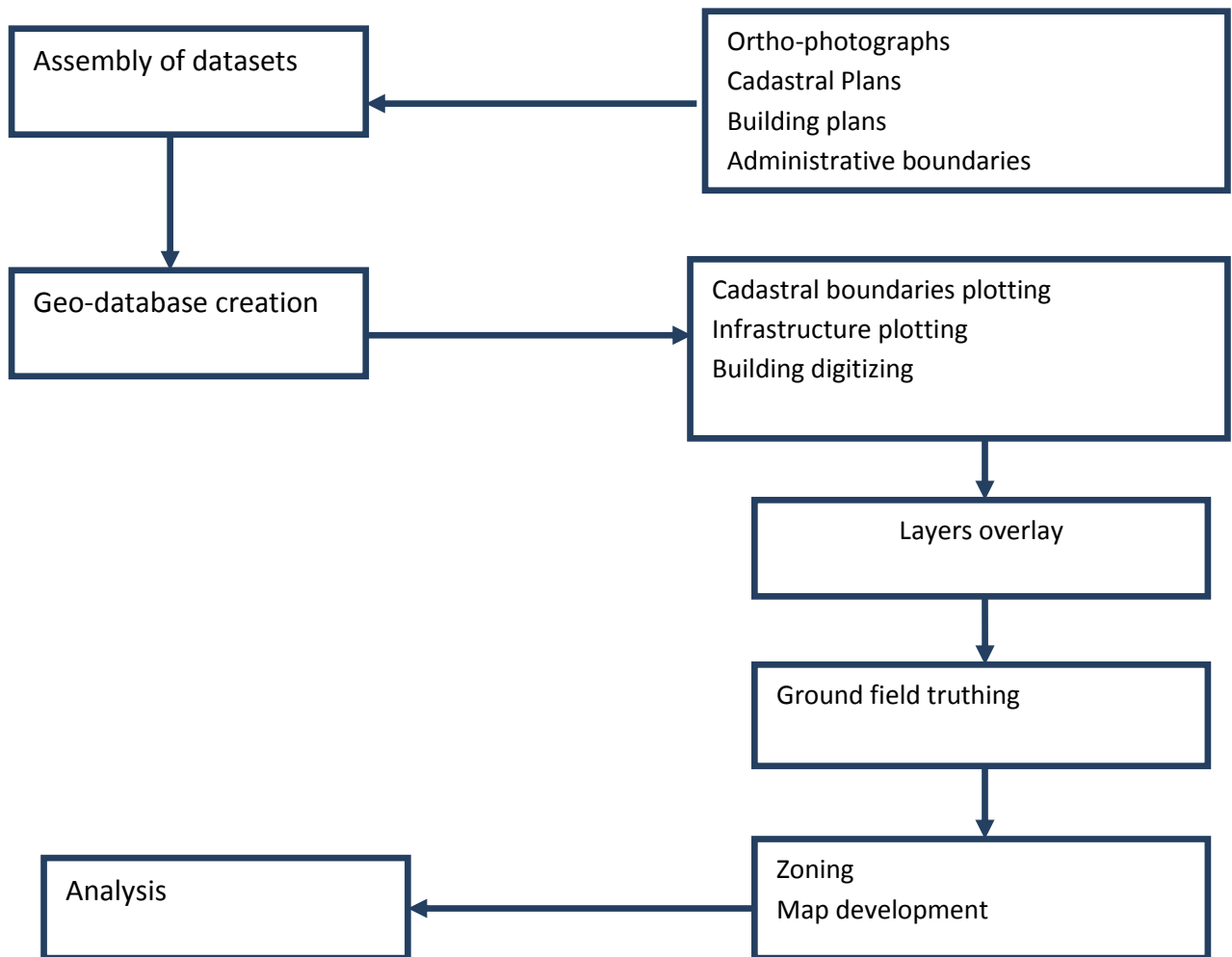
The software used in the project included:

- i). ArcGIS 10.1
- ii). Microsoft office (2010) suite

#### **3.7.4 Data Processing**

The flowchart below shows the processes undertaken for data preparation, data capture and geodatabase design and analysis done in this study.

**Figure 3.2: Summary of the data processing**



**Source: Field Survey, 2012**

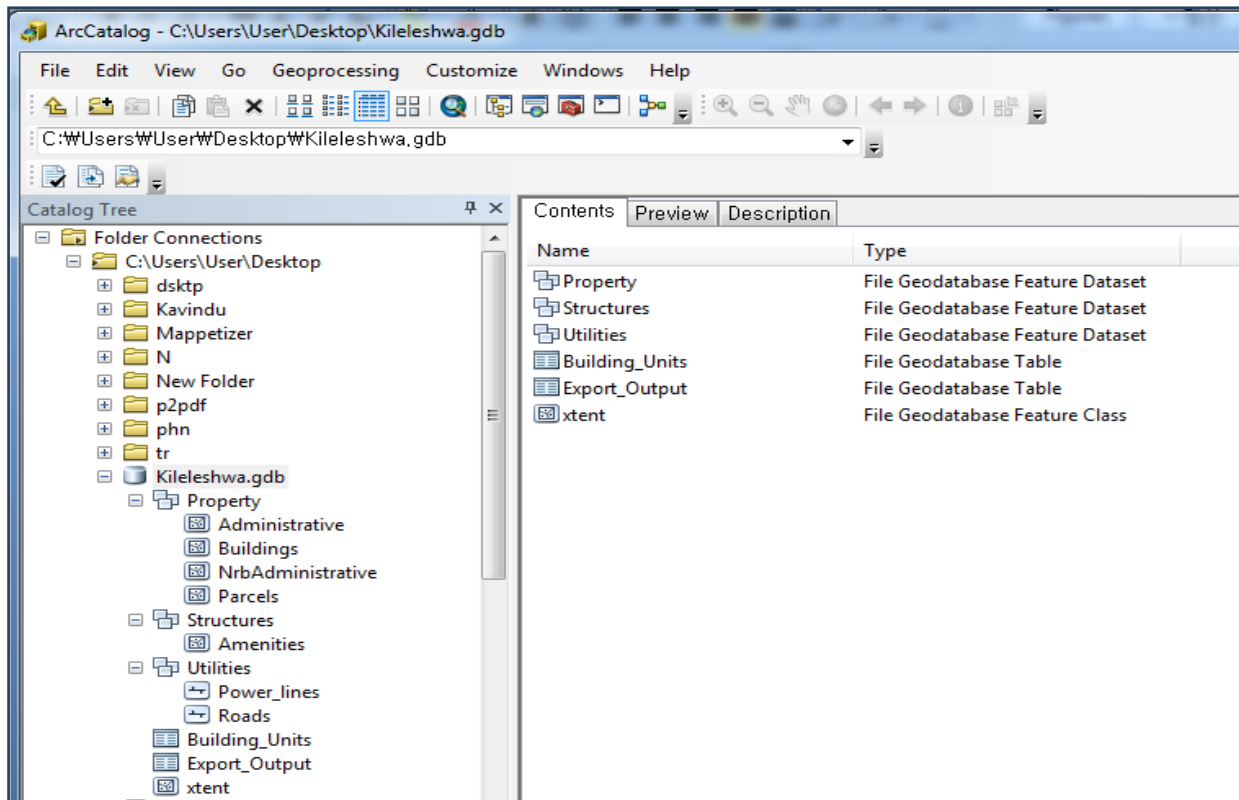
### **3.7.5 Data Preparation**

The data collected was pre-processed to turn it into a form suitable for manipulation and integration. The pre-processing it underwent is as follows;

#### **3.7.5.1 Creation of a Geodatabase**

A file geo-database was created using Arc Catalog and saved as Land.mdb. Feature datasets such as cadastral, administration, infrastructure, raster and classes in them were created in the file geo-database. Available data collected, orthophotographs were added to the raster feature classes and image pyramids built to improve the performance.

**Figure 3.3: Geodatabase**



**Source: Field Survey, 2012**

### 3.7.5.2 Georeferencing of Registry Index Maps

The scanned and cleaned Registry Index Maps, RIMS of Nairobi-Kileleshwa were obtained in JPEG file interchange format. The image of each map sheet was added into ArcMap and the type of projection set to Geographic projection Datum (Arc1960) with Meters as the unit of measurement.

The four corner points on each map were used as the registering points for the RIM. Four pairs of points on each maps were identified and their registration applied. The software calculated the root mean square (RMS) error and compared the value with the user specified error limit box within the software environment to ensure if the calculated RMS was within the specified limit, then the map would registered completely. The georeferenced image was then exported and tagged.

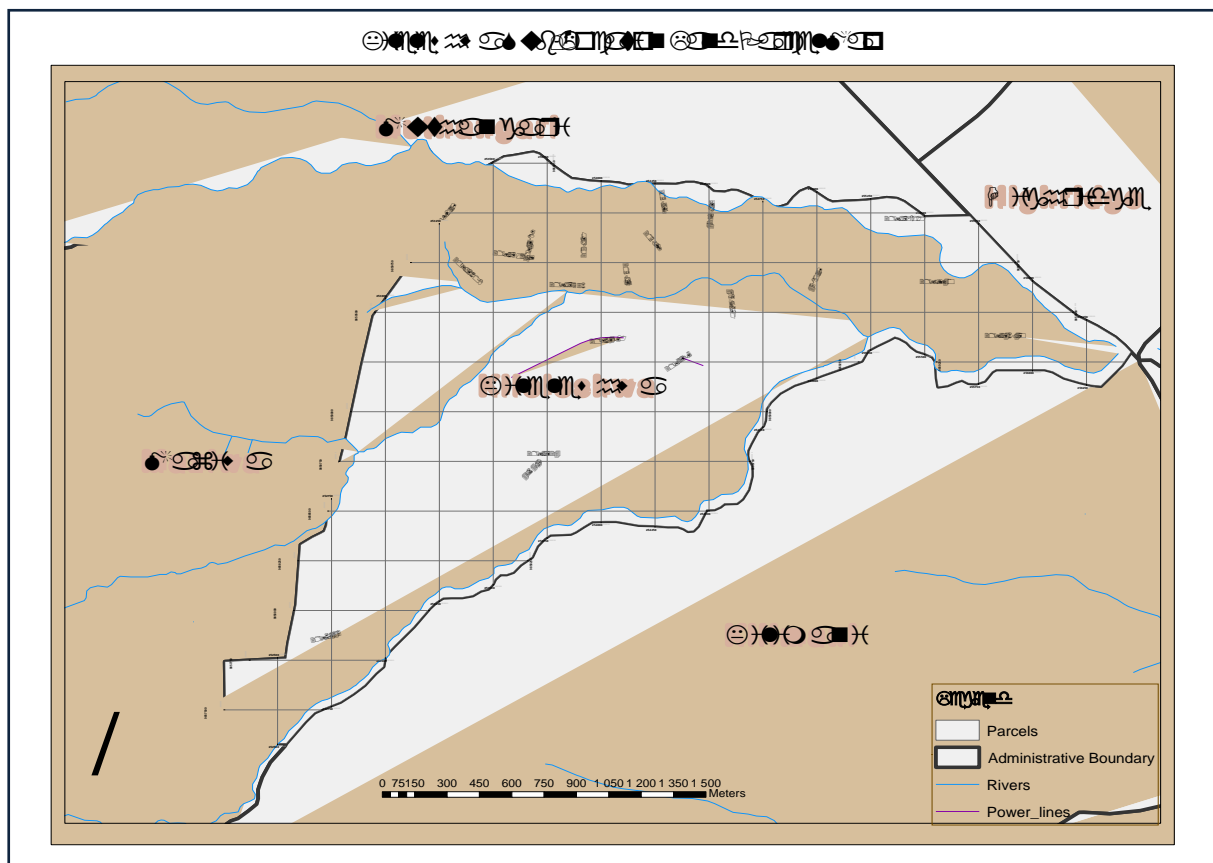
### 3.7.5.3 Spatial data capture

#### A. Vectorization

Land parcel boundaries were vectorised through on-screen digitizing and plotting. Kileleshwa has fixed and general boundaries which are represented in survey plans and registry index maps respectively.

The plans of the land parcels were obtained in hardcopy from Survey of Kenya. As the boundaries were needed in digital format, they were plotted in ArcMap. Coordinates obtained from the survey plan were typed in excell and saved as an .xls file. The file was then imported into ArcMap and the land parcels plotted using line feature type. The plans were however in Cassini Coordinate system and so had to be transformed into the system in use, UTM 37s Arc1960. This was done in ArcMap. The figure below shows the resulting parcel boundaries.

**Figure 3.4: Kileleshwa parcel boundary Map**



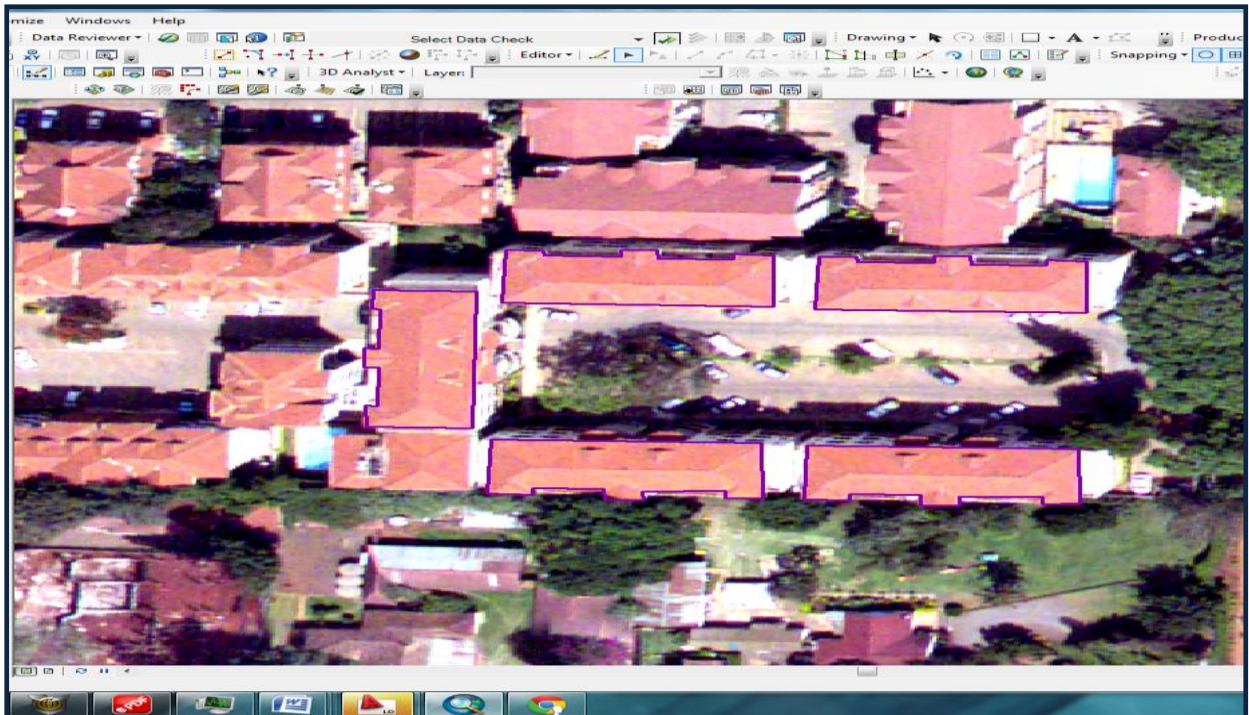
**Source: Field Survey, 2012**

The georeferenced RIM maps were vectorized through on-screen digitizing using ArcGIS 10 software. The derived vector data from the digitizing process was then stored for further

analysis. The snapping tool was activated prior to digitizing so as to improve the way features meet and align at intersection points. Both general and interactive snapping were set during digitization.

Orthophotographs of Kileleshwa were imported into ArcMap and digitization done along building features and streets by using the polygon and line feature type respectively. The figure below shows the digitization process.

**Figure 3.5: Kileleshwa building digitization**



Source: Field Survey, 2012

#### **B. Spatial data editing and validation**

This was done to detect and correct errors incurred during spatial data capture. Editing was done to ensure that:

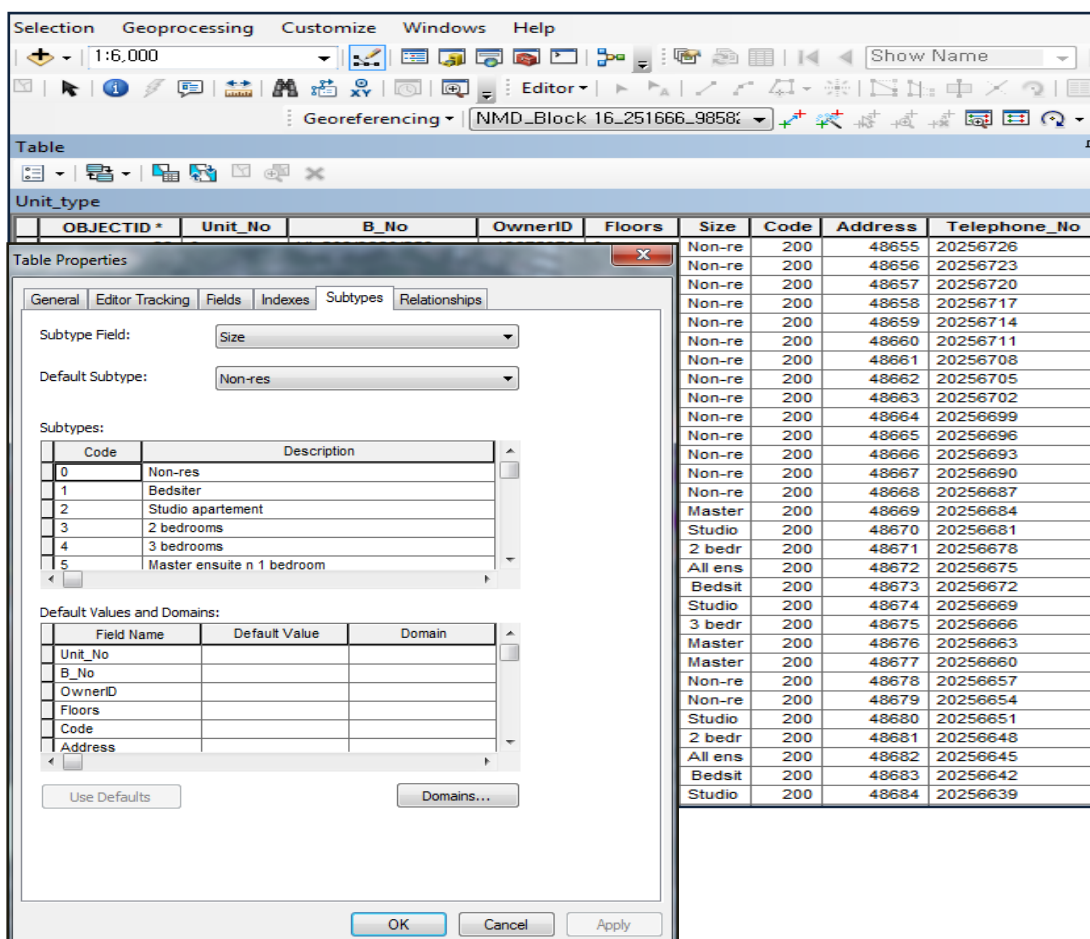
- All unclosed polygon features were closed.
- All line features were connected to create topology (network connectivity).
- No overlaps existed between adjacent building polygons.

#### **3.7.5.4 Non spatial data capture**

The attribute data for the respective spatial data captured (buildings, parcels and roads) was entered carefully in the attribute tables of separate themes to ensure that accuracy,

completeness and quality were maintained. A table was created with the building units characteristics and subtypes used to classify the types so as to limit what was entered in the tables in future. Coded values were used to classify the size of residential houses. The values ranged from 1-7 and represented bedsitter, studio apartment, 2 bedrooms, 3 bedrooms, master ensuite and 1, bedrooms master ensuite and 2 bedrooms, and 4 bedrooms all ensuite respectively. The figure below shows the table and subtypes created. Joins and relates between feature classes were made and privileges granted and revoked on the feature datasets, and feature classes for other database users.

**Figure 3.6: Building units attribute table with subtypes**

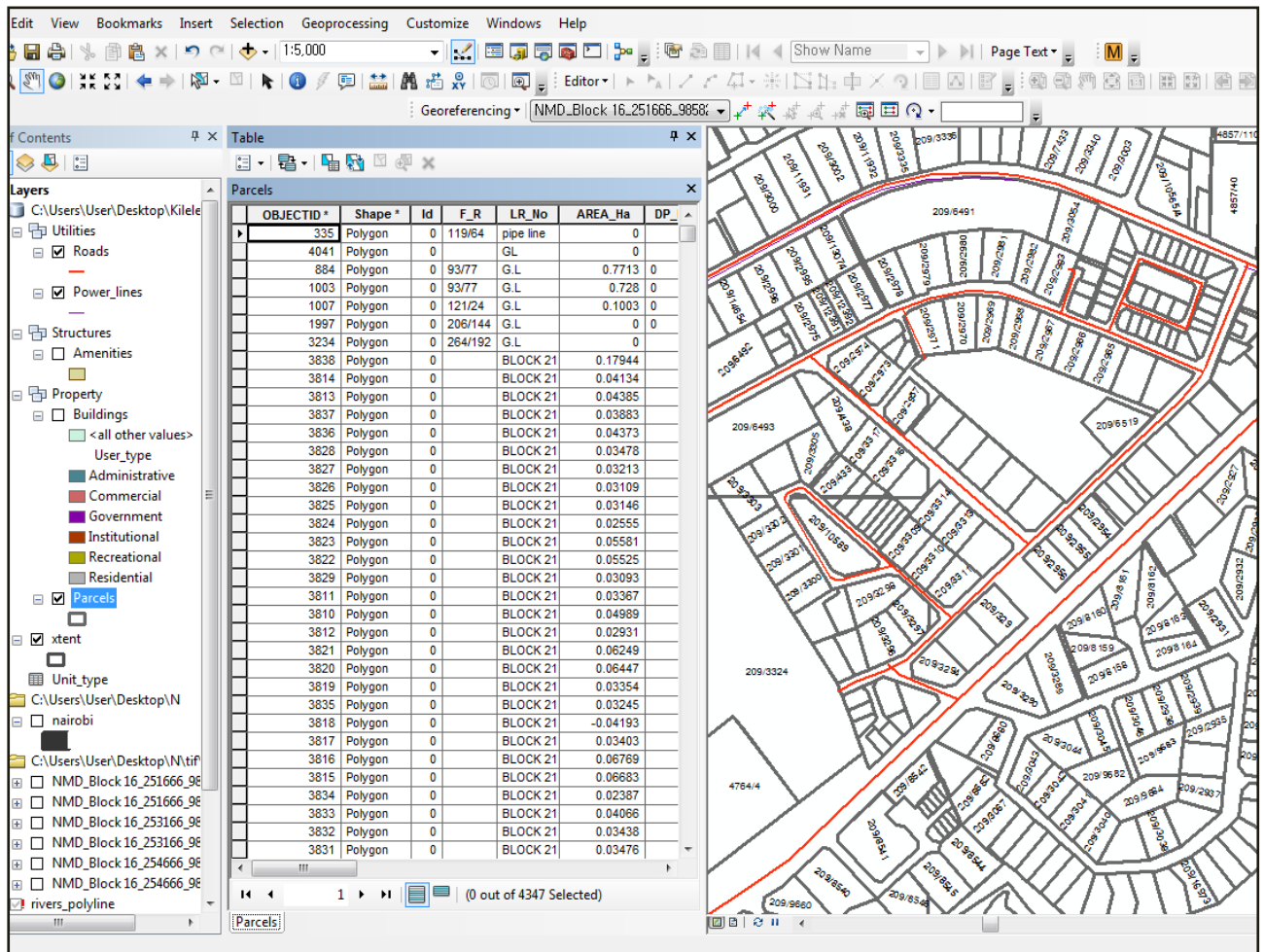


Source: Field Survey, 2012

### 3.7.6 Layers Overlays

An overlay of all the layers on the orthophotos was done. The layers were administrative boundaries, parcels, buildings, roads, rivers and amenities. The figure below shows the overlaid layers.

Figure 3.7: Layers overlay



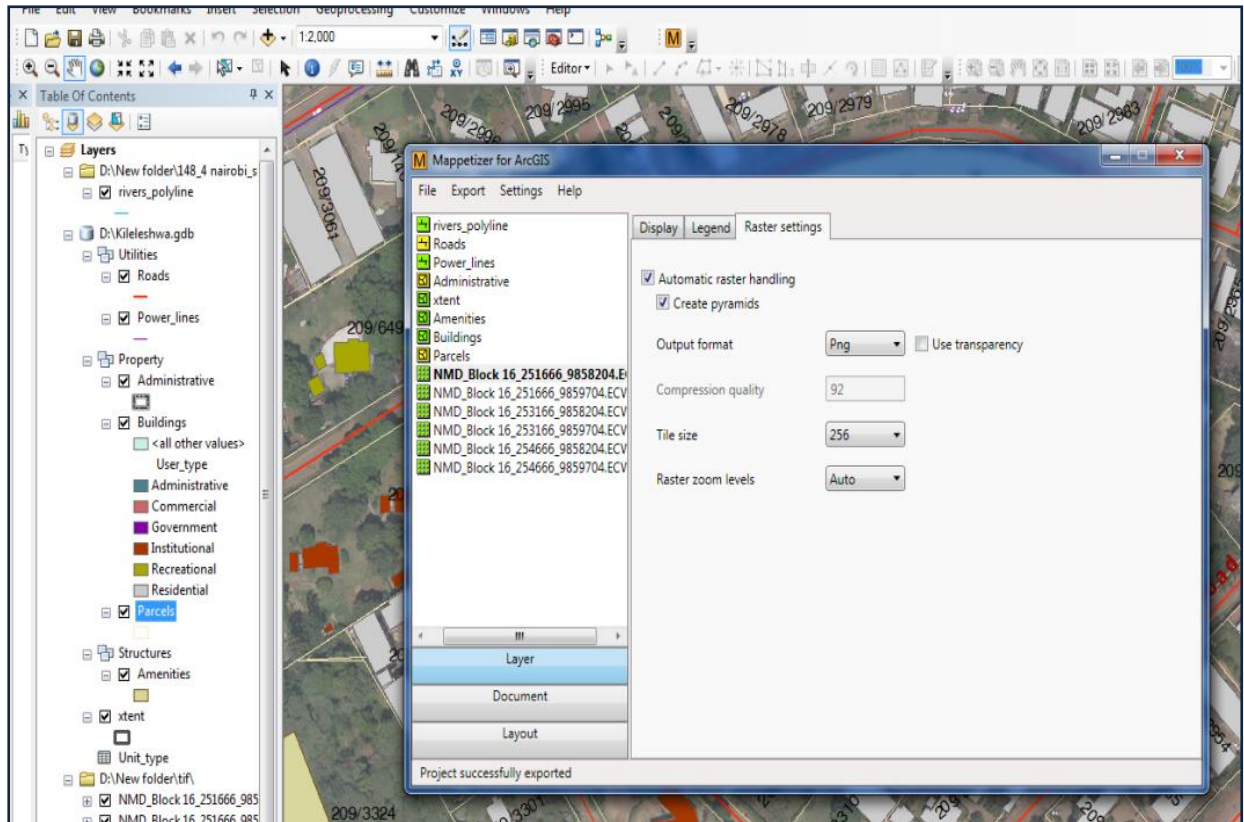
Source: Field Survey, 2012

### 3.7.7 Map Publishing

An ArcGIS add-on extension, Mappetizer was used to publish the map including all layers. This was done so as to create a user interface in which a 'non-expert' user with no knowledge of Arcmap can be able to access the map. The figure below shows the publishing process in Arcmap.



**Figure 3.8: Map publishing**



**Source: Field Survey, 2012**

## **CHAPTER FOUR**

### **ANALYSIS AND PRESENTATION OF DATA**

#### **4.1 Introduction**

This chapter presents the data analysis and findings from 96 questionnaires completed by Real estate professionals who were visited at their places of work. The purpose of this study was to show how new technology (i.e. information and communications technology (ICT)) is impacting on the shape and form of real estate in Nairobi.

The objectives of this study were:

1. To assess to what extent real estate firms have accepted and implemented technology in their day to day activities.
2. To examine how new technologies are affecting working practices in a real estate office.
3. To develop a GIS application that can be used in estate agency.

Questionnaires were given to more than 150 professionals in the real estate sector after a brief introduction and stating the purpose of the research. Only 106 responded positively by accepting to fill the questionnaire. Reasons for non-response included busy schedules, lack of interest among others. The respondents were assured that they would remain anonymous persons i.e. no filled questionnaire would be linked to any specific person. After a thorough examining exercise of the questionnaires, 10 of them could not be used for analysis of data since they were not completely filled.

A response rate of 50% is adequate for analysis and reporting, 60% is good while 70% is very good (Mugenda, 1999). A targeted sample of 153 various firms and individual practices in Nairobi area was scientifically selected. A total of 96 valid responses were received. Therefore, the response for this survey was not only adequate but good.

The data from the questionnaires were statistically analysed using MS Excel program because of the ease in calculation as opposed to the manual methods of arithmetic calculations. The findings are discussed according to the sections of the questionnaire.

The two sections of the questionnaire were:

Part 1: Background Information (Personal data)

Part 2: Office and Information Technology

#### **4.2 Personal (Biographic) Data**

This section of the questionnaire covered the respondents' gender, age, education history, area of specialization, length of service in the real estate sector and current position in the organization. Though not central to the study, the personal data helped contextualise the findings and the formulation of appropriate recommendations to enable more professionals to utilize information technology in their day to day activity.

##### **4.2.1 Gender**

The respondents were supposed to state their gender. 31% were male while 69% of the respondents were female.

##### **4.2.2 Respondents' Ages**

The respondents were supposed to tick one of five options to show which age bracket they fall in. The results were as follows:

**Table 4.1: Respondents' Ages**

<b>CODE</b>	<b>AGE</b>	<b>FREQUENCY</b>
1	20-25	40
2	26-35	53
3	36-45	3
4	45-55	0
5	Above 55	0

**Source: Field Survey, 2012**

From Table 4.1, 96% of the respondents were between the ages of 20-35. This is because most of the people who were filling the questionnaires were mostly youthful employees who are more technology savvy and conversant with changing trends in the market. It is also because they are the most accessible people in a firm and they are the people you will first encounter in any firm. The higher the rank of a person in an organization the more difficult it is to access and the more secluded he/she becomes e.g. has an office all by himself. Also, the managers and supervisors in the firms that the researcher visited would delegate the filling of

the questionnaire to junior staff. The researcher in twelve firms insisted that the managers fill the questionnaires since they are the people who make decisions and thus their input was vital on how organizations were coping with the upsurge in technology.

#### 4.2.3 Education History

Of the 96 respondents, 44% were graduates from various local universities holding a Bachelor of Arts in Land Economics, in procurement, in architecture, in planning and accounting. 56% of the respondents were diploma holders in property management, procurement and secretarial studies from various local universities and colleges. Most employers would rather employ people with diplomas rather than graduates because they ask for a lower salary and are more ready to be trained and remain part of the company for a long time. “The degree students are always on the move”, one manager stated showing that they are always looking for better opportunities and do not have company loyalty unless the pay is very good and the working environment is excellent. This might also be the case because most of the junior officers were the ones filling the questionnaires and so it seems most of them are diploma holders.

#### 4.2.4 Area of Specialization

The table below summarizes the different professions of the respondents.

**Table 4.2: Area of Specialization**

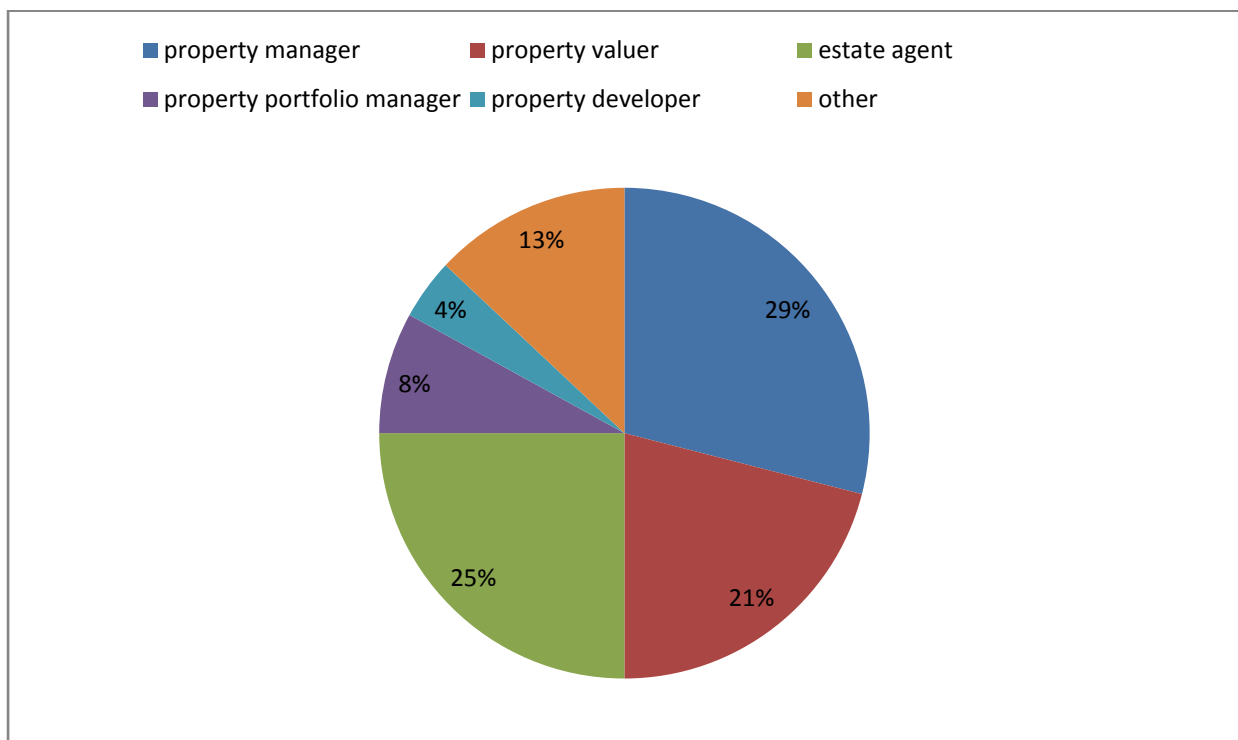
CODE	SPECIALIZATION	FREQUENCY
1	Property Manager	42
2	Property Valuer	30
3	Estate Agent	36
4	Property Portfolio Manager	12
5	Property Developer	6
6	Other (Financial Consultant, Procurement, I.T & Audit)	18

**Source: Field Survey, 2012**

The data from Table 4.2 shows the different professions that fall under real estate. The results above indicate that the survey was able to capture all the major professions in the Real Estate Industry. This implies that the results gotten from this survey can be generalized to all spheres of Real Estate. Table 4.2 also shows that professions in the Real Estate can specialize

in more than one area. For instance, one of the respondents stated that he is a property manager, a property valuer and also an estate agent. Being able to specialize in more than one area is due to the fact that one office might be engaged in all the above activities and that their (respondents) training prepares them to be able to tackle different problems in the real estate sector. Also, the commonness of their sale product i.e. buildings and landed property, plays a major role in enabling professionals in this sector to wear many caps. Something interesting to note is that most real estate professionals are either property managers or estate agents – they form 54% of total representation of professionals. Property developers are the least – only 4%. This is due to the resources one requires to have so as to be able to develop property. Property valuers that took part in the survey comprised of 21% of total responses.

**Figure 4.1: Profession**



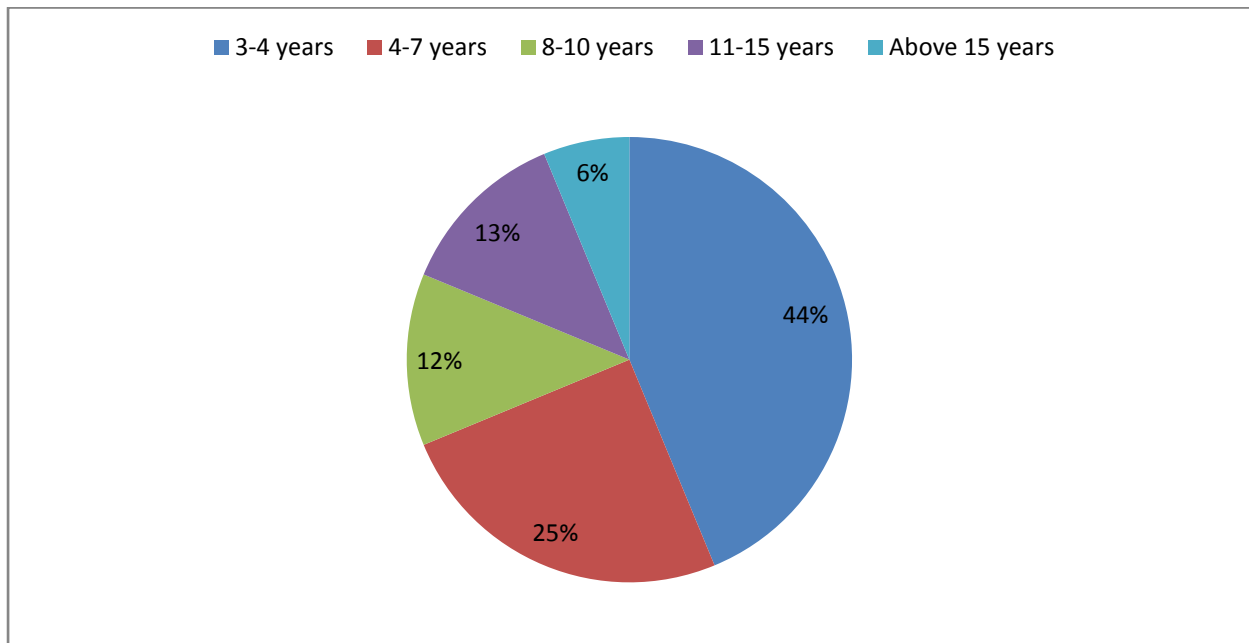
**Source: Field Survey, 2012**

#### **4.2.5 Length of Service**

31% of the respondents have worked for more than seven years. 25% have worked for more than four years and 44% have worked for between one and three years. There was correlation between number of years worked and age showing that most of the respondents who stated they have worked for less than three years were between the ages of 20-35 years showing that they were recent graduates or had recently completed the diploma courses. This also indicates that in the past five years, there has been an increase in employment of professionals which

might be fueled by the ‘construction boom’ that is currently being experienced in the country, thus increasing the need for professionals in the real estate industry. Also, the general state of the country’s economy has been improving steadily since 2003. If all factors remain constant, we expect that the need for professionals in this area will increase and thus finding employment for young people in this sector won’t be as difficult as it was in the past (i.e. in the 1990’s).information obtained from this section also showed that the people who have worked for more than seven years in a firm, 71% were diploma holders agreeing with the analysis of the manager that diploma holders are more likely to stay loyal to a firm for a longer time than degree graduates.

**Figure 4.2: Length of service**



**Source: Field Survey, 2012**

#### 4.2.6 Current position

Table 4.3 summarizes the respondents' current positions.

**Table 4.3: Current position**

CODE	POSITION	FREQUENCY
1	Employee	84
2	Manager	12

**Source: Field Survey, 2012**

There was no respondent who stated that he was a 'supervisor'. The survey got responses from both workers (decision implementers) and managers (decision makers). This was important in that views were gotten from different ranks within the real estate professions. These were compared to come up with similarities and differences in the responses.

#### 4.2.7 Summary of Background Information

Part 1 revealed the respondents' gender, age distribution, education history, area of specialization, length of service in real estate and current position. Most of the respondents were female, between the ages of 26-35 years. Most of them had diplomas and were in the property management profession. Majority of the respondents were employees who had worked for less than three years. The information collected from part A was important in helping formulating the following assumptions: from the literature review, it was noted that very few women have been able to access information technology either through communication or as part of their routine in the offices. Also, the level of education does determine if one will appreciate the capabilities of this new technology and want to use it in accomplishing tasks. Also noting that the internet has only been in use for the last 25 years, the older generation might not be very conversant with computers and the new software and may be reluctant to use computers or keep up with emerging technology.

From the survey, most respondents were women below the age of 35 years. Most were diploma holders. These group, it can be assumed, know how to use computers and value the tasks that a computer can accomplish within a short time. Their access to computers cannot be guaranteed since they are just junior officers. The managers, who belong to the years above 35, may not be so much interested in new technology and since they are the decision makers, the firms might be running on outdated technology or none at all. It's also interesting to note that 75% of real estate professionals are either property managers, estate agents or

property valuers. It is important if a developer is producing information technology for sale to mainly target this group since 1 out of every 4 real estate professionals belong to this group.

### **4.3 Office and Information Technology**

This section consisted of ten questions about the adoption of information technology in the carrying out of real estate activities. It also had a question dealing with benefits of introduction of information technology within an organization and also if the respondents had heard of G.I.S and if they were using it in their offices.

#### **4.3.1 How They Manage Information in their Companies**

The study started by ascertaining the number of firms that were using computers to manage their data. Management of data may include storage, manipulation, analysis and presentation of data. All the respondents stated that they used computers for management of data. This data includes clients' details, agreements, financial data, reports, employees' details, maps etc. This was good in that it showed professionals in real estate have come to accept and appreciate the importance of computers in their day to day activity. They no longer manage data primarily manually but they have come to embrace computers and use it to manage data in their offices.

#### **4.3.2 Does the Company have a Website?**

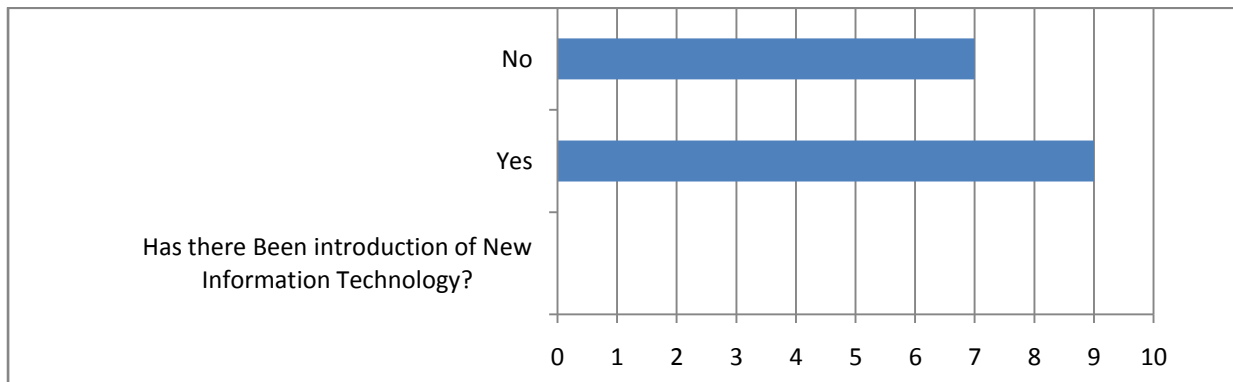
The researcher wanted to know if the firms had discovered the benefits of using the World Wide Web (WWW) and if so, if they had a website. This question aimed to identify if companies had websites and reasons why the respondents who answered 'no' did not use websites. 96% of the respondents answered they had websites. Those who had no websites stated reasons like, it's expensive to maintain or the type of client they target do not need websites. This shows that some people still do not understand how the internet works or do not appreciate the benefits that come with incorporating internet and websites in our day to day work. Websites have become a major part of marketing and advertising for organizations. Today, for a company to be known and for people to consider it as a serious organization, it has to have a website.



### 4.3.3 Information Technology that has been Introduced and Information Technology Currently in Use

The respondents were asked these two questions so as to indicate what software and hardware has been introduced in their duration as an employee of the organization and what they were currently using. 56% of the respondents stated that there was a significant change i.e. introduction of software and hardware while 44% of them stated that not even one new software or hardware had been introduced. For those who stated that there was introduction of information technology, they listed the following: management programmes, webmail, website, smart phones, office 2013, windows 8, emails, virtual tours on website, quick books, Google path, online documents back up, GPRS and online advertising. Since most of the respondents were new employees i.e. they have worked for less than three years, it can be noted that almost half of them have never seen any new hardware or software being introduced in their place of work. For the software that is being introduced, we can term it as general software since it can be used for any type of work in any type of organization. It is not specifically packaged for real estate firms.

**Figure 4.3: Technology**



**Source: Field Survey, 2012**

The next question to the respondents was for them to list the information technology that they were currently using. 50% wrote nothing down while the rest of the respondents, stated the following as the new information technology introduced: internet, computer, telephone, ms office, Google maps, and website, email and data management softwares.

It can be noted from the above results that real estate companies are not upgrading their software and hardware regularly. Most of the respondents who answered this question replicated the answers to the first question in the second question. Also we can see that they

use general software that can be used by anyone and not specialized software for specific tasks. This raises questions on the quality and accuracy of their work. For example, only 12 respondents stated that they used Google maps (which you can freely get when connected to the internet). That is about 13% of all the respondents. For professions dealing with landed property that can be uniquely identified and positioned using coordinates, it is expected that they would use software that can help them position property, value property, manage property in their thousands and in development of property. This is in agreement with Dixon (1998) and Waller (2000) that current ICT “successes” have essentially been based upon the automation of mundane tasks rather than a genuinely innovative approach to real estate practice.

#### **4.3.4 Reasons for Choosing the Technology that you are currently using**

The respondents were asked the reasons behind choosing the technology that they were currently using. From the choices, the respondents could choose more than one option. The results are tabulated below in Table 4.4:

**Table 4.4: Technology**

<b>CODE</b>	<b>REASON</b>	<b>FREQUENCY</b>
1	Its cheap	6
2	Its easily available	18
3	Its efficient	60
4	Easy retrieval of data	48
5	Enhances communication	30
6	Mobility	12

**Source: Field Survey, 2012**

From Table 4.4, it’s clear that most respondents use the technology that they have because it’s efficient. Its costs, availability and mobility do not play a major role in how one chooses technology to use. This might be the reason why most organizations that the respondents work for do not upgrade their information technology regularly. They think that’s efficient and thus do not need to change it or upgrade it. But the truth of the matter is that those who cannot keep up with technology will be phased out because they will not be able to beat competition. You cannot use the tools of yesterday to do today’s work and still remain relevant tomorrow.

For the second part of the question, respondents were supposed to state whether they were trained in how to use the technology that they were currently using. Only six (6) respondents,

(about 6%), stated that they were not trained. All other respondents are trained to use the software and hardware they currently have. This may be true because most of them are using basic software and hardware that they come across while in high school and post high school.

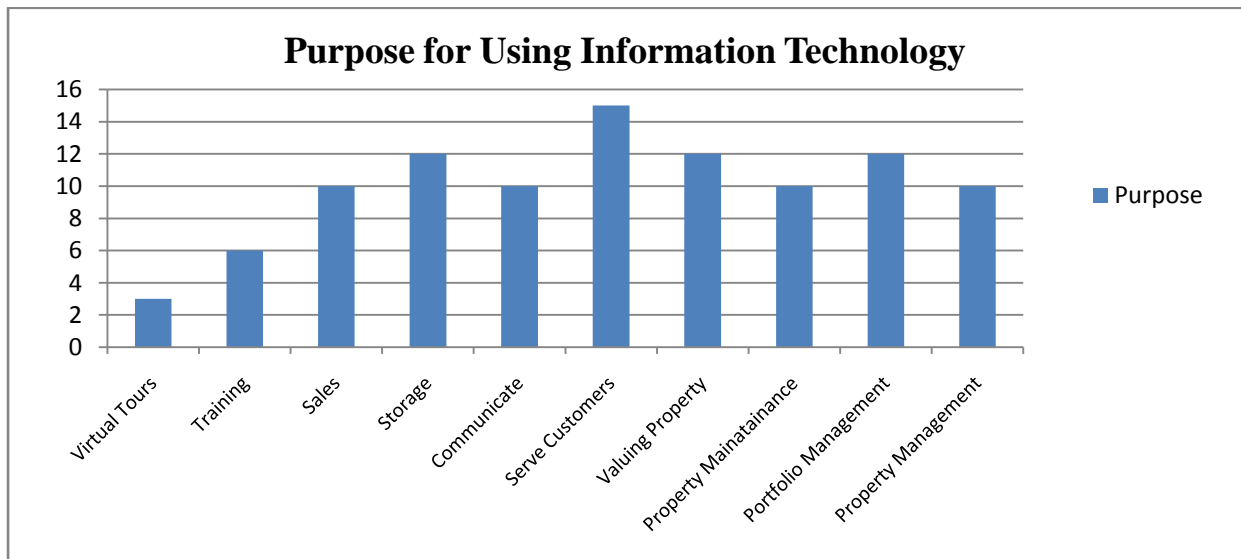
**Part (b) of question five asked the respondents the reason for using this technology. The results are as below in Table 4.5:**

**Table 4.5: Reasons for using Technology**

CODE	PURPOSE	FREQUENCY	PERCENTAGE (%)
1	Virtual tours	12	3
2	Training	24	6
3	Sales	36	10
4	Storage	42	12
5	Communicate	36	10
6	Serve customers	54	15
7	Value property	42	12
8	Property maintenance	36	10
9	Portfolio management	42	12
10	Property management	36	10

**Source: Field Survey, 2012**

**Figure 4.4: Purpose for Using Information Technology**



**Source: Field Survey, 2012**

From Table 4.5 above, it's evident that most of the respondents use information technology available in their organizations to serve customers. 40% of the people use it for selling property, property management, property maintenance and for communication. This is possible using the general softwares available in the firms e.g. Ms Office. Some respondents also use information technology available to accomplish specific work in valuing property,

management of property, property maintenance and portfolio management. Only 3% of the respondents use the information technology available for virtual tours. This maybe so because of the kind of information technology that they are using in their offices i.e. it cannot conduct virtual tours. The type of general software they are using cannot enable virtual tours of houses to be carried out. It maybe also, especially for estate agents, that they do not understand the value of virtual tours and how much it would save them in terms of money and time while showing would be clients houses.

For the third part of the question, the respondents were supposed to state whether the use of technology brings positive results in sales, customer satisfaction, staff/department relations and handling of data and information. The results are tabulated below:

**Table 4.6: Effect of Technology on Sales**

Sales		
	YES	NO
Increase of sales	56	44
Organization quick to respond to market needs	75	25
Sales people are motivated	56	44
Increase of profits	63	37

**Source: Field Survey, 2012**

From Table 4.6 above, it is interesting to note that 56% of the respondents stated that introduction of information technology leads to increase of sales. 75% believe that it makes the organization respond faster to the ever changing market needs. 56% believe technology is by itself a motivator to sales people i.e. the use of websites, smart phones, virtual tours etc make the sales people be more interested in their work and in achieving positive results. 63% of the respondents believe that technology leads to increase of profits.

It is evident from the results that the respondents believe that technology plays a major role in sales. The majority of them are convinced that information technology helps the organization respond quickly to market needs and increases profits. These two areas are the core of any business – profits and to be able to have the right product for the market. From the respondents, it can be seen that if any organization wants to succeed, it must introduce information technology. Most of the respondents stated that currently, apartments and

townhouses are the type of property most sought for. Would be purchasers are mostly concerned about location, pricing and design. For apartments, big firms on average sell atleast two units and for town houses in a compound, for a company to be termed as competitive should be able to sell atleast 60% of them in 6 months. One thing that all the respondents agreed on is that to achieve all this you must use information technology and especially the internet for advertising and communicating with would be buyers. Some firms stated that they used to sell at least 3 apartments in five months before they started using the internet for advertising but since they embraced the internet for on-line advertising, they were selling atleast one apartment each month and they were getting more enquiries on property they have on sale compared to when they were not using internet. This is in agreement with Macoco (1999) and Baker (1990) that the people with information and those who know how to disseminate it will have an advantage over others and will lead to better sales

**Table 4.7: Customer Satisfaction**

Customer Satisfaction		
	YES	NO
There is referrals from clients	63	37
Customers are satisfied with quality of work done	63	37
Customers are satisfied at the speed its done	63	37
Customers are willing to spend more at your organization rather than go somewhere else	60	40

**Source: Field Survey, 2012**

Table 4.7 is clear that the majority of the respondents (63%) agree that information technology has a great impact in customer satisfaction. Information technology plays a major role in ensuring clients are satisfied with the work done and at the speed it is done. This in turn leads to the organization receiving many customers, through referrals, some of whom are willing to spend more at that particular organization rather than somewhere else. As Porter (1995) puts it, continuous innovation is a pre condition for sustaining competitive advantage. This is true when you compare it serving customers using large folios and books. Writing down someone’s name, looking for the name in all books physically so as to access it etc is tedious work that requires a lot of time, which in this ‘instant generation’, is a rare commodity!

**Table 4.8: Staff/Department Relations**

Staff/ Department Relations	YES	NO
Sufficient top-to-bottom communication	56	44
Departments share information and are not primarily concerned with themselves	56	44
High morale within staff	63	37
Less administration and more production	69	31

**Source: Field Survey, 2012**

From the respondents, it can be seen that a large number (69%) agree that information technology leads to less administration and more production. This means that valuable time is used in the core business of the organization and not in administrative issues. Thus, the company is able to meet its targets and work more efficiently. 56% of the respondents agree that there is sufficient top-to-bottom communication when there is information technology and that there is flow of information between departments. 63% of the respondents agree that information technology at work place boosts morale within staff. This is in agreement with the research conducted by Confederation of Indian Industry (2012) that proves that the implementation of advanced technology has permitted the sector to significantly reduce the time wasted in coordinating activities and in managing, moving, and installing materials for construction

**Table 4.9: Handling of Data and Information**

Handling of Data and Information		
	YES	NO
Enough and timely information received	69	31
People know what their responsibilities/duties are	69	31
Data is easily accessed by staff	69	31
Data is well stored	75	25

**Source: Field Survey, 2012**

Majority of the respondents (69%) agree that information technology is vital in handling of data and information in an organization. 75% of the respondents said that data and information is better handled when information technology is present. 69% of respondents agree that the presence of information technology means that data is easily accessed by staff, enough and timely information is received and staff know their responsibilities and therefore can carry them out effectively and efficiently.

#### 4.3.5 Rate the Company's Information Technology

The respondents were supposed to rank the effectiveness of the information technology that they are currently using in their offices. The results are as below:

**Table 4.10: Rate the Company's Information Technology**

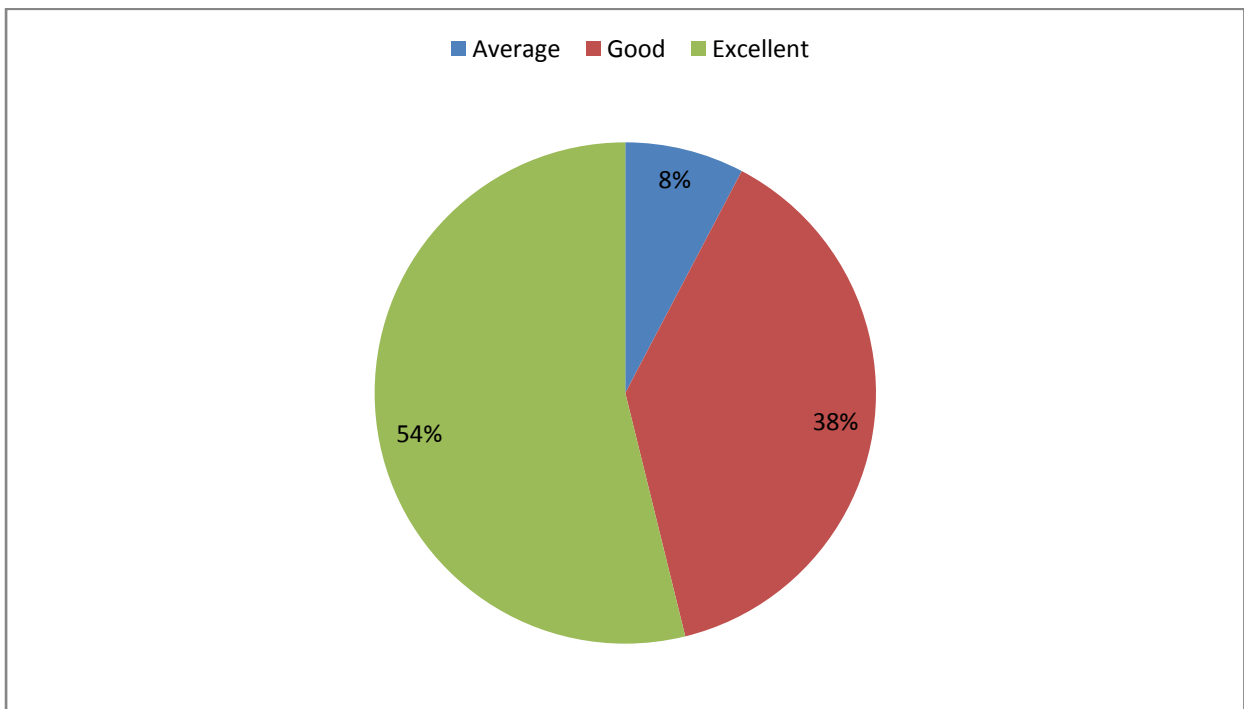
CODE	RANK	FREQUENCY
1	Poor	0
2	Average	30
3	Good	24
4	Excellent	42

**Source: Field Survey, 2012**

44% of the respondents stated that the information technology they were using was 'excellent'. 25% stated it was 'good' and 31% said it was 'average'. It was interesting to note that majority are saying that the information technology currently in use in their organization is 'excellent' when it is plain to see that they mostly use it for serving customers and not their core professional business e.g. property valuation, property management, property maintenance and portfolio management. Majority stated that the reason why they use the

technology is because it's efficient and maybe that is why they think it's excellent. Though it's bringing out customer satisfaction, it is not being used to help in accurately valuing property, portfolio management, virtual tours by estate agents etc. There is still a lot of software, for instance, ARGUs software, price-to-sale ratio software, Vebra etc. out there that real estate professions seem not to know of and if they know of its existence, they are not utilizing it.

**Figure 4.5: Rate the Company's Information Technology**



**Source: Field Survey, 2012**

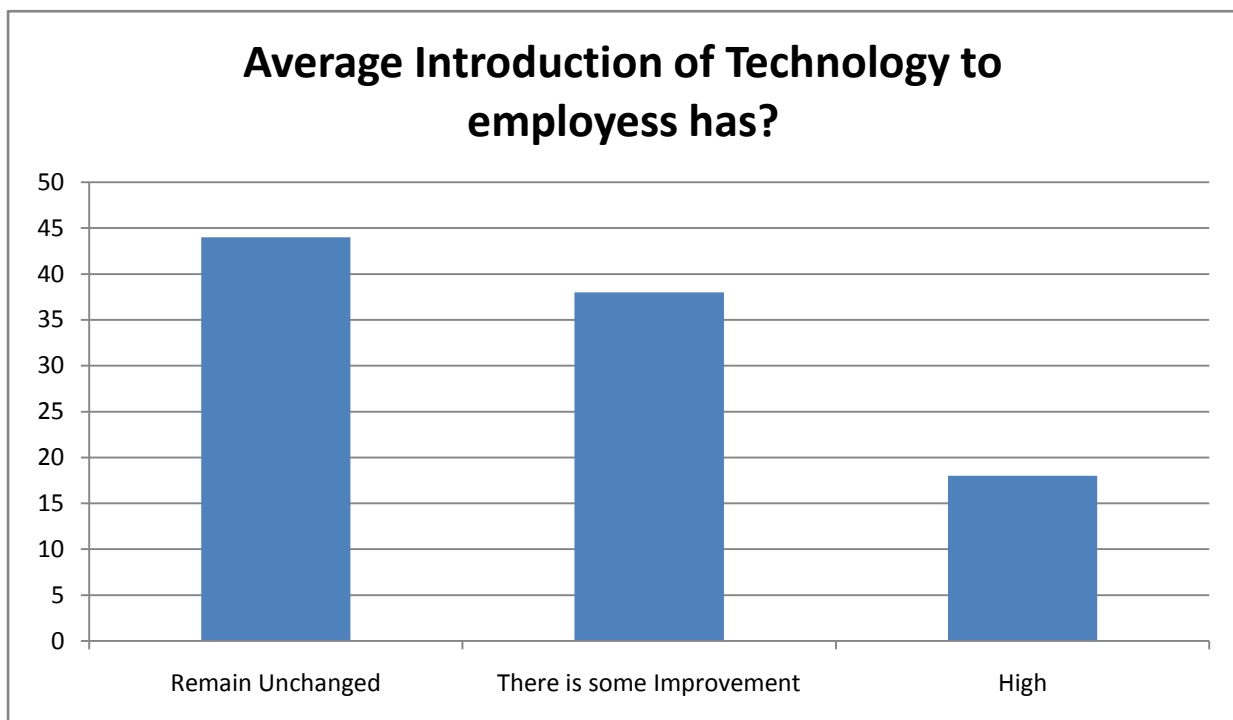
#### **4.3.6 Introduction of New Technology to Employees**

The study was interested in knowing if there had been any recent introduction of new technology in the firms to help the employees achieve their objectives. 44% respondents said that in the past five years there has been no change. 38% of the respondents said there has been some improvement and 18% of the respondents said that there has been frequent introduction of new technology. None stated that it was in decline in that they were reverting back to previous methods that were used to manage information, activities and clients. The implication of this finding is that almost half of the respondents state that in the last five years there has been no significant change in information technology being used in the company. This is a worrying trend in that this is the age of technology where every other month there is



new software released to the market and technology keeps on advancing. If professionals in real estate will not move with the times then they will be relegated to only being spectators and not players in this age of advanced information technology. This in turn will lead to the situation that people will be doing the same things over and over again and expecting different results – which is impossible. The quality of your work is only as good as the tools that you use. What is taking place in Kenya might be in agreement with what is happening in Singapore (Han, 2001), in USA and UK (Castells, 1996; Sherwood, 2001) that there is some resistance to technological advances in the entire real estate sector.

**Figure 4.6: Introduction of New Technology to Employees**



**Source: Field Survey, 2012**

#### **4.3.7 Significance of Using Technology in the Day to Day Activities**

All the respondents (96) stated that there is significant improvement in how one conducts business when you incorporate information technology in your activities. All the respondents agree that information technology plays a major role in making a business successful. Some of the advantages of using information technology that the respondents list are: it enables you to refer previously held information, makes work more efficient, faster communication, maximize productivity, less manual work, aids in report writing and statistics, accountability and less paper work.

### 4.3.8 Knowledge on Existing Information Technology

Respondents were asked this question so as to get to know how much information they had on existing information technology in their areas of expertise. Two (2) respondents stated that they knew very little. The responses are tabulated below.

**Table 4.11: Knowledge on Existing Information Technology**

CODE	HOW MUCH	FREQUENCY
1	A lot	59
2	Not Very Much	35
3	Very Little	2

**Source: Field Survey, 2012**

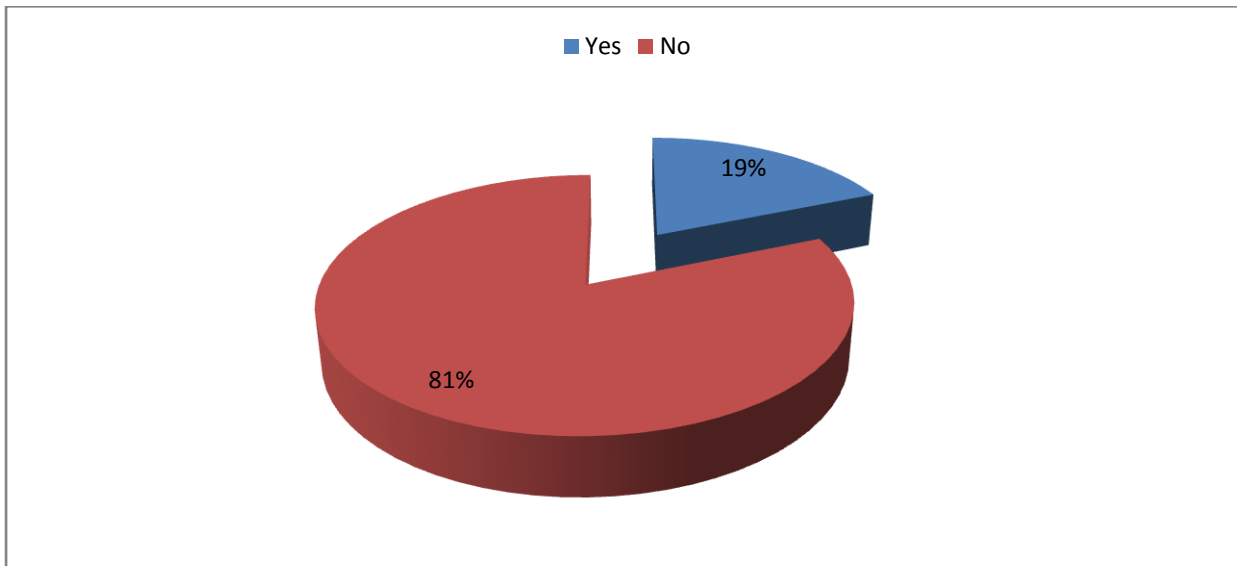
From Table 4.11, it was interesting to note that more than half of the respondents (61%) said that they knew much of the information technology (i.e. hardware and software) existing in their respective professions that fall under real estate. Though they ‘know’ much of the existing information technology, they are using basic software in their day to day activities. They are also using the software that they have majorly for communication. Maybe the professionals think they know ‘a lot’ because they have not been made aware of that there is more software in the market or they have not done more research to know the kinds of software available. If it’s true that they know a lot, then an assumption can be made that the ones they are using are so efficient that they do not want to acquire new software. It might also be so since most of the questionnaires were filled by junior staff, they might know of existing software and if they know of any new software in the market, since they are not the decision makers they are forced to use the old software. 2% of the respondents stated that they know very little about information technology in their area. This might be new employees who have recently graduated or are employees whose tasks do not require them to use computers. They maybe also people who have not been trained in real estate profession. 36% of the respondents stated that they do not know a lot about existing information technology in their area of expertise. This is a significant number since it means 4 out of 10 real estate professions don’t know what kind of software and hardware they can use to improve on accuracy and data presentation and also improve on speed and storage of data.

#### **4.3.9 Geographic Information System**

Geographic Information System (GIS) is a computer based information system used to digitally represent and analyse the geographic features present on the Earth' surface and the events (non-spatial attributes linked to the geography under study) that taking place on it. GIS has become important to all professionals dealing with land and landed property. The researcher asked this question to the respondents so as to get to know if they had heard of GIS and whether they were using it. Twenty (20) respondents i.e. about 21% of the respondents said that they have heard of GIS. Seventy six (76) respondents i.e. about 79%, answered that they did not know what GIS is. This was an interesting finding since it showed that more than three quarters of the respondents did not know what GIS was. This was worrying since GIS has been around in Kenya for more than ten years and its capabilities would greatly be valuable to any professional dealing with land and landed property. Also, being that all the respondents were from Nairobi, the capital city, it was worrying to think of what was happening to the real estate professionals in the smaller towns and in the rural areas. Also, it is interesting to note that in the previous question, more than half of the respondents said that they knew a lot about existing information technology in their area but they do not know anything about GIS. This maybe so because they do not consider GIS as one of their 'software' or do not know anything about the capabilities of GIS. This concurs with the literature reviewed that "... progress (of acquiring GIS) is slow because of the complexity of the technology, the capital investment required and the disruption to existing practices".

ESRI, a worldwide company that produces GIS software, states that it has software that can be customized for all applications in real estate. Currently they have different software that can be used for property management, estate agency and valuation. Therefore, it seems most professionals in real estate don't know a lot about GIS and its capabilities since if they knew, they would readily accept it since most real estate professionals are more concerned with efficiency of information technology they are using rather than cost.

**Figure 4.7: Geographic Information System**



**Source: Field Survey, 2012**

The respondents were also asked if they were using GIS in their firms. 97% of the respondents said no. Reasons they stated for not using GIS included that it had not yet been introduced and they did not know about it. This is a worrying trend noting that a combination of graduates and diploma professionals, managers and employees have not heard of GIS and thus do not know the benefits that GIS can bring in their organizations.

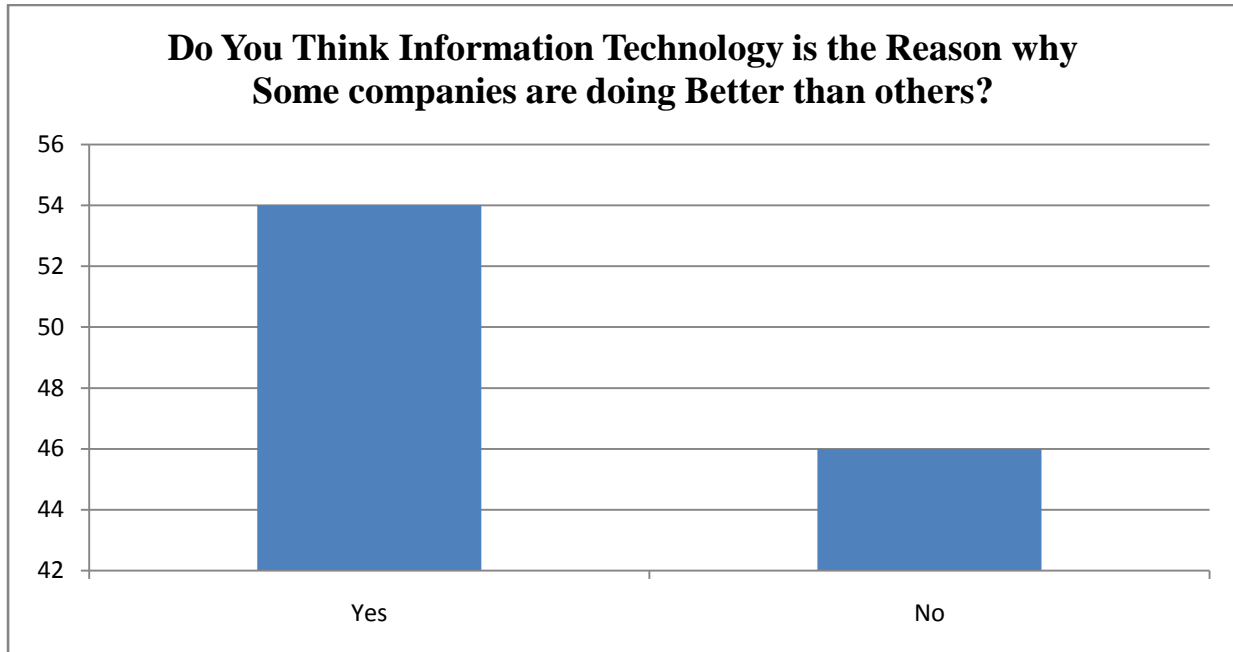
#### **4.3.10 Reason Why Real Estate Firms are doing Better than Others**

The study wanted to elicit the respondents opinion on what they thought made a company successful. 54% of the respondents stated that they believe that information technology plays a big role in making a firm successful. 46% of the respondents believe that information technology plays a small role in making an organization successful. They believe that success in an organization is due to having the right network with the right people, having right reports and analysis, marketing skills, resources and expertise.

The Ministry of Lands, Housing and Urban Development has realized the importance of information technology in their departments. The Cabinet Secretary is spearheading the digitization of all records in the ministry. This has led to 'lost' files being found and maps and title deeds being stored in a proper, safe way. She is also acquiring new hardware and software e.g. computers, GIS software etc that will aid in better management and administration of land and lead to better services being offered to the people. It is evident that

application of information technology by the ministry leads to better performance, public has confidence with the ministry and are more satisfied with the speed that services are offered.

**Figure 4.8: Reason Why Real Estate Firms are Doing Better than Others**



**Source: Field Survey, 2012**

#### **4.3.11 Summary of office Information Technology**

Questions in Part II were based on acceptance of information technology in real estate firms. All the respondents stated that they managed their data by use of a computer. They also stated that they all have a website. This was very encouraging to see that almost all the respondents valued the importance of a website in their day to day activities. Website is used for marketing and passing any other relevant information to would be clients. Through the research, it was also noted that most of the clients are using basic software such as Ms Office. It was important to see that they do not primarily base the reason of using a particular software on cost; it is majorly on its efficiency. If a particular software will make work easier and enhance the flow of information, real estate professions will get it despite its cost. All the respondents except two stated that they had been trained on how to use the information technology they were using. This is a good initiative by the employers to make sure that their employees know how to use the particular software and hardware so as to achieve maximum results. Most respondents use information technology in their offices to serve customers. This refers to record keeping, access of data, searches and presentation of

information. Information technology available is also used for property valuation, property management and property maintenance.

More than half of the respondents stated that information technology leads to increase in sales and consequently increase in profits. It also makes the organization respond quickly to market needs and sales people are motivated to work harder and smarter. More than half the respondents also stated that information technology in an organization leads to satisfied customers which in turn lead to more referrals. It enhances staff/departmental relations in that there is sufficient top-to-bottom communication, departments share information and there is less administration and more production. Information technology also makes sure that data is stored well and is easily accessible by the staff.

Most of the respondents stated that the information technology currently in use in their organizations was excellent. 18% of them stated that in the past five years, there has been introduction of new technology to employees. Some of them stated that there has been no change i.e. the technology they were using five years ago is still the same one they are using. All the respondents agree that there is significant improvement when one incorporates information technology in the day to day activities of the firm. The advantages include efficiency, better storage of information, enhanced communication etc. though they all agree that information technology plays a major role in the success of a firm a few of them state that its not the key factor to success. Success also depends on networking, marketing skills and employee's hardwork.

More than half of the respondents stated that they knew a lot of the existing information technology in their area of specialization. Only 21% of the respondents knew what GIS is. This was discouraging since GIS has been in the country for more than 10 years and its capabilities can be used by all in the real estate sector. 97% of the respondents do not use GIS in their organizations. The major reason they give is that they have not heard about it.

#### **4.4 Results and Analysis from GIS Application**

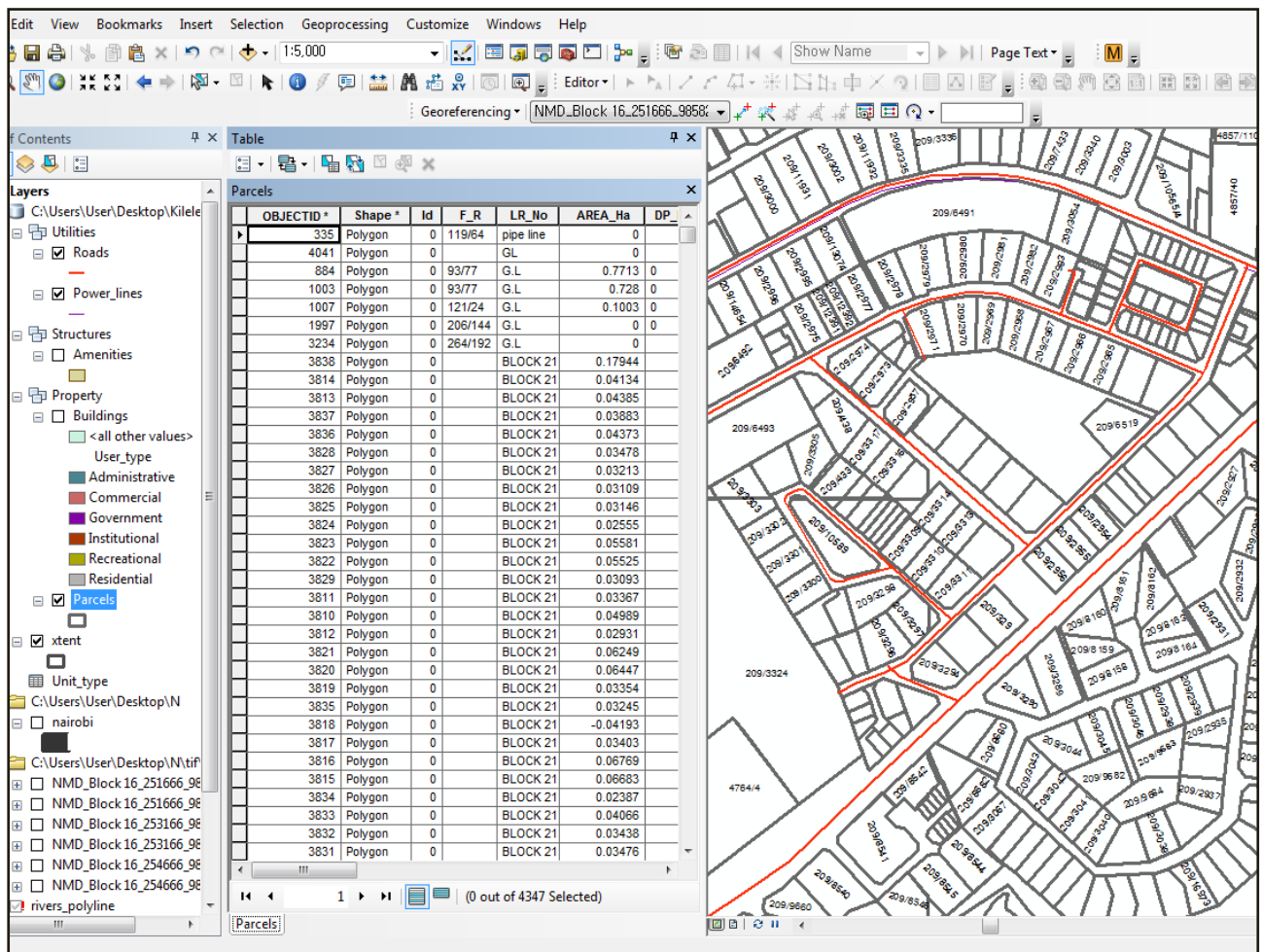
##### **4.4.1 Outputs**

The objective set out was achieved i.e. coming up with a GIS application that can be used in Estate Agency. This involved:

**a) Land Parcel Cadastre**

A database of the land parcels and their attribute information was built as set out. Using joins among the different layers, tabular non-spatial information was linked to spatial data; land parcel. The figure below shows the land parcel layer and its attributes.

**Figure 4.9: Kileleshwa Land Parcels**

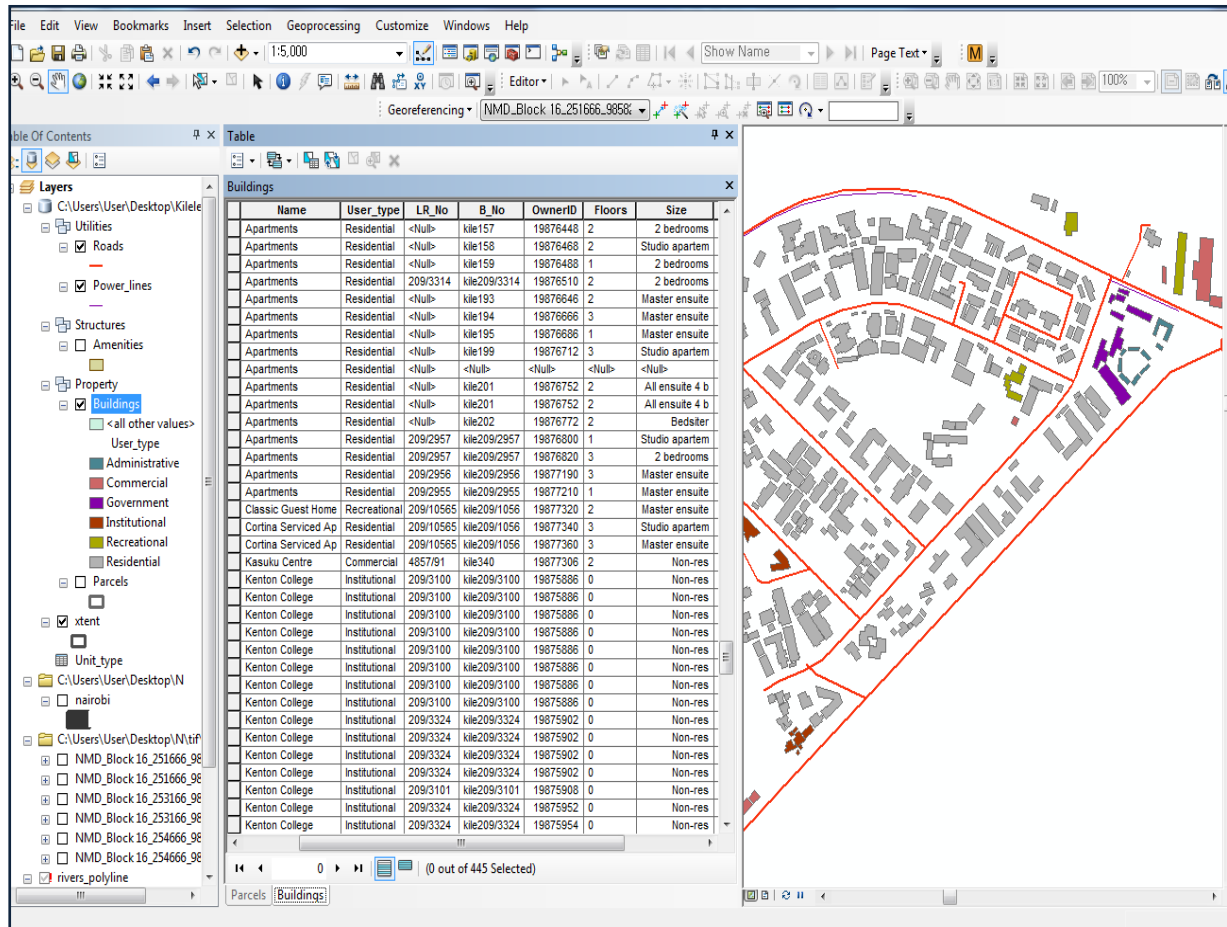


Source: Field Survey, 2012

**b) Buildings**

The buildings in the area of study were digitized, attributed and classified. This is illustrated in the figure below.

**Figure 4.10: Buildings**

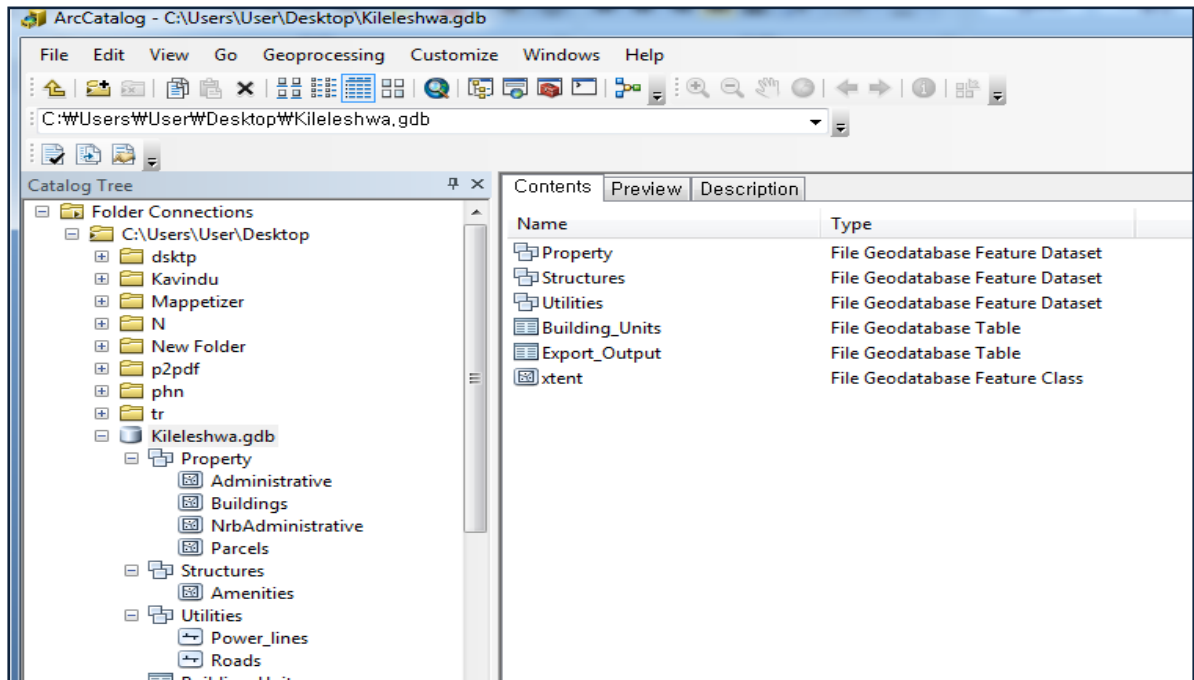


**Source: Field Survey, 2012**



c) Real property database

**Figure 4.11: Real Property Database**

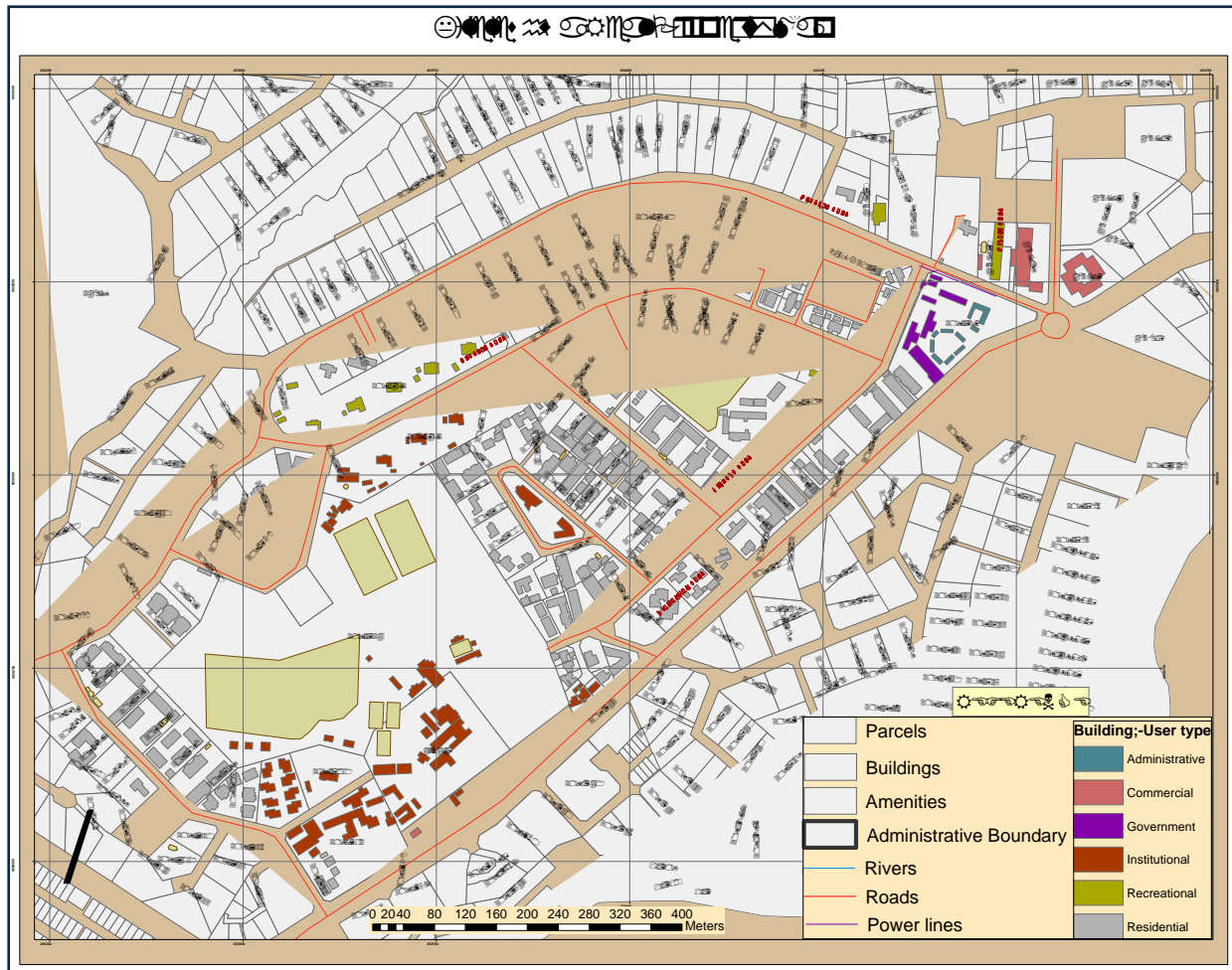


**Source: Field Survey, 2012**

**d) Real property map**

The buildings were classified and symbolized as per the user type. The user types identified include; Commercial, Residential, Institutional, Government, Administration and Recreational. The table below shows the classes used. The resulting map distinguishes the different building types.

**Figure 4.12: Real Property map of Kileleshwa**

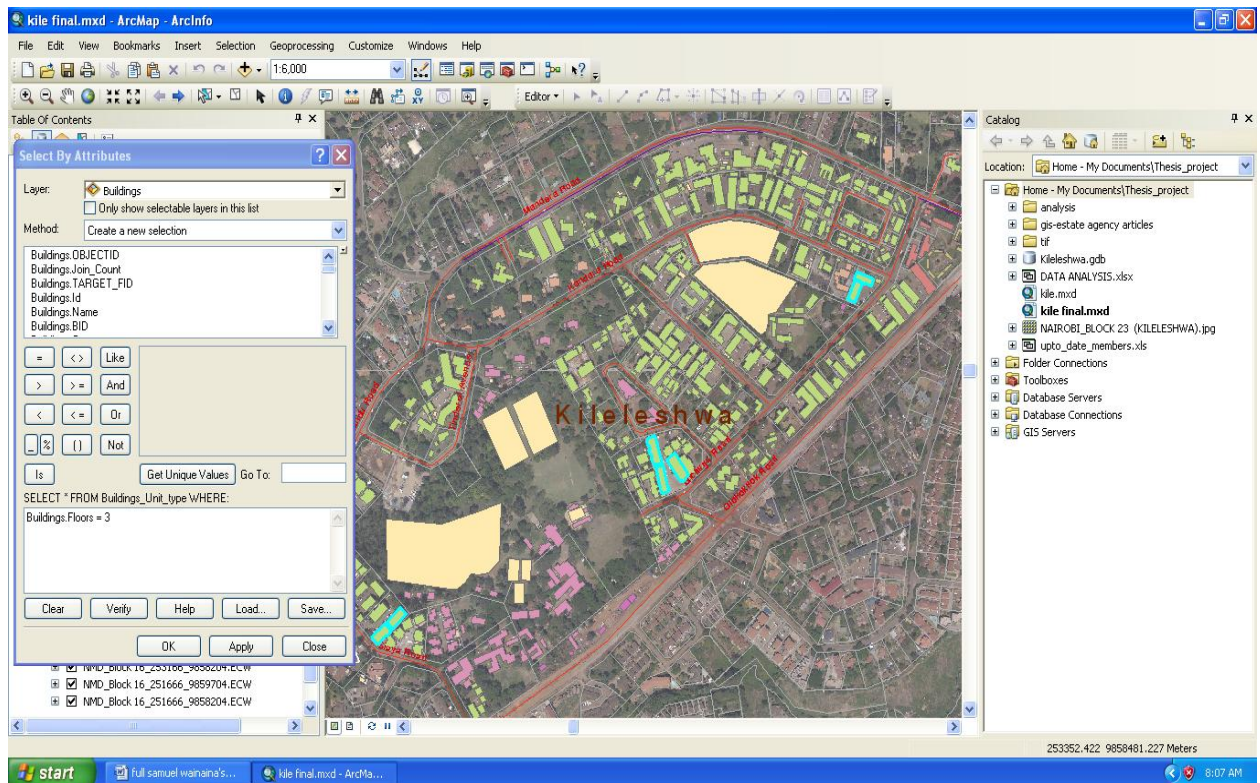


**Source: Field Survey, 2012**

**e) User building query**

The published map had a user interactive interface. Users can select what layers to see, and query. This will be the public platform whereas the administrator of the system will use Arcmap to update and maintain the database. Fig 4.13 below shows a query and the page created after the query has been answered.

**Figure 4.13: Properties in the Area with Three Floors**



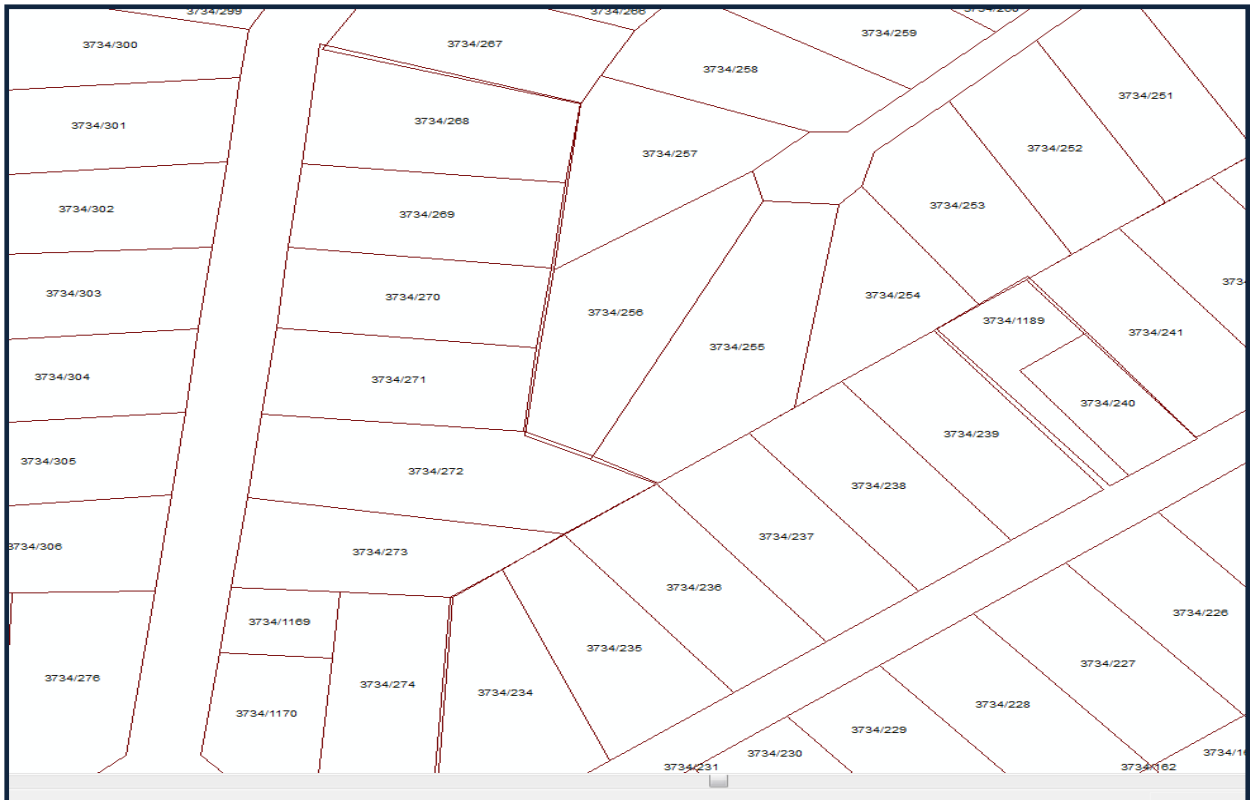
**Source: Field Survey, 2012**

## **4.4.2 Accuracy Analysis**

### **4.4.2.1 Parcel Boundaries**

The cadastral boundaries were plotted and it was observed that some of the parcel boundaries were not coinciding at the edges as would be expected as abutting parcel survey plans had differing corner beacon coordinates. This is illustrated in the figure 4.14. This could be due to a number of reasons; use of different coordinate systems and errors occurring during transformation, long traverses that were not adjusted correctly or an error in the initial control survey of the area block. This can be solved by adopting the ground boundary position and adjusting survey plans and titles accordingly. Another solution could be arbitrating between the abutting parcel owners on the boundary position to adopt.

**Figure 4.14: Non-coinciding parcel boundaries**

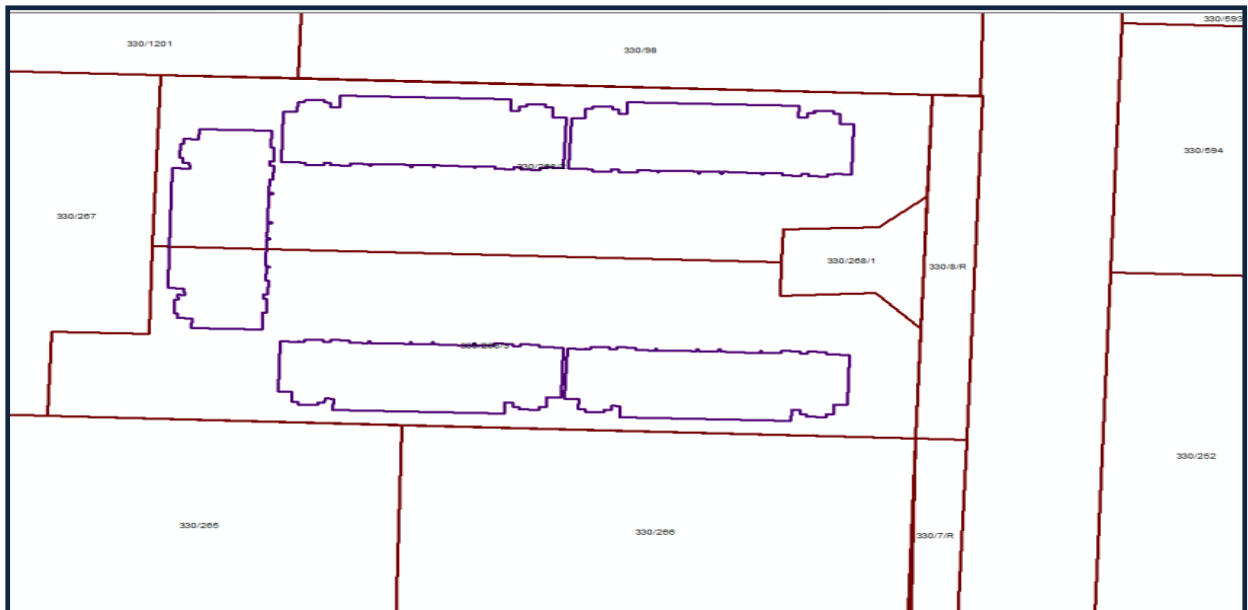


**Source: Field Survey, 2012**

#### **4.4.2.2 Buildings**

It was noted that some buildings didn't belong to one parcel as expected but to three parcels with one apartment building actually lying in two parcels. From the survey plan, there seems to be no evidence of an amalgamation done hence this can be assumed to be negligence on the part of the approving authorities before they were constructed. Figure 4.15 below shows the building positions on the survey plans.

**Figure 4.15: Apartment buildings occupying 3 parcels**



**Source: Field Survey, 2012**

#### **4.4.3 Summary of GIS Application in Estate Agency**

A GIS is an information system designed to work with data referenced by spatial / geographical coordinates. In other words, GIS is both a database system with specific capabilities for spatially referenced data as well as a set of operations for working with the data. It may also be considered as a higher order map. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps. These abilities distinguish GIS from other information systems and make it valuable to a wide range of public and private enterprises for explaining events, predicting outcomes, and planning strategies.

At some stage in every one lives most of them will need to look for a new home. Perhaps, because of a new job or a change in family circumstances or accommodation requirements will change and look for a new place to live. Some of them need to be close to schools, major roads or a railway station? Perhaps some of them would prefer to be in an area where costs are lower. May be they want to a house that is close to shops and their place of work. This can be a time consuming and frustrating task. The requirements of individual family members need to be considered in selection of place. In order to pose these questions in finding a home acceptable to all family at right place at right cost; a real estate information management with an appropriate decision support system is necessary. A range of criteria that will influence the

decision must be defined. The criteria can be thought as data layers for a GIS. Therefore GIS provides a framework for exploring solutions to decision-making problems.

GIS in conjunction with the internet enables every user access various data at anytime from anywhere in the world. The would be buyer or renter only needs to be able to access an internet enabled computer with GIS software. The next step is to open the user friendly interphase and follow the simple instruction. For instance, the buyer/renter can state in which area he wants to get a house. From there, he can list the specifications he has e.g. should be at least 2KM to the nearest primary school, at least 5KM to the nearest hospital and less than 500 Meters from the tarmac. The software will do the rest i.e. using the specifications that it has been given, it will search from the database the available houses that fit the parameters and it will show all of them. From there, the buyer/renter can continue giving more specifications so as to reduce the options popping up. Then from at least a list of three or two, he can decided to visit them physically so as to make a final decision on which one he will settle on. This significantly reduces the time and money it would have taken one in visiting all the options so as to get the best fit.

The respondents who use GIS in their day to day work stated that they have realized that their ability to negotiate with grounds maintenance contractors is considerably strengthened when they have used GIS to provide accurate measurements of the spatial extent of areas to be maintained. One of them when commenting on the benefits of introducing GIS to their firm states that, "We are making annual savings of about Kshs 200,000 on a bundleof grounds maintenance services that would previously have cost us Kshs 900,000 annually. That is a total saving of Kshs 2m over a ten year contract period. I can't be precise about the contribution of GIS to this saving, versus, say, the impact of increased levels of professionalism in our firm and a changed economic climate. However, it seems to me that the bulk of these savings are directly attributable to our firm being better informed and that is down to the use of GIS and the spatial information it manages." Another responder stated that he has been able to increase profits by 8% since he incorporated GIS into his daily activities. This was through the savings he was making when looking for a property for his clients and because of the commissions he was getting because of increased customer satisfaction.

One of the respondents using GIS stated the following when it comes to providing the right property to a clients specific demand; "Much of a real estate agent's life is spent studying the matrix of the multiple listing service (MLS). The MLS provides a network of real estate

information to real estate agents within the geographic service area. Real estate professionals have access to every listing and sale within the database. Information availability of the MLS is impressive and invaluable useful for industry professionals. However, although the MLS allows for a search by area, the selectable boundaries are broad in range, crude and confusing amongst MLS subscribers. Since the relevance of location is key for clientele, the introduction of GIS seems idyllic. While logged in to the MLS, a vast amount of data can be exported into a CSV file, opened in Microsoft Excel and added to ArcMap. The very same analyses can be performed by ArcGIS as with the MLS. But the GIS can incorporate a spatial aspect in a way that the MLS cannot. Suppose a client seeks a home located no further than three kilometers away from a police station. A GIS can operate the same search as discussed earlier but include a distance parameter of any length from any point on earth.” Using MLS data, a GIS can produce a map for a client that could reduce the mystic of house hunting, thereby calming apprehension (Donlon, 2010).

GIS can be used to answer questions on location, condition, trend, pattern and modeling. From the application created, it can be noted that GIS is a tool whose capabilities and functions can be greatly utilized in estate agency and to a greater extent in all professions falling under real estate. Some of the other benefits encountered by GIS users are:

- Increases productivity thanks to an automated proposal process, enabling staff to work more quickly and proactively.
- Delivers competitive advantage to online clients by offering access to high-value audiences.
- Enables advertising messages to be targeted to specific localities.
- Provides unmissable, accountable, attractive advertising, which enables audience numbers to be independently verified.

## CHAPTER FIVE

### FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

#### 5.1 Introduction

The overriding purpose of this study was to determine the application of information technology in real estate and how it is impacting on the shape and form of real estate in Nairobi. Operating in a dynamic environment, the success of real estate companies hinges, in large part, on their ability to deliver innovative, user-accepted products and services in a timely, seamless manner. With so much riding on the prosperity and future of their companies, more and more developers are turning to advanced technology as a tool for optimizing the value of their businesses in the marketplace. Emerging technological trends are redefining the real estate space and taking it to the next level, for both now and in the future. Technology is emerging as a catalyst of change for the real estate companies – be it construction, project management, marketing, business management or customer service. Today, the real estate sector is grappling with a number of challenges such as shortage of skilled manpower, escalating project cost and prolonged construction period. Technology holds the key to not only address some of these issues, but also a promise for the sector to react to the changing market conditions more effectively and efficiently.

With the changing face of real estate, it is important to determine whether professionals in this area are accepting and using technology in achieving their objectives and day to day activities. With Kenya's rapid development and economic expansion combined with the importance of information especially when dealing with land and landed property, professionals dealing with real estate cannot choose to ignore information technology in the 21<sup>st</sup> century. Any professional who wants to remain relevant must embrace technology. This is the information age and wealth and development will therefore be found with those with information, who know how to process it and disseminate it. The present study was undertaken to determine whether real estate professional in Kenya have embraced information technology in their activities and how it is affecting their activities. To accomplish that goal, specific objectives were formulated:

- i). To asses to what extent real estate firms have accepted and implemented technology in their day to day activities.
- ii). To examine how new technologies are affecting working practices in a real estate office.
- iii). To develop a GIS application that can be used in estate agency.



A questionnaire was formulated to achieve these objectives and it was given to professionals in the real estate sector to fill. Ninety six respondents completed the questionnaires as required and the data was used for analysis and to come up with findings. This chapter reports the findings, conclusions and recommendations that resulted from this study.

## **5.2 Findings**

The findings of the study are briefly stated below:

1. All the respondents of the study state that they manage their data by use of a computer and that they have websites for their companies.
2. Most of the software used to manage data is Ms Office.
3. Software used in the offices is mostly based on its efficiency and not its cost.
4. 94% of the respondents of the study stated that they were trained on how to use the software that they were currently using.
5. Most of the respondents (above 55%) state that they use the software for serving customers, followed by 44% who state that they use the software for storing data, valuing property and portfolio management.
6. Most of the respondents (above 55%) agree that information technology plays a major role in improving sales, customer satisfaction, improving staff relations and handling of data and information.
7. 44% of the respondents rated the information technology that they are currently using as 'excellent'.
8. 56% of the respondents stated that there has been some improvement in the introduction of software and hardware in the company they work for in the past 5 years. 44% say that it has remained unchanged.
9. All the respondents agree that there is significant improvement when a real estate professional decides to use technology in the day to day activities.
10. 61% of the respondents state that they know 'a lot' about the existing technology in their area of expertise.
11. Only 21% of the respondents have had about GIS (Geographic Information Systems).
12. Less than 3% of the respondents are using GIS in their offices today.
13. 54% of the respondents believe that the reason some real estate companies are doing better than others is because of advanced information technology in their offices.

### **5.3 Conclusions**

All the respondents stated that they managed their data by use of a computer. They also stated that they all have a website. This was very encouraging to note that all the respondents valued the importance of a website in their day to day activities. It was also reassuring to note that 100% of the respondents use computers to manage data. Websites are used for marketing and passing any other relevant information to would be clients. If an organization does not have a website today, it is usually not considered to be a serious one. Through the research, it was also noted that most of the clients are using basic software such as Ms Office. This was because it is easily available and most computer users know how to use it. It was important to note that they do not primarily base the reason for using a particular software on cost; it is majorly on its efficiency. If a particular software will make work easier and enhance the flow of information, real estate professions will get it despite its cost.

All the respondents except one stated that they had been trained on how to use the information technology they were using. This is a good initiative by the employers to make sure that their employees know how to use the particular software and hardware so as to achieve maximum results. The respondents also know how to use the software because they are using basic software that one can be trained from high school level. This can also be seen in what they mostly use the software and hardware for. Most respondents use information technology in their offices to serve customers. This refers to record keeping, access of data, searches and presentation of information. Information technology available is also used for property valuation, property management and property maintenance. Having these basic software and hardware allows them only to be able to do basic tasks which beg the question, “what is the accuracy of the information being provided? What analysis can be done in Ms Word or Ms Excel pertaining location?”

More than half of the respondents stated that information technology leads to increase in sales and consequently increase in profits. It also makes the organization respond quickly to market needs and sales people are motivated to work harder and smarter. More than half the respondents also stated that information technology in an organization leads to satisfied customers which in turn lead to more referrals. It enhances staff/departmental relations in that there is sufficient top-to-bottom communication, departments share information and there is less administration and more production. Information technology also makes sure that data is

stored well and is easily accessible by the staff. Generally, it can be seen that information technology impacts all facets of an organization. Information technology makes work easier, faster and more accurate. Using technology also makes information to be presented better thus communicating easily to the client and making him/her understand. Information technology revolutionizes how an organization conducts business.

Most of the respondents stated that the information technology currently in use in their organizations was excellent. This is because they are basing their evaluation on efficiency. But new technology is being churned out almost daily; technology with different capabilities. The fact that they are saying the information technology is efficient and yet they are mostly using it for customer service and not their core business i.e. property management, property valuation etc is discouraging. Most of them stated that in the past five years, there has been introduction of new technology to employees. Some of them stated that there has been no change i.e. the technology they were using five years ago is still the same one they are using. It is difficult to introduce new information technology because they do not know it exists or if they know it exists, they don't know its capabilities. The introduction of new technology will enable them to perform better.

For those not responding to market trends and new technology, they will find it difficult to compete with the more information technology savvy companies. All the respondents agree with that statement and they state that there is significant improvement when one incorporates information technology in the day to day activities of the firm. The advantages include efficiency, better storage of information, enhanced communication etc. Although they all agree that information technology plays a major role in the success of a firm, a few of them state that it's not the key factor to success. Success also depends on networking, marketing skills and employees' hard work. It is evident that all the respondents agree that no real estate firm can do well without the use of information technology. Even though you need marketing skills, networking etc information technology plays a vital role in ensuring you succeed.

It was interesting to find out that more than half of the respondents stated that they knew a lot of the existing information technology in their area of specialization while only two (2) of the respondents knew what GIS is. This was discouraging since GIS has been in the country for more than 10 years and its capabilities can be used by all in the real estate sector. All the respondents do not use GIS in their organizations. The major reason they give is that they

have not heard about it. GIS has not been introduced to real estate professionals. GIS has mostly been portrayed as a tool that can only be used by land surveyors. This has led to real estate professionals not viewing GIS as a tool that they can employ in their activities. The fact that they also say that they know a lot of existing information technology in their areas of expertise and yet use Ms Office to do most of their work is mind boggling. Is it that the other softwares and hardwares are costly, not available etc. or is it that Ms Office is just too efficient that they do not need other softwares?

#### **5.4 Testing of the Study Hypothesis**

The evidence from this study suggests that the hypothesis is not supported by the data collected i.e. application of technology in real estate revolutionizes working practices and leads to better presentation of services offered. All the respondents agreed that there is significant improvement when a real estate profession decides to use technology in the day to day activities. More than half of the respondents believe that the reason some real estate firms are doing better than others is because of advanced information technology in their offices. The application of technology in real estate agency does lead to better data management.

#### **5.5 Limitations of the Study**

Although the study has successfully demonstrated that application of information technology in real estate is important, it has certain limitations in terms of: First, these data apply only to real estate firms based in Nairobi. Although 60% of G.D.P is from Nairobi and Nairobi is the capital city of Kenya, we cannot assume that conditions in smaller towns or in rural areas will be the same as those in Nairobi. Although we can safely assume that most real estate firms concentrated in one area will be found in Nairobi which will be of diverse sizes, handling different clients and information and thus offering different experiences, most firms in Nairobi cannot be compared with those in rural areas. For instance, in some smaller towns, electricity is being connected now and thus real estate firms in those areas cannot use computers to manage data and serve clients.

Another limitation of this study is the low response rate that was at 63%.With a small sample size, caution must be applied, as the findings might not be transferable to other areas.

Thirdly, the study did not evaluate individually each area of specialization that falls under real estate. That is, it did not evaluate estate agency, property valuation, property management, portfolio management and property development as separate entities so as to

consider their differences in light of how they have accepted and use information technology. Although the respondents indicated their area of specialization, the researcher believes that if each area of specialization under real estate is considered separately, this would lead to a better questionnaire being tailor made for each area and thus leading to a more accurate result pertaining to each different segment of the real estate profession.

## **5.6 Recommendations**

The findings of this study have a number of important implications for future practice:

Real estate professionals should be taught about technology that exists and can be used in their areas of specialization. Preferably, this should be undertaken while still in school so that when they start working, they already know what information technology can be used to accomplish a particular task. Also, GIS should be introduced to real estate professionals. It will greatly aid them as they deal with land and landed property. It should also be taught in schools i.e. educational policies and legislative structures governing education should be set up to advance the teaching of GIS in primary, secondary and tertiary institutions of learning.

Regular workshops and trainings e.g. twice a year should be carried out for real estate professionals so as to let them know what new information technology is available and how it can be used. The workshops will also enable the professionals to state what they require so that it can be produced. In conclusion, a comprehensive automated database should be constructed which would avail property and land information on demand. This would lead to real estate professionals and surveyors accessing important information on land in a timely and easy manner. Security measures should be taken to protect the valuable information.

## **5.7 Areas of Further Research**

It is recommended that further research be undertaken in the following areas:

The impact of digital mapping of all spatial information contained within land registries to Real Estate.

The viability, adoption and benefits of the concept of e-government to real estate.

The costs and benefits of introducing GIS in Real Estate and its impact on the individual, organization and the activities to be undertaken.

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## APPENDICES

### Appendix I: Questionnaire

#### PART I: BACKGROUND INFORMATION

1. Gender: Male ( ) Female ( )
  
2. Age: 20-25 ( ) 26-35 ( ) 36-45 ( ) 45-55 ( ) Above 55 ( )  
)
  
3. Educational History: Diploma ( ) Graduate ( ) Masters ( ) Doctorate ( ) Other  
\_\_\_\_\_
  
4. Your area of specialization: Property Manager ( ) Property Valuer ( ) Estate Agent ( ) Property Portfolio Manager ( ) Property Developer ( )  
Other\_\_\_\_\_
  
5. Your length of service in the Real Estate sector: 1-3 years ( ) 4-7 years ( )  
7-10 years ( ) 11-15 years ( ) above 15 years ( )
  
6. Your current position: Employee ( ) Supervisor ( ) Manager ( )

#### PART II: OFFICE AND INFORMATION TECHNOLOGY

1. How do you manage information in your company?  
Manually ( ) By Use of Computer ( )
  
2. Does your company have a website? If no why?  
  
Yes ( ) No ( )

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3. In your years as an employee in this firm, what Information Technology has been introduced? Please list at least four.

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4. What Information Technology are you currently using in your office? Please list five.

- a) \_\_\_\_\_
- b) \_\_\_\_\_
- c) \_\_\_\_\_
- d) \_\_\_\_\_
- e) \_\_\_\_\_

5. a) Why do you choose the technology that you are using? (You can Tick more than one)

It's cheap ( ) Its Easily Available ( ) Its Efficient ( ) Easy Retrieval of Data ( )  
Enhances Communication ( ) Mobility ( ) Others (Please Specify)

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Are you trained in how to use this technology?

Yes ( )

No ( )

If No, Why?

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b) For what purpose do you use the technology for? (You can Tick more than one)

For virtual Tours of Houses ( ) For Training ( ) For Sales ( ) For Storage ( ) To  
Communicate ( ) To serve Customers ( ) Valuing Property ( ) Property  
Maintenance ( ) Portfolio Management ( ) Property Management ( ) Others  
(Please Specify)

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c) Has the use of this technology brought positive results in the following four areas:

Sales

YES NO

Increase of sales

Organization quick to respond to market needs

Sales people are motivated

Increase of profits

Customer Satisfaction

YES NO

There is referrals from clients

Customers are satisfied with quality of work done

Customers are satisfied at the speed its done

Customers are willing to spend more at your organization rather than go somewhere else

Staff/ Department Relations

YES NO

Sufficient top-to-bottom communication

Departments share information and are not primarily concerned with themselves

High morale within staff

Less administration and more production

Handling of Data and Information

YES NO

Enough and timely information received

People know what their responsibilities/duties are

Data is easily accessed by staff

Data is well stored

6. How would you rate the company's Information Technology that is currently in use compared to manual system of doing things or the one that was used before?

Poor ( )      Average ( )      Good ( )      Excellent ( )

7. During the past 1 to 5 years, the average introduction of new technology to the employees has been:

In decline ( )    Remain Unchanged ( )    There is Some Improvement ( )    High ( )

Please explain your answer? (If in decline, please give reasons why that is happening)

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8. a) In your opinion, would you say there is significant improvement when one decides to use technology in the day to day activities of the firm?

Yes ( )      No ( )

b) If No, Please Explain.

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c) If yes, can you list some of these advantages?

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9. How much do you know about the existing Information Technology in your area of expertise?

A lot ( )                      Not Very Much ( )                      Very Little ( )

10. a) Do you know about GIS (Geographic Information Systems)?

Yes ( )                                      No ( )

b) Do you use GIS in your company?

Yes ( )                                      No ( )

c) If No, please explain why.

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11. a) Do you think the reason why some Real Estate companies are doing better than others is because they use Information Technology?

Yes ( )

No ( )

b) Please explain your answer in (a) above.

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c) If no, then what do you think is the reason?

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