

**THE EFFECT OF TECHNOLOGY ON RISK MANAGEMENT
PRACTICES BY FUND MANAGERS IN KENYA**

BY

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DECLARATION

This research project is my original work and has not been presented to any other University or institution of higher learning for academic award.

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DEDICATION

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LIST OF ABBREVIATIONS

| | | |
|-------------|---|---|
| CMA | - | Capital Markets Authority |
| ERM | - | Enterprise Risk Management |
| IT | - | Information Technology |
| KRA | - | Kenya Revenue Authority |
| MPT | - | Modern Portfolio Theory |
| PMPT | - | Post Modern Portfolio Theory |
| RBA | - | Retirement Benefits Authority |
| RTGS | - | Real Time Gross Settlement |
| SWOT | - | Strengths Weakness Opportunities and Threat |
| VaR | - | Value at Risk |

ABSTRACT

In many businesses today, technology is considered the most strategic capital investment and information, important for the success of an entity. Business technology has advanced tremendously over the century. Some of these notable changes in the fund management environment are use of internet, clouding, information technology, computing intelligence, virtualization and software and hardware developments. However, despite all this developments, technology has inducing another aspect of technological risk which needs to be managed. Therefore, this study examined the effect of technology on risk management practices in the case of fund managers in Kenya. To answer the research questions, the study used a descriptive research design. The population of the study comprised of the 20 registered fund managers in Kenya. Due to small population size, the study used a census for data collection. The study used primary data which was collected through the use of questionnaires. The data collected was analyzed using descriptive and inferential statistics using the statistical package for social studies. The study findings established technology has a negative and insignificant relationship with risk management whereas training and compliance had a positive and insignificant relationship with risk management practices. Effective data management was found to have a positive and significant relationship with risk management practices. The study concluded that technology, training and compliance and effective data management influences risk management by Fund managers in Kenya. The study recommends that fund managers should regularly carry out technological risk audit risks to establish the effect of technology on risk management practices.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

In many businesses today, technology is considered the most strategic capital investment and information, important for the success of an entity. It might be in information system or information technology infrastructure. In this paper we analyze the effects of technology on risk management which is vital for all business activities as continuous and forecasting process. Risk management especially in fund management is important processes that minimize the risk exposure to investment to boost the returns. Any factor that alters the risk composition of the investment environment will in turn affect the expected returns (Kozak, 2015). The sole business of fund managers is to maximize returns for their clients. Hence, need to understand if the continuous change in technology has any effect on risk management.

Today various business communities are adapting technology to conduct business. Technology is advancing at a very high rate, which is affecting both positively and negatively in various sectors of the economy. The effect of technological developments recently has a tremendous impact on how we conduct business. These developments have changed how the investors gather information about their investments, how fund managers disseminate their report and other financial transactions. Development of new products and the concept of financial engineering have been introduced. Generally, positive improvements have been experienced. However, on the other hand risk has gradually increased. To be able to keep up the investment returns, risk management has to cater for these changes effectively. On the supply side, we have witnessed unprecedented growth in new markets for the transfer and sharing of these risks. Technology advances in the information processing and telecommunications have enabled financial service firms to provide efficient hedges and guarantees to manage these risks (Novick, 2014).

Asset managers act on a fiduciary capacity of the asset owners, investing the client's assets within specific investment guidelines of a given mandate. Assets invested are held by third parties referred to as the custodian hence live within the environment of multiple players. These players comprise of asset owners, intermediaries, custodians, fund administrators and electronic

trading platforms. The platforms comprise of trade web, market axes where trading is executed and confirmed. Data is transmitted among parties, processed by asset managers and communicated back to third parties. This data transition should be consistent, timely and efficient to respective clients (Tuckett, 2012).

Risk management involves all phases of investment process and feedback between asset measurement and allocation. Risk management can be defined as the forecasting and evaluation of financial risks together with the identification of procedures to avoid or minimize their impact. Risk management is a practice that has been in place since time immemorial. As technology improves the fund managers are increasingly adopting various strategies to enhance competition and profitability (Ernst and Young, 2013). The inherent risks and various information and technology functions can be managed effectively to yield the optimum performance for the various fund managers in the country.

1.1.1 Technology

Technology can be defined as inventions applied to solve problems. In the today's world, technology has become the way of life. Technology is used to enhance transactions in various business models. The way we conduct business is changing drastically each day. Technology is advancing each day and is affecting the way we conduct business. It is impacting on the time we take to conduct business, the risk exposure and the risk management practices adopted are also changing. In the investment sector the market much revolution is taking place. For instance the adoption of sophisticated mathematical models, computerized information processing, telecommunication technology is impacting on the accuracy of production, pricing of commodities, exchange rates, interest rates, inflation rates estimate, credit ratings and stock market valuations (Novick, 2014). This will help in identification of the risk factors in advance and estimating the impact of their variations from the expected output, plan how to mitigate and communicating the findings in real time. More so advances in payment settlement methods has greatly impacted on the industry. Real Time Gross Settlement (RTGS) is key in remitting payments to the respective parties and securing assets in real time (Njoroge, 2015). This has shortened the payments period drastically as well as reduced risk associated with fraud.

Development of financial engineering from the principle of dynamic replication has changed the face of investment over the years. The discovery of Black Scholes option pricing model , Mertons applications of continuous time stochastic modeling has led to the development of the financial economics field which is improving the social economic in the society. This has improved the risk management models that are reducing the vulnerability to financial insecurity in the global arena (Bonie, 1999).

Despite all this developments technology is inducing another aspect of technological risk which needs to be managed. Fund managers are dealing with sensitive and valuable information hence a high target by cybercrimes. Recently, cybercrime has increased leading to losses in many business entities. These frauds are as a result of development in social engineering that makes it easy to target their victims. Thus protecting data for the client is essential for fund managers as it means protecting their business. Mishandling of this information and dealing with the third party can be a nightmare especially this period of technological advancement and where rule and regulations governing the same are not very much profound. Human mistake such as errant email by an employee, malware infestation and other organized cybercrimes (Kouns, 2011). The fund managers may be the target or their clients with less security measures. Thus technology may be one of the major risks with both positive and negative impact to the fund managers risk management practices.

Business technology has advanced tremendously over the century. Some of these notable changes in the fund management environment are use of internet, clouding, information technology, computing intelligence, virtualization and software and hardware developments. This has virtually impacted on time taken to execute on risk management practices and cost of implementation (Novick, 2014).Hedging one of the strategies applied by fund managers to mitigate risk, requires numerous data analysis and forecasting of various variables. Availability of technology has enhanced application of complex models to achieve these. A good example can be demonstrated by StockCity for Oculus a too developed by Fidelity Labs that combines virtual reality with data visualization to transform an investor's stock portfolio (IBM, 2011).

1.1.2 Risk Management Practices

Risk management can be defined as the process of forecasting and evaluation of financial risks together with the identification of procedures to avoid or minimize their impact. Risk management plan involves the process of risk identification, analyzing risk, developing strategies to mitigate and respond to risk. This involves various risk management activities namely risk identification, analyzing such risks and their probability of occurrence and impact on the company's objective and lastly how to mitigate their impact. More so, to further develop a response plan, monitoring mechanism, how to control and report the risk. This is necessary to identify in advance the risks that might affect the profitability of the investment strategies. In the process of identifying these risks technology plays a major role in its identification, analyzes, monitoring and reporting. Risk management is carried with sole purpose of minimizing losses or consequence associated with such risk and optimize on the returns (Ziemba, 2008).

Fund managers deal with diversified risk from market risk and operational risk. This risk need to be managed in line with the client's expectations and risk appetite. The risk management is a process that needs to be evaluated frequently due to the changes in the market dynamics. The changes can be legal factors that may lead to changes in compliance, the geographical changes, the changes in business operations and technological changes among others. The following are some of the risk management process in place to cater for varies causes (Ziemba, 2008).

Risk Identification is a role played by all parties in the institution. It is described as an iterative process to identify threats that may be faced by an entity. These risks differ in magnitude and degree for various clients. Hence, need for continuous evaluation of this risk. They may include operational risk, financial risk, technological risk and business risk. Fund managers should identify specific risk that may affect completion in the industry. Various techniques applied in risk identification are depi-technique, SWOT analysis, root cause analysis, influence diagramming and flow charts (Ronald, 2008).

Risk analysis is carried out with the sole objective of establishing the likelihood of the occurrence, the consequences associated with the risk in terms of performance, time schedule and cost. Some consequences are very severe if they occur and may lead to failure or huge losses to the fund managers. A good example is cybercrimes that may result to financial losses that may

affect the profitability of the clients. The commonly used risk analysis is qualitative and quantitative analysis. Qualitative risk analysis involves prioritizing the identified risk using probability of occurrence, corresponding impact on occurrence and other factors such as time and cost. Quantitative risk analysis follows after the qualitative analysis where the most impacting risks are analyzed using numerical rating (Ronald, 2008). Other techniques applied are probability distribution sensitive analysis, decision tree analysis, modeling and simulation.

Risk mitigation and monitoring will encompass the process of responding to the identified risks and action plan to minimize the deviation from expected output (Ronald, 2008). Some of this action plans can be mitigating the occurrence, contingency plans and transfer the risk.

One of the main practices in risk management is enterprise risk management. It is defined as viewing all risks together within a coordinated and strategic framework. ERM is a concept that combines disparate financial and operating risks into single program. An effective ERM has a long-run competitive advantage over those that manage and monitor risks individually (Rocco and Stulz, 2006). In brief companies that measure and manage its risks consistently and systematically, and by giving its business managers the information and incentives to optimize the tradeoff between risk and return strengthens its ability to carry out its strategic plan.

In the early 90's firms dealt with corporate risk management coverage as operating risk characterized by operating losses. This trend is changing over time to adopt a more holistic approach in dealing with risk. Most of the risks have been identified to be interdependence, hence need to address them in consolidation. It is argued that adapting an effective ERM program the cost of risk management is drastically reduced especially in case of correlated risks (Rocco and Stulz, 2006). The consolidation of the risks will take in effect the various risk exposures a company is facing, its risk philosophy and tolerance. The main aim is to determine the link between the goals and implementation. Having identified technological risk as one of the developments in the risk environment, then ERM must be structured to address this change. The first step in operationalizing ERM is to identify the risks to which the company is exposed. A common approach is to identify the types of risks that will be measured. For useful inventory of risks, the information possessed by people within the organization must be collected, made

comparable, and continuously updated. Firms that have less developed IT systems face more challenges of addressing these issues.

1.1.3 Effect of Technology on Risk Management Practices

Fund managers face various risks in their endeavor to meet the clients' target. Recently, technology advancement has led to change of the risk environment in the daily operations. The traditional risk management strategies have changed. Previously risk factors such as inflation, business risk, and financial risk were common. But today technological risk is one of the major risks facing asset managers. Among these changes cybercrime is the most common. Cybercrime is defined when computer is the object of crime. This can be viewed in terms of hacking, phishing or spamming. Most cybercrimes use computer technology to access personal information, business trade. Use of internet for malicious or exploitative purpose can be classified as cybercrimes (Chorafas, 2011). Normally computer crimes are very catastrophic and costly to the entity. According to a research carried in UK, the rate of cybercrimes is on the rise. Many firms are losing millions of sterling pounds on these malicious acts. Asset managers are not exemption and are vulnerable too. The dynamics of risk management have changed to keep vigil of this criminal acts carried out by hackers. Some of the common changes are use of cyber security to curb this technological risk (Chorafas, 2011).

The nature of business managers requires the need to hold and manage rapidly increasing volumes of data. This data comprise clients' information, the market data, the asset portfolio and numerous bank account transactions. These require a complex data management strategy that may be outsourced or at times managed by the firm. This has in turn increased the risk management spectrum to the asset managers. Data is normally an easy target by cyber criminals.

Though cloud computing has made it easy to access data from the server with much ease. Risk management is highly boosted by the ability to identify this risk due to availability of data (Chorafas, 2011). More so, monitoring of these data is becoming more efficient hence much more informed decisions are made. Thus the process of risk management has lowered the time schedule and cost. Cloud computing can be described as a model in which computing resources are abstracted from their underlying physical hardware elements. The act of virtualization services provide scalable, on-demand access to a pool of computing resources typically accessed

over the Internet. The importance of cloud computing includes scalability, agility and speed-to-market, and cost control which is the main aim of risk management. Therefore technology enhances risk management process (IBM, 2011).

Fund managers serve numerous individual and corporate clients. Third parties such as custodians also interact with fund managers in their daily operations. Hence, need to communicate on frequently. Technology has made it possible to interact with these parties with ease. Information technology enabled by mobile gadgets such as iPhone has made it possible to send information at any time. Social media is enhancing the speed of communication which in turn enhances the period of service delivery. This will help the asset managers to reduce cost on customer interaction (IBM, 2011). Communication is too enhancing risk management by reducing the information asymmetry. All fund managers are able to access the vital information for their daily transactions. These new technologies also present huge risks, however, when these benefits are offset by data management hurdles and customers expressing dissatisfaction online for all to see. The responses on social sites can lead to negative publicity which may increase to reputation risk. Hence need for risk management that caters for these new changes.

As high-risk activities increasingly occur beyond the boundaries where traditional control environments operate, these changes will tear up the rule book in the way successful enterprises think about and govern risks. Compliance with ISO27001, ITIL or adherence to Cobit standards within the IT function may no longer alone be sufficient to govern risks over IT services (Kouns and Minoli, 2011).

The counterpoint of risk is opportunity and IT functions which can effectively manage their risks will enable their businesses to radically outperform those companies which are put off by or simply not up to the challenge. Companies where IT feels empowered to influence commercial decision-making by demonstrating how business enablement can be driven by effective management of technology risks, will prosper greatly at the expense of those companies where ignorance or fear of new or changing technology risk areas either prevents them from moving into new areas, or results in failures when they attempt to. This is the time for IT leaders to step up and put themselves and their function at the center of driving their business forward (Kouns and Minoli, 2011).

1.1.4 Fund Managers in Kenya

Fund manager is responsible for managing the fund's investments and aligning the funds strategy in line to its goals. He is also responsible for other operations of the fund from risk management to customer relationship. This will encompass reporting obligation to the specific regulatory authorities and the client. In Kenya, the concept of fund managers was introduced in the late 1990's. A good example of these fund managers are Old Mutual established in 1998 and Genesis Kenya Investment Management Limited in 1996. Today we have around 20 registered fund managers in the Country as per RBA act. The main industry regulations are guided by following laws and regulations Kenya: Capital Markets Act, Retirement Benefits Act, Income Tax Act and Companies act. They play a role in the management of institutional assets on behalf of clients and investment both in local and international markets (Ernst & Young, 2013). The major common roles undertaken include reporting, offer education to clients, acting as investment advisors, pension fund management and other investment activities.

1.2 Research Problem

Risk management can be traced back in time immemorial. Various techniques have been applied to reduce and control the impact of uncertain future event. Risk management can be traced back to the Markowitz theory and modern portfolio theory that highlights the importance of risk mitigation in the market environment (Bodie, 1999). In the past risk management practices are changing. Among the many factors that affect risk management includes technology, organization structure and communication. Technology can be both information and infrastructure (Wariya and Ranoggi, 2009). These two have changed the way we conduct business. Technology has led to adoption of risk management software that is changing the face of risk management. Risk management programs are further improving process of risk identification in advance. Previous studies have identified various factors affecting risk management. Out of this information technology has been identified as one of the main factor, though no research has linked how technology is impacting on risk management either positively or negatively. Currently, risk environment is shifting towards advance in technology. Technological risk is emerging has use of technology is advancing. Therefore there is a need to research on the effects of technology in risk management practices. Is technology worth investing into despite the risk threats?

The world is losing millions of dollars in form of technological risk. In Kenya, technology is gaining momentum. Widely institutions are adopting technology at high rate. Consumers too are well informed. Therefore technological risk is on the rise. Though little reports of fraud have been reported, financial institutions are losing a lot of millions in Kenyan Shillings. Asset management which is an emerging market in Kenya, and has potential for growth technology is inevitable. Fund managers act on fiduciary capacity for investors hence need to invest in technology to reduce agency cost and improve communication. Further it's an industry exposed both to market risks and firm risks (Ernst & Young, 2013). Risk management is a vital process to the functions of fund managers. In mitigating both the firm risk and market risk to maximize the investors returns. Thus need arises to study how the increased use of technology is impacting risk management practices.

Technology is one of the greatest innovations that are changing globally how we conduct business. From transportation to communication and modes of money transfer technology is the key driver. Over the years technology has been growing all over the world and hence need to understand its impact to the society. The following factors have been identified to impact on risk management communication, culture, information technology, training, organization structure, and commitment from management and trust (Wariya and Ranoggi, 2009). It is further supported by Ashoori and Teymouri (2010) who narrows the research to impact of information technology to conclude a positive relationship between technology and risk management. The studies argue technology is impacting on competition, higher performance levels, globalization and effective data management. Locally the impact of technology is being felt to financial sector that has greatly improved its operation efficient. Though this too has its disadvantage, technological risk is on the rise. It has been identified Kenya is making loses associated with technology (Kiragu, Wanjau and Kanali, 2013). The study further find out our increased innovation can enhance competition among the players in the industry (Maingi and Wanjiru, 2013). To expound further on this studies is to find out how innovation in technology is affecting the risk management in fund managers.

In the last decade, scholars have identified an increase in technology in the daily life activities. This comprise of social media in communication, more advanced gadgets and friendly to users both for individuals and business. Technology is on the rise. Hence, need to understand how the

risk environment is changing due to the advance in technology. Previous studies have not identified a relation between technology and risk management. Further, is investing in technology commensurate with the cost of investing in risk management. Is technology impacting positively to risk management or negatively? Therefore, this study seeks to find out what is the effect of technology on risk management practices in the case of fund managers in Kenya?

1.3 Objective of the Study

To examine the effect of technology on risk management practices in the case of fund managers in Kenya.

1.4 Value of the Study

In the current trend where banks are facing, many institutions and individuals are turning for fund managers for investment. In Kenya with the establishment of RBA in 2007, there is growth in the number of fund managers. The clients' base too is increasing, from pension schemes and individuals, hence the need to adapt new technology. Fund managers being fiduciary agent, many players are involved which comprise of custodian, clients, fund administrators, regulation authorities such as RBA, CMA and government. Hence, the research is important for all the parties involved to learn about the effect of advanced technology in risk environment. In returns Fund managers are investing in technology to keep up with the growth in sector globally. Technology is creating a competitive advantage hence a need to understand how it will change the risk management practices adopted by a firm (Kozak, 2010).

Increased adoption of technology is changing the risk environment and the traditional rules cannot keep up with the changes (Kouns and Minoli, 2011). Hence the government, CMA and RBA must understand how these changes will affect risk management practices and develop a framework to set a level competitive field. Further, guidelines will ensure the investors' interests are protected by (Rono and Bittok, 2010).

Technological risk is a diversified field that needs to be researched further (Lytras, 2012). This study lays a foundation on how risk management is changing due to changes in risk management. Future scholars will find it useful to further research on how technology and risk management is correlated.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter entails literature review analyses related to risk management and technology. It starts by discussing the various theories relating finance and technology, followed by previous studies both locally and international. Lastly it concludes with summary and the research gap.

2.2 Theoretical Review

2.2.1 Introduction

Theoretical review highlights the three earlier established theories such as MPT that explains the importance of risk management. The other two theories explain how an innovation spreads to be the norm in the society, such as technology. Lastly the use of technology is seen to expound how the three are changing the dynamic of an organization from innovation, adaption and its effects.

2.2.2 Modern Portfolio Theory

Modern portfolio theory was developed by Markowitz in 1952 and explains how to maximize returns for a given level of portfolio risk or on the other hand to minimize risk for a given level of return. It expounds on the importance of perfect asset selection in regard to the risk exposure of an investor. The theory argues that for assets with similar risk but different returns an investor will select an asset with less risk (Sharpe, 1963). It is a theory that has been used widely by fund managers to maximize value of their clients' portfolio. Later, Brom introduced the post modern portfolio theory that added the concept of intern rate of return to measure the link between assets and liabilities. It differs with modern portfolio theory in risk measurement by use of mean return. The use of this theory was made possible by the use of software developed by Rom that highly enabled market optimization. Unlike MPT, PMPT gave room for use of more sophisticated techniques in risk analysis (Sharpe, 1963).

2.2.3 Diffusion Theory

Diffusion of Innovation Theory was discovered by Rogers in 1962 expounds how an idea can be communicated over time and spreads through the population or social system. Diffusion can be described as the process which innovation spreads and is accepted in the society. Many factors interact to influence the spread or diffusion of technology (Rogers, 1995). It involves communicating the idea, the time it takes to spread and the nature of the society in which it's introduced. It goes farther to expound and investigate how the various factors interact, facilitate the new innovation and the effects of the invention. This inculcates a culture in people and adopts the idea or product over time. Over the years diffusion theory has been used extensively both in technology and economics. More theories have been derived out of diffusion to explain spread of various innovations in the society. In Information technology, the use of developer based theory and adopter based theory (Surry, 1997).

Further Rodgers explains the adoption using the rate of adoption theory that defines how innovations diffuse to form a pattern that is S shaped curve. It identifies how the idea follows a path from inception at a slow gradual growth before exploding into rapid growth (Rogers, 1995). Diffusion theory is further supported by theory of perceived attributes that explains the potential of innovation adopter's judge based on five attributes of invention. They comprise of relative advantage, compatibility, observability, complexity and lastly triability (Rogers, 1995). Surry supports this perception which plays a major role in the adoption of technologies in the society (Surry, 1997).

2.2.4 Situational Theory

Situational theory was well developed in the year 1984 by Hersey. It has been widely used to explain how internal and external dimensions to identify the problem, level of involvement, and constraint recognition. Further analysis of situational theory has identified three independent variables that expound on the external and internal dimensions could be altered through communication (Williams, 2015). Publics can be classified into those who are aware of the problem and what they do about the problem. Communication is identified as a means of creating awareness and effectively addressing such challenges. To expound further on the situational theory is the buildup of the contingency theory that states the best way to organize will depend on the nature of the environment in which an entity must relate. Build up on the

theory identified factors that could alter environment uncertainty of an entity could influence performance of an organization. The main areas identified include technology, government, customers and competitors (Williams, 2015).

2.3 Determinants of Risk Management

Various factors have been identified to affect the risk management practices in an organization. They comprise of technology, top management, communication, culture, training, organization structure and trust. The study expound on how technology is impacting on this various factors and its overall effect on risk management practices.

2.3.1 Technology

Risk management can be determined by various factors and technology plays a key role. Among the factors that are influenced by the information technology comprise of risk associated with technology and internet penetration. This is one of the major risks that are changing the face of risk management practices. Technological risk will have an adverse effect on risk management by increasing the cost of carrying out risk management process. Technological risk takes different forms from simple malfunction of computer, phis, to complex malicious act such as cybercrime. Organizations are losing billions of dollars through cyber-attacks especially financial institutions. Fund managers are prone to these attacks. Risk management practices are being streamlined to take in consideration the increased use of technology (IBM, 2011). Technology risk management programs are applied to control and minimize the risk environment. ERM is integrated to cater for numerous risks affecting the firm. Of recent ERM is emphasizing on technology related risk. Technology risk is increasing the cost of risk management practices and only large fund managers can afford to implement strong IT risk management techniques. Internet penetration has led to globalization and information can be widely accessed over the globe. Internet is the key leading innovation for business success as well as increased risk environment (IBM, 2011).

2.3.2 Effective Data Management

Risk management practices from the initial stages of risk identification to risk monitoring; data management plays a crucial role (Ravi, 2007). Increased use of technology has enhanced data management strategies. Firms are adopting the clouding and virtualization techniques to manage

the firm's information in a centralized system. Information is readily available in advance hence risk personnel are able to identify risk. The identified risk can be then be analyzed using complex models such Delphi technique (Ronald, 2008). Data input checks such as field validation and naming policies minimize errors; field validation protects data by ensuring that data in a given field conforms to set standards, while naming policies keep computers from interpreting slightly different names of the same entity as two separate entities. Effective data management is improving on transparency and better reporting mechanism both within and outside the firm. Fund managers are said to handle large client data. Effective data management is a strategy that can improve on better risk management strategies by offering data security. Thus loss of information to authorized personnel is minimized (IBM, 2011). Increased data management is impacting on risk management process.

2.3.3 Communication

Successful risk management puts into consideration various factors that should be coordinated systematically to give a firm the desired objective. Risk management can lead to less cost and improved returns (Hasanali, 2002). She identifies various factors affecting risk management and among them is communication. Information technology is changing the way we communicate and hence reporting of risk analysis and finding is made easy. Monitoring of risk is simplified by a well-informed organization (Beroggi and Wallace, 2012). Communication of risk management practices to all the employees ensures a culture that is aware of the risk procedures within the firm. This is echoed by Ranong and Wariya (2009) in their study that recognized communication has one of the factors affecting risk management practice. Communication has a positive impact on time taken in risk management process.

2.3.4 Training and Compliance

Some firms are opting to engage risk management experts on how to conduct technology risk management. Advanced use of technology is impacting on the regulation and compliance to curtail the risks associated with technology. Changes in regulations are gaining momentum and all firms must comply. A good example is the creation of ISO27001 and change of information use technology (Kouns &Minoli, 2011). These changes in the industry are impacting on the training of individuals in the field of technology and risk management. Though little has been done to address this in Kenya, global changes are affecting the operations of firms in Kenya.

2.4 Empirical Review

Empirical review highlights various studies previously done that relates to technology and risk management. It highlights recommendations and conclusions that will guide us in our research.

2.4.1 International Studies

A study carried out by Kontio and Basili (1997) recognizes three challenges namely technology awareness, limitations of risk management approaches and lack of empirical evidence on the usefulness of risk management methods. It highlights on the importance of risk management technology and discusses approaches that help overcome the shortcomings. It discuss Risk it method that allows thorough documentation of risk scenario, sound approach to ranking risk and supports multiple goals on stakeholders. Also it goes further to explain the difficulties in evaluating the risk management methods.

Bodie (1999) carried out a study to analyze changes in technology in the investment industry. The study highlights on the changes of the investment environment and how the industry responded to some of the challenges at the time. Drastic increase in the level and volatility of interest rates commenced in the year 1965 and was more consistent in the early 1980s. It is believed the increase was as a result of the effect of the Vietnam War on the U.S. economy and the oil price crisis when the Middle East cartel was formed (Bodie, 1999). The price changes led to increased inflation that further led to increased nominal interest rates. New markets for the derivative security exchanges to trade listed futures and options were born in the 1970s. The new market traded in major currencies, treasury bills, bonds and stocks. Due to the volatility of the economic market, managing this risk was necessary. Financial models to manage these risks were developed (Bodie, 1999).

The computing and telecommunications industry had made some strides in development of personal computers that could process at a higher speed and memory. This was a boost to the financial sector. The processing of complex numerical solution and multivariate differential equations were made possible (Bodie, 1999). Real time estimation of prices and other ratios were enhanced. In the words of Merton it was described as the financial innovation spiral.

Wariya and Ranoggi (2009) carried out a study in Thailand to establish critical success factors in risk management for financial institutions. The research highlighted various critical success

factors for effective risk management and how they impact the industry. The research question highlighted seeks to expound and gain a better understanding of risk management procedures and to examine the critical success factors for effective risk management procedures. To explore the importance of these factors use of quantitative method to analyze data collected using self-completion questionnaire to financial institutions in Thailand. The selected institutions comprised of banks, stock securities exchange, asset management and insurance. The study found out seven factors that play a major role in effective risk management. These factors are Commitment and support from top management, Communication, Culture, Information technology, Training, Organization structure and Trust. The importance for effective risk management to financial institution is also highlighted. The study is aimed to change the procedures adopted to address the need for effective risk management practices in financial institutions in Thailand. It further expounds on how both IT and Infrastructure helps in increasing competition, higher performance levels, globalization and data management. These achievements help the firm to reduce cost of documentation and further reduce time in carrying out risk identification and analysis. This concludes IT is crucial for firms to establish sound risk management practices at all levels.

Ashoori and Teymouri (2010) in their study on the IT impacts on risk management in Iraq found out in many organizations, information system and IT infrastructure have been considered as the most strategic capital. Valid information is an important factor that leads to business success. The study further emphasizes the importance of risk management in strategic management of the organization by controlling the threads. The study was to estimate the effects of IT usage on 50 Iranian oil companies by analyzing the data which was collected by use of questionnaires. Information technology impact on risk management was summarized into three components mainly cost, time, and performance. It concluded that there is a positive impact of information technology on risk management especially in optimizing time of process rather than cost and performance.

Stoneburner and Feringa (2012), define risk management as the process of identifying risk, assessing risk, and taking steps to reduce risk to an acceptable level. To identify the risk in organizations, risk assessment is used to determine the extent of the potential threat, vulnerabilities, and the risk associated with an information technology system. The second step

which involves risk mitigation utilizes the output of the first process to help identify appropriate controls for reducing or eliminating risk. The ultimate goal is to help organizations to better manage IT-related mission risks. Organizations may choose to expand or abbreviate the comprehensive processes and steps suggested in this guide and tailor them to their site environment in managing IT-related mission risks. In addition, this guide provides information on the selection of cost-effective security controls. These controls can be used to mitigate risk for the better protection of mission-critical information and the IT systems that process, store, and carry this information. The third step in the process is continual evaluation and assessment. In most organizations, IT systems will continually be expanded and updated, their components changed, and their software applications replaced or updated with newer versions. In addition, personnel changes will occur and security policies are likely to change over time. These changes mean that new risks will surface and risks previously mitigated may again become a concern. They conclude that risk management process is ongoing and evolving.

2.4.2 Local Studies

A study carried out by Rono and Bittok (2010), on Impact of RBA guidelines on the return on investments of both pension funds under management and those for pension schemes in Kenya summarizes on the importance of regulations to financial performance. The study was conducted on a sample of fund managers and fund trustees in Kenya and determined a return of about 10 to 21.52 %. The study highlighted how the overall weighted returns changed on implementation of the RBA guidelines. This research further highlights the need harmonize on legislation that ensures schemes are encapsulated from risk. It touches on the importance of risk management to the firm and schemes. The study is generally based on how to improve on productivity and returns of the different schemes. It helps understand that risk management is necessary for firms to ensure they achieve targeted returns. It further summarizes on the expected growth in the industry hence need to address a large population in the future. It concludes by touching on the need to address and strengthen compliance and enforcement to cater for emerging issues in the market in the future.

A study carried out in Kenya to establish financial innovation as a competitive strategy has highlighted the importance of technology in enhancing competition (Maingi and Wanjiru, 2013). It recognizes rapid change in the world business environment and becoming intensely

competitive. In this context, most organizations are realizing that knowledge is the most important resource in creating sustainable competitive advantage. It defines knowledge management as a discipline designed to provide strategy, process, and technology to increase organizational efficiency and effectiveness. The survival and success of a firm are dependent on the capacity of management to generate new ideas. One such a topical idea is financial innovations. Economies and businesses across the world have embraced creativity and innovation to circumvent market imperfections. Kenya as an economy has been hailed as a regional financial hub. This paper is a narrative review seeking to establish the extent of financial innovation in Kenya and how this enhances competitiveness. The research finds out that the Kenyan financial sector has made some remarkable strides towards financial innovations which are enhanced by changing and embracing of technology. However, it is noted that there is still enormous untapped potential that can enhance Kenya's economy further (Maingi and Wanjiru, 2013).

Kiragu, Wanjau and Kanali (2013) highlights global statistics shows that the banking sector has the highest occupational fraud incidence compared to other sectors and that an organization loses at least 5% of its annual revenues to fraud. In Kenya, applying this statistic to consolidated commercial banks revenue for the year 2011, the loss is approximately Kshs 13 Billion. The study set to find if commercial banks growth has had an effect on occupational fraud in the commercial banks. Occupational fraud can be associated with the change in risk environment. Many attributes can be associated with the growth of Banks and one of the many factors identified is the adoption of technology and competition. A representative sample of 30 banks out of the 43 commercial banks licensed by Central Bank of Kenya by June 30, 2012 was used in this study. The test statistic used was bivariate linear regression was used the relationship between bank growth and occupational fraud risk in commercial banks. The findings from this study are the negative and not significant effect of bank growth on occupational fraud risk in commercial banks in Kenya. These results provide important insights on to management on the overall effect of customer base expansion and occupational fraud risk and further provide a pointer to the regulatory authorities as to what their efforts should be in deterring occupational frauds in Kenya.

2.5 Summary of Literature Review

Over the years technology has been growing all over the world and hence need to understand its impact to the society. Some of these factors affecting risk management have been identified as Communication, Culture, Information technology, Training, Organization structure, Commitment from Management and Trust (Wariya and Ranoggi, 2009). However, the studies fail to highlight on how technology is playing a role in determining risk management practices. More so technology will lead to increased competition, higher performance levels, globalization and effective data management.

Earlier, studies established positive relationship between technology and risk management. But we need to identify to what extent will change in technology impact on risk management practices. It leads to increased competition, higher performance levels, globalization and effective data management. These achievements help the firm to reduce cost of documentation and further reduce time in carrying out risk identification and analysis. Which is further supported by (Ashoori and Teymouri, 2010) who narrows the research to impact of information technology to conclude a positive relationship between technology and risk management.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research methodology used in the study. Firstly, the choice of study, research design applied, the population of study and sample population selected for the purpose of study are presented. Subsequently, the data collection method that provides information to base our research conclusion is also covered. Finally, the validity and reliability of our research is explained.

3.2 Research Design

A study design refers to the procedure employed to achieve the objectives of research. Research design is important as it facilitates a smooth sailing of various research operations and benchmarking research efficient to yield maximum information (Kothari, 2004). To answer the research questions, this study used a descriptive research design. Descriptive research was directed at making careful observations and detailed documentation of a phenomenon of interest. Descriptive research was identified for the study as it explains the relation between technology and risk management practices. It demonstrated how changes in technology impacted on the risk management practices.

3.3 Population of the Study

The population of the study involved all the registered fund managers in Kenya. Currently we have twenty registered fund managers (RBA, 2015). Due to small population size, the study used census for data collection.

3.4 Data Collection

The study used both primary and secondary source of data. Questionnaires were used to collect primary data which were sent through emails and personally administered. The questionnaire was semi structured. On the other hand, secondary data was obtained from books, journals, magazines and the internet

3.4.1 Validity and Reliability

The study used the Cronbach Alpha coefficient to test the instruments reliability. The Cronbach alpha coefficient is a multi-scale item measure and a ratio of 0.7 and above is an indication of reliability. Validity was ensured through discussions and consultations with experts.

3.5 Data Analysis

The data collected was analyzed using descriptive and inferential statistics with the help of the statistical package for social studies. Descriptive statistics involved summarizing the data into measures of central tendency like the mean and standard deviation. Inferential statistics included correlation analysis and multiple linear regression and were used to draw conclusions.

3.5.1 Analytical Model

The regression model took the following form

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + e$$

Where

Y=Risk Management Practices

Risk management practices which was measured in terms of its effectiveness and efficiency, which is measured in reduced cost and improved returns on investment.

$B_{1,2,3}$ = Regression Coefficients

X_1 = Technology

Technology was determined by internet penetration, information technology and technological risk.

X_2 = Employee Training measured by level of education and training attained

X_3 = Effective Data Management which was determined by the time and cost in risk management practices

e =Error term

3.5.2 Test of Significance

The study applied the t statistic to determine the validity of the research, which was at 95% confidence interval. F statistic was also useful in the determination of the significance of the model used while R^2 which measures the correlation coefficient of the variables was used to determine to what extent the model determines risk management practices.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND INTERPRETATION

4.1 Introduction

This chapter presents the descriptive statistics which includes reliability analysis and summary statistics. The chapter also presents the inferential statistics comprising of correlation analysis, regression analysis and ANOVA. Finally, the chapter presents an interpretation of the study findings

4.2 Descriptive Statistics

This presents reliability analysis and the descriptive summary statistics.

4.2.1 Reliability Analysis

The Cronbach Alpha Coefficient was used to establish the instruments reliability. A coefficient of 0.797 was obtained which is an indication that the instrument was reliable since coefficient of 0.7 is considered an indication of reliability. Table 4.1 shows the results obtained

Table 4.1 Reliability Analysis

| Cronbach's Alpha | N of Items |
|------------------|------------|
| .797 | 23 |

Source: Research Findings

4.2.3 Summary Statistics

A total of 20 questionnaires were administered to the 20 registered fund managers in Kenya and all of them were returned fully responded to hence a 100% response rate. Table 4.2 shows the descriptive summary statistics.

Table 4.2 Descriptive Summary Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---------------------------|----------|----------------|----------------|-------------|-----------------------|
| Risk Management Practices | 20 | .786 | 11.707 | 2.42071 | 3.350777 |
| Technology | 20 | 1.0 | 1.8 | 1.370 | .2452 |
| Training and compliance | 20 | 1.50 | 2.25 | 1.8375 | .21877 |
| Effective data management | 20 | 1.0 | 2.5 | 1.625 | .5821 |

Source: Research Findings

According to the results on table 4.2, risk management practices had a mean of 2.42 and standard deviation of 3.35 with the minimum and maximum values being 0.786 and 11.707 respectively. Technology had a mean of 1.370 and standard deviation of 0.245 with minimum and maximum values of 1.0 and 1.8 respectively. Additionally, training and compliance had a mean value of 1.8375 with standard deviation of 0.219 and minimum and maximum values of 1.50 and 2.25 in that order. Further, effective data management had a mean value of 1.625 with a standard deviation of 0.582 and minimum and maximum values of 1.0 and 2.5 correspondingly. The summary statistics results indicate that the values were evenly distributed

4.3 Inferential Statistics

This entails correlation analysis, regression analysis which shows the model summary and the regression coefficients.

4.3.1 Correlation Analysis

Correlation analysis was carried out to measure the strength of a linear association between the dependent and the independent variables. Table 4.3 shows the results obtained

Table 4.3 Correlation Matrix

| | | Risk Management Practices | Technology | Training and compliance | Effective data management |
|---------------------------|---------------------|----------------------------------|-------------------|--------------------------------|----------------------------------|
| Risk Management Practices | Pearson Correlation | 1 | | | |
| | Sig. (2-tailed) | | | | |
| Technology | Pearson Correlation | .000 | 1 | | |
| | Sig. (2-tailed) | .999 | | | |
| Training and compliance | Pearson Correlation | -.109 | .150 | 1 | |
| | Sig. (2-tailed) | .647 | .529 | | |
| Effective data management | Pearson Correlation | .478* | .507* | -.349 | 1 |
| | Sig. (2-tailed) | .033 | .022 | .132 | |

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Research Findings

According to the results on table 4.3, risk management practices have no correlation with technology since the correlation coefficient is 0 which is insignificant. In addition, risk management practices have a weak negative insignificant correlation with training and compliance with a correlation coefficient of -0.109. Further, risk management practices have a fairly weak positive correlation as indicated by a coefficient of 0.478 which is significant. The results indicate that effective data management and training and compliance have a weak correlation with risk management practices with technology having no correlation with risk management practices.

4.3.2 Regression Analysis

Under regression analysis the model summary and the regression coefficients have been presented

4.3.2.1 Model Summary

Table 4.4 indicates the model summary which shows the R value, R-square, the adjusted R square and the std. error of the estimate

Table 4.4 Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1 | .587 ^a | .345 | .222 | 2.955913 |

a. Predictors: (Constant), Effective data management, Training and compliance, Technology

Source: Research Findings

Table 4.4 indicates that the R-Square (coefficient of determination) has a value of 0.345 which indicates that 34.5% of the variation in the dependent variable (Risk management practices is explained by the independent variables (technology, training and compliance and effective data management) while 65.5% of the variation is explained by other factors not considered by the model and the error term. The correlation coefficient of 0.587 which indicates that there is a strong positive correlation between technology and risk management practices in the case of fund managers in Kenya.

4.3.2.2 Regression Coefficients

At 95% confidence level the study variables were tested to establish whether they were significant or insignificant. Table 4.5 shows the model coefficients

Table 4.5 Regression Coefficients

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---------------------------|-----------------------------|------------|---------------------------|--------|------|
| | B | Std. Error | Beta | | |
| 1 (Constant) | -3.126 | 7.097 | | -.441 | .665 |
| Technology | -5.809 | 3.509 | -.425 | -1.656 | .117 |
| Training and compliance | 3.422 | 3.616 | .223 | .946 | .358 |
| Effective data management | 4.442 | 1.559 | .772 | 2.849 | .012 |

a. Dependent Variable: Risk Management Practices

Source: Research Findings

As per the study findings the regression equation was as follows

$$Y = -3.126 - 5.809X_1 + 3.422X_2 + 4.442X_3 + e$$

Table 4.5 indicates that technology has a negative insignificant relationship with risk management as indicated by beta value of -5.809 and the p value of 0.117>0.05. Training and compliance has a positive insignificant relationship with risk management practices as indicated by the beta value of 3.422 and the p value of 0.358>0.05. Effective data management has a positive significant relationship with risk management practices as indicated by the beta value of 4.442 and the p-value of 0.012<0.05. This shows that technology and training and compliance have an insignificant relationship with risk management practices while effective data management has a significant relationship with risk management practices.

4.3.3 Analysis of Variance

An analysis of variance (ANOVA) was also undertaken to establish the significance of the regression model. Table 4.6 shows the results obtained

Table 4.6 ANOVA

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|-------|------------|----------------|----|-------------|-------|-------------------|
| 1 | Regression | 73.528 | 3 | 24.509 | 2.805 | .073 ^a |
| | Residual | 139.799 | 16 | 8.737 | | |
| | Total | 213.326 | 19 | | | |

a. Predictors: (Constant), Effective data management, Training and compliance, Technology

b. Dependent Variable: Risk Management Practices

Source: Research Findings

According to the study findings on table 4.6, the f statistics value of 2.805 is insignificant at 5% level of significance since the P-value of 0.073 > 0.05. This indicates that the study model is poor and there is no significant relationship between technology and risk management practices by fund managers in Kenya. In addition the regression sum of square value (73.528) is less than the residual indicate that the study variables explain less of the variation in the regression model.

4.4 Interpretation of the Findings

The study findings have established technology has a negative and insignificant relationship with risk management whereas training and compliance has been found to have positive and insignificant relationship with risk management practices. On the other hand effective data management has been found to have a positive and significant relationship with risk management practices. Thus, the study has revealed that technology and training and compliance have an insignificant relationship with risk management practices while effective data management has a significant relationship with risk management practices.

The above findings are similar to those of Kouns and Minoli (2011) who established that the Information Technology (IT) function may no longer alone be sufficient to govern risks over IT services. IBM (2011) also posited that data input checks such as field validation and naming policies minimize errors and risk and that effective data management is a strategy that can improve on better risk management strategies by offering data security. In Kenya, Kiragu, Wanjau and Kanali (2013) also established that there is negative and insignificant effect of

technology on occupational fraud risk in commercial banks in Kenya However, the findings are in contrast to those of Ashoori and Teymouri (2010) established a positive relationship between technology and risk management.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary, the study conclusions, recommendations, limitations of the study and suggestions for future research.

5.2 Summary

The aim of this study was to examine the effect of technology on risk management practices by fund managers in Kenya. A total of 20 questionnaires were administered to the 20 registered fund managers in Kenya and all of them were returned fully responded to hence a 100% response rate. The Cronbach Alpha Coefficient was used to establish the instruments reliability. A coefficient of 0.797 was obtained which is an indication that the instrument was reliable. The dependent variable was risk management practices while the independent variables included training and compliance, technology and effective data management.

The study used correlation analysis and the regression model to establish the relationship between the dependent and independent variables. The correlation analysis findings established that effective data management and training and compliance have a weak correlation with risk management practices while technology no correlation with risk management practices. The regression model obtained an R-Square value of 0.345 which indicates that 34.5% of the variation in the dependent variable is explained by the independent variables while 65.5% of the variation is explained by other factors not considered by the model and the error term. Analysis of variance the f statistics value of 2.805 is insignificant at 5% level of significance since the P-value of $0.073 > 0.05$.

The study findings established that technology has a negative insignificant relationship with risk management with a beta value of -5.809 and the p value of $0.117 > 0.05$. The study findings also established that training and compliance has a positive insignificant relationship with risk management practices with a beta value of 3.422 and the p value of $0.358 > 0.05$. Additionally, the study established that effective data management has a positive significant relationship with risk management practices with a beta value of 4.442 and the p-value of $0.012 < 0.05$.

5.3 Conclusions

Based on the study findings the study concludes that technology has a negative relationship with risk management practices and that the type of technology adopted by fund managers in Kenya influences the risk level in the organizations. In addition, the study concludes that training and compliance with rules and regulations influence the risk level in fund organizations in Kenya since compliance makes sure fund managers operate according to specified rules thus minimizing compliance risks. Finally, the study concludes that effective data management significantly influences risk management practices by fund managers in Kenya since data is an asset to any organization hence effective management of this sensitive asset reduces risks.

5.4 Recommendations for Policy and Practice

Based on the study findings the study recommends that fund managers should regularly carry out technological risk audit risks to establish the effect of technology on risk management practices. This is because technology is highly dynamic and adoption of new technologies may increase risk or reduce the risk the organization is facing.

The study also recommends that fund managers should develop effective training and development policies to ensure that employees have knowledge on various aspects on risk management. In addition effective training policies would ensure compliance with procedures and regulations.

Additionally, the study recommends that fund managers should develop effective policies on data management and security. This is because data is a valuable asset to any organization which should be highly protected to ensure only authorized personnel have access. Access of data by unauthorized persons may lead to increased risks.

5.5 Limitation of the Study

This study used primary data collected through the use of questionnaires which had structured questions and required specific responses. Structured questions require specific answer hence qualitative and in-depth views by the respondents was not captured by the study.

The study focused on risk management practices by fund organizations in Kenya and sought the views of fund managers hence the findings are limited to fund organizations and may not be

generalized to other organizations. This is because all organizations face different risks and use different technologies and risk management practices.

5.6 Suggestions for Further Research

Risks and risk management remains a wide and open research area. Thus, this study suggests an additional research on risk management practices used by fund managers to reduce risk facing fund organizations. This is because an investigation into the risk management practices would help fund managers to identify the appropriate risk management strategies.

Additionally, the study suggests further research on the effect of risk management on the performance of fund organizations in Kenya. This would provide an insight on the effects of risk management practices on the performance of fund organizations.

Risk management practices and technology are negatively correlated which is an indicator technological risk is impacting negatively on the risk management practices. This suggests a further research on the effects of technological risk on the performance of fund managers. A further insight on how fund managers are prone to risk due to third parties is necessary and recommendations on how to handle the challenges.

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Appendices

Appendix 1: Registered Fund Managers as at 31st December 2014

| | |
|----|--|
| 1 | African Alliance Kenya Investment Bank Limited |
| 2 | Alpha Africa Asset Managers Limited |
| 3 | Amana Capital Limited |
| 4 | Apollo Asset Management Company Limited |
| 5 | British-American Asset Managers Limited |
| 6 | CIC Asset Management Limited |
| 7 | Co-op Trust Investment Services Limited |
| 8 | Dry Associates Limited |
| 9 | Fusion Investment Management Limited |
| 10 | Genesis Kenya Investment Management Limited |
| 11 | ICEA Lion Asset Management Limited |
| 12 | Kenindia Asset Management Company Limited |
| 13 | Madison Asset Management Services Limited |
| 14 | Nabo Capital Limited |
| 15 | Old Mutual Investment Group Limited |
| 16 | Pinebridge Investments East Africa Limited |
| 17 | Pan Africa Asset Management Limited |
| 18 | Stanlib Kenya Limited |
| 19 | UAP Investments Limited |
| 20 | Zimele Asset Management Company Limited |

Source: RBA

Appendix II: Questionnaire

The purpose of the questionnaire is to establish the effects of technology in risk management practices by fund managers in Kenya. The questionnaire consists of 16 questions that should take no more than 10 minutes. Your answers will be of great help.

The questionnaire is subdivided into two sections: The risk management practices and determinants of risk management.

SECTION 1

RISK MANAGEMENT PRACTICES

1) Do you agree risk management practices in the firm for the last 10 years have increased?

Strongly Agree Agree Neutral Disagree Strongly disagree

2) What is your expectation from effective risk management practices by fund managers?

| | Strongly Agree | Agree | Neutral | Disagree | Strongly disagree |
|------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Reduced financial cost | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Improved investment returns | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Improved resource allocation | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Others | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

3) What is your expectation from efficient risk management practices in fund management?

| | |
|--|-----------------------|
| Reduced time in risk management practice | <input type="radio"/> |
| Low cost of risk management | <input type="radio"/> |
| Reduced risk exposure | <input type="radio"/> |
| Others | <input type="radio"/> |

4) Do you agree risk management practices will lead to increased investment returns?

Strongly Agree Agree Neutral Disagree Strongly disagree

5) Does your organization use risk management software?

Yes No

If **YES** does the use of software reduce cost of undertaking risk management?

Strongly Agree Agree Neutral Disagree Strongly disagree

6) Do you agree risk management practices in the firm have changed due to change in technology?

Strongly Agree Agree Neutral Disagree Strongly disagree

7) The cost attributable to risk management incurred in the firm for the last five years

| Year | 2014 | 2013 | 2012 | 2011 | 2010 |
|--------------|------|------|------|------|------|
| Cost in Kshs | | | | | |

SECTION 2

DETERMINANTS OF RISK MANAGEMENT

A. Technology

8) Do you agree use of technology in the firm for the last 10 years has increased?

Strongly Agree Agree Neutral Disagree Strongly disagree

9) Is information technology important for effective risk management practices?

Strongly Agree Agree Neutral Disagree Strongly disagree

10) Do you agree there is increased internet penetration both to the firm and clients?

Yes No

If **YES** does it have an impact on risk management practices?

Strongly Agree Agree Neutral Disagree Strongly disagree

11) Do you agree there is increased technological risk in the firm?

Strongly Agree Agree Neutral Disagree Strongly disagree

B. Training and Compliance

12) Do you agree risk management training courses affect risk management practices?

Yes No

13) How often does your organization provide risk management training courses?

Never

Less than 1 time per year

1 time per year

2 times per year

More than two times a year

14) Does your organization have established procedures for keeping up to date and informed with changes in regulation?

Yes No

If **YES** do you agree they have any implication on the risk management practices?

Strongly Agree Agree Neutral Disagree Strongly disagree

C. Effective Data Management

15) Do you agree effective data management reduces cost of risk management?

Strongly Agree Agree Neutral Disagree Strongly disagree

16) Do you agree effective data management improves risk management practices?

Strongly Agree Agree Neutral Disagree Strongly disagree

Appendix III: Data used in Regression

(Averages of the responses from the 20 fund managers on the variables)

| Respondent No | Risk Management Practices | Technology | Training and compliance | Effective data management |
|----------------------|----------------------------------|-------------------|--------------------------------|----------------------------------|
| 1 | 11.636 | 1.40 | 1.75 | 2.50 |
| 2 | 11.707 | 1.38 | 1.69 | 2.52 |
| 3 | 0.786 | 1.11 | 2.30 | 1.05 |
| 4 | 1.000 | 1.00 | 2.00 | 1.00 |
| 5 | 1.071 | 1.40 | 1.50 | 2.50 |
| 6 | 1.214 | 1.60 | 2.00 | 2.00 |
| 7 | 1.214 | 1.60 | 1.75 | 1.50 |
| 8 | 1.000 | 1.60 | 2.00 | 2.00 |
| 9 | 0.929 | 1.20 | 2.00 | 1.50 |
| 10 | 5.143 | 1.00 | 2.00 | 1.00 |
| 11 | 1.000 | 1.80 | 2.25 | 2.00 |
| 12 | 1.071 | 1.40 | 1.50 | 2.00 |
| 13 | 3.929 | 1.60 | 1.75 | 2.00 |
| 14 | 1.000 | 1.00 | 1.75 | 1.00 |
| 15 | 0.857 | 1.20 | 1.50 | 1.00 |
| 16 | 1.071 | 1.60 | 1.75 | 2.00 |
| 17 | 0.929 | 1.40 | 2.00 | 1.00 |
| 18 | 0.929 | 1.40 | 2.00 | 1.00 |
| 19 | 1.000 | 1.20 | 1.50 | 2.00 |
| 20 | 0.929 | 1.60 | 2.00 | 1.00 |

Source: Research Findings