

## **Effects of Information Technology on Enterprise Risk Management of Listed Firms in Kenya**

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**Abstract:** *As technology improves risks affecting firms also increases and they become complex. The purpose of this study was to investigate the effect of information technology on enterprise risk management of listed firms in Kenya. Enterprise management is measured by financial performance. With the advancement in technology risk management becomes complex and therefore posing an increasing number of new risks on market players. There are increasing cases of fraud through use of technology and mostly affecting financial institutions where large amounts of money is transferred from one account to another without the knowledge of the owners. An increase in business activities, complexity, unpredictability and evolving risks have triggered momentum in enterprise risk management (ERM) globally. While there is growing attention on ERM globally in recent years, disturbing statistics on increasing and evolving risk continue to affect firms.*

*Empirical evidence shows that risks keep on increasing and evolving a manifestation of weak enterprise risk management in place. Despite the fact that most of the firms in Kenya are adopting technology to enhance service delivery, there are increasing challenges arising from the use of technology. This study sought to establish the influence of information technology on ERM.*

*Methodology; Using a descriptive study of listed firms in Kenya, questionnaires and record survey sheets was used to collect data from the firms. All firms that had put in place ERM was sampled and questionnaire was used to collect data from the managers heading ERM departments in the listed firms. Secondary data on financial performance was collected using survey sheets. Data collected was analyzed using SPSS version 21 to calculate descriptive statistics and regression analysis models. The qualitative data was analyzed using content analysis method. The relationship between independent variables and dependent variable was analyzed using linear regression model.*

*The findings from the study confirm that effective information technology on ERM has significant influence on financial performance of the firms. Information technology on ERM can be used to set risk management objectives, identification of risks, assessment of risks, setting measures to mitigate against risks, controlling risks and passing information about risks. On financial performance, effect can be in terms of efficiency in service delivery, quality of products and increase in earnings.*

**Key words:** *Information Technology, Enterprise Risk Management, Financial Performance and Listed Firms.*

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### **I. Introduction**

Despite the fact that enterprise risk management (ERM) has gained momentum globally, risks affecting firms continue to increase while new risks were evolving (Rasid&Golshan, 2012). Inadequate and ineffective corporate/firm risk assessment has been identified as one of the key contributing factors to the recent financial crisis resulting in meltdown of the United States of America economy and financial markets (Soileu, 2010). Survey done in Kenya among chief executive officers (CEOs) show that 90% of the CEOs felt that risks was not being well managed, the top rated risks affecting firms were; financial risks, operation risks, competition and reputation and brand risks rated at 64%, 58%, 58% and 56% respectively (PWC, 2012).

Although ERM is a management tool used to increase shareholders' value and firm's financial performance, many firms were yet to adopt effective ERM system (Golshan&Rasid, 2012). A research done in US in 1997 to 2001 show that only 26 firms had adopted ERM and another research done in 1999 to 2005 show that only 138 firms in the US had adopted ERM (Rasid&Golshan, 2012). Similarly, a study done by Economic Intelligence Unit, show that only 41% of companies in Europe, North America and Asia had implemented some form of ERM (Watt, 2008). The reasons behind low implementation of ERM was attributed to lack of adequate information on the effects of ERM on performance of firms, difficulty in measuring the benefits derived from ERM and inappropriate organizational structure to support effective ERM framework (Golshan&Rasid, 2012). Effectiveness of ERM is affected by; lack of adequate facilities to capture accurate data on risk profile, difficulty in quantifying risk, lack of appropriate infrastructure and lack of clear policy on compliance with risks' regulations (Watt, 2008).

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The consequence of weak ERM program can lead to huge losses due to disruption in business operations and high costs incurred to mitigate the risks. The United State of America (USA) crisis of 2008 led to failure of business estimated at value of US \$ 400 billion and hence affecting the capital market (Watt, 2008). ERM is geared to address risks that can occur to a business organization such as financial risks, strategic risks and operation risks (Tahir&Razali, 2010). The complexities of business transactions, advances in technology, globalization, speed in product cycles and the overall pace of change continue to increase the volume and the scale of risks facing organizations (Beasley, Hancock & Branson, 2009). According to Economic Intelligence Unit of 2008, 59% (106 out of 316) of the respondents felt that credit crisis and growing regulatory pressure had forced firms to scrutinize their risk management practices in detail (Watt, 2008). Similarly, financial crisis, credit rating agencies and the pressure from the exchange had also increased the clamor for effective risk management and oversight practices (COSO, 2009). The New York Stock Exchange's corporate governance rules require audit committees of listed firms to disclose risk assessment and risk management policies. The Standard and Poor's which is a credit risk agency is now using ERM processes as part of their corporate ratings analysis (COSO, 2009).

### **Enterprise Risk Management: Kenya Perspective**

According to a survey done by PricewaterhouseCoopers on risks in Kenya in 2011, 81% of the chief executive officers (CEOs) interviewed from various firms felt that risk to their firms was increasing while traditional risks were evolving (PWC, 2012). Waweru and Kisaka (2011) examine the state of ERM in Kenya and found out that performance of firms was influenced by effectiveness of enterprise risk management method adopted. According to Nyang'aya (2012) traditional risks such as; operational, regulatory and market was rated at 95%, 89% and 83% respectively. These were the key risks affecting firms in Kenya and this was a manifestation that ERM framework in Kenya was not effective or inadequate.

Within the East Africa region, ERM was found to be weak, 69% (41 out of 60) of the firms within the region felt that their ERM system was not effective (Nyang'aya, 2012). The key factor that influence the performance of ERM in the region was low usage of technology to manage firms' operation. Other factors that were also found to play key role in the success of ERM were; quality of staff, influence of regulators; shareholders' demand; influence of board of directors and establishment of risk functional department.

Despite the fact that 94% (40) of commercial banks and financial institutions in Kenya had developed ERM framework according to CBK guidelines of 2005, 74% (32) of the institutions had challenges in adopting effective technology to manage ERM (CBK, 2010). The main cause of increase in risk were; complexity in business operation, unpredictable business environment, evolving risks and influence of globalization (PWC, 2012). There is perception that though the senior executives and their board of directors were aware about the existing risks they were not prepared to manage the risks (COSO, 2009). Weak ERM had affected the performance of Kenya as a country in terms of competitiveness (KIPPRA, 2009). Kenya was ranked in position eighty six (86) in terms of GDP among two hundred and seven (207) countries while in attractiveness as a business destination it was ranked at number seventy two (72) out of one hundred and seventy eight (178) countries. In comparison with Singapore, Taiwan and Malaysia which were ranked in position six (6), eight (8) and nine (9) respectively (KIPPRA, 2009).

### **The Profile of Nairobi Securities Exchange**

The Nairobi Securities Exchange (NSE) has a long history that can be traced to the 1920's when it started trading in shares while Kenya was still a British Colony (Ngugi, 2005). Share trading was initially conducted in an informal market, however, there was a growing desire to have a formal market that would facilitate access to long-term capital by private enterprises and also allow commencement of floating of local registered Government loans. The NSE was constituted in 1954 as a voluntary association of stockbrokers registered under the Societies Act (NSE, 1997). The newly established stock exchange was charged with the responsibility of developing the stock market and regulating trading activities (KIPPRA, 2007).

The NSE is made up of members (brokers) who are licensed to buy and sell securities listed on behalf of investors. Currently there are sixty (60) quoted companies; fifty eight (58) were active. The NSE is divided into ten segments namely; Agricultural, Automobile and Accessories, Banking, Commercial and Services, Construction and Allied, Energy and Petroleum, Insurance, Investment, Manufacturing and Allied and Telecommunication and Technology (NSE, 2012). The NSE was restructured in 2011 and has changed its name to Nairobi Securities Exchange from Nairobi Stock Exchange. This was done with the aim of introducing new financial instruments to the market such as forwards and futures market products (Africa Economic Outlook, 2012).

In comparison with other stock exchanges in Africa, the NSE is relatively smaller in terms of number of listed companies; South Africa Stock Exchange (JSE) and Egypt Stock Exchange had three hundred and four hundred and seventy two (472) and eight hundred and thirty three (833) quoted companies respectively as at the

end of 2009 (KIPRA, 2009). Trading performance at the NSE market was not impressive in the year 2011, the NSE 20 share index dropped from an average of KES 4464.99 in January 2011 to a low of KES 3109.79 in December 2011. Similarly, market capitalization declined from KES 1166.99 Billion in January 2011 to KES 845.55 billion in December 2011. The bearish trend in the NSE was attributed to reduced interest on part of foreign investors, the inflation rate and currency devaluation (Africa Economic Outlook, 2012).

The firms listed in NSE formed the target population of this study. These firms were chosen because, according to the Capital Market Act Cap 485A, the guidelines on corporate governance practices by public listed companies in Kenya, all listed firms are required to publish their financial statements and the directors are required to develop risk policy plan to be adopted by their company (Republic of Kenya, 2012).

### **Statement of the Problem**

Enterprise risks in Kenya continue to be a challenge, in a study by PriceWaterHouseCoopers in Kenya, 90% (22) of the CEOs interviewed, felt that risk was not being managed well and the problem of risk was also aggravated by increasing, evolving and emerging risks (PWC, 2012). The rate of fraud in Kenya according to KPMG – Barometer index in the banking industry, reported 520 cases valued at US \$ 3.3 billion in 2011 (KPMG, 2011). Majority of financial institutions (74% of 32) in Kenya had weak risk management system due to lack of capacity among staff and low level of technology adoption (CBK, 2010). Within the East Africa (Kenya, Uganda and Tanzania), 69% (41 out of 60) of the firms in the region had weak ERM system (Nyang'aya, 2012). The purpose of this study was to determine the effect of information technology on ERM of the listed firms in Kenya.

### **Theoretical Review**

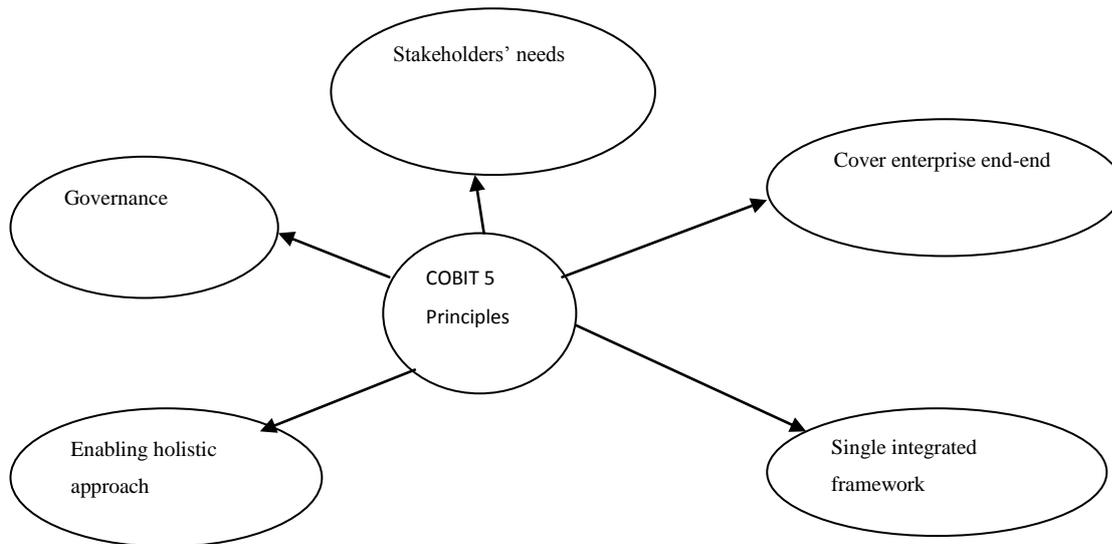
The COSO ERM – Integrated Framework of 2004 shows that information and communication is one of the key elements in ERM. Anderson et al (2004) argue that information technology is needed at all levels of an organization to identify, assess, and respond to risks, and to otherwise run the entity and achieve its objectives. Information Technology (IT) plays a critical role in enabling the flow of information in an organization, as well as in monitoring various risks that can affect an organization. The selection of specific technology to support ERM for an organization typically is a reflection of the: entity's approach to ERM and its degree of sophistication; types of events affecting the entity; entity's overall information technology and degree of centralization of supporting technology (Anderson et al, 2004).

### **Technology Acceptance Model**

The level of technology adoption is explained in terms of the usage of technology to manage risk in an organization. According to Pincher (2008) there are two theoretical models that influence the adoption of technology in an organization: the locus of adoption (individual or a firm) and the class of technology (the level of knowledge burden and user interdependences). Similarly, Technology Acceptance Model (TAM) explains that the user acceptance has typically been a critical factor in determining the success of an IT in management. The TAM captures an individual's (manager) intention to accept/adopt an IT, as compared to diffusion of innovation (DOI) theory's emphasis on existing system usage. Several previous studies have shown that intention to adopt IT is highly correlated with actual adoption (Pincher, 2008).

### **COBIT Principle Model**

The COBIT model provides a framework that assists enterprises in achieving their objectives for the governance and management of enterprise's IT. It also provides good practices across a domain and process framework and presents activities in a manageable and logical structure. COBIT describes five principles and seven enablers that support enterprises in development, implementation and continuous improvement and monitoring of good IT-related governance and management (ISACA, 2012). The COBIT framework contributes into internal control systems in the following ways: make a link with business requirements, organize IT activities into a generally accepted process model, identify major IT resources to be leveraged and defining the management control objectives to be considered. Figure 1.1 show COBIT 5 Principles framework.



**Figure 1.1 COBIT 5 Principles (ISACA, 2012)**

### **Type of Technology Adoption**

The report of the Institute of Management Accountants (IMA) of 2007 explains that technology plays an important role in risk identification process. For example most organizations utilize an intranet in their management processes. The group responsible for a company's ERM process can encourage units to place their best practices on the ERM site. Risk checklists, anecdotes and best practices on the intranet serve as stimulation and motivation for operating management to think seriously about risk in their unit (IMA, 2007). Anderson et al (2004) argue that in some organizations, information is managed separately by unit or function, whereas others have integrated systems. The component on information and communication on COSO ERM – Integrated Framework shows that with added focus on information technology needed for risk management; some organizations have enhanced their technology architecture to allow greater connectivity and usability of data, with some organizations using the internet and data interchange capabilities. Anderson et al (2004) also added that web service-based information strategies enable real-time information capture, maintenance, and distribution across units and functions, offer enhancing information capture, better controlling multiple sources of data, minimizing manual processing of data, enabling automated analysis and reporting.

### **Extensible Business Reporting Language (XBRL)**

Anderson et al (2004) added that under open architecture, technologies such as extensible business reporting language (XBRL), extensible markup language (XML) and web services are used to facilitate data aggregation, transfer and connectivity between disparate or stand-alone systems. Extensible business reporting language (XBRL) is open, royalty-free, internet-based information for business reporting of all kinds. Extensible business reporting language (XBRL) labels data so that they are provided with context that remains with them and brings conformity to the names by which they are recognized by disparate software. Web service is an internet protocol for transporting data between disparate applications, within a company's system. Extensible business reporting language (XBRL), used with web services, facilitates automated business information exchange across diverse platforms and different applications and automates business reporting processes.

### **Conceptual Framework**

In this study the conceptual framework was based on two indicators measuring the independent variable being types of technology and level of technology and the dependent variable ERM is measured by financial performance of listed firms in Kenya. Effective ERM is reflected in financial performance. Figure 1.2 show the conceptual framework information technology and ERM.



Figure 1.2: Conceptual framework

### Empirical Review

A study by Deloitte in 2012, show that information technology is vital element of risk management capabilities and act as a key enabler to an organization's effectiveness and value addition. The value gained from formal risk technology infrastructure are; provide for availability of consistent and reliable risk information, enhance the capabilities of technology infrastructure to support new functional requirements needed by the business and support effective regulatory compliance, increased stress testing and enhanced risk reporting.

Kumsumprom, Corbitt, Pittayachawan and Mingmalairaks (2010) carried a study on ICT risk management in Thai business organizations. The findings from the study is that effective planning of enterprise information technology security is a critical factor that helped organizations to mitigate, prevent and avoid operational, technical and strategic risks related to Information Technology. Straub and Welke (1998) explain the nature of information technology risk that affect an organization ranges from physical systems which hinders a firm to deliver goods and services to customers and to computer-based systems which affect a firm from delivering critical information.

Nayak and Mohanty (2009) explain that effective system on risk management usually improves business performance and most companies usually focus on the limited resources they have at their disposal so as to effectively and efficiently control risks, whenever a major problem occurs. Nayak and Mohanty (2009) added that the degree to which a firm can utilize the leverage of its IT risk management processes to exploit commercial business opportunities depends on factors such as governance, product management, customer management, and knowledge management and how each of these processes of the firm in question are matched. The interaction between these generalizations in business processes and a firm's IT risk management process characterizes the company's culture in managing risks.

The level of Technology adoption in this study was measured in terms of the phase of the firm in adopting technology in ERM as shown in figure 1.1, Basic COBIT Principles Model. The usage of technology in internal control by linking information technology with business requirements, identifying major resources and controlling processes using technology (Johnson et al, 2007). The hypothesis tested was to find out the effect of information technology on ERM of the listed firms in Kenya.

Althonayan Keith and Misiura (2011) in a study on aligning enterprise risk management with business strategy and information systems. The aim of the study was to determine the factors contributing to the failures and successes of risk management programmes in enterprises. The findings indicated that alignment of ERM with business strategy and information systems steers risk management initiatives and strategies in the same direction and consequently allows enterprises to improve on organizational effectiveness, increase shareholders value, and gain competitive advantage in the market.

Dafikpaku (2011) carried out a study on the strategic implication of Enterprise Risk management in a case study of two companies; Infosys and Rolls Royce Corp. The purpose of the study was to develop a framework on how ERM brings about the strategic implications or its 'promise' as it is popularly known in the ERM circle. The findings from the study indicated that IT is a top priority in effective risk management procedures by most of the respondents. It enables prompt searches, access to and retrieval of data and support communication in organizations.

Kumsumprom, Corbitt, Pittayachawan and Mingmalairaks(2010) carried a study on Determinants of Successful ICT Risk Management in Thai Organizations. A sample of three hundred and two respondents from listed organizations on the Stock Exchange of Thailand (SET) were surveyed and the data analyzed to establish the strength of the relationships in a model derived from extant literature and the application of the most commonly used governance standards for information and communication technology (ICT), COBIT and ISO/IEC 17799. The results show that the success factors of ICT were; effective organizational policy that can assist in planning effective ICT risk management, effective management of ICT resources facilitated the planning of enterprise information security to achieve successful ICT risk management planning.

Ranong and Phuenggam (2009) carried a study on Critical success factors for effective risk management procedures in financial industries. The key factor identified in the study was Information Technology (IT) as a critical factor in the face of increasing competition, higher performance levels, globalization and liberalization. Information Technology (IT) plays a key role in achieving an organization's objectives, enhances business processes, enable shared infrastructure such as knowledge, human assets, core competencies, resources allocation, performance management and communication support.

## **2. Research Methodology**

This study used descriptive research design which was appropriate in description of the state of affairs as it existed. Kombo and Tromp (2006) explains that descriptive studies are not only restricted to fact findings, but may often result in the formulation of important principles of knowledge and solution to significant problems. All listed firms in Kenya were sampled and questionnaire was used to collect data from managers who were heading ERM departments. Secondary data on financial performance of the firms was collected using a survey sheet.

Sekaran (2010) explain that population refers to the entire group of people, events or things of interest that researcher wishes to investigate. Cooper and Schindler (2009) explain that a population is the total collection of elements about which we wish to make some inferences. On the other hand Cooper and Schindler (2011) define a population as a total collection of elements about which we wish to make some inferences. The target population for this study was all the listed companies in Nairobi Security Exchange (NSE) in Kenya during the period beginning on 1<sup>st</sup> January, 2007 to 31<sup>st</sup> December, 2011. The number of active listed firms at NSE during the period of the study was forty (40) as per NSE Handbook of 2011. The forty (40) listed firms had complied with Companies Act 486, and CMA Act Cap 485, which require all the listed and public companies to publish their annual financial statements every year.

This study used the following rating scales; dichotomous scale, a 5 point Likert scale and open ended questions to measure ordinal data on the perception on independent variables (information technology). Dichotomous questions were used to elicit a Yes or No answer, open ended question gave chance to the respondents to add information that might not be included in the closed ended questions while Likert scale 1-5 was designed to examine how strongly subjects agreed or disagreed with a statement (Sekaran, 2010). Kothari (2009) explain that 5-point likert scales are used because they are more reliable and can provide more information. Ordinal scale group ranked subjects or objects into some order. The numerals used in the ordinal scale were used to represent a relative position, but not the measured quantity (Mugenda, 2008).

This study used statistical models to measure the variables. Two models were used to measure the independent variables (information technology) and the dependent variable (ERM). ERM was measured by firm's financial performance which is an indicator of ERM success or failure. Similar studies in the same area of ERM used the models. Among the scholars that have used multiple regression models are; Kumsuprom et al (2010) in the study on determinants of successful ICT risk management in Thailand and Pagach and Warr (2010). Namusonge (1998) in the study on determinants of growth oriented small and medium enterprises in Nairobi, Kenya, used linear regression model to determine socio-economic variables on the rate of return and used the same model to test the effect of types of various determinants of growth.

$Y = \alpha + \beta_0 + \beta_1 X_1 + \varepsilon$ .  $\alpha$  and  $\beta$  are constants. Where;  $Y$  = Financial performance,  $X_1$  =IT (Information Technology).

The relationship between the independent variable (information technology) and the dependent variable (ERM) was measured ANOVA test. The calculated F value was compared with the expected F value at .05 level of significant. If calculated F value is greater than expected F value then we reject the null hypothesis and accept the alternative hypothesis.

## **3. Empirical Results**

Reliability test was done for the items used in the questionnaire. Reliability refers to the extent to which a measuring instruments contains variable errors that appear inconsistently from observation to observation during any one measurement attempt (Sekaran, 2010). Reliability is therefore an indication of stability and consistency with which the instruments measures the concept and therefore help to measure reliability of information collected.

The current study piloted the questionnaire on three public firms that were not sampled for the final study. Cronbach's alpha was used on the standardized items. Cronbach's alpha is a reliability coefficient that indicates how well the items in a set are positively correlated to one another. Cronbach's alpha is computed in terms of inter-correlation among the items measuring the concept. The closer Cronbach's alpha is to 1, the higher the internal consistency reliability (Sekaran, 2010). If the Cronbach's alpha is above .70 the instrument is reliable. The reliability test for this study was .943 for 108 items in the questionnaire. Since the reliability test is closer to one then the results of the independent variables are reliable and therefore appropriate for analysis.

Table 3.1 shows the reliability test of all the independent variables which is 0.943 for 108 items.

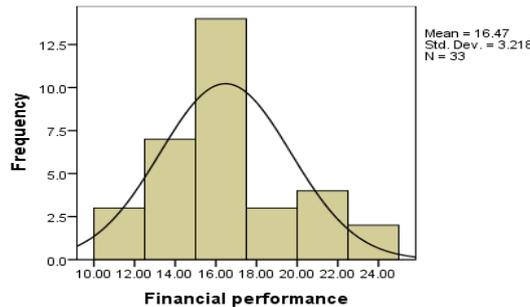
**Table 3.1: Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.943	.937	108

Source: Research Data

**Normality Test for the Dependent Variable**

Figure 3.1 show the distribution of dependent variable. The distribution ranges from -.2 to .4 and is positively skewed. The shape of distribution is leptokurtic. Orodho (2005) explain that a leptokurtic distribution is characterized by having most of the scores piled up around the mid- point. This means that the difference in financial performances among the listed firms was thinly distributed.

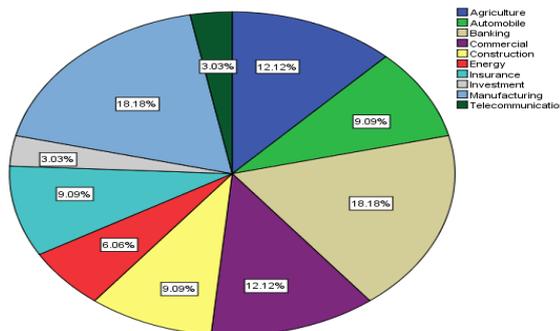


**Figure 3.1 Normality Test for the Dependent Variable**

The descriptive results were obtained from the research questions answered as discussed in the sections below.

**Demographic Data**

This section contains the analysis of demographic data collected through questionnaires. The listed firms in Kenya by NSE are categorized into ten segments. The respondents were asked to indicate the segment in which the firm belongs. 18.18 % of the respondents who filled the questionnaires were from banking and manufacturing segments; 12.12% from agriculture and commercial; 9.09 % from Automobile, Energy and construction; 6.06% from Energy and investment and 3.03% from Telecommunication sector. This shows that majority of the respondents were from the banking and manufacturing sectors. The distribution of firms is shown in figure 3.2



**Figure 3.2 Categorization of Listed firms**

**Employee Population**

The study sought to find out the number of employees in each firm. 33.3% of the firms had employee population of between 101 to 500, 21.2% of the firms had employees between 501 to 1000 and 2001 to 5000, 15.2% had employees between 1001 to 2000 and 9.1% had employees below 100. This shows that majority of the firms had employee population of 101 to 500 as shown in figure 3.3.

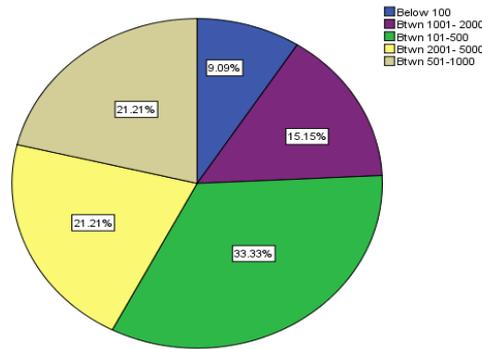


Figure 3.3 Employee population

**Risk Management Methods**

Enterprise risk management adoption was low, out of thirty three (33) firms only eighteen (18) had developed ERM framework and the other 17 were using silo-based risk management. Table 3.2 show the percentage of firms that implemented had developed ERM framework. 51.5% of the respondents indicated that firms had adopted ERM while 48.48 % indicated that they were using silo-based risk management system.

Table 3.2: Method Used to Manage Risks

	Valid Percent
Silo-based/departmental	48.5
ERM/IRM/SRM	51.5
Total	100.0

**Effects of information technology (IT) on ERM**

Use of information technology on ERM was assessed through responses from questionnaires. The responses were analyzed using descriptive analysis, correlation analysis and regression analysis. The aspects for analysis were; use of information technology (IT) to manage risk, contribution of IT on firms’ performance, role of IT in risk management, contribution of IT to firms’ ERM strategies and use of IT to manage risk activities.

Respondents were asked to provide information on Likert scale 1 – 5, dichotomous and open ended questions on technology adoption on ERM. Dichotomous question was meant to assess the level of information technology while open ended questions were to find out the use of information technology on ERM and whether information technology on ERM had significant influence on financial performance.

**Use of Information Technology to manage risks**

The dichotomous question sought to find out whether the firms were using IT to manage risks. 58.8% indicated that they were using IT to manage risks, 38.2% were not using IT to manage risk and 2.9% did not respond (Table 3.3). The number of firms using information technology to manage risk was found to be low and therefore there is need to intensify the use of information on ERM.

Table 3.3 use of Information Technology to manage risks

Respond	Valid Percent
Yes	58.8
No	38.2
No responds	2.9
Total	100.0

**Contribution of information technology to risk management**

The open ended questions sought to find out how firms were using information technology to manage risks. Table 3.4, indicates how firms were using information technology to manage risks. 33.3% of the respondents indicated that they were using information technology to assess risks, 24.2% indicated that they were using information technology to identify risks facing firms, 6.1% indicated that information technology on ERM was used to set risks objectives and 36.4% indicated that they were not using information technology on risk management.

**Table 3.4 contribution of information Technology to Risk Management**

	Valid Percent
Non/ no role	36.4
Set risk objectives	6.1
Identify risks	24.2
Assess risks	33.3
Total	100.0

**Effect of information technology on ERM**

The question sought to find out the contribution of information technology on risk management as reflected on firms’ financial performance. Table 3.5; show the contribution of information technology on enterprise risk management. 24.2% of the respondents indicated that information technology on ERM improves quality of service, 21.2% indicated that information technology on ERM enhances operation efficiency, 12.1% indicated that information technology on ERM enhances risk mitigation systems, 3.0% of the respondents indicated that information technology improves firms’ asset value and 39.4% indicated that information technology on ERM has no effects on firms’ financial performance. Quality service, operation efficiency, and effective risks mitigation are indicators of positive financial performance.

**Table 3.5 Contribution of technology adopted on improvement of firms’ financial Performance**

	Valid Percent
Non/ no effect	39.4
Improves quality of service	24.2
Improves Company's assets	3.0
Enhances operation efficiency	21.2
Enhances risk mitigation systems	12.1
Total	100.0

**Role of Information Technology in risk management**

The Likert scale 1-5 questions were used to find out the following; contribution of information technology on ERM, the extent to which information technology adoption on ERM contributes to firms’ benefits and the extent to which information technology contributes to the measures used in assessing effectiveness of ERM. Where 1= strongly disagree, 2= disagree, 3= Neutral, 4= Agree and 5= Strongly Agree.

Table 3.6 show that 70.6% of the respondents indicated that information technology was used to link ERM with business requirements, 61.8% of the respondents indicated that technology adopted was used to identify risks and 58.9% indicated that information technology on ERM assist in organizing IT activities into acceptable processes and also in identifying IT resources to be used in risk management. Information technology on ERM therefore enhances operational controls, resource efficiency, and predictable system processes leading to positive financial performance.

**Table 3.6 Use of information technology on ERM**

Statement	1	2	3	4	5	Mean	SD
1 Whether information technology on ERM link business requirements	5.9	2.9	20.6	44.1	26.5	3.82	1.06
2 Whether information technology on ERM organize IT activities into acceptable processes model	2.9	0	32.4	32.4	26.5	4.18	1.45
3 Whether information technology on ERM identify major IT resources for risk management	0	0	35.3	35.3	23.5	4.18	1.45
4 Whether information technology on ERM define management control objectives	2.9	0	29.4	35.3	26.5	4.21	1.47
5 Whether information technology was used for identification of risks	2.9	5.9	35.3	26.3	23.5	3.97	1.62

**Contribution of Information Technology to firms’ ERM strategies**

Respondents in table 3.7 indicated that the contribution of information technology on ERM was as follows; 76.5% of the respondents indicated that information technology on ERM assist in enhancing reporting, 73.3 % of the respondents indicated that information technology enhances capability of technology infrastructure, 67.7% of respondents indicated that information technology assist in provide for reliable and consistent risk information as well as supporting regulatory framework and 55.9% of the respondents indicated that information technology on ERM increase stress testing.

**Table 3.7 Contribution of Information Technology to firms' ERM Strategies**

Statement	1	2	3	4	5	Mean	SD
1 Whether information technology provide reliable and consistent risk information	0	0	23.5	47.1	20.6	4.47	1.56
2 Whether information technology enhance capability of risk infrastructure	0	0	17.6	52.9	20.6	4.47	1.56
3 Whether information technology support risk regulatory compliance	2.9	0	20.6	44.1	23.5	4.38	1.69
4 Whether information technology Increase stress testing of risk	2.9	2.9	29.4	26.5	29.4	4.29	1.78
5 Whether information technology enhance risk reporting	0	2.9	11.8	50	26.5	3.88	1.89

**Effectiveness of ERM Measurement framework**

The respondents were asked to indicate effectiveness of information technology in assessing ERM measurement framework. Table 3.8, shows the response on the effectiveness of ERM measurement framework. On specific tools used to assess effectiveness of information technology on ERM, the respondents indicated that standard documentation was rated highest at 61.8% followed by risk profiling, recovery mechanism, security mechanism, corrective mechanism, monitoring risks and putting in place broad-based risk structures at 55.8%, 52.9%, 52.9%, 47.5%, 44.3% and 35.3% respectively.

**Table 3.8 Effectiveness of ERM Measurement framework**

Statement	1	2	3	4	5	Mean	SD
1 Effectiveness of information technology on ERM in assessing risks metrics put in place to monitor risk activities	2.9	14.7	29.4	32.4	11.8	3.88	1.89
2 Effectiveness of information technology on ERM in assessing risks Security mechanism in existence	0	2.9	35.3	38.2	14.7	4.17	1.7
3 Effectiveness of information technology on ERM in assessing risk recovery mechanism	0	0	38.2	44.1	8.8	4.15	1.69
4 Effectiveness of information technology on ERM in assessing risks risk profile mechanism	2.9	2.9	29.4	38.2	17.6	4.18	1.77
5 Effectiveness of information technology on ERM in assessing risks documentation standards	2.9	0	26.5	35.3	26.5	4.35	1.72
6 Effectiveness of information technology on ERM in assessing risks broad-based mechanism controls	14.7	8.8	32.4	32.4	2.9	3.53	2.03
7 Effectiveness of information technology on ERM in assessing risks corrective mechanism	2.9	0	41.2	38.2	8.8	4.02	1.75

**Correlation between information technology and ERM**

Relationship between information technology on ERM and financial performance of listed firms' in Kenya  
 The null hypothesis ( $H_{02}$ ) tested was that there no significant relationship between adoption of information technology and ERM. The alternative hypothesis denoted by  $H_{A2}$  was that there is significant between adoption of information technology and ERM. Table 3.9 show the model summary of the relationship between information technology and ERM. R is .389 shows that there is low correlation between the variables (IT and ERM).  $R^2$  is .152 which is also stated as 15.2%. This means that only 15.2% of changes in financial performance as a result of effective ERM are explained by a unit changes in information technology.

**Table 3.9 Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics
					R Square Change F Change df1 df2 Sig. F Change
1	.389 <sup>a</sup>	.152	.124	.56951	.152 5.537 1 31 .025

a. Predictors: (Constant), use of Tech on ERM

Table 3.10 shows the calculation of ANOVA. The calculated F value for information technology and ERM is 5.537 at .05% level of significant while the expected F value is 4.17 at .05level of significant. Since the calculated F value is greater than the expected F value then the null hypothesis is rejected and the alternative hypothesis accepted. The conclusion is that there is significant relationship between information technology on ERM and financial performance.

**Table 3.10 ANOVA**

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.796	1	1.796	5.537	.025
Residual	10.055	31	.324		
Total	11.850	32			

a. Dependent Variable: ERM

b. Predictors: (Constant), Information Technology on ERM

Table 3.10 provides the information needed to predict the firms' financial performance from information technology. Both the constant and information technology contribute significantly to the model. The regression equation is presented as follows;  $Y = 1.796 + 10.055X_2 + \epsilon$ .

Where Y = financial performance,  $X_2$  = is information technology and  $\epsilon$  is the error term in the model.

Figure 3.4 show the scatter plot for information technology and financial performance of listed firms. The regression line indicates that firms' characteristic is randomly distributed around the regression line in respect of financial performance. The scatter graph show a positive gradient which mean that an improvement in information technology leads to an increase in firms' financial performance.

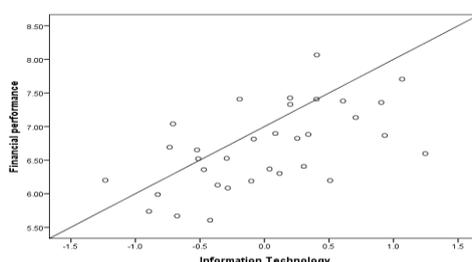


Figure 3.4 Scatter Plot for relationship between information technology on ERM and financial performance

#### 4. Conclusion

This study aimed to investigate the effect of information technology on enterprise risk management of the listed firms in Kenya. The study used financial performance to measure the effectiveness of ERM. Firms that had implemented ERM were by asking the respondent to indicate the risk management adopted and the same information was compared with the annual financial report submitted to the Nairobi Security Exchange.

The correlation between information technology and financial performance is positive and the regression analysis shows that the relationship between information technology and financial performance is significant. This means that investment in information technology in risk management improves financial performance of a firm. This finding support other studies in the same area such as; Hoyt and liebenberg (2008), Ranong and Phuenngam (2009) and Kumsuprom, Corbit, Pittayachawan and Mingmalaraks (2010). In addition information technology on ERM support the COBIT principle model that provides good practices across a domain and process framework that contribute significantly to the successful information technology risk management. Firms should therefore invest on technology on enterprise risk management as it enables firms to enhance efficiency and accuracy. Information technology also can be used to set risk management objectives, evaluate risks, monitor and control risks within a firm.

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