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TECHNOLOGY ADOPTION AND OCCUPATIONAL FRAUD RISK: EMPIRICAL EVIDENCE FROM COMMERCIAL BANKS IN KENYA

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ABSTRACT

Fraud risk is a global problem and its frequency is highest in commercial banks than any other industry globally. Occupational fraud statistics indicate that a typical organization looses approximately 5% of its annual revenues to fraud. When applied to the consolidated Commercial banks revenue for the year 2011, the loss translates to approximately Kshs 12.82 Billion. The problem is that Kenya has the highest incidences of fraud is East Africa. The study set to find if technology adoption influence occupational fraud in Commercial Banks in Kenya. 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. Bivariate linear regressions were used to test the null hypothesis; there is no relationship between technology adoption and occupational fraud risk in Commercial Banks in Kenya**.** The findings from this study are the positive correlation between technology adoption and moderate influence on occupational fraud risk in Commercial banks in Kenya. These results provide insights into the Occupational Fraud Risk Management and the regulatory authorities in the deterrence of fraud in Kenya and developing Countries.

Key Words: Occupational Fraud risk, Technology adoption, Factor analysis, Bivariate Regression.

1.0 Introduction

1.1 Background of the Study

Occupational fraud risk is a global problem and its frequency is highest in banks than any other industry globally (Kroll, 2011, ACFE, 2010, ACFE, 2008, PriceWaterhouse Coopers, 2007). Global fraud study report to the Nations, a publication of the Association of Certified Fraud Examiners (ACFE, 2010) on occupational fraud and abuse indicate that a typical organisation losses 5% of its annual revenue to Fraud. Applied to the consolidated Commercial Banks revenue for the year 2011, (CBK, 2011) the loss translates to KShs 12.8 Billion loss to fraud. Occupational Fraud loss is not unique to Kenya and is in the rise globally (Kroll, 2011). Occupational fraud prevalence remains high with the estimated prevalence levels as; North America (23%), Canada (16%), Europe (16%), Mexico (23%), Latin America (18%),Middle East(19%),India (23%), China (20%), South East Asia(24%) and Africa 33%. Further statistics show that Africa has not only the highest fraud prevalence (33%), but also the fastest growing exposure levels of 84% (2011) up from 70% (2010). Globally, occupational fraud is highest in Africa compared to other regions globally. The vice continue to threaten the expansion of businesses globally. In another global fraud survey, PricewaterhouseCoopers indicate that Kenya has the highest incidences of fraud in the world, based on a global ranking of 78 countries surveyed way ahead of other more developed economies like South Africa, UK, New Zealand, Spain and Australia PricewaterhouseCoopers (PwC, 2011).

1.2 Occupational Fraud in Kenya

Fraud is unique to East Africa in that it ranks number 2 out of 25 risks when ranked in order of severity (PWC 2011) while the global ranking of fraud in Commercial banks is number 15 out of 25 risks in order of perceived severity. Kenyan banking sector is the most affected by the vice compared to Uganda, Tanzania, Rwanda and Zambia (PWC, 2011, World Economic Forum, 2010). Government of Kenya statistics report an alarming 45% annual average increase in number of economic crimes (GOK, 2011). Kenya has the highest incidences of fraud in the world, based on a global ranking of 78 Countries surveyed (PwC, 2011. Fraud statistics are nearly double the global average of 34 per cent and significantly higher than the fraud incidence average in Africa of 57 per cent.Banks occupy a unique position within the Kenyan economy because of their special role in financial intermediation (CBK, 2011). The banking sector

maintain over 14.25 million deposits accounts with gross Kshs 1.19 trillion and over 1.99 million loan accounts worth over Khs 914.9 billion (CBK, 2010).

Kenyan Banking sector is a key employer with 30,056 staff members (CBK, 2011). Perhaps, no where else are frauds more serious, more frequent and more pronounced than in the Banking sector in the economy (Eseoghene, 2010). Direct costs of crimes are difficult to gauge (PWC, 2011). Banks in Kenya lost a staggering Kshs 1.7bn in the three months August to October 2010. Commercial banks lost Kshs 761Milion in the first six months of 2010 through fraud, according to the Central Bank of Kenya (PwC, 2011). Kenya rank favorably (26 out of 142 countries) in financial development. A relatively advanced banking sector could be expected to be more conscious of operational risks than the lower ranking banking sectors. Why then does the Kenyan banking sector rank unfavourably in fraud risk exposure?. The Government of Kenya earmarked the banking sector as one of the key pillars to the achievement of vision 2030. Within the Medium Term Plan (2008-2012) under vision 2030, some of the target areas include development of a safe and reliable payments system that will ensure smooth transfer and settlement of funds between customers and banks as well as between banks. Towards this end, the use of mobile phone networks, internet and payment cards, operational resilience and security will be pursued in order to increase trust, integrity and confidence in the ICT based payment systems (GOK, 2008).

1.2 Statement of the Problem

Financial Services survey report that Commercial banks in Kenya are more susceptible to Fraud risk than banks in her neighbouring countries in Eastern Africa (PWC, 2010). Despite the significant 84% (36) of Commercial banks in Kenya complying with risk management guidelines issued by Central Bank of Kenya for over half a decade (2005- 2010), an alarming proportion 95% (41) Commercial banks are concerned with fraud risk (CBK, 2010). The concern is principally due to the rising losses from fraud to their employees and customers. Rising rate of the vice can erode investor and consumer confidence and pose a great threat to potential investors in Kenya (PWC, 2011). Empirical studies; Duffield & Grabosky (2001), Zahra, Priem & Rasheed (2005), Mustafa & Youssef, (2010) have concentrated on the causes and motivations to defrauding by staff. Other scholars, Alleyne and Howard (2005), Bakre (2007), Brazel,

Carpentre & Jenkins (2007), Hamersley, Bamber & Carpenter (2007), Lange (2008), Owusu & Ansah (2002), studied the role of external auditors in fraud, detection and prevention and they produced conflicting findings. Some of the fraud risk studies that incorporated technology and its role in fraud risk management include; Baker (2003), Graziolo & Jarvempaa (2003), Haugen & Selin (1999), Maclnnes, Musgrave & Laska (2005) and Nikitkor & Bay, (2008).

From the reviewed empirical literature, it is evident that there is hardly any empirical study on Fraud risk management in Commercial banks in Kenya. The study aim was to find out the influence of technology adoption on occupational fraud risk in Commercial banks in Kenya.

2.0 Literature Review

2.1 Concept of fraud

Irrespective of the sector, a wide category of crimes, swindles and employee trust violations fall under the category of fraud (ACFE, 2010), (Duffield and Grabosky, 2001), (Levi ,2008). ACFE (2010) define occupational fraud as the use of one's occupation for personal enrichment through the deliberate misuse of or misapplication of the employing organizations resources or assets.

2.2 Theoretical Literature Review

Occupational frauds are not random occurrences (Bagnoli & Watts, 2010), (Gillett and Uddin, 2005), (Carpenter and Reimers, 2005). Various factors contribute to the likelihood of their occurrence, and the form of the occurrence (ACFE, 2010, Langenderfer & Shimp, 2001, Zahra, 2005, Bakre 2007). Many theories have been put forward in an attempt to explain the concept of fraud. Among the most popular in fraud studies include Cressey's Fraud Triangle Theory which describe a triangular relationship between opportunity, pressure, and rationalization (Wells, 2001; Wilson, 2004). Wilson (2004) describes "opportunity" as the ability to bypass or override controls meant to prevent manipulation, "pressure" the motivation to commit the fraudulent act, and "rationalization" as referring to the moral and ethical argument used to justify the act. On the other hand, Wesley (2004) points that fraud management is a lifecycle with a network made up of interrelated, interdependent, independent actions, functions, and operations. Wesley's Fraud Management Lifecycle Theory is made up of eight stages; deterrence, prevention, detection, mitigation, analysis, policy, investigation and prosecution. Unlike the fraud triangle theory, Wesley (2004), view that fraud management activities do not necessarily, occur in a

sequential or linear flow. Fraud occurrence is therefore an empirical question among scholars but it is generally agreed that it is not random.

2.3.4 Technology Adoption and Occupational Fraud

Technology adoption has continued to provide a versatile platform for banks to offer their services to customers in a convenient manner. Today, Kenyan banking business is characterized by increased use of information access terminals, growing use of information sensitive applications such as c e-commerce, internet banking, e-banking, Electronic Funds Transfer (EFT), Debit cards, Credit Cards, Real Time Gross Settlements (RTGS), Automated Teller Machines (ATMs), Point of Sale Terminals (POS), Mobile Banking, and customized cheques. Technology adoption in banking not indeed empowered banks towards taking their services and profitability to a higher notch (CBK, 2011). This great success has not come without challenges and one of the biggest headaches to system developers, banks and customers are the system security threats which easily continue to erode banks' reputation and customer confidence (Ganesan & Vivekanandan, 2009).

These successes have led to possibilities of technology adoption threats from customers, (Hertzum, Jorgense & Norgaar, 2004). There are many types of technology related security threats in Banks including; "Botnets" a large network of fictitious personal computers that are centrally controlled from a server (Mirkovic (2005), Markoff (2004). Additional threats include "Phishing", or "credential harvesting", (Laerte, Marcelo, Bernardo, Flavio & Rafael, 2011), "Vishing" (Markoff, 2004), "hardware key logging", (Anderson (2001), "Domain Name System (DNS) Cache Poisoning", (Ollmann (2005), "Secure Sockets Layer (SSL) Encryption", (Deepshikha & Devanand, 2009),"Shoulder Surfing" (Herzogl & Shahmehri, 2007) and Hybrid attacks (Dhamija & Tygar, 2005).

To understand IT fraud, Vasiu and Vasiu (2004) propose taxonomy of IT fraud with respect to the perpetration platform and method. Haugen and Selin's (1999) explain IT fraud categories to include; alteration of input, theft of computer time, software piracy, alteration of data files, theft of computer output, and unauthorized access to systems. Haugen et al further cite fraud techniques to include; Trojan horse, salami technique, trapdoor, SuperZap, piggybacking, masquerading, hacking, eavesdropping, browsing and use of viruses. Haugen and Selin (1999) also discuss IT Fraud prevention controls; which are grouped into the use of passwords,

firewalls, connectivity security and cryptography. MacInnes (2005) categorise IT fraud into five major causes: incentives of criminals, characteristics of victims, the role of technology, the role of enforcement, and system related factors. To address IT fraud, Grazioli and Jarvenpaa (2003) conduct a study to find out which tactics are most commonly used, and which IT products are most susceptible to fraud. Casabona and Yu (1998) suggest the need to understand the occurrence of fraud in which data processing stages - input, processor, software, storage or output stage, in order to handle IT fraud. The authors suggest a three-tier line of defense, which are prevention, detection and minimization. For example, to establish an environment of integrity, design a set of sound internal controls and enhance the role of internal audit departments. Given the high levels of occupational frauds in Kenya, and the associated and reported benefits of technology adoption among the Commercial banks; the following is hypothesized;

HO: There is no relationship between technology adoption and occupational fraud risk in Commercial banks in Kenya.

2.3 Conceptual Framework

The conceptual framework is based on (technology adoption) as the predictor and Occupational Fraud Risk (Amount of fraud, number of frauds and frequency of frauds) as the predictand.

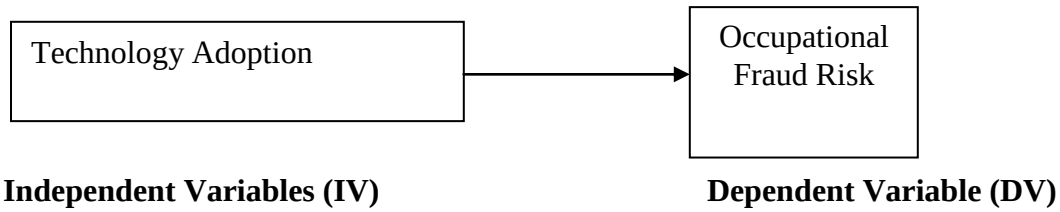

Figure 1: Conceptual Framework for the influence of technology adoption on occupational fraud risk in Commercial banks in Kenya.

2.4 Empirical Literature Review

2.6 Research gaps

From reviewed empirical literature, it is evident that research on the influence of technology adoption on occupational fraud risk in Kenya not been done in a comprehensive approach. Literature reviewed indicate that many scholars have concentrated on antecedents of fraud,

Dunn & Albrecht (2001), Erickson & Maydew (2006), Ball (2009), Hochberg , Sapienza & Jorgensen (2009) , Miller (2006). Other researchers, Knapp and Knapp (2001), Cullinan and Sutton (2002), Ramos (2003) Alleyne and Howard (2005), Bakre (2007) Lange (2008), Hoffman and Zimbelman (2009), Mustafa and Youssef (2010) have studied the role of internal audit in fraud risk management. Baker (2002), Chua and Wareham (2004), Vasiu and Vasiu (2004), Gregg and Scott (2006) studied the role on Information technology in fraud risk management. Idowu (2010) concentrated on fraud assessment in Commercial banks. This aim of the study was to provide insight "if technology adoption influence occupational fraud risk in Commercial banks in Kenya and provide pertinent recommendations based on the findings.

3.0 Methodology of the Paper

The study assessed the bivariate relationship between Technology adoption and Occupational fraud in commercial banks in Kenya. The target population was all the 43 Commercial banks operating in Kenya 30th June 2012.

These banks are classified by the Central Bank of Kenya using Market Share Index (MSI) ; 6 large banks operating in 546 branches, 15 medium banks operating in 310 branches and 22 small banks with 199 branches. The study used multi -stage sampling process in the selection of a stratified sample of 30 Commercial banks and 257 respondents in total; 105 "management", 72 "Section Heads" and 201 "Clerks". This sampling method is strongly supported in some social research studies (Oladipo & Adenkule, 2009).

Bank category	Total	Management	Section heads	Clerks
Large Banks (4)	42	12	8	22

Table 1: Sample size determination per "Bank category" from Bank's Head Office Staff

Medium Banks(10)	133	37	25	71
Small Banks (16)	82	23	16	44
Total	257	105	72	201

Source (Researcher, 2012) . ** To the nearest whole number

Self administered questionnaires were used to obtain primary data while secondary data was obtained from Central bank of Kenya reports, banking anti fraud unit and the Nairobi Stock Exchange report for the years 2008- 2012. Over 79% of the Commercial banks in Kenya have centralized risk management model (CBK,2010) and each is head quartered in Nairobi (the capital city). It was be imperative to focus on the head offices of each bank because branches will generally reflect technologies by the head office. Questionnaires' reliability of 0.86 was achieved using Cronbach Alpha. This measure was considered adequate for the study (Cooper & Schindler, 2011). The questionnaire was also subjected to thorough examination by two independent resource persons, from the Certified Fraud Examiners, Kenya Chapter to enhance content validity and final questionnaire was refined before subjecting it to the final data collection exercise. Technology adoption, items used to construct the questionnaire were Likert-type scale that ranges from 1 to 5 with the following equivalences, ``1": ``strongly disagree"; ``2": ``disagree"; ``3'': ``neutral"; ``4'': ``agree"; and ``5": ``strongly agree". Likert scale is a useful in measuring attitudes and perception (Chimi & Russel, 2009).

4.0 Discussions and Results

4.1 Response Rate

Response rate was approximately 89% and majority of the Banks 25 (83%) had 80% and above response rate. Overall the response rate in this study was higher compared to other similar previous studies. For example, Idolor (2010) reported a response rate of 71% in his study on the causes, effects and possible remedies of fraud in Nigerian Commercial banks. Response distribution of the 236 respondents in terms of age was categorized between the age of 21 – 30 (28%), 31- 40 years (40%), 41-50 years (32%), over 50 years (2%). This is a pointer that the respondents had reasonably sufficient knowledge on the subject of the study within the banking

sector in Kenya. A significant 206 (87%) of the respondents had banking sector experience between 1 and 10 years and therefore likely to have reasonable exposure to the subject of this study; occupational frauds in Commercial banks.

4.2 Drivers of Technology adoption

When the 10 statements on technology adoption were subjected to factor analysis, 8 measures loaded between 0.416 and 0.92 while two (credit card and ATM) loaded with 0.274 and 0.029 respectively. This study used statements with factor loadings above 0.4 which is recommended (William, Onsman & Brown, 2010). Principle component Analysis is an important tool for data reduction (Bhattacharyya (2011), Andrys, Ted & Brett, 2012). Bank Technologies maintained were, Mobile banking, Debit cards, Point of sale terminals, Electronic Funds Transfers, Customized Cheques, Real Time Gross Settlements (RTGS) and Internet Banking.

4.3 Test of Assumptions

Durbin –Watson *d* statistic test of univariate independence for Technology adoption resulted a coefficient of *d=1.863*, well within the range of 1.5 and 2.5 for independent observations (Garson, 2012), (Porter & Gujarat, 2009). Normality test statistics computed for technology adoption in both Kolmogorov-Smirnov (K-S) and Shapiro-Wilk tests are insignificant with p-value greater than 0.05 in both measures, an indication of held normality assumption based on both numerical methods.

Table 2: Normality Test for Study Variables

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Technology Adoption	.089	30	.200*	.967	30	.469
Occupational Fraud Risk	.088	30	.200*	.965	30	.423
a. Lilliefors Significance Correction						
*. This is a lower bound of the true significance.						

4.10 Statistical Model

Aggregate weighted scores of influence of technology adoption on occupational fraud were regressed against the weighted scores of occupational fraud risk. Results of curve estimation using SPSS Version 17.0 indicated that a linear mathematical model was adequate for the testing

of hypothesis. Linear relationship between determinants of fraud and fraud risk is expected based on the results of above tests of assumptions (Shevlin & Miles, 2010). The mathematical relationship between the variables was hypothesized as;

OFR= α + x1TechAdopt

Where: OFR is Occupational Faud Risk (regressand)

TechAdopt= Technology Adoption (regressor)

Table 3: Model Summary of OFR/ Technology Adoption

Model Summary[b]

Model	R	R Square	Std. Error of the Estimate	Durbin-Watson
1	.642[a]	.412	.2019868	1.863

a. Predictors: (Constant), Technology Adoption

b. Dependent Variable: Occupational Fraud Risk

The linear regression analysis shows that there is significant relationship, R= .642 and R- Square = .412 which means that 41.2% of the corresponding variation in Occupational Fraud risk is explained by a unit change in Technology measures. **Table 4** shows significance of the model predictor in the hypothesized model.

Bindiya, Manishi & Navaratan (2011) found that there is a relationship between technology and risk exposure among financial institutions. Baker (2002) pointed that fraud can be technology fraud, faster to perpetrate and equally easily detected and prevented if appropriate technology is adopted.

Table 4: Regression Model Significance

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.802	1	.802	19.650	.000[a]
	Residual	1.142	28	.041		

Total	1.944	29

a. Predictors: (Constant), Technology Adoption

b. Dependent Variable: Occupational Fraud Risk

Regression analysis is table 4; shows that the Linear relationship between occupational fraud risk and technology adoption has an F value F=19.650 which is significant with p value p=.000 < p=.05 meaning that the overall model is significant in the prediction of occupational fraud risk in Commercial banks in Kenya. We therefore fail to reject the null hypothesis and confirm that indeed, there is a positive and significant influence of technology adoption on occupational fraud risk in Commercial banks in Kenya.

Table 5: Model Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	.258	.193		1.334	.193
	Technology Adoption	.884	.199	.642	4.433	.000

a. Dependent Variable: Occupational Fraud Risk

Table 5 shows; test on the beta coefficient of the resulting model, the constant α= .258 is insignificant with p value p= 0.193 > p=0.05. The coefficient β = 0.884, has a p value, p= .000 which is less than p= 0.05. This means it is significant in the regression model.

The model residuals normal P-P plot presented in figure 2 show that the standardized residuals plot a lot the 45 degree straight line from origin, an indication that the residuals are normally distributed. Normality of the residuals indicates the linear regression was adequate for the analysis of the relationship between OFR and Technology Adoption**.**

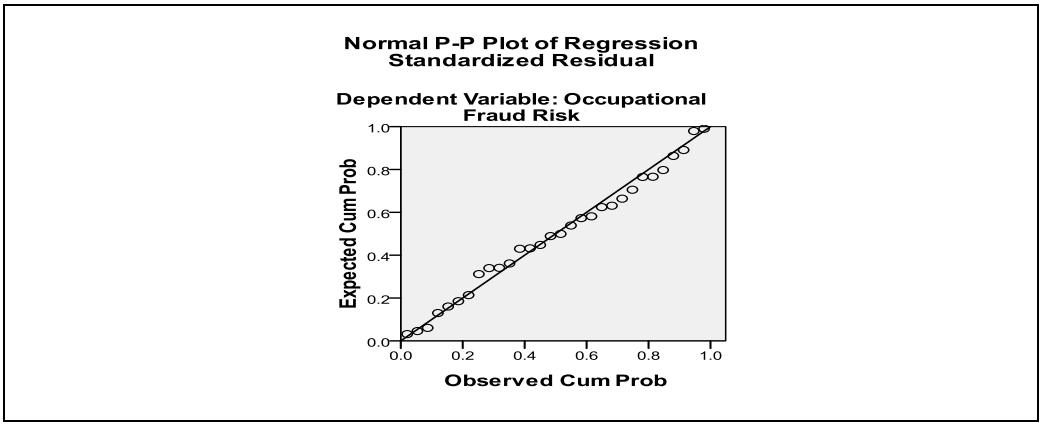

Figure 2: Normal P-P plot of regression standardized residual of occupational fraud risk and technology adoption

5.0 Conclusion and Recommendations

There is a positive and significant relationship between technology adoption and occupational fraud risk in commercial banks in Kenya. Fraud triangle theory indicates fraud occurs when a "perpetrator" finds an "opportunity", exploits it and subsequently "rationalizes" the act. To this extent, this study finds that commercial bank in Kenya appear to have enormous opportunities which perpetrators have exploited. The opportunities are created by insecure adopting technology. Conclusively, this study confirms that the number of frauds, frequency and amount of fraud loss experienced in commercial banks in Kenya are influenced partly by technology adoption. While there is an inherent constant loss from technology adoption, this was found to be statistically insignificant. These findings point that commercial banks in Kenya have not been spared by security threats and should adopt a comprehensive approach to fraud deterrence. Biometric based authentication systems provide new solutions to address the issues of security and privacy. Moreover, banks should also practice and maintain high ethical standards in performance of the duties as well as ensure tight top on the top for occupational frauds. Management should also conduct thorough background checks for staff to reduce the exposure level to occupational frauds. These measures are necessary to safeguard access to assets and enhance deterrence of occupational frauds in the banks.

6.0 Limitations and Future Work

Major drawback to this study is that it used likert scaled perception of the bank players' perception on the influence of technology adoption on occupational fraud. It is limited to

Commercial banks in Kenya and excludes other financial intermediation players such as the Forex Bureaus, mortgage banks, micro finance institutions, Savings and Credit Cooperatives (SACCO's) and pension funds. Better work could be achieved in future by using data of more than one industry to generalize the fraud phenomena in the Kenyan context.

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