JOURNALOS

Volume 10, No. 29, December 2016

ISSN: 219 318 11

JASRI

Journalos of Advanced Scientific Research and Innovation

Germany, 2016

"An Integrated Approach to Enterprise Risk: Building a Multidimensional Risk Management Strategy for the Enterprise"

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ABSTRACT

The development of enterprise risk management frameworks is an ongoing effort by various organizations and has an influential role in shaping organizational-wide risk strategies and policies in a shared governance structure. Investigating the perceived silo-based nature of risk management and the relevant risk function integration and communication holistically however, remains a challenge. The main objective of this study is to address this significant problem by proposing a multidimensional Risk Management framework with three key domains: a Business Process-Centric Risk Management System (BPC-RMS), a Risk Dialogue Matrix (RDM) based on Expert rules and Data-Mining, and a Risk Management Program (RMP) led by a Risk Management Office. A holistic multidimensional risk management approach looks at all functional areas in the enterprise, identifies all the risks in these areas, analyzes their relationship and impact, and provides a balance among all risk activities. The proposed framework is designed to build upon the standards and best practices of risk management. Using design science methodology, we propose and evaluate a multidimensional framework to integrate these risk management concepts into the business process of the enterprise.

Keyword: Risk, Risk Management, Risk Assessment, Risk Control, Risk Response, BPC-RMS, RMP, RMO, RDM, SOFIC model, Enterprise Business Processes, Risk Integration, Risk Communication

INTRODUCTION

Risk management is designed to identify potential events that may affect the organization[1], manage risks to be within its risk appetite, and to provide reasonable assurance regarding the achievement of entity objectives (COSO, 2004).Risk management, among other things, requires embedding of risk management responsibilities into the organization, and understanding of compliance requirements (ITGI, 2007). Focusing on "***risk culture***" and "***strategic risk management***", Standard & Poor has factored enterprise risk management(ERM) activities into its overall rating of management and company outlook since 2008, giving companies extra incentive to think seriously about implementing ERM in their organizations (Aon, 2009).

The amount of interest and research on risk management testifies to its relevance. Researchers and practitioners through empirical and field studies indicate that in today's business environment, traditional risk management practices are no longer sufficient to deal with emerging threats (Woodhouse, 2008; PWC, 2015).

[1]Throughout this paper, we will be using "organization" as a generic reference to large or small businesses, government, or not-for-profit entities.

Intense competition, natural disasters, financial crises, terrorism and cyber terrorism, along with regulatory requirements and many others require dealing with new levels of risk, exacerbated by the speed of onset fostered by Internet and a 24/7 news cycle(Layton & Wagner, 2007).

Since risk in one functional area could very much affect a risk in another area, such "risk knowledge" could help in defining more precise and cohesive strategies about how to deal with risk. As such, "risk knowledge" should be shared among people in different functional areas (Papadaki& Despina, 2008; Rodriguez and Edwards, 2014). In such environments, people should be able to share risk knowledge in an ad-hoc setting, rather than coordinating with others who are in the same field with similar expertise. Moving to such a level of "risk knowledge" and establishing "risk culture" requires the establishment of a *risk management program* (RMP) led by a risk management office (RMO) to ensure that risk management knowledge will be shared among people in different functional areas and to integrate all risk-related activities into a single, comprehensive model that better analyses and minimizes risk to an organization. After the 2008 financial crises, risk management has been an important agenda item of the business enterprises since it leads to better decisions and enhances performance (Gates et al. 2012). Farrell and Gallagher (2014) concluded that firms show a 25% gain in performance value when the level of top–down executive engagement and the resultant cascade of ERM culture throughout the firm.

In this study we aim to contribute both theory and management practices related to risk management, and to add to the ongoing debate about whether the current practices of risk management are sufficient to help organizations meet their objectives and goals. Current practices of risk management are lacking in providing organizations with sufficient framework and structure to meet business needs. In particular, "lack of integration and communication appears to be one of the most significant problems" and companies with segregated risk management fared worse in the 2008 crisis (Harner, 2010:1335).A structural focus on separate business units does not necessarily effectively address enterprise wide risks, despite COSO's provision for entity level consideration. A major criticism of COSO (Marks, 2011) is that it confuses the framework (organizational structures and policies) with the process of risk management (the integration of assessment and monitoring into processes where decisions are made).Other researchers, (e.g. Lundquist, 2014), found that different components of ERM proposed by COSO framework are used in measuring ERM quality and effectiveness, and that these have been proven as influential in improving corporate performance. In this paper we propose an integrated, multidimensional approach to enterprise risk, in which we are recommending a business process-centric risk management system to integrate all processes of risk management and interactively engage all responsible parties in such a system. Such integration would be managed and controlled through a risk management office. Moreover, a new Risk Dialog Matrix is proposed to enhance the shared risk knowledge concept to integrate risk among different business units or functional areas.

In the following sections, we examine the literature and discuss the traditional risk management approach. We then describe our methodology and develop our framework starting from the business process centric risk management approach followed by a discussion of the risk dialogue matrix, and the integrated program coordinated by the risk management office. This is followed by an initial evaluation by professionals and a discussion of the implementation of enterprise risk management. Finally, the impact on practice and conclusion of the study are presented together with ideas for future research.

BACKGROUND

RISK MANAGEMENT COMPONENTS, FRAMEWORKS, MODELS, AND TECHNIQUES

Many researchers and organizations (McShane et al. 2011; Baxter et al. 2013; Mikes & Kaplan 2014; Lundqvist 2014; Pagach&Warr 2010; CGMA 2015; COSO 2004; Orange Book 2004; ITGI 2007; ITS 2007;Stoneburneret al. 2002; Holmes 2002;Alexander & Sheedy 2005;ISO 31000:2009) have written about the topic of risk, risk analysis, and risk management by proposing methodologies, frameworks, techniques, tools, and empirical studies. For example, ISO (2009) defines risk as "the effect of uncertainty on objectives". In general, risk is the potential exposure to damage of an activity or an asset. Moreover, risk has to be connected with enterprise activities to help organizations meet their goals and objectives: ISO (2009) defines risk management as "coordinated activities to direct and control an organization with regard to risk", while Stoneburneret al. (2002) define risk management more operationally as: "the process of identifying risk, assessing risk, and taking steps to reduce risk to an acceptable level. Del Bel Belluz (2012) further highlights organizational culture in her definition: "The culture, processes and structures that are directed towards the realization of potential opportunities and the effective management of adverse effects". In general, risk management concerns the processes established at an organization that help managers assess risk, determine the acceptable level of risk and then adopt strategies to control the risk. The assessment of risks includes identification, analysis, and prioritization. To a large extent however this is done only within silos, and there is a widely held view of "a distinct lack of information on how to bring all the silos together" for which COSO was found complex and "(not) the most useful for actual practice" with roughly half of firms surveyed seldom using its recommendations (Fraser and Simkins 2009).

Today many organizations still rely on stovepipe oriented risk management tools in dealing with risk. Our proposed solution is to advance the conceptualization of risk management by moving it from a stovepipe approach to a multidimensional holistic approach. A holistic approach looks at all functional areas, identifies all the risks in these areas, analyzes their relationship and impact, and provides a balance among all risk activities. A business process focus allows alignment of cross functional activities with strategy and its achievement. We operationalize our viewpoint by introducing three dimensions to the holistic approach: business process-centric risk management system, risk dialog matrix, and a risk management program coordinated by the risk management office. These three dimensions need to be part of the enterprise risk management solution to bring about the multidimensional holistic approach.

To develop our solution, we examined many articles and research papers from organizations and researchers. For example, COSO (2004) provides a detailed description of the essential components, and seeks to provide direction and guidance for enterprise risk management. Critics (e.g. Shaw, 2006) of the COSO framework however claim that the frame work, as a broad, principle-based document is not particularly suited to internal-controls monitoring. The traditional audience for COSO has been internal and external auditors and members of the accounting community, with a compliance, rather than strategic, focus. This is why some are saying that COSO is too complicated to be applied practically and for use by midlevel managers and business units (Shaw, 2006; Williamson, 2007). Furthermore, Williamson (2007) argues that COSO takes a command and control approach and ignores shared management of uncertainties and social implications of ERM.

A second theme that emerged from our review concerns the sharing of knowledge across functional units. Knowledge management practices and shared repositories of information can support decisions here, and Rodriguez and Edwards (2009) report work showing an association between the perceived value of ERM implementation and the quality of knowledge sharing about risk. Apart from the technological support for knowledge sharing a supportive organizational culture is critical for implementing risk management effectively. Del Bel Belluz(2010) describes two otherwise comparable companies but which differed in organizational culture (including risk mindset), employee and partner relationships, business processes (one could sustain innovation) and results (consistent profitability or otherwise), highlighting the importance of organizational context in effective ERM, and she particularly commends ISO31000 in this regard. These aspects are well researched in knowledge management (KM), whose core processes, including capturing and sharing knowledge, are related to risk management by Rodriguez and Edwards (2009).Massingham (2010) describes the emerging field of Knowledge Risk Management (KRM) and the case study he describes suggests the value of including knowledge management constructs over traditional approaches to risk management. Similar approaches integrating KM with ERM, both theoretical and practical, are reported by Alhawari et al. (2012) with sector specific integrations in e.g. software engineering/ IT projects (Ardimento et al. (2011)), telecommunications (Taletet al., (2014)), and construction (Arrow, 2008). These studies point to the centrality of knowledge in assessing risks and its embeddedness throughout the organization.

While local knowledge of unit managers is certainly relevant to identification and assessment, general settings around risk appetite and strategy are more appropriately centralized (Economist Intelligence Unit, 2007). Layton and Wagner (2007) call the compartmentalization of risk by departments the “silo factor” whose effect is to prevent top managers understanding enterprise wide risk, and which brings numerous other associated problems (CFO, 2014). These include duplication, gaps, lack of relevant communication, varying risk philosophies, and the potential for a risk in one area to rapidly propagate to affect others. These problems make it difficult to create an enterprise wide risk culture. This entails a shared overarching framework, but should also pervade everyday decision making processes.

A portfolio view that allows consideration of the interrelationship among risks is essential, and this “net assessment” can be properly referenced to a centralized strategy and risk appetite. To illustrate, in Gammack (1991) a set of modular expert systems was developed to identify risk in UK life insurance and personal loan applications. These modules separately addressed quantified, business rule-based risks associated with lifestyle, medical, travel, financial and other categories in the application form. The interactions among these areas was a non-trivial challenge as risks could compound one another or, conversely, mitigate each other. A doctor (safe) in Australia (safe) might have to fly a small plane to remote bush land (unsafe), or a skilled but unemployed worker (financially risky) intending to take employment in the Middle East (risky) might suddenly become financially low risk. Simply combining the numbers failed to give a realistic picture, motivating a more holistic design involving contextual judgment: similar stove piped and model-heavy risk management, (together with an overly aggressive risk culture) led to the downfall of RBS (CFO, 2014).A frequently expressed recommendation by holistic approach advocates is by all means to consider the numbers, but to exercise judgment as well.

Although many ERM frameworks and proposals exist, these are often sector specific, or pitched only at a general level of guidance. CGMA (2015) found that about 60 percent of 1,300 executives in organizations worldwide agree that they face a wide array of complex and increasing risk issues, despite that 35 percent or fewer organizations claim to have formal ERM in place. Lundqvist (2014) indicates that there exists no real consensus about the value creation and inconclusive of the implementation of ERM because of the multiple frameworks for the implementation of ERM. McShane et al. (2011) specifies that although ERM has emerged as a framework that supposedly overcomes limitations of silo-based traditional risk management, yet little is known about its effectiveness on the firm's performance. Consulting firms also offer frameworks and because of the unique context of each enterprise it is normal that one size does not fit all, so proprietary solutions are likely torequire non-transferrable customizations. Whilst dominant frameworks unsurprisingly outline similar areas around identification, assessment and monitoring, philosophical differences exist, with implications for implementation. COSO's structural and compliance emphasis is weak on process and context, whereas McKinsey's framework sees ERM not as a function, but as the consequence of successfully interacting processes, emphasizing culture and behavior in the comprehensive inaction of five core capabilities. Their process view moves ERM towards a more strategic role from a focus on compliance, but where the procedures involved are "articulated(in various) institutional languages" (McKinsey, 2013). Respondents in Fraser andSimkins (2009) study reported "a distinct lack of information on how to bring all the silos together—otherthan to say that a common reporting system and language are important", and this is a feature of the ISO31000 standard, which established a common risk vocabulary, but does not provide a specific framework.

METHODOLOGY

The lack of solutions and implementations for an advanced risk management practice and the potential value organizations could gain from adopting such solutions are clearly relevant in the study of risk management. Relevance is one main cycle of the design science methodology and is well defined in our framework. Not only it is important to identify the role risk management must play in business and strategic planning but also to provide a comprehensive framework to apply such a practice in an effective andefficient manner. Efficiency involves helping organizations integrate risk into their business processes and as a result, organizations will utilize resources effectively, minimize surprises and shocks, enhance communications between internal entities and internal and external entities, and be ahead of competitors when it comes to grasping opportunities, the upside of risk often neglected in a focus on control and threat avoidance.

To ensure rig our in solution development, we draw upon *the design science research process* (Peffers et al., 2008) and the design science information systems research methodology (Hevneret al., 2004). This involves a design cycle where arte facts are designed and evaluated. This approach is appropriate in the development of theoretical arte facts such as models, frameworks and other constructs, and we now define its guiding steps in the context of this study:

- *Problem identification and motivation* (relevance cycle)

The background section above reviewed the literature to understand the problems that motivate the need for and drive the development of the multidimensional business Process-Centric Risk Management framework. Summarizing, the three main problems identified are (a)The current practices of risk management

proved to be lacking in providing organizations sufficient framework and structure related to risk management to meet their business needs (Harner, 2010); (b) risk knowledge should be shared among people in different functional areas (Papadaki& Despina, 2008); (c) The current traditional risk management approach is exercised in silos in organizations (Woodhouse, 2008): in such environments it is hard to create a "risk culture" within organizations; and (d) The inability to manage all kinds of risks in a cohesive and precise approach results in dramatic impacts on organizations.

- *Objectives of the solution* (Implicit in "relevance")

Based on the aforementioned problems, we identify five main objectives of this study: *(obj1)*to build a multidimensional business process-centric risk management framework to help enterprises meet their organization's needs; *(obj2)* build a Business Process-Centric Risk Management System (BPC-RMS) based on predefined principles;*(obj3)*establish a risk management practice for planning, designing, implementing, and maintaining to help organizations create a "risk culture" and share the risk knowledge among people in multifunctional areas; *(obj4)* build a risk dialog score formula to analyze and balance among all risk activities to help organizations to manage all kinds of risk; and *(obj5)*help organizations integrate the risk management function into their business processes of the enterprise to compete effectively, to satisfy their customers, to retain their employees, to meet their financial responsibilities, and to meet their goals and objectives.

- *Design and development* (Iterative search Process)

To explicate the design of the solution that fulfills these objectives, we first carried out an extensive review of related literature (summarized in the previous section), which indicated that currently no sufficient risk management conceptual framework solution exists. Hence, advancing the view of risk management by moving it from a silo approach to an enterprise approach to a multidimensional approach is proposed in this paper through several *iterations* to ensure that we have a complete and sound solution. To address *(obj1)* we identified the building blocks of the multidimensional framework in light of three key domains: 1) *Business Process-Centric Risk Management System (BPC-RMS),* 2) *Risk Dialog Matrix (RDM),* and 3) *Risk Management Program(RMP).* To address *(obj2)* we introduced the BPC-RMSmodel with a predefined set of principles, then we extended the model for generality across implementations. This was done by introducing a set of elements to address requirements that come from Service-Oriented Architecture (SOA) service standardization efforts to be enabled based on the business process requirements. To address*(obj3)* we outlined a risk Management Program for planning, designing, implementing, and maintaining to help organizations create a "risk culture" and share the risk knowledge among people in multifunctional areas. To address *(obj4)*we built a risk dialog score formula to analyze and balance among risk activities to help organizations to manage all kinds of risks. To address *(obj5)*we studied the validity, usability, adaptability and the usefulness framework by comparing it with the current ERM software packages that organizations adopt or develop in-house prior to a representative stakeholder evaluation.

- *Evaluation* (Evaluate)

Preliminary evaluation regarding the validity, usability, adaptability and usefulness of the proposed framework are discussed in a later section. We evaluate the model in terms of the objectives of our study and how our proposal is viewed by risk professionals across the general areas and how an office leading a risk program would cover. In order to assess the necessary insight in the practicality of our framework, we developed and administered a survey to risk management practitioners who are members of the ISACA organization in the United Arab Emirates in addition to many executives in the public sector.

MULTIDIMENSIONALRISK MANAGEMENT FRAMEWORK

In the following sections we will explain the three domains of the proposed multidimensional framework as shown in Figure 1.

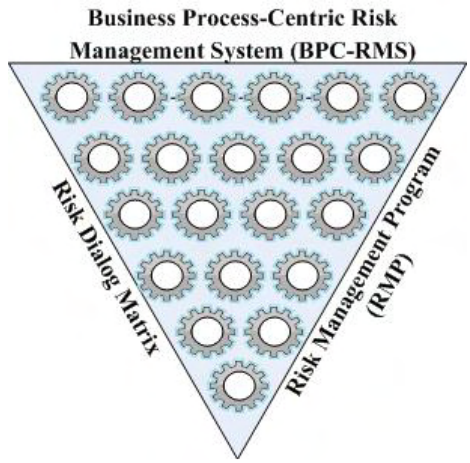

Figure 1: Multidimensional Holistic Approach

THE BUSINESS PROCESS-CENTRIC RISK MANAGEMENT SYSTEM (BPC-RMS)

Majdalawieh (2014) proposed the structure of the Business Process-Centric Risk Management Systems (BPC-RMS) in which organizations need to build trust, control, independence, and share models. The BPC-RMS represents one of our three domains of our multidimensional risk management framework covering 16 risk service areas (figure 2).

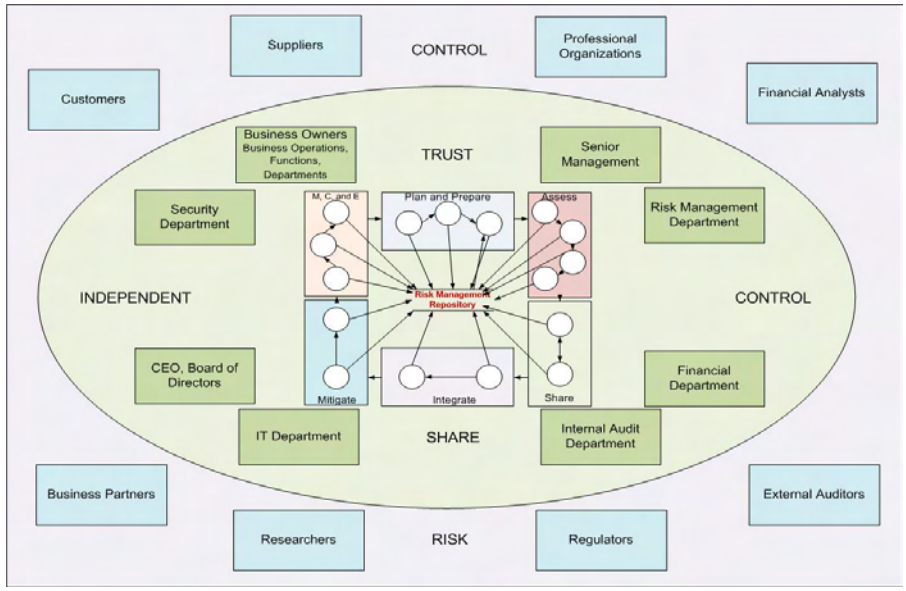

Figure 2: The interaction of the BPC-RMS System with internal and external entities (Majdalawieh 2014)

The BPC-RMS fulfills the compliance requirements from the companies own policies and the government's legislations.

THE RISK DIALOG MATRIX

Markowitz (1952) introduced the Modern Portfolio Theory (MPT), where, in order to determine the impact of relevant (systematic) risk of any individual financial asset to the riskiness of well diversified financial portfolio, correlations between all pairs of assets should be calculated. There are numerous critics of MPT. Mangram (2013) summarized some of the key criticisms as: Investor 'Irrationality' (Morien, n.d.); Higher Risk = Higher Returns (McClure, 2010); Perfect Information (Bofah, n.d.), Unlimited Access to Capital (Morien, n.d.); Efficient Markets (Morien, n.d.); Investment Independence (McClure, 2010); and there is no such thing as a "truly risk-free" asset (McClure, 2010).

In this study, we developed a simple and a new risk dialog score formula that has been borrowed from the concept of Markowitz's MPT to reflect on the need for the new BPC-RMS system as a shared repository between all stakeholders. All enterprise (dialog) risks can be calculated by this formula. In this formula, a risk dialog is calculated according to the combination of the function of impact and likelihood of a risk plus the function of impact and likelihood of other risks on the calculated risk, and a corporate risk appetite factor. The first step in using the formula is by creating the standard Risk Probability Impact (PI) Matrix. This matrix will be developed using the combination of probability (likelihood) and impact identified by each functional area, department, or project manager. The risk dialog matrix is built on the PI Matrix which is used in the traditional risk management model by analyzing risk using the following standard formula:

$$\mathbf{Risk_i = (P_i) \times (I_i)}$$

Where:

(P_i) is the Probability (likelihood)of occurrence of event$_i$, and

(I_i) is the Impact of event$_i$

Traditionally, the probabilities (likelihoods) and the impact factors are determined by the risk manager within a functional area.

The second step in using the formula is by creating a risk dialog matrix similar to the one shown in Table 1. The risk dialog matrix will help different parties to identify and quantify the impact of one risk in one department on another risk in another department or a function area. The rows and columns of the risk dialog matrix represent all the risks identified from all function areas driven from step 1.

The elements of the risk dialog matrix are donated by $I_{j,i} \times P_j$where $I_{j,i}$ is the calculated impact of $risk_j$ on $risk_i$, and P_j isthe calculated likelihood of $risk_j$. For example, element $I_{3,2} \times P_3$ is equal to the calculated impact for $risk_3$ on $risk_2$ times the calculated likelihood of $risk_3$.

Table 1: Risk Dialog Matrix

Risk (R)	**R_1**	**R_2**	**R_3**	**….**	**R_{n-1}**	**R_n**
R_1	**$I_1 \times P_1$**	**$I_{2,1} \times P_2$**	**$I_{3,1} \times P_3$**		**$I_{n-1,1} \times P_{n-1}$**	**$I_{n,1} \times R_n$**
R_2	**$I_{1,2} \times P_1$**	**$I_2 \times P_2$**	**$I_{3,2} \times P_3$**		**$I_{n-1,2} \times P_{n-1}$**	**$I_{n,2} \times R_n$**
R_3	**$I_{1,3} \times P_1$**	**$I_{2,3} \times P_2$**	**$I_3 \times P_3$**		**$I_{n-1,3} \times P_{n-1}$**	**$I_{n,3} \times R_n$**
….						
R_{n-1}	**$I_{1,n-1} \times P_1$**	**$I_{2,n-1} \times P_2$**	**$I_{3,n-1} \times P_3$**		**$I_{n-1} \times P_{n-1}$**	**$I_{n,n-1} \times R_n$**
R_n	**$I_{1,n} \times P_1$**	**$I_{2,n} \times P_2$**	**$I_{3,n} \times P_3$**		**$I_{n-1,n} \times P_{n-1}$**	**$I_n \times P_n$**

The third step is to calculate the total risk for each row ($Risk_i$) by adding the values in each element; such value will be called $(total\ risk)_i$. As such the $(total\ risk)_i$ will be calculated as:

$$\mathbf{(Total\ Risk)_i = \Sigma^{n}_{j=1}(Ij,i \times Pj)}$$

Finally, since different organizations have different risk appetite, the amount of risk exposure that the organization is willing to accept, the risk owner will identify a risk appetite factor from (0 – 1) to be applied to risk dialog to reflect the risk appetite that the management team agreed upon. The appetite risk should be identified and validated by the program risk manager and be communicated with function units of the organization. As such the risk dialog will be calculated as:

$$\mathbf{(Risk\ Dialog)_i = (Risk_i + (Total\ Risk)_{i)} \times RA_i\ ,\ or}$$

$$\mathbf{(Risk\ Dialog)_i = (Risk_i\ Probability\ of\ Occurrence \times Risk_i\ impact\ of\ the\ event + \Sigma^{m}_{n=1}(I_i \times P_n)) \times RA_i}$$

Where:

$(Risk\ Dialog)_i$ = The total dialog risk for risk i

$Risk_i$ = risk i in a specific function area

I_i = Impact of risk i

P_n = Probability of occurrence of risk n

RA_i = Risk appetite of risk i of the organization (RA_i has a value from 0.0 – 1.0)

The higher the risk score the more serious the risk. At the conclusion of risk prioritization step by a risk dialog formula, a consolidated list of risks is created in the BPC-RMS system to be shared with all functional teams to be used as a foundation for developing and handling control strategies.

In the traditional approaches to risk management, risks are ranked and prioritized as part of risk handling based on the likelihood and the business impact of each risk; for example, stopping the improper release of patients' medical information may take precedence over a virus that defaces a Web page on an internal test server. This can be done based on well-known qualitative and quantitative approaches by developing a risk prioritization matrix by using some type of composite probability-impact score (DACS Gold Practice, 2004).

The risk dialog matrix not only provides a holistic view of all risks, but also provides a shared risk knowledge in which integration of risk takes place rather than the narrowly focused linear process presented in traditional risk models. The risk dialog matrix is the second dimension of our multidimensional holistic approach and should be integrated in the BPC-RMS system.

In order to manage and supervise all activities related to BPC-RMS system including the development of the risk dialog matrix we recommend the establishment of a Risk Management Office (RMO), which will develop an enterprise wide program suited to its particular organization. Depending on the organizational structure and culture, different organizations see different implementations for RMPs. For example, a RMO's program can provide one-stop view of risks status, supervise the development and the deployment of common BPC-RMS system, determine skills needed and training focus, and provide a home for career development and advancement. In the next section we describe the proposed RMO responsibilities.

THE RISK MANAGEMENT OFFICE

The proposed Risk Management Office (RMO) is management-centric and the home for planning, designing, implementing, and maintaining the BPC-RMS system including its risk management repository and shared management of uncertainties (Williamson, 2007). The RMO is responsible for creating and maintaining a risk dialog matrix within the BPC-RMS system as described above for the entire organization to help different parties to identify and quantify the impact of one risk in one department on another risk in another department or a function area. In addition, the RMO working with the functional management teams will identify and validate a risk appetite factor to be applied to risk dialog and communicate with function units of the organization.RMO will replace the currently established executive risk committee in some organizations. Some advantages of RMO over the executive risk committee that it will continuously link internal audit, corporate work plan, budgeting (prioritization), and process management. In such a setting, the program established by the RMO will move the function of the executive risk committee from a concept of project and oversight to operational and ongoing functions. This perspective raises risk management structure from a decentralized business unit or functional area responsibility in an ad-hoc basis to an influential role in shaping organizational-wide risk strategies and policies in a shared governance structure.

In addition to a well-built governance system, the proposed Risk Management Office (RMO) should include the following activities: develop policies, procedures, standards and guidelines related to risk management

functions; adopt a common risk management methodology; guarantee exposure identification and analysis mechanisms, document the BPC-RMS system, instigate a formal and standardized incident reporting process, implement a prevention program, implement an emergency response program, prepare/submit a risk management plan, develop an incident follow-up process, a tracking/trending process, review risks and issues, review processes and risk registers, ensure continuous risk reviews to perform a quality assurance role of the risk management system, and staff training/education. Successful Risk Management Office programs will require consistent and detailed processes.

To describe how the RMO program works and for the purpose of this study we will use two main classifications of risks: internal and external. For the external risk we will adopt the PESTLE model (Orange Book, 2004) and for the internal risk we will use what we call the SOFIC model. We now briefly indicate our reasons for this.

Knowing risk categories can provide a structure for organizations to conduct risk assessment by identifying risk and communicating risk information. In addition, classifying risks can help in formulating a risk management plan. Such classification is not meant to establish a hard and fast rule between different types of risks since many risks fall into different categories and one risk in one category may very well have an impact on another risk from another risk category. For instance, a change in foreign exchange rates might have impact on organization's strategy since it may hinder the company's ability to sell internationally.

PESTLE (Political, Economic, Social, Technological, Legal, and Environmental) is well known and is used to analyze change drivers in the external environment. Variants include, for example, Ethics, Education and Demographic factors, which are more organization-specific but would be accommodated as appropriate in our approach. For internal risks, various classifications also exist, of which Strategic, Operational and Financial are central to all enterprises. Factors such as governance, safety and technology may likewise be enterprise-specific and accommodated as required. Whilst various classifications exist, because of increasing general focus on Compliance and the centrality of IT to contemporary organizational activity we add these to the core set used in our illustration. The SOFIC model classifies internal risk categories as: strategic risk, operational risk, financial risk, Information Systems risk, and compliance risk. *Strategic risk* covers the planning, scoping, resourcing and growth of the business; *Operational risk* covers the planning, daily operational activities, product defects, inventory obsolesces, resources (including people) and support required within the a business that results in the successful development and delivery of products/services; *Financial risk* covers cash flow (reduction in income and investment), budgetary requirements (budget overruns), tax obligations, creditor and debtor management, value of tenders and contracts, capital costs change, exchange rate changes, inflation, covenant violation, default on debt, remuneration and other general account management concerns; *Information systems risk* covers the design, implementation, management, maintenance and upgrades associated with technology, recognizing critical IT infrastructure and loss of a particular service/function for an extended period of time, cost benefit associated with technology as part of a business development strategy, and the comparative effectiveness of business processes reliant on designed combinations of people, ICT and enterprise procedures. Finally, *compliance risk* covers legislation, regulations, standards, codes of practice and contractual requirements. Reputation risk is very important and it is included in all the above mentioned risk

categories since if one of the risks become an issue, problem, or crisis it will negatively affect the reputation of the enterprise and public opinion.

To reflect on the "knowledge thinking" and the BPC-RMS system capabilities, the risk Management Office (RMO) approach can best be described through a cog and wheel metaphor, as shown in Figure 3. Rather than the linear process presented in traditional risk models, we propose a holistic program whereby a change in one risk component is supported by other risk components. This approach is reflected in the dialog risk function that we described above. The risk component is integral in ensuring each part of the program interacts appropriately with all other parts of the RMP elements. The ultimate goal is to make the RMO's program a self-improving process that incorporates risk management into the business processes of the organization.

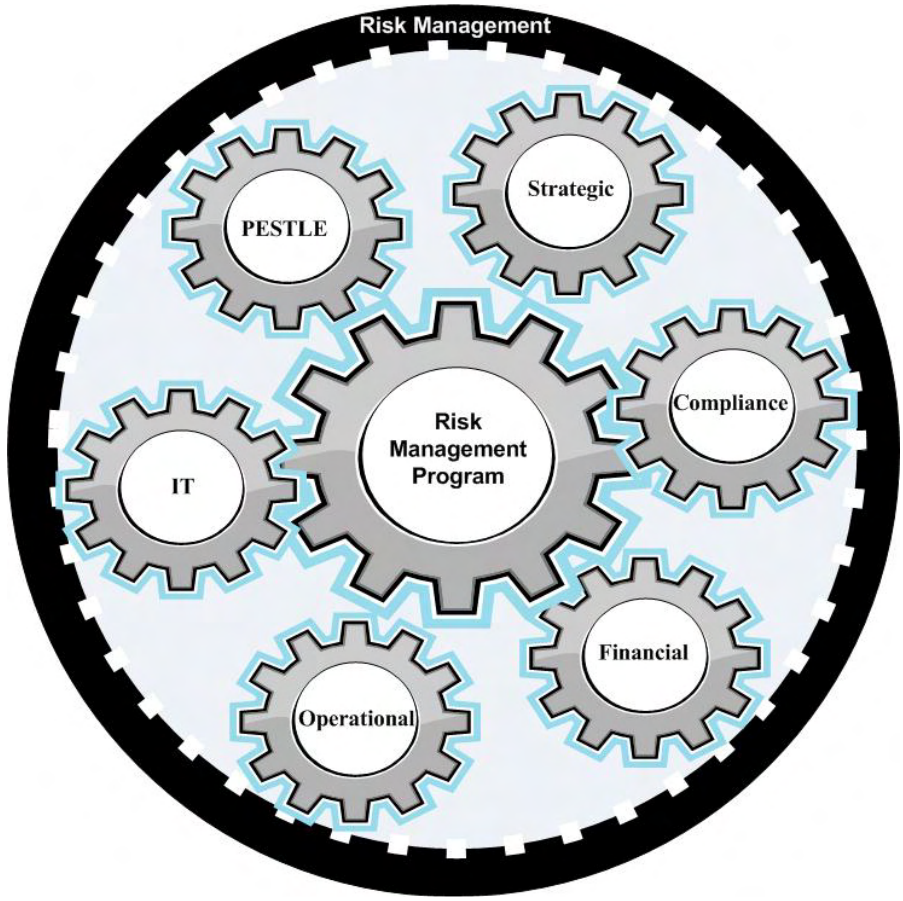

Figure 3: The Risk Management Program Approach

RMP integrates all risk-related activities into a single, comprehensive model that better minimizes risk to an organization, as opposed to the traditional risk model of addressing issues by using a piecemeal approach and making ad hoc decisions.

The RMO will provide assurance to the management team on the effectiveness of risk management within the specific functional area or the firm. Such an office must have the authority working with the risk managers to assign responsibilities to employees and hold them accountable for their actions. As such, the head of the RMO must be a member of the organization's executive team to have such power and to provide risk scrutiny

support to monitor the implementation of the RMO program. In most cases, the head of the RMO will be the Chief Risk Officer (CRO). The RMO will give organizations a visible, repeatable, and consistently applied risk framework and process to support decision making. The RMP approach will give an organization the venue to incorporate all the activities required to assess and control the exposure to any type of risk which may have an impact on the achievement of the organization's business goals and objectives. In addition, the RMO should be aware of the danger of "samethink" and "groupthink" (Janis, 1972) and help organizations to avoid the negative impact of such modes of thinking. Instead, the RMO approach should create a "risk culture" and a "risk knowledge" to avoid these negative modes of thinking.

Our proposed framework requires the establishment of a Risk Management Office as part of the organizational structure and its program should be an integrated part of corporate strategy. The proposed BPC-RMS system is strategically focused and provides the components to be an effective and efficient system for risk management, internal and external auditing, and compliance. The proposed RMO will raise risk management structure from an ad-hoc basis focused on a narrow business unit or functional area responsibility to an influential role in shaping organizational-wide risk strategies and policies in a shared governance structure. By combining BPC-RMS and RMP, they will institute a strong corporate governance to establish an environment for obtaining all risk data from the predefined internal and external resources and by sharing risk knowledge with these trusted resources to assess and control risk associated with their job functions. Such an environment will move focus from "detection after the fact" represented by traditional risk management, to a more preventive identification of fraud and misconduct to meet the organization's goals and objectives.

The six domains and sixteen risk services of the BPC-RMS system will enforce the practice of improving discussions and collaborations between the internal and external stakeholders and help in interchanging risk knowledge in very effective and efficient means. As such and reflecting on the functional emphasis as described above, our framework can be used very effectively for data management, reporting, systems integration, monitoring & tracking, and can be easily integrated into the established financial analysis system that an organization is using. Compiling of risk data and reporting capabilities are provided through the data management capabilities of the BPC-RMS system. Also, the BPC-RMS system integration with other systems within the organization (such as enterprise resource planning) will provide a rich database system that can be used within the structure of the BPC-RMS system to provide background information about the company business. In addition, the alignment of the BPC-RMS with the RMO will give more control on the selection, adoption, and the management of the ERM software packages. Such alignment will give stakeholders very effective monitoring & tracking mechanisms through its powerful risk services and will create a risk culture and focus on strategic sources of risks.

EVALUATION

We developed a questionnaire to assess the practicality of our framework. In order to assess the necessary insight in the practicality of our framework, we developed and administered a survey to risk management practitioners who are members of the ISACA organization in the United Arab Emirates in addition to many executives in the public sector. A total of 67 useable responses were received. Figure 4 presents the industry distribution of the survey respondents. The banking / finance sector represents the largest group followed by

Table 2: Establishing a Risk Management Office (RMO) will help your organization to:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
establish a framework for consistently managing risks through a standard methodology	40.32%	43.55%	12.9%	1.61%	1.61%
define clear lines of responsibility while coordinating people, processes, and tools with one another	40%	41.67%	16.67%	1.67%	0%
avoid both gaps and overlaps between risks and reduce or eliminate duplication of effort	37.29%	50.85%	11.86%	0%	0%
provide better communication	34.48%	56.9%	8.62%	0%	0%
reduce risk management cost	18.18%	41.82%	32.73%	5.45%	1.82%
improve resource management	18.97%	53.45%	24.14%	3.45%	0%
have more accountability	32.14%	53.57%	14.29%	0%	0%
better managing the mitigation strategies	29.09%	56.36%	12.73%	0%	1.82%
have less overhead associated with risk management	12.5%	41.07%	35.71%	8.93%	1.79%
have a common risk repository (database)	37.93%	44.83%	15.52%	0%	1.72%
integrate the risk repository in the business processes of the enterprise	37.93%	44.83%	15.52%	1.72%	0%
maximize risk management efficiency.	42.86%	41.07%	16.07%	0%	0%

The modal response in all cases was to agree or strongly agree and these answers together comprised the vast majority of responses. Thus across a broad range of risk management responsibilities therewas consensus among the professional participants about the importance of establishing risk management office since it will bring a significant value to the enterprise, define clear lines of responsibility, more accountability, avoid both gabs and overlaps between risks, provide better communication, provide significant integration across the functional areas of the enterprise and maximize risk management efficiency.

IMPACT ON PRACTICE AND FURTHER AREAS OF RESEARCH

In the relevance cycle in design science, evaluation considers the designed arte fact against the “utility it contributes to its environment”, but for full scientific status evaluation must go further. (Venable et al., 2014). Whilst our initial evaluation suggests that our proposed approach will help in overcoming the challenges and the limitations that practitioners have had in applying the traditional or the enterprise risk management approaches, a fuller reckoning can only occur by longer term assessment of its value in actual practice which is not a matter for controlled experiment. Although an innovative design may be an improvement and evaluated as such to confirm practical relevance, design science as *research* is fulfilled by the “rigour cycle”, which considers its general contribution to the knowledge base. As per the analysis discussed earlier in this paper, it is clear that the current practices of risk management lack specific features that our holistic approach addresses. These include setting a consistent level of risk appetite which gives a reliable value across interacting risks, making provision for an enterprise wide view not available to siloed approaches, ensuring a repository for risk knowledge is maintained and current and which allows an enterprise wide risk knowledge sharing culture to evolve, ensuring comprehensive oversight of internal and external risks by an organization-specific program framed within the categories of best practice. An extension to standard risk calculations has

also been formulated to accommodate risk appetite. These contributions are theoretical, but the framework is specified to be practicable.

The proposed framework and solutions is expected to increase the confidence of management in the way functional teams are cooperating when it comes to dealing with risk and will help in increasing the capacity to analyzeinteracting risks in a dialog setting, a potentially measureable indicator. In turn creating risk knowledge and fostering risk-aware culture will increase the success factors of mitigating and responding to all levels of risks. As such, the proposed framework and solutions will have a crucial effect on practice, again a measureable outcome.

As noted, the proposed frame work remains a theoretical contribution, and has not yet been implemented in real world applications. It presents a conceptual framework based on a design science approach but does not include a fuller empirical validation of the framework. Future research should endeavor to validate the framework developed in this study. Another area for research is to develop business process controls for the ABC-PDMS. Such controls will provide assurance about the quality of the data collection process and the accuracy process. Control systems enable management to meet this responsibility.

Further work should attempt to show how integration methods of risk into the business processes used in this study is appropriate across all business processes. One area for research is to develop business process controls for the BPC-RMS. Such controls will provide assurance about the interactions of internal and external entities and the flow of data and information between the domains' components of the BPC-RMS system. Control systems enable management to meet this responsibility. In addition, the rules and responsibilities of the chief risk officer (CRO) should be defined within the framework of the RMO program. Such values will enhance the function of the CRO and provide more power to deal with the board of directors (trustees) and the risk managers within the function areas. Moreover, the newly proposed risk dialog score formula will give meaningful explanation to the values of the integration of risk management and demonstrate the power of opening a formal dialog between all risk managers from all function areas. Such formal dialog will help in providing a detail-oriented approach in which the smaller risks will be treated from analysis point of view equally with more serious risks.

CONCLUSION

The development of enterprise risk management frameworks is an ongoing effort by various organizations and it has an influential role in shaping organizational-wide risk strategies and policies in a shared governance structure. This paper has addressed a number of issues related to the current implementations of enterprise risk management. By using the sciences of design methodology, we have proposed an integration of risk data into the business processes of the enterprise.

The implementation of a well-defined integrated risk management will improve the enterprise business performance and will enhance the value for shareholder by identifying, analyzing, prioritizing, monitoring and controlling all risks across all functional areas that can prevent the enterprise from achieving its set of goals and objectives.

We believe that risk management must be fully integrated with the business processes of the enterprise and be communicated in an effective and efficient manner. We proposed a multidimensional holistic approach which consists of three dimensions: BPC-RMS system, Risk Dialog Matrix, and a centrally led risk management program. In the traditional approaches to risk management, risks are ranked and prioritized as part of risk handling based on the likelihood and the business impact of each risk. The proposed matrix recognizes risk interactions and avoids anomalous values due to linear calculations. The RMP dimension of our approach provides necessary decision support system tools and supports an enterprise-wide approach to ensure an organization's mission is sustained. Whereas Williamson (2007) argued that COSO's command and control approach ignores shared management of uncertainties and social implications of ERM, the risk knowledge and the shared management of risks through RMP is an essential part of our proposal. The holistic approach provides a one-stop view of all risk statuses, develops and deploys a common risk management methodology, accelerates adoption of risk management through training and coaching, and provides systems to integrate risks. This approach to risk management supports the organization's mission by ensuring that no risk activities are stove piped. This paper is one of very first to apply the sciences of design methodology with its three cycles to risk management research and has aimed to provide both a theoretical and a practical contribution. It is hoped this will be of value in the continuing challenge of managing risk.

REFERENCES

Alhawari, S., Karadsheh, L., Talet, A.N., Mansour, E. (2012). Knowledge-Based Risk Management framework for Information Technology project, International Journal of Information Management, 32, (1), pp50-65

Alexander, C., Sheedy, E. (2005). The Professional Risk Managers' Handbook: A Comprehensive Guide to Current Theory and Best Practices. Wilmington, DE, USA: PRMIA Publications; 2005.

Aon Global Risk Consulting (Aon), (2009). "Enterprise Risk Management: S&P Enhancement White Paper. Learn how incorporating a strategic, enterprise-wide approach to risk can enhance your company's credit rating." August 2009.

Ardimento, P. Nicola Boffoli, Danilo Caivano and Marta Cimitile (2011). Towards Knowledge Based Risk Management Approach in Software Projects, Risk Management Trends, Prof. Giancarlo Nota (Ed.), ISBN: 978-953-307-314-9, InTech, DOI: 10.5772/16377. Available from: http://www.intechopen.com/books/risk-management-trends/towards-knowledge-based-risk-management-approach-in-software-projects

Arrow, J. (2008). Knowledge-Based Proactive Project Risk Management. AACE International Transactions (2008): RI11-RI19

Baxter, R., J. C. Bedard, R. Hoitash, and A. Yezegel. 2013. Enterprise Risk Management Program Quality: Determinants, Value Relevance, and the Financial Crisis. Contemporary Accounting Research 30 (4): 1264-1295.

Bofah, K. (n.d.) Portfolio theory explained. eHow. Retrieved on 12/12/11 from http://www.ehow.com/about_5436842_portfolio-theory-explained.html

CFO (2014). The Perils of Silos in Risk Managementhttp://ww2.cfo.com/accounting-tax/2014/05/the-perils-of-silos-in-risk-management/

CGMA (2015). “Global State of Enterprise Risk Oversight 2nd Edition: Analysisof the Challenges and Opportunities for Improvement.” Retrieved from https://www.cgma.org/Resources/Reports/DownloadableDocuments/2015-06-13-The-global-state-of-enterprise-risk-oversight-report.pdf

Committee Of Sponsoring Organizations of the Treadway Commission (COSO) (2004). “Enterprise Risk Management – Integrated Framework – Executive Summary.” September 2004.

DACS Gold Practice (2004). Document Series GP 12 V 1.0 Formal Risk Management (2004).

Del Bel Belluz D (2010).Announcing the Definitive Risk Management Guidance. Risk Wise E-Zinehttp://riskwise.ca/~riskwise/images/stories/printable/Risk_Management_Made_Simple_E-zine_-_June_2010_Issue.pdf

Del Bel Belluz D (2012).http://www.riskmanagementmonitor.com/the-key-to-an-effective-erm-program/bizculture/

The Economist Intelligence Unit, (2007).Best practice in risk management. A function comes of agehttps://www.kpmg.com/CN/en/IssuesAndInsights/ArticlesPublications/Documents/best-practice-rm-EIU-0703.pdf

Farrell, M. & Gallagher, R. (2014). The Valuation Implications of Enterprise Risk Management Maturity. Journal of Risk and InsuranceVolume 82, Issue 3, Version of Record online: 10 MAR 2014

Fraser, J. and Simkins, B. J. (2009). Who Reads What Most Often?: A Survey of Enterprise Risk Management Literature Read by Risk Executives, in Enterprise Risk Management, John Wiley & Sons, Inc., Hoboken, NJ, USA. doi: 10.1002/9781118267080.ch22

Gammack JG (1991).Simulating a risk assessor’s knowledge for automated decision support In: Shangxu Hu and Shaozhong Jiang (Eds) Information and Systems International Academic Publishers Beijing Vol II p653-657

Gates, S., Nicolas, J.L., WalkerP.L. (2012). Enterprise risk management: A process for enhanced management and improved performance. Management Accounting Quarterly, 13 (3) (2012), pp. 28–38

Harner, Michelle M. (2010). "Barriers to Effective Risk Management," Seton Hall Law Review: Vol. 40: Iss. 4, Article 2. Available at: http://scholarship.shu.edu/shlr/vol40/iss4/2

Hevner, A.R., March, S.T., and Park, J. (2004). "Design Research in Information Systems Research," MIS Quarterly (28:1) 2004, pp 75-105.

Holmes, A. (2002), Risk Management, ExpressExec Module 5.1 Finance, Capstone Publishing, 2002

IT Governance Institute (ITGI), (2007). Control Objectives for Information and related Technology (COBIT 4.1)

The Office on Information Technology Services (ITS) (2007). Enterprise Security and Risk Management Office, “Risk Management Guide”, March 09, 2007, Revision 1.7

ISO 31000:2009 Risk Management -- Principles and guidelineshttp://www.iso.org/iso/iso31000

ISO (2009). Guide73 Risk management – vocabulary https://www.iso.org/obp/ui/#iso:std:iso:guide:73:ed-1:v1:en

Janis, Irving L. (1972).Victims of Groupthink. Boston. Houghton Mifflin Company.

Layton, M. and Wagner, S. (2007). "Traditional Risk Management Inadequate To Deal with Today's Threats." March 2007. International Risk Management Institute, Inc. 20 April 2008 <http://www.irmi.com/expert/Articles/2007/Deloitte03.aspx>

Lundquist, A. E. (2014). “Implementing Enterprise Risk Management: Case Studies and Best Practices; CHAPTER 9 Lessons from the Academy ERM Implementation in the University Setting, Western Michigan University”. Wiley.

Lundqvist, S.A. (2014). An exploratory study of enterprise risk management: pillars of ERM. Journal of Accounting, Auditing & Finance, 29(3), 393–429

Marks, N. (2011).10 reasons not to like the COSO ERM framework – a discussion with Grant Purdy https://normanmarks.wordpress.com/2011/02/21/10-reasons-not-to-like-the-coso-erm-framework-%E2%80%93-a-discussion-with-grant-purdy/

Majdalawieh, M. (2014). “An Integrated Approach to Enterprise Risk: Building a Collaborative Risk Strategy Within the Business Processes of the Enterprise,” ISACA Journal, volume 1, 2014.

Mangram, M. E. (2013). “A SIMPLIFIED PERSPECTIVE OF THE MARKOWITZ PORTFOLIO THEORY”. Global Journal of Business Research, Vol 7, Number 1, 2013.

Markowitz, H. M. (1952). Portfolio selection. Journal of Finance, 7(1), 77–91

Massingham, P. (2010).Knowledge risk management: a framework Journal of Knowledge Management 14:3, 464-485

McClure, B. (2010). Modern portfolio theory: Why it’s still hip. Investopedia. Retrieved on 12/10/11 from http://www.investopedia.com/articles/06/MPT.asp#axzz1g3JQY7nY.

McKinsey (2013).McKinsey Working Papers on Risk, No. 43Getting to ERM: A road map for banks and other financial institutionshttp://www.mckinsey.com/~/media/McKinsey/dotcom/client_service/Risk/Working%20papers/43_Getting_to_ERM.ashx

McShane, M.K., Nair A., Rustambekov E. (2011). Does Enterprise Risk ManagementIncrease Firm Value, Journal of Accounting, Auditing and Finance, 26(4): 641-658.

Mikes A., Kaplan S.R. (2014) Towards a Contingency Theory of Enterprise RiskManagement. Working Paper. Harvard Business School.January 13, 2014

The Orange Book 2004. “Management of Risk - Principles and Concepts” http://www.hm-treasury.gov.uk/d/orange_book.pdf, October 2004

Pagach, D, Warr, R. (2010). The Effects of Enterprise Risk Management on FirmPerformance. Working paper 27695, Jenkins Graduate School of Management, NorthCarolina State University. April 10, 2010.

Papadaki, K. and Despina,P. (2008). “Collaboration and Knowledge Sharing Platform for supporting Risk Management Network of Practice” The third International Conference on Internet and Web Application and Services, IEEE, 2008pp. 239-244, doi:10.1109/ICIW.2008.78

Peffers, K., Tuunanen, T., Rothenberger, M. A., and Chatterjee, S. (2008). "A Design Science Research Methodology for Information Systems Research." Journal of Management Information Systems, 24(3), 34

PWC (2015) “Threat smart: Building a cyber resilient financial institution,” PwC FS Viewpoint, January 2015, www.pwc.com/fsi.

Rodriguez, E.& Edwards, J.S. (2014). Knowledge management in support of enterprise risk management International Journal of Knowledge Management, 10(2), 43-61, April-June 2014 43

Shaw, Helen, CFO Magazine, (2006). “The Trouble with COSO: Critics say the Treadway Commission's controls framework is outdated, onerous, and overly complicated. But is there an alternative?” March 15, 2006 http://www.cfo.com/article.cfm/5598405/c_5620756

Stoneburner, G., Goguen, A., &Feringa, A. (2002). Risk Management Guide for Information Technology Systems (NIST Special Publication 800-30). National Institute of Standards and Technology, July 2002.

Talet, A.N.,Alhawari, S. &Karadsheh, L. (2014). The Support of Knowledge Management (KM) Processes to Accomplish Risk Identification (RI) in Jordanian Telecommunication Sector Arab Gulf Journal of Scientific Research (Impact Factor: 0.05). 03/2014; 32(1):26-40.

Venable, J., Pries-Heje, J. and Baskerville R. (2014). FEDS: a Framework for Evaluation in Design Science ResearchEuropean Journal of Information Systems doi: 10.1057/ejis.2014.36

Williamson, D.(2007). “The COSO ERM framework: a critique from systems theory of management control”, International Journal of Risk Assessment and Management, Volume 7, Number 8 / 2007, Pgs 1089 - 1119

Woodhouse, P.(2008). “Enterprise Risk Management, BADM 458 – IT Governance” <http://citebm.business.uiuc.edu/TWC%20Class/Project_reports_Spring2008/Business%Risk%20Management/PortiaWoodhouse.pdf>

A SURVEY ON WEED DIVERSITY IN COFFEE ESTATES WITH PROLONGED USE OF GLYPHOSATE IN KIAMBU COUNTY, KENYA.

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ABSTRACT

A weeds survey was conducted in ten different coffee estates in the main coffee growing zones within Kiambu County in the central highlands of Kenya covering different elevations and agro ecological zones of UM1, UM2 and UM3. These estates are characterized by prolonged use of glyphosate for weed control. The aim was to identify the most common and prevalent weeds associated with coffee during the months of November and December 2014. Fields surveyed were done according to the quantitative survey method by using 1.0 m x 1.0 m size quadrat with ten (10) farms representing ten sampling sites. Out of seventy-eight farms, fourty eight farms were established be managed under a routine weed management program. Weeds present in each field were identified and counted by species. The data was used to calculate the frequency, field uniformity, density and relative abundance values for each species. Tables were used to summarise the classifications and quantitative calculations. A total of 47 different weed species including 31 annuals and 16 perennials which comprised of 39 broadleaved weeds 7 grasses and 1 sedge were established. On the basis of relative abundance, the most prevalent and abundant weed species was selected to thereafter determine the tolerance to glyphosate herbicide. Bidens pilosa L (black jack) was found to be the most abundant weed species. Based on relative abundance, the results indicated that annuals were more dominant than perennials. Regular survey is needed to identify possible problematic weeds and weed population shifts to direct research and improve control measures.

Key words: survey, weed diversity, glyphosate, coffee. Kiambu, Kenya.

INTRODUCTION

Coffee is one of the most important cash crops in Kenya and the second most traded produce in Kenya. Kiambu area under coffee covers an area of 12,814 Ha under estates. Coffee is Kenya's fourth leading foreign exchange earner with horticulture leading followed by tourism and tea. Kenya is the leading producer of Arabica coffee in Africa**.** Weeds in coffee have been reported to reduce yields by over 50% (Nyabundi *et al*, 1998). The use of non-selective herbicides has resulted to bare lands which become a principle avenue for soil erosion as well as a landing ground for new weeds species which establish and may re-establish thus becoming common weeds. This subsequently antagonizes the flora and fauna balances in the environment. Increased cost of production has been a principle item in coffee production caused by weed species dominant and prevalent in areas where they are common, where otherwise were previously efficiently and effectively managed. Costs associated with weed control in coffee and the losses caused by weeds vary from one location to another, depending on the predominant weed flora, the timing on weed control interventions especially necessitated by prior application of ground fertilizers and on the control methods practiced by farmers during the wet seasons. Agronomic costs and concerns accrued due to weed competition are significant and these vary with the rainfall levels, emergent of persistent and difficult to control weed species or populations as well as across the Agro-ecological zones such as UM1, UM2 and UM3 coffee growing zones.

The drier UM3 has fewer concerns as compared to the wetter zones of UM2 into UM1. The fact that the common weeds in coffee are shallow rooted than the main root zone of coffee makes planning for ground fertilizer application a nightmare. There is occasional overhead irrigation that occurs in these estate farms during extensive dry spells and this promotes weeds establishment and related concerns to the growers. Uddin *et al*, 2010 observed that surveys are commonly used to characterize weed populations in cropping systems. Weed succession and distribution patterns in coffee fields are dynamic in nature. The main factors for which crops and weeds compete are light, water and nutrients. Weeds as any other plant normally absorb added nutrients as much and more rapidly than crops and also competing for nutrients, light, space and moisture throughout the growing season (Hussain *et al*., 2008 and Uddin *et al*., 2010 observed that the composition of the weed flora may differ depending on location.

Information on the up todate presence, composition, abundance, importance and ranking of weed species is needed to formulate appropriate weed management strategies. The distribution and nature of the weeds in coffee estates area could be different due to the different agronomic practices employed and the altitudes across the main coffee growing areas. Specific sound knowledge on the nature and extent of infestation of weed flora in the coffee growing area through weed surveys is essential for planning of their control and a precursor to formulate recommendations on the standard practices as well as appropriate herbicides doses under ideal management. However, detailed information on the presence, composition, abundance, importance and ranking of weed species especially in main coffee growing areas in Kenya is lacking. Therefore, the present study was undertaken to investigate the distribution and severity of weed flora prevailing in the large estate coffee growing area of Kiambu County in Kenya.

MATERIALS AND METHODS

The survey was conducted in some selected coffee farms in Kiambu County, Kenya (Table 1) to identify and evaluate the major weed species during the period of 25th November to 5th December 2014. Ten coffee fields were surveyed covering each block ranging from 1-2 Ha representing the sampling area. To achieve the 75% target of farms to be surveyed, the farms were listed alphabetically and every 4th farm was picked for the exercise. In cases where the 4th entry was not accessible for the survey, the following farm was picked to achieve the sampling interval. A questionnaire was also used to collect information weed management from every farm. Mapping (each survey location) was determined by posing (standing stationary) at a convenient point within the sampling area for one minute to allow for full searching stability of the positioning gadget to give the GIS value of each area that was then recorded and tabulated (Table 1) by use of a Global Positioning Satellite (GPS) tool (Model:(GARMIN GPS Maps 62S).

Table 1. Elevation and GIS values of the surveyed area.

Site	Altitude (MASL)	GIS values
Ibonia Estate	1,717	S 01° 10.901' & E 036° 49.170'
Cianda Estate	1,880	S 01° 08.211' & E 036° 46.652'
Gatatha Estate	1,926	S 01° 07.687' & E 036° 45.639'
Nyala Estate	1,640	S 01° 08.069' & E 036° 52.049'
Kays Estate	1,411	S 01° 05.573' & E 036° 54.261'
Karunguru Estate	1,477	S 01° 03.807' & E 036° 57.644'
Benvar Estate	1,536	S 01° 03.306' & E 037° 00.906'
Mutoma Estate	1,585	S 01° 01.433' & E 036° 58.334'
Bendor Estate	1,553	S 00° 58.150' & E 037° 02.550'
Koorali Estate	1,566	S 00° 59.514' & E 037° 01.189'

DATA COMPUTATION:

Weed frequency (F);

Weed frequency was determined as the percentage of the total number of fields surveyed in which a species occurred in at least one quadrat in the following formulae;

$$F_k = \frac{\sum_{i}^{n} Y_i}{n} \times 100$$

Where; F*k* = frequency value for species k; Yi = presence (1) or absence (0) of species *k* in field *i* and *n* being the number of fields surveyed.

Field uniformity (FU):

The field uniformity was calculated as the percentage of the total number of quadrats sampled in which a species occurred, as below;

$$FU_k = \frac{\sum_{i}^{n} \sum_{i}^{20} Yij}{20 \times n} \times 100$$

Where; *FUk* = field uniformity value for species k, *Yij* = presence (1) or absence (0) of species *k* in quadrat *j* in field *i* and *n* being the number of fields surveyed.

Field density (*D*):

The field density of each species in the field was calculated by summing the number of plants in all the 20 quadrats per site and dividing by their area.

$$D_{ki} = \frac{\sum_{i}^{20} Z_i}{A_i} \times 100$$

Where; *D*ki = density (in numbers m^2) value of species *k* in field i, *Z*i = number of plants of a species in quadrat j and *Ai* being the area in m^2 of 20 quadrats in field *i*.

Mean field density (MFD).
This value was obtained by totalling each field density (D) and dividing by the total number of fields. MFD is the mean number of plants per m^2 for each species averaged over all fields sampled and it was determined as below;

$$\mathbf{MFD}k = \frac{\sum_{i}^{n} \mathbf{D}Ki}{\mathbf{n}}$$

Where MFD*k* = mean field density of species k, D*ki* = density (in numbers m^{-2}) of species k in field *i* and *n* being the number of fields surveyed.

Dominance (D) is the measure of mean field density of species k (MFD_k) expressed as a percentage of the total mean field density of all weed species (MFD_l) and was established as;

$$\mathbf{D} = (\mathbf{MFD}k) / \sum \mathbf{MFD}l) \times 100$$

Relative abundance (RA):
This value was used to rank the weed species in the survey and it was assumed that the frequency, field uniformity, and mean field density measures were of equal importance in describing the relative importance of a weed species. This value has no units but the value for one species in comparison to another indicates the relative abundance of the species (Thomas and Wise, 1987). Relative abundance values quantify the predominance of a given weed species in an environment by calculating the frequency, field uniformity, and density of a particular weed species relative to all other species observed. This value is an index that is calculated using a combination of frequency, field uniformity, and field density for each species, as described by Thomas (1985). Relative abundance allows for comparison of the overall abundance of one weed species versus another.

The relative frequency (***RF***), relative field uniformity (***RFU***)**,** and relative mean field density (***RMFD***) shall be calculated by dividing the given parameter by the sum of the values for that parameter for all species and multiplying by 100 as illustrated below.

The relative frequency for species k (RFk) as;

$$\mathbf{RF}k = \frac{\text{Frequency value of species}}{\text{Sum of frequency values for all species}} \times 100$$

Relative field uniformity for species k (RFU*k*)as;

$$\mathbf{RFU}k = \frac{\text{Field uniformity value for species K}}{\text{Sum of field uniformity values for all species}} \times 100$$

Relative mean field density for species k (RFU*k*)as;

$$\mathbf{RMFD}k = \frac{\text{Mean field density value for species K}}{\text{Sum of mean field density values for all species}} \times 100$$

The relative abundance of species *k* (RA*k*) was calculated as the sum of relative frequency, relative field uniformity, and relative mean field density for that species as;

$$\mathbf{RA}k = \mathbf{RF}k + \mathbf{RFU}k + \mathbf{RMFD}k$$

RESULTS:

Weed species taxonomy:

Generally, the weed vegetation of a particular area is determined not only by the environment but also by edaphic and biological factors that include soil structure, pH, nutrients and moisture status, associated crops, weed control measures and field history especially in local geographical variation (Hakim, *et al*, 2010). A total of 47 different weed species including 31 annuals and 16 perennials which comprised of 39 broadleaved weeds 7 grasses and 1 sedge (Representing by 83%, 15% and 2% respectively, by habitat) were identified in coffee farms of Kiambu County (Table 2). The annual species were greater in number than perennial species and overall annual broadleaved species were more prevalent than perennial broadleaved species and grasses.

The weed species represented 19 families in the surveyed area where Asteraceae family had the highest number of weed species (12), followed by Poaceae (7), Solanaceae (4), Fabaceae (3), Convolvulaceae (3), Acanthaceae (3), Oxalidaceae (2), Malvaceae (2). The rest of the 11 families were represented by one species each. Asteraceae and Poaceae and Solanaceae families accounted together for 50% of the species established. Based on percentages, represented families were at; Asteraceae (26%), Poaceae (15%), Solanaceae (9%), Cyperaceae (7%), Acanthaceae (6%), Convolvulaceae (6%), Fabaceae (6%) Malvaceae (4%) Oxalidaceae

(4%) Amaranthaceae (2%), Brassicaceae (2%), Chenopodaceae (2%), Commelinaceae (2%), Cucurbitaceae (2%), Cyperaceae (2%), Euphorbiaceae (2%), Portulacaceae (2%), Rubiaceae (2%) and Zygophyllaceae at 2%.

Species frequency (F):

The frequency values and in a descending order established that the top ten weed species were, black jack, double thorn, wandering jew, asthma weed, purslane, pig weed, horse weed, love grass, star grass and finger grass with a frequency value equal to or greater than 42.5%. Black jack was found to have the highest relative abundance (RA) value of 46.69%, the highest frequency (F) value of 89.00%, frequency uniformity (79.21%), relative frequency (RF) of 8.69% as well as the highest relative field uniformity (RFU) value of 16.92% (Table 3). Nine (9) broadleaved weeds and three grass weeds species topped in the cluster of weeds whose frequency (F) value was ≥ 40%. Black jack topped overall in frequency (F) value at 89% followed by double thorn, asthma weed, wandering jew, purslane, pig weed, horse weed, love grass, star grass, finger grass, gallant soldier & common groundsel with 79.5%, 65.5%, 65.00%, 58.00%, 52.50%, 50.00%, 45.50%, 45.00%, 42.50%, 41.00% & 40.00% in descending order respectively in the top 11 species. The rest of the broadleaved and grass weed species had a frequency value ranging between 1% and 40% (Table 3).

Field uniformity (FU):

In a similar descending order of field uniformity values, the same seven (7) broadleaved and three (3) grass weed species in the top ten weeds species had their frequency uniformity (FU) values being ≥ 18.06% where black jack was leading at 79.21% followed by double thorn (63.20%), wandering jew (42.90%), asthma weed (42.25%), purslane (33.64%), pig weed (27.56%), horse weed (25.00%), love grass (20.70%), star grass (20.25%) & finger grass at 18.06%. The other thirty-two (32) broadleaved species had their frequency uniformity values being ≤ 16.81% with the least being wild lettuce at (0.01%). Among the grasses, the highest field uniformity was reported in love grass at 20.70%, followed by star grass at 20.25% and finger grass at 18.06%. The lowest field uniformity in grass weed species was found to be in foxtail at 0.06 % (Table 3).

Table II. Weed species observed in the survey of large scale coffee farms in Kiambu County in Kenya.

Family	Common Name	Scientific Name	Life Cycle	Morphology
Acanthaceae	Climbing asystasia	*Asystasia schimperi* L.	A	Broadleaf
	Water willow	*Justicia Calyculata* (Deflers) T. Anders	P	Broadleaf
	Jacobinia	*Justicia elliotii* S. Moore	P	Broadleaf
Amaranthaceae	Pig weed	*Amaranthus graecizans* L.	A	Broadleaf
Asteraceae	Black jack	*Bidens pilosa* L.	A	Broadleaf
	Gallant soldier	*Galinsoga parviflora* Cav.	A	Broadleaf
	Horse weed	*Conyza floribunda* H.B.& K.	A	Broadleaf
	Common groundsel	*Senecio vulgaris* L.	A	Broadleaf
	Goat weed	*Ageratum conyzoides* L.	A	Broadleaf
	Parthenium weed	*Parthenium hysterophorus* L.	A	Broadleaf
	May weed	*Matricaria spp*	A	Broadleaf
	Sow thistle	*Sonchus oleraceus* L.	A	Broadleaf

Jacobinia	2.50	0.06	0.24	0.01	0.80	0.04	0.29
Kenya clover	2.00	0.04	0.20	0.01	4.20	0.19	0.40
Egyptian mallow	2.00	0.04	0.20	0.01	1.00	0.05	0.25
Climbing asystasia	2.00	0.04	0.20	0.01	2.00	0.09	0.30
Wild lettuce	1.00	0.01	0.10	0.00	0.40	0.02	0.12

Mean Field density (MFD): Black jack was at the top of the analysis list with a mean field density (MFD) value of 462 plants per m² followed by double thorn (259.60), asthma weed (157.80), pig weed (132.20), wandering jew (132), star grass (112) and gallant soldier (106.8) in the top seven (7) weed species. All the other 40 weed species had their mean field densities below 100 plants per m² with the lowest being the wild lettuce at 0.4 plants per m² (Table 3).

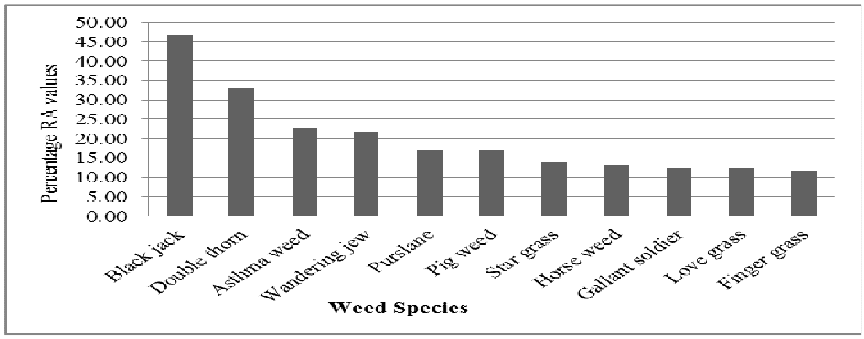

Figure 2. Relative abundance levels of the 11 most prevalent weed species established in the survey.

Relative abundance (RA):

Black jack had a relative abundance (RA) value of 46.69% and was thus significantly outstanding among the forty-seven weed species identified in the surveyed. It topped both as a broadleaf weed species as well as in the overall top eleven (11) weeds species that were established to have a relative abundance (RA) value ≥ 11.66%. In descending order, black jack was followed by double thorn (33.11%), asthma weed (22.57%), wandering jew (21.58%), purslane (17.09%), pig weed (17.05%), star grass (13.83%), horse weed (13.11%), gallant soldier (12.47%), love grass (12.45%) & finger grass at 11.66%. All the other 36 weed species had their relative abundance values being > 11.66% where the wild lettuce was found to have the lowest relative abundance of 0.12% (Table 3).

DISCUSSION:

In this study, most of the abundant weed species were annual and broadleaved in nature. The methodology used highly borrowed from the description by Kuchler and Zonneveld (1988) on the forms of field surveys being; exploratory survey, reconnaissance survey, extensive and intensive types of surveys which allowed for the linear technique used in this survey. The observations made in this survey reflected the usefulness for determining the occurrence and relative importance of the established weed species in large scale coffee production defined as a cropping system (Thomas in 1985, McCully *et al*., 1991 and Frick & Thomas 1992). The rankings of these weed species differed on the list based on their frequency (F), field uniformity (FU) and

mean field density (MFD). Within the weed type, the higher RA value reflected its respective higher values of frequency (F), field uniformity (FU) and means field density (MFD) (Table 3).

Bidens pilosa L. was found to be the most prevalent weed species with a relative abundance value of 46.69% followed by double thorn *(*33.11%), asthma weed (22.57%), wandering jew (21.58%), and purslane (17.09%) in the top five species whose relative abundance values were ≥ 17.09%. The same weed species had in the same order leading in their frequency values of 89, 79.5, 65.5, 65 and 58% respectively. Cardina *et al.* in 1999 made related weed species compositions findings and their observations were based on an agricultural land where compatible techniques were employed in managing weeds.

In related studies done by Kimemia *et al.* in 1998 on different weed control methods in coffee in Kenya, the observations indicated that *Cynodon dactylon* was the most common grass species while *Bidens pilosa* and *Galinsoga parviflora* were the most abundant broad leaved weed species where *Tagetes minuta* recorded zero dominance. It was also noted that the broadleaved weeds were more in number of species as compared to the rest of the weed species. These findings compare closely with the observations made by Thomas (1985) who observed that in weeds survey, the relative abundance value clearly indicates very few dominated weed species in a given cropping environment. Similarly, Moody and Drost (1983) observed that the dominant weed flora in any crop field is usually about ten (10) species of which the dominant species are rarely more than three (3) to four (4). These observations closely related in the survey findings on the relative abundance values as tabulated in table 3.

CONCLUSION:

In this study, most of the abundant weeds species were annual and broadleaved in nature. The ranking of weed species differed on the list based on frequency (F), field uniformity (FU) and mean field density (MFD) but, within the weed type, the higher RA value reflects its respective higher values of frequency (F), field uniformity (FU) and means field density (MFD). No grass species or sedge was found to have >53% frequency value. However, the top 12-14 weed species significantly indicated a range for their frequencies, uniformities, their related means and their relative abundance values (Table 3). *C. rotundus,* the only sedge established by the studies was ranked 13th overall in the 47 species with a RA value at 9.42%.

The results of the survey provide a quantitative comparison of the common weed species in large scale coffee growing estates in Kiambu County in Kenya. These estates have had a common history of prolonged use of glyphosate for weed control. Is it possible then that *Bidens pilosa* L has developed tolerance/resistance to glyphosate? On the basis of relative abundance, the most prevalent weed species (*Bidens pilosa* L) was selected to determine the lowest doze at which the weed is susceptible to glyphosate in a subsequent dose response study.

RECOMMENDATION:

Overall, more survey work is needed on a regular basis to establish a coffee weed log for the area and identify possible problematic weeds and weed population shifts and thus direct research towards new or improved control measures.

ACKNOWLEDGEMENT:

The author would like to acknowledge the input, support and guidance accorded by the project study supervisors, the botany department of the University of Nairobi, all the farm managers and management staff of the surveyed farms, the coffee research foundation (Kenya), the survey biometricians, the librarians at the museums of Kenya and botany departments (University of Nairobi).

REFERENCES:

Chancellor, R. J. and R. J. Froud-Williams (1982). A survey of grass weeds in central southern England. *Weed Res. 22*: 163-171.

Chancellor, R. J. and R. J. Froud-Williams (1984). A second survey of cereal weeds in central southern England. *Weed Res. 24*: 29-36.

Hakim, M. A., A. S Juraimi, M. R. Ismail, M. M. Hanafi and A. Selamat (2010). Distribution of weed population in the coastal rice growing area of Kehah in Peninsular Malaysia. *J. Agron. 9*: 9-16.

Hakim, M. A.; A. S. Juraimi, M. Razi Ismail1, M. M. Hanafi and A. Selamat (2013). A survey on weed diversity in coastal rice fields of sebarang perak in peninsular Malaysia. *J. Animal and Plant Sci. 23(2)*: **pp:** 534-542.

Hussain, S., M. Ramzan, M. Akhter and M. Aslam (2008). Weed management in direct seeded rice. *The J. Anim. and Plant Sci. 18*: 86-88.

Kuchler, A. W. and I. S. Zonneveld. 1988. (Eds.) *In;* Vegetation Mapping, Handbook of Vegetation Science, Vol. 10. Boston, MA: Kluwer **pp.** 193 – 202.

McCully, K. V., M. G. Sampson, A. K. Watson. 1991. Weed survey of Nova Scotia low bush blueberry (*Vaccinium angustifolium*) fields. *Weed Sci*. **29**: 180-185

Nyabundi K. W. and J. K. Kimemia, 1998. Difficult weeds in Kenya coffee. *Kenya coffee Review*: Vol. 63: 744, **pp** 49.

Thomas, A.G, 1985. Weed survey system used in Saskatchewan for cerealand oilseed crops. *Weed Sci*., *33*: 34–43.

Thomas, A. G. and R. F. Wise, 1987. Weed survey of Saskatchewan for cereal and oilseed crops. *Weed surveys series*. Pub.87-1. Agri. Can. Regina, Saskatchewan. **pp**. 251.

Uddin, M. K., A. S. Juraimi, M. R. Ismail and J. T. Brosnan (2010). Characterizing weed populations in different turf grass sites throughout the klang valley of western peninsular Malaysia. *Weed Technol. 24*:173– 181.

A CRITICAL DISCOURSE ON THE CHALLENGES OF MIGRATION TO DIGITAL TELEVISION BROADCASTING IN NIGERIA

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Abstract

At the Regional Radio communication Conference of ITU which took place in June 2006 in Geneva, Switzerland, participants unanimously endorsed a motion for broadcast stations to migrate from analogue to digital broadcasting with deadlines of June 17, 2015, and June 17, 2020, for countries using frequency bands such as VHF. In a bid to fully comply before the ITU deadlines, Nigeria had set 3 unsuccessful deadlines for herself. It first of all set June 17, 2012, which it failed to actualize. The date was extended to December 31, 2012, without success, while a further extension to January 1, 2015, could not equally herald the intended success. Sequel to these failures, the critical question that demand urgent response is, what are the specific factors that have continued to hinder Nigeria's transition to digital broadcasting? On this premise, the researchers(using the intensive interview research method as well as a review of relevant empirical studies), aim to critically unveil and explicate the various factors impeding the successful migration from analogue to digital television broadcasting in Nigeria, this is with a cardinal intention of advancing well thought-out recommendations that will ensure successful transition.

Keywords:• Television •Digital •Migration •Broadcasting •Critical

1. Introduction

At the Regional Radio communication Conference (RRC-06) of The International Telecommunication Union (ITU) which took place in June 2006 in Geneva, Switzerland, participants unanimously endorsed a motion for broadcast stations to migrate from analogue to digital broadcasting with deadlines of June 17, 2015, and June 17, 2020, for countries using frequency bands such as VHF. "The conference was held to develop digital terrestrial broadcasting plan in the frequency bands III (174-230 MHz) and IV/V (470 –862 MHz) in Region 1countries being Europe, Africa, Middle East and the Islamic Republic of Iran. The RRC- 06 established the Geneva Agreement of 2006 (GE-06) by which countries that are party to this agreement are required to replace the existing analogue television broadcasting under the GE-89 Plan for the same frequency bands on 17 June 2015 when digital broadcasting should be fully implemented (Somaila, 2013).

Within a 10-year window, each country was allowed to choose its own switchover date. Several countries chose one single date for all broadcast operators to switch over to digital broadcasting while others such as the United Kingdom and India chose different dates for different cities and regions within their territories. Buoyed by optimism, stakeholders in the Nigerian broadcast industry adopted June 17, 2012 as the nation's switchover date. This date was approved by the late President UmaruYar'Adua. By the approval, June 17, 2012 became Nigeria's official switchover date. However, few months to the Nigerian deadline, the National Broadcasting Commission (NBC) and the federal government came up with December 31, 2012 as the new switch over date. The reason given by the federal government was that it wanted "everybody to be ready by 2015" (Ocholi, 2009 cited in Ihechu&Uche, 2012, p.38). Unable to still meet this deadline, it was extended to January 1, 2015, which the nation also failed to fully comply with. According to the ITU time table, thestart date for transition from analogue to digital television broadcasting was 17th June, 2006 while the deadline was 17th June, 2015. Some African and Arab countries were granted an extension to protect their analogue stations till 17th June, 2020 only in Band III, that is 174 230 MHz frequency. Since the coming into force of the 2006 agreement, many countries, among them the United States of America and eighteen (18) European countries have completed their switchover to digital television (Somaila 2013). This is a sharp contrast to the Nigerian situation where the switchover has become a herculean task for broadcast stations in the country.

2. Objective of the Study

The study was aimed at unravelling and explicating the challenges impeding the successful migration from analogue to digital television broadcasting in Nigeria.

3. Challenges of Migration to Digital Television Broadcasting in Nigeria

There is no doubt about the fact that the inability of television stations in Nigeria to successfully migrate to digital broadcasting is as a result of several factors. The fundamental question is, what are the challenges to effective migration from analogue to digital television broadcasting in Nigeria? Some of the core challenges are hereunder explicated;

3.1 The challenge of unawareness: This is no doubt a very cardinal factor impeding the successful migration from analogue to digital television broadcasting in Nigeria. It is heart breaking that many Nigerians are not even aware of the switchover. Worse still, some broadcasters are even ignorant of it.

This has slowed down the pace of the switchover in Nigeria. Giving credence to this,Ihechu and Uche, (2012, p.42) asserted that another challenge is the issue of awareness of the audience, government officials and sundry, of the digitization process. Nigeria has a large segment of illiterate population. Most of this population dwell in the rural areas. They do not readily get information concerning the process. Also in the government offices, the awareness is not yet there. These scenarios create a gap between those that are aware of the process and those that are not. In this wise, the digitization process is faced with the challenge of being drawn backwards by people who do not understand the issues and other intricacies of the programme. Njoku (2015) also found in his study that the ignorance level of both the media personnel and audience members alike regarding the migration to digital broadcasting is at a high level thereby affecting the overall effort of migration. Furthermore, indepth interviews conducted with some broadcasters and audience in Northern Nigeria revealed that many of the respondents have never heard of the switchover to digital broadcasting.

3.2 Challenge of unavailable/inadequate digital equipment: The issue of unavailability/inadequate digital equipment is also a core impediment to the successful migration in Nigeria. Many television stations in the country lack the needed digital equipment to make the switchover a reality in their various stations. A visit to some stations in the country showed that analogue broadcast equipment are still very visible in the stations. Accordingly, a qualitative study by Ilesanmi (2015) showed that Ondo State Radio vision Corporation (OSRC) does not have sufficient digital equipment for digital broadcasting. Another study conducted by Oka for (2015) revealed that most television stations in South-East and South-South Nigeria do not have adequate digital broadcast equipment in their stations. More so, interviews with some broadcasters in North-Central Nigeria revealed that many television stations in the geopolitical zone do not have sufficient digital broadcast equipment.

3.3 Challenge of Scarcity of Qualified Manpower: Apart from the challenge of unavailability/inadequate digital broadcast equipment, the inability of many television stations to get the needed manpower to operate digital equipment is a serious challenge to the stations. Many technical staff of the television stations do not possess the requisite technical knowledge to operate crucial digital equipment. Some of them are not well trained to man the equipment for maximal performance. In line with this, Ihechu and Uche, (2012, p.42) stated thus "as the complex and fragile equipment are coming in, there is need for matching manpower. The task of training and retraining personnel to fit into the digital process pose a challenge to the race. The existing broadcast personnel who may likely fit in may not be enough to fill the spaces and as such, pose an initial challenge. However, some of the existing personnel may be adversely affected too. Those who may not be able to understand the flexibility and, or, cope with the fragility of the new technology may be thrown to the labour market."Ogbuoshi and Efetobor (2014) conducted a study entitled "Towards Digitization of Broadcasting in Nigeria: Deadline, Challenges and Realities" with the aim of determining the possibility of Nigeria meeting up with the ITU deadline. The findings revealed that presently, Nigeria is largely unprepared for the digital switchover. In terms of infrastructure, and manpower needed to drive the digitalization process, Nigeria is still miles away from getting close to achieving the ITU's digitalization benchmark. An interview with the general managers of television syations in the South-West geopolitical zone of Nigeria, revealed that

manpower to operate equipment is a challenge to the match towards complying with the ITU mandate of switchover to digital broadcasting in Nigeria.

3.4 Inadequate/Elliptic power supply: This issue of inadequate power supply has continued to bedevil Nigeria unabated. The necessary power supply needed by the televisions to operate relevant digital broadcast equipment is often times inadequate. Stations are left with no choice than to resort to buying fuel and diesel (with limited resources) to power their equipment. This no doubt has affected the effective match towards migration to digital broadcasting. Accordingly, Ihechu and Uche, (2012, p.42) averred that "the power sector in the country is nothing to write home about. The country has spent huge sums of money, though not accountably, to revive the power supply to no avail. Consequently, the sound of generators at every corner of a Nigerian street calls for alarm. But the people have to use these generators to at least, "live life". Also, all the companies in the country – petrol stations, telecom, banks, manufacturers, broadcast organizations, etc – rely on standby generators to carryon their businesses. In the long run, it impacts on the cost of production or service rendering costs. The charges are later transferred to the consumers. It would be apt to point here, that the epileptic power supply and the invariable dependence on generators pose big challenges to the digitization process. It would create high cost of programme production and presentation."Ogbuoshi and Efetobor (2014) in their study also revealed that physical infrastructures like power that are largely unavailable are major threats to the actualization of the digitalization in Nigeria. Interviews with broadcasters in selected states in Nigeria affirmed the fact that lack of adequate supply is a major impediment to the quest for a successful switchover to digital broadcasting.

3.5 The challenge of Poverty: Many broadcast audience in Nigeria reside in the rural areas and are bedeviled with high level of poverty. So affording digital television/the relevant facilities such as set top boxes to access digital contents is a fundamental challenge to them. This obviously affects the way and manner they respond to the digital switchover. This has no doubt affected their compliance to the demands of the switchover. A visit to many homes revealed that the analogue television sets are still much around in their homes without the recommended box to empower the television to receive digital contents. Hassan (2015) found in his study that many broadcast audience in Northern Nigeria lack the needed financial muscle to comply with the move to digital broadcasting. In a related study, Ebimini (2015) found that majority of residents in rural communities in South-South Nigeria cannot afford the digital facilities to enable them watch digital contents from digital television. More so, in depth interviews with some rural dwellers in South-East Nigeria showed that they lack the financial capacity to comply with the digital switchover.

4. Conclusion

From the explication above, it is obvious that Nigeria's inability to fully comply with the ITU demand of digital migration was as a result of a number of factors such as unawareness, scarcity of qualified manpower, poverty, inadequate power supply, and inadequate digital equipment. Until these and other relevant issues are addressed, a successful migration may be unattainable in Nigeria.

5. Recommendations

Sequel to the challenges identified, the following recommendations are advanced

1. A massive awareness campaign should be launched in Nigeria to properly inform the people about the digital switchover. The Nigerian Broadcast Commission should champion the campaign.
2. Television stations in Nigeria should start the process of acquiring relevant and current digital equipment to enable them fully migrate to digital broadcasting.
3. All television stations in Nigeria should as a matter of urgency commence the training and retraining of their staff to herald enhanced skills in the operations of digital equipment.
4. The Nigerian government must as a function of necessity address and restore normalcy in power supply. The government must ensure there is regular power supply in the country. This will enable the broadcast stations to maximally utilize the digital equipment to transmit digital contents to the audience.
5. The Nigerian government and other donor agencies should assist the audience in providing digital facilities either by giving them free of charge or by giving them at a highly subsidized rate. This will enable the people to comply with the demands of the digital switchover.

REFERENCES

Ebimini, G.N. (2015).An evaluation of the compliance to digital switchover among residents of South-South Nigeria.*Journal of Media and Communication*, 2(2), 13-33.

Hassan, I.W. (2015). Compliance to the digital migration among residents of Northern Nigeria.*Journal of Communication Studies*. 3(1), 1-17

Ihechu, I.P., and Uche, U. (2012).The challenges of digitization of broadcasting in Nigeria. *New media and Mass Communication*. 5. Pp.38-44.

Ilesanmi, A.R. (2015). Awareness study of Ondo State Radiovision Corporation (OSRC) compliance to digital broadcasting. A Bachelor of Arts project submitted to the Department of Mass Communication, Adekunle Ajasin University, Akungba Akoko.

Njoku, H.I. (2015). Awareness and compliance to digital broadcasting among residents of South South Nigeria.*Journal of Information and Communication Studies*, 9(2).12-37.

Ogbuoshi, L.I,Efetobor, O.E. (2013). Towards digitization of broadcasting in Nigeria: Deadline, Challenges and Realities. *Journal of Media, Security and Development,* 1(1), 122-134

Okafor, O.M. (2014). An assessment of the digital broadcasting compliance level of television stations in South-East and South-South Geopolitical Zones of Nigeria. *Journal of Policy and Strategic Studies*. 7(1), 1-19.

Samaila, B. (2013). Digitization of Television Broadcasting in Nigeria: A Review. *World Academy of discipline, Engineering and Technology International Journal of Social, Education, Economics and Management Engineering*. 7(10), 1495-1498.

Concentrations of trace elements in human hair as a biomarker expose to environmental contamination

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Abstract:

Scalp hairs have been recognized as a biological tissue indicator for toxic elements in the human body in the last decade. In this work scalp hair samples were collected from workers employed in industry workshops and perfume factory in Omdurman, Sudan considered the expect difficulty of exposure to environmental pollution. The hairs content determination was performed using XRF of Cd^{109} radioactive source to assess toxic elements Ca, Mn, Fe, Cu, Zn, Hg, Pb and Sr. An alternative approach of hair sample treatment was implemented with grinding in liquid nitrogen at a temperature of $77^{o}K$ to form a dry weight samples in fine powder mode. In a comprehensive assessment of the results are compared with the IAEA and several countries. The data used variable contributions, factor analysis, t-test values and correlation for method validation that shows the elements Ca, Fe and Sr on optimal levels of hairs workers in workshops, and element Ca, Cu and Zn in perfume factory hairs employers within the range of international reference material. Average elements concentrations of 42 hair samples of the employers indicate the Ca, Sr, Cu and Zn are approved fairly on optimum standards hairs references materials in the literature. However, the high levels of Mn, Cu, Zn, and Pb in workshops for employers and the increasing levels of Fe, Hg and Pb in perfume factory workers are possible to be exposed to environmental pollutants.

Keywords: XRF, Employers, Scalps hairs, toxic elements, Environmental pollution.

1. Introduction:

Hair is extra product of human tissue that reflects elements of metabolism in the body and became a subject of interest to environmental and biomedical sciences. Thus, element concentrations in hair are infection of the levels in other tissues. Moreover, the elements in hair can be absorbed from the environment over historical time, which reflects the impact of accumulation of the trace elements in the body (1). The levels of elements in human hair are important implications serve as a useful adjunct biochemical indices for assessing elements the burden in human body(2). Hence, trace element concentrations in scalp hair are affected by various factors such as environmental exposure, foods, gender and geographical location. The determination of impact of substances in blood and urine, hair and other specimens in people relative to exposure to environmental contamination is known as human biomonitoring. Human biomonitoring is defined as the approach to measure the chemical substances or their metabolites in biological tissues and identify the relation between element exposure to contamination sources and disease (3). The biomontering of hair assessment has the advantage of detecting element variation represents the long-term historical exposure trend and recent exposure of the individual when are compared to urine and blood engaged to observe the current element status of the human body. Hair is widely accepted for many advantages to evaluate the relation between essential elements in body burden and disease (4). Moreover, the elements concentrations are at higher levels in hair, so that accurate results of analysis can be obtained (4).

Scalp hair is one of the easier samples to be collected at low cost, which facilitates the storage and transport processes that offer several advantages for analysis including matrix stability in the human body. Trace element in hair is accurate and precise analysis for external contaminations. The analysis of human scalp hair has more effect in environmental monitoring and important to the validity and usefulness of the assessment (4). The scalp hair analysis, investigation has improved the analytical considerations and limitations of heavy metals in a variety of environmental health, which is related to the broad spectrum of pollution, occupational exposure and the geographical distribution of contaminated regions(4). Additionally, hair grows; structure included trace elements that are separated from the metabolic activity of the body, which is influenced by numerous internal and external factors. However, the trace element content of hair being used as an indicator for screening population groups as well as individuals exposed to environmental contaminants and in internal chemical variations in human body balances(5). Analyses of hair are used in different application such as criminal investigation with the determination of doping relevant substances and metabolites of the drug (6). Hair composition analysis of the toxic substance's determination delivers valuable information about the impact of contaminations is strongly correlated with many disorders, certain drugs and some diseases (6). Comparison of the measured and certified values of Fe, Zn, Cu and Ni in the certified reference material (IAEA-85) used as a QC for the AAS.Y. MURAMATSU and R.M. PARR 1988 were observed a highly significant positive correlation between Hg in the hair and kidney cortex of autopsy (7).

In general, hair is a record of metabolic processes in the organism for a long period of time with a lower metabolic activity of protein tissue. Scalp Hairs characterization, properties and element concentrations are the mirror of individual peculiarities of a human being such as sex, age, diet, cosmetics and pharmacological effects (Vazina et al., 1998). The samples of hairs can be collected frequently and stored for an unrestricted time used for repeated analyses without damage, which uses occupational potential exposure and environmental conduction's investigation flows up (8). The heavy metal's exposure As, Cd, Cr, Cu, Mn and Zn

have been assessed in hair of two different communities at the South and North of the mine area related to about potential exposure pathways to these elements, which were found, no significant differences were found in the average concentration of these elements between villages, R.Per eiraa,b, , R.Ribeir oc, F.Gonc¸alves(8). X-ray fluorescence energy dispersive technique has been used to analysis the elements Cr, Mn, Ni, Cu, Zn and Mo in scalp hair samples of a group of both genders may provide an indirect screening test for deficiency of elements in the body, Peter O. Onuwa2012(10). Hair is a site of excretion for essential, non-essential and potentially toxic elements. The hair element's contents and amount are incorporated with growing that proportional to the level of the element in other body tissues (10). Therefore, elements cadmium, lead and mercury are toxic heavy metals can be exposed to the hairs via a continuous daily process in the place of work, water, food and in the air (GOYER 1996) (11,12). Trace elements have a wide range of roles of the living system of the human body, with some elements of toxic effects, if inhaled at sufficiently high levels for long enough times (13). The objective of research, evaluation will assist to demonstrate the element's toxicity in scalp hairs of Sudanese workers, mainly as data recording and XRF method validation and results reliability compared to the certified international standards literatures.

2. Material and Method:

Data for this study were retrospectively collected from workshops for cars maintenance, iron welding workshop and perfume factory in Omdurman city. The samples of the scalp hairs were collected from different ages of Sudanese's workers in two sites of both genders for measurement utilizing X-ray fluorescence (XRF) spectrometer in energy dispersive mode. Generally, scalp hairs are influenced with numerous external contaminations such as exogenous contamination, fats, oils and assorted types of organic and inorganic substances (14). These hair samples were cleaned by implementing the procedure recommended by the International Atomic Energy Agency (IAEA, 1985), using water-acetone solution of water 50% and acetone 50% to remove external impurity (Chen et al., 1999), Mikasa et al. (1988) and then dry in an oven (5, 15).
Traditionally, the method of preparing the sample for XRF measurement in simple pellet press solid sample with geometrical dimensions for the X-ray absorption and transmission via homogeneous shape. The new approach of hair samples was prepared in fine mode powder using liquid nitrogen at low temperature of 77 ^{o}K. The solid hair immersed in liquid nitrogen was crushed into a fine powder with a hand grinder rod and tray of Teflon prepare specially for this work. The samples powder was prepared in pellet form using a pressing machine that compress to a manual pressure up to 15 tons to form the sample on a dry weight basis. Hair standard reference material sample from IAEA has been applied for measurement and result calibration. The standard reference sample and the hair samples collected from workers were prepared according to the procedure used for XRF measurement geometry. Samples were analyzed for elements of determination and concentration obtains relative to the data and reference certificate of the standard sample. The experiment was run using radioactive Cd^{109} source X-ray fluorescence spectrometer to utilize the elemental analysis in hairs samples. The X-ray spectra was collected by Si (Li) detector with energy resolution of 180 eV at Ekα (5.8 KeV) of manganese (Mn) linked to a Canberra 35 plus (MCA) system that connected to the computer to obtain acquiring data. A quantitative approach was employed for elements concentration in hairs using a calibration comparative approach to the certified standard sample (16).

3.1 Results:

A number of 22 hair samples of men in different types of workshops and 20 samples from both genders males and females in perfume factory were collected for the elements calcium (Ca),manganese (Mn), iron (Fe), copper (Cu), Zinc (Zn) mercury (Hg) , lead (Pb) and strontium (Sr) assessment. The results of the X-ray intensity of the element's concentration in both standard and samples were obtained after calibration and comparison with standard data using Axil package program. Fig.1 shows the average element's contents in scalp hair of the workers in the workshops in industry area. From the data of workers in the factory of the elemental concentration is displayed in the fig.2. Table (1) shows correlations of the elements in the first group men category in the workshops of ages range between 27 to 50 years old. Element correlations of 15 males (22 – 56 years) and 5 females (40- 50 years) in perfume factory are present in the table (2). Table (3) compares the factors and t-test of the both groups under investigation. Figure (2) provides the results obtained from the hair analysis of workers average elements concentration of the workshops groups. Data on the elemental concentration of hairs workers in the factory are displayed in fig (3). Average elements concentration of 42 samples from Sudanese population, compared to the literatures of elements concentration in human scalp hairs of other studies worldwide is shown in table (4).

3.2 Discussion:

The present results are significant in the two major groups of workers, which show the elements Ca, Fe and Sr in the workshop group in optimum values and Mn, Cu, Zn, Pb and Hg are higher levels compared to the International Atomic Energy Agency (IAEA) data and other countries (17). Therefore, the assessment of data indicates the level of Mn is increasing by 5.9 fold, Cu approximately 2 fold, Zn similarly with 1.2 folds; Hg higher by 23 folds and Pb are much higher at 62 fold.

The data on elements concentration of hair workers in perfume factory compared to the international data indicates the elements Ca, Cu and Zn in optimizing value, while Fe is indicate 4.7 fold, Hg of 26 fold higher and Pb shows higher values of 23 fold. However, Mn and Sr were not detected in a perfume factory hairs samples that likely to be impact of environmental contamination in the workshops. In table (1) the elements in hair demonstrate the Cu is correlated with Mn, Pb and is highly correlated with Zn and Hg, while Pb is correlated with Mn, Zn and Hg in group one. The observed correlation between elements Cu, Mn, Zn, Pb and Hg of high levels in the hairs might be explained that are related to external source of contamination. The correlations of elements in table 2 shows that Fe is correlated Pb and Hg, which are indicated high level of concentration in hair and possible to be an impact of contamination in the area.

Statistical significance was analyzed using analysis of initial eigenvalues of total variance and t-tests as appropriate to provide the difference in variation of element concentrations in each site. Table (3) present t-tests were used to analyze the relationship between the elements that possible to be related to sources of contamination, which provides the values of Mn, Pb and Hg in the range of 4.572- 5.570 and values of Cu, Zn 6.877-6.957 in the same range, respectively. Initial eigenvalues of the total variance of the workers 67.68% in the workshops group and 74.07% are total variance of the workers in perfume factory.

The results of factor analysis of variance contributions in table 3 indicate the contents of the element in hairs of high level Cu and Hg in factor 1 and Mn, Zn in Factor 2, while Pb in factor 3 relates to many types of contamination in workshops workers. From this data in table 3, we can see that factors analysis of variance contributions resulted in an optimum level value of elements Ca, Cu and Zn in factor 1 and the high level elements Fe and Hg in factor 2, while Pb in factor 3. Comparisons between the two figures (3, 4) that the projection of variable in fig.3 is revealed the Mn and Pb at the upper section of the graph and Cu, Zn and Hg in the lower section that may be due to different types of impact sources. From the result of the projection of variation in figure 4, it is apparent that the elements Fe, Hg and Pb not in the same position in the graph that indicates different levels of values of effect of contamination in hairs workers in a perfume factory.

The data for evaluation of the elements concentration in hairs in the two sites under study using statistical analysis, correlation, and t-test value factor analysis are compared to International Atomic Energy Agency hairs standard(IAEA) and several countries (table 5) that provides a possible suggestion of contamination in the area (16,18.19.20). The assessments of elements of hairs content in an industrial area in Omdurman in two different sites are indicated by high values Pb and Hg in both sites that possible to be impacted by environmental pollution. It is apparent from this result obtained that Mn, Cu, Zn in hairs of workshops worker and Fe in a perfume factory might be the indoor environmental exposure on both sites.

4. Conclusion:

The purpose of the work was measured to determine the effect on the element concentration in hairs of workers in two sites in the industrial area of Omdurman city using XRF analysis. This work was accepted to use liquid nitrogen to grind the hairs at the lower temperature basis of dry weight sample in the fine mode powder form. The results of this assessment show that industrial workshops, workers are affected by higher levels of Mn, Cu, Zn, Hg and Pb; while perfume factory influence environmental contamination that is increasing the level of Fe, Hg and Pb comparable to the trace elements human hair of IAEA-086 reference material. Therefore, the results of this analysis show that heavy metals are accumulated in the hairs workers relate to the indoor and outdoor environmental exposure. Consequently, Hg and Pb elements are higher in both situations that may be connected to external contamination exposure in the industrial site. However, the high levels of Mn, Cu and Zn in the hair of the workers in the workshops and the Fe in the perfume factory are connected to the indoor contamination in both sites respectively. The results of this research are assessed using statistical analysis, correlation, t-test value and factor analysis to obtain the relation between elements hairs and the sources of pollution that accumulated in the hair that probable to be linked to the indoor or outdoor contamination with heavy toxic metals. This assignment has explained the average elements Ca, Cu, Zn, Sr concentrations in hairs of Sudanese workers are more strongly coinciding with international data of hairs standards for several countries. The outcomes of hair analysis have detected toxic metals such as Mn, Fe, Hg and Pb of high concentrations probably associated with exposure by environmental contaminations, which indicates potential health problems of the workers.

6. Acknowledgement:

The author(s) gratefully acknowledge Khartoum University, represented by the Physics Department, on the hair (I.A.E.A) standard reference sample material and XRF support for this research.

7. References:

1- F. I. Abdulrahman, J.C. Akan*, Z. M. Chellube, M. Waziri, Levels of Heavy Metals in Human Hair and Nail Samples from Maiduguri Metropolis, Borno State, Nigeria, World Environment Vol. 2(4), pp.81-89 , 2012, DOI: 10.5923/j.env.20120204.05 .

2- Ibrahim B.-A. Razagui I and Stephen J. Haswell, The Determination of Mercury and Selenium in Maternal and Neonatal Scalp Hair by Inductively Coupled Plasma-Mass Spectrometry, Journal of Analytical Toxicology, Vol. 21, 1997.

3- Abdelrazig M. Abdelbagi1,2, Wafa S. Abdelrahman3,4, Mohmaed A.H. Eltayeb5,6 and Abubakr M. Idris6, Bio-monitoring of occupational exposure to heavy metals in metallurgical factories in Khartoum state, Sudan, , Fresenius Environmental Bulletin, by PSP Volume, 22 , No 12a., pp.3625 – 3631, 2013.

4- Dean A. Bass, Darrell Hickok, David Quig, Karen Urek, Trace Element Analysis in Hair: Factors Determining Accuracy, Precision, and Reliability.

5- M. I. Szynkowska*, A. Pawlaczyk, E. Wojciechowska, S. Sypniewski, T. Paryjczak Human Hair as a Biomarker in Assessing Exposure to Toxic Metals, Polish J. of Environ. Stud. Vol. 18, No. 6 , pp. 1151-1161, (2009).

6- Y. Muramatsu and R.M.Parr, Concentration of some trace elements in hair, liver and kidney from autopsy subjects- relation between hair and internal organs, The Science of the Total Environment, Elsevier Science Publishers B.V ,Vol.76 (1988) pp. 29-40, (1988)

7- Khalid Saleh Ali Aldroobi a,n, A. Shukri a, Sabar Bauk b, Eid Mahmoud Abdel Munema , Determination of arsenic and mercury level in scalp hair from a selected population in Penang, Malaysia using XRF technique, Radiation Physics and Chemistry Vol.91,pp/ 9–14, (2013).

8- P.Pereiraa,b, R.Ribeir oc, F, Gonc.alves, Scalp hair analysis as a tool in assessing human exposure to heavy metals(S.Domingos mine, Portugal. Science of the total environment vol. 327, pp. 81-92, 2004.

9- Peter O. Onuwa*, Lami A. Nnamonu, Ishaq S. Eneji, Rufus Sha'Ato, Analysis of Heavy Metals in Human Scalp Hair Using Energy Dispersive X-Ray Fluorescence Technique, Journal of Analytical Sciences, Methods and Instrumentation Vol.2, 187-193, 2012, http://dx.doi.org/10.4236/jasmi.2012.24029.

10- Piotr Trojanowski1, Jan Trojanowski2, Józef Antonowicz2, Ma³gorzata Bokiniec, Lead and cadmium content in human hair in central Pomerania, Northern Poland, Journal Elementol, Vol.15(2), pp.363–384, 2010.

11- Margarita Torrente 1,2,*, Mireia Gascon 3,4,5, Martine Vrijheid 3,4,5, Jordi Sunyer 3,4,5,6, Joan Forns 3,4,5, José L. Domingo 1 and Martí Nadal, Levels of Metals in Hair in Childhood: Preliminary Associations with Neuropsychological Behaviors, *Toxics* 2014, *2*, 1-16; doi:10.3390/toxics2010001.

12- E.O. Amartey, 2A.B. Asumadu-Sakyi, 2C.A. Adjei, 2F.K. Quashie, 3G.O. Duodu and 4N.O. Bentil, Determination of Heavy Metals Concentration in Hair Pomades on the Ghanaian Market Using Atomic Absorption Spectrometry Technique, Maxwell Scientific Organization, British Journal of Pharmacology and Toxicology 2(4): 192-198, 2011.

13- Flavia Laura Barbieri & Amandine Cournil &, Jorge Eduardo Souza Sarkis & Eric Bénéfice &, Jacques Gardon, Hair Trace Elements Concentration to Describe Polymetallic Mining Waste Exposure in Bolivian Altiplano, Biol Trace Elem Res Vol. 139:pp.10–23, (2011) ,DOI 10.1007/s12011-010-8641-1.

14- Selma V. Frazão and Mitiko Saiki, Study on trace element determination in human head hair using neutron activation analysis, 2007 International Nuclear Atlantic Conference - INAC 2007, Santos, SP, Brazil, September 30 to October 5, 2007.

15- Paul P. Coetzee and Hendrik Pieterse, Determination of trace elements in the human hair reference material, HH-I, by neutron activation analysis and atomic absorption spectrophotometry, South Africa Journal of Chemistry, Vol. 39(2),pp.85-88, 1986.,

16- A. R. Bleise, S. F. Heller-Zeisler, R. M. Parr, Methyl mercury, Total mercury and other trace elements in human hair, (NAHRES), (AQCS) Reference material, IAEA-086,pp.1-4,2000.

17- Y.Takagi, S.Matsuda, S.Imai, Y.Ohmori, T.Masuda, J.A.Vinson, M.C. Mehera, B.K. Puri, and A.Kaniewski, Trace elements in human hairs: an international comparison, Bulletin of Environmental Contamination and Toxicology, springer, Vol.36, pp.791-800, 1986. DOI: 10.1007/BF01623585, https://www.reseachgate.net/publication/19443051.

18- Dean A. Bass, Darrell Hickok, David Quig, Karen Urek, Trace Element Analysis in Hair: Factors Determining Accuracy, Precision, and Reliability, Alternative Medicine Review _ Volume 6, Number 5 ,pp.471-481, 2001.

19- Rashed, M. N. and Hossam, F. Heavy Metals in Finger Nails and Scalp Hair of Children, Adults and Workers from Environmentally Exposed Areas at Aswan, Egypt, Environmental Bioindicators vol. 2 (3), pp.131-145, (2007).

20- Shah, M. H., Shaheen, N., Khalique, A., Alrabti, A. A. A. and Jaffar, M.. Comparative Metal Distribution in Hair of Pakistani and Libyan Population and 60Source Identification by Multivariate Analysis. Environmental Monitoring and Assessment, vol.114, pp. 505 - 519. (2006).

China logistics financial status quo analysis

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Abstract： *The logistics finance is the inevitable outcome of the market economy development, It appearance can improve the efficiency of financing, promote economic development. In this paper, writer through methods such as literature reading do a brief summary about the present situation of the logistics financial development analysis.*

Key word: Logistics finance traditional logistics social financing

In recent years, financing problem is more and more prominent. Especially small and medium-sized enterprises (SMEs). SMEs account for 90% of the market, but most of them can't get loan from bank, such a situation seriously influence the healthy development of the economy of our country. Under the situation, logistics finance comes.

1. Information about logistics finance

The logistics finance is evolved with development of logistics and provides financial services such as financing, settlement, and insurance. It refers to financing activities using and developing various financial products in the process of logistics operation, implementing effectively integration of material flow, fund flow and information flow, effectively organizing and adjusting flow of monetary funds in the supply chain, so as to increase fund operation efficiency and realize increase in logistics value. These fund activities include deposit, loan, investment, trust, rent, mortgage, discount, insurance, issue and transaction of negotiable securities in the process of logistics, as well as intermediate businesses handled by financial institutions involving logistics.

2. The development situation of logistics finance.

2.1. There were part of the third party logistics enterprise tried to investigate the logistics finance service.

After many years of development, because of the late start of research and poor base, the logistics management in China is still in the beginning though it has advanced very much. According to statistics, logistics costs to around 17% of GDP, far above the logistics industry in developed countries abroad headed by the United States. It should be noted that china's logistics enterprise widespread "low price, high cost, small profits" And with the development of the society, the traditional logistics services have been unable to meet the needs of the user differentiation. So, although the traditional logistics services can occupy a share of the market, some large domestic logistics industry also began to actively seek cooperation with financial enterprises and to do logistics finance business. As one of the largest third party logistics enterprise company in China, China Postal Savings Company cooperation with rate banks. in order to push the warehouse receipt pledging improvement of the scale of the expansion. They chose some warehouses as Bank special warehouses. At present, China Postal Savings Company has carried out extensive cooperation with a number of Banks, including big four state-owned banks.

2.2 It involved in many industries and fields, management pattern and more diverse.

Logistics finance services from China Postal Savings Company includes nonferrous metal-related products, construction materials, chemical products, coal, cars, paper, automobile, domestic appliance and so on. Speed transmission Logistics's warehouse receipt pledge business covered some steel and nonferrous metal, plastic, chemical materials, rubber, paper, cotton, etc. China Postal Savings Company in WuXi push the model of the total amount control, Using all inventory as the pledge. The bank shall control the total amount of goods and goods are allowed to flow. Some financial institution such as Shenzhen Development Bank accept on the basis of pledge of the goods-"Chattel and title-pledge-credit". Bank through constant "Margin call- Redeem the pledge" in order to meet financing enterprise normal operation.

2.3 Logistics finance plays an important role in promoting the Logistic industry.

2.3.1 Promote the Logistic industry with multiplex.

The traditional logistics business which focuses on the transportation. The cost is high to be made very little profit. With arrival of "Internet+" era coming, social demand for logistics has greatly. Due to the relatively low entry barrier in the past, a lot of enterprises have entered the logistics industry. Logistics marketing be in a low-level competition environment and growing slowly. The logistics industry's experience of those developed countries like America is worthy of being used for reference by China, we can see most big logistics enterprise in developed have already regarded logistics finance as the important content of developing strategy to enhance its status. UPS is a global logistics giant with its headquarter in Atlanta, the United States. It even bought a bank for providing logistics finance service better. China has come to a critical stage of development and the number of small and medium-sized enterprises has increased sharply because of the state provides funding supports more than before. The registered small and medium enterprise hold 90% amount all registered enterprises in China and the gross product and tax achieve 40% and 60%, with their operating status directly impacting on the stability of national

economic development. But such problems exist in China's credit rating as being lack of credit rating awareness, incompleteness of credit rating agency system, Absence of scientific rating quota and methods, etc, led to more than 7 trillion RMB loaned out in the first half of this year by Chinese banks, only an estimated 10% has gone to smaller firms. Due to SMEs' own weaknesses, banks' institutional and some other factors, the financing gap is the major problem that has plagued SMEs so much. As a financial logistics of innovative value-added logistics services, it is the logistics industry and the development of the financial industry to a certain stage of the product. Logistics enterprises can instead bank to carry out factoring operations to assess their client's credit risk, it not only save bank's human and material resource but also expand reach. And change the perspective of risk assessment, and let SME to be ruled in the credit verification, it will meet the financing needs of SMEs to the greatest extent and achieve the win among three parts. The generation of logistics finance will create a good market environment for the healthy development of logistic industry, not only provide its customers with new technology but also develop channels of diversified investment. Logistics finance are the integration of object flow, money flow and information flow, it is considered to be another way to improve profit. For example, Dell sales totaled approximately 450 million dollars and on an average 1.23 million dollars a day. Dell's cash conversion cycle is five days, but HP and IBM are 30-90 days, it make Dell's cash conversion less at least 35 days and save working capital 43.05 billion dollars than their competitions. Dell got 2.53 billion dollars more than competition on cash management if calculated at 5.88% interest rate. Nowdays, profit margins in the PC industry has reduce, the extra profit from the cash management to be the important factor of the success of the Dell. The fund of the logistics must come from various sources if we have logistics finance, this innovative value-added service will promote the logistics is more character and multiple. And the innovation management and financial system will promote innovated in the mode of the management. Logistics finance provide new mode and ideas for logistics companies and financial institutions carry out business innovation.

2.3.2 Logistics finance speed perfect credit mechanism.

"Internet+" is conducive to the development of traditional industry. In the past, China post has been dominance of logistics led to the quality of service provided by its decline. In recent years, the number of companies which provide related service grows fast with rapid development of E-commerce. It led to the scope of business, quality of service and cost as well as the determining factor to decide logistics can foothold in the fierce competition in the logistics market. Logistics finance help logistics enterprise bid farewell to the past traditional logistics business mode and realization cross-border, changing the "high cost, low profit" industry status. But logistics enterprise as a third part in the supply chain dominated by bank, its normative factor more and more becomes the bank to choose partners. Due to spend much time and waste human resources to the enterprise credit assessment with strong liquidity, the application often be rejected without strictly validate. It is detrimental both of bank and enterprises. The third part logistics enterprise instead of bank to verify the applicant's assets in logistics finance mode, and make sure the borrower will be able to repay the loan through the establishment the warehouse financing. It not only save a great deal of manpower, material resources, but also in favor of changing the difficulty that SME gain the loans. But how to choose the best partner? Social credit tied mechanism is imperfect,

people lack of credit idea, the logistics industry is not standardized, which led to financial institutions don't really trust them. So, enterprise is going to exist in market competition to develop, must enhance normative. Standardization in operation, service, staff, risk awareness and evaluation, we might overlooked with no competition in the past have already become an urgent issue to meets to the needs of bank. In this market-oriented economy, law of jungle is inevitable for enterprises. The logistics enterprises are facing a lot of challenges now and these will push them to change and innovate indubitably.

Corporate Governance and Dividend Policy:

A Study of Listed Manufacturing Companies in Sri Lanka

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Abstract

The primary objective of this study is to find out the relationship between corporate governance variables and dividend policy of listed manufacturing companies at the Colombo Stock Exchange in Sri Lanka. The investigation is performed for a sample of twenty manufacturing companies listed at the Colombo Stock Exchange during the period of 2010-2016. The independent variables of the study comprise of the Size of the Board of Directors, Independence of the Board and the CEO duality. Whilst the Return on Assets considered as a control variable. In analyzing the data, the study used fixed effects on fixed effects model with panel data. The results of the study advocated a significant relationship between corporate governance variables and dividend policy of listed manufacturing companies in Sri Lanka.Board independence, CEO duality and return on assets have significant positive impact on dividend policy and size of the board has negative impact on dividend policy in the listed manufacturing companies in Sri Lanka.

Key words*: Corporate governance, dividend payout, control variable, Manufacturing companies, Colombo Stock Exchange*

1: Introduction

Corporate governance can be defined as a mechanism, processes and relations by which organizations are monitored and directed. Corporate governance basically acts as a balancing process of the interests of the stakeholders in an organization; these include its shareholders, management, suppliers, government, financiers, community and customers. Corporate governance also creates the framework for achieving an organizations' objectives, it gathers generally every sphere of management, from internal controls and action plans to corporate disclosure and performance measurement. The corporate governance framework includes explicit and implicit contracts between the company and the stakeholders for distribution of rights, responsibilities, rewards and procedures for reconciling. Sometimes conflicting interests of stakeholders in line with their duties, privileges, roles, procedures for proper supervision, control, and information-flows to serve as a system of checks-and-balances. There is a globally accepted truth that organization's competitiveness, growth, and sustainability are highly depending on the corporate governance. Boards of directors of Sri Lanka provide great attention to discharge their duties with high ethical values and accountability in their commitment to good governance practices. Good corporate governance system consists with the strong business ethics, sound policies and procedures, effective and efficient monitoring systems.

Dividends can be considered as a signal of firm's prospects due to asymmetric information, not only that but also act as a corporate governance component to align the management's interests with those of the shareholders.Dividend policy is affected by several factors.Corporate governance is a one of several factors that determine by the dividend policy.Now a day's corporate governance has obtained great attention from the public because of financial scandals and interest conflicts among shareholders in the corporate structure. Size of the board, composition of the board of directors, Managerial ownership, CEO, directors' compensation schemes and audit controls, for corporate control are the crucial components of an effective governance structure. There are two ways to handle the agency conflicts between management and investors by using effective corporate governance.One way is the dividend policy minimizes the free-cash flow problem of a firm.Second, the likelihood of management entrenchment can be deducted by strengthening shareholders' rights.There is a fundamental question in dividend policy which is how can shareholders hope to extract dividends from firms, given that the legal environment of the country and the governance mechanisms of individual firms offer investors relatively few protections? This Fundamental question regarding dividend policy might be highly involved in countries that have weak investor protection.Agency theory gives an idea that external shareholders have discretion for dividends more than retained earnings because insiders might spend cash retained within the firm.

Being the controller of the corporate governance in Sri Lanka, Securities and Exchange Commission of Sri Lanka (SEC) has the authority to impose rules and regulations on Sri Lankan capital market in order to maintain a higher standard of Corporate Governance and market integrity.In order to establish good corporate governance practices in Sri Lankan capital market, SEC has created the connection with Institute of Chartered Accountants of Sri Lanka (CASL) and they published the "Code of Best Practices on Corporate Governance" in the year 2008.

Dividend policy means the bundle of guidelines an organization employed to determine how much of its earnings it will pay to shareholders.There are evidences that suggest investors are not thought about company's dividend policy since they have the ability to sell a portion of their portfolio of equities if they need cash.

Dividend policy has always considered as one of the most crucial financial issues for all organizations.The problem systematically generates that why organizations pay dividend. It is a question of consideration and few studies have been conducted on dividend policy.Dividend policy becomes most influential policy within the financial corporate policies because it is an important control mechanism to minimize the conflicting interests of the shareholders and directors as shareholders pay more attention to receiving dividends, while directors intend to hold earnings.Shareholders generally are the final owners of organization and have residue right on the resources, profits and losses.Dividend policies are determined by several factors.One of these factors is corporate governance.Developing countries are now enhancing and involving the concept of good corporate governance due to its ability to impact positively on sustainable growth.

This study examines the corporate governance & dividend policy in listed manufacturing companies of Sri Lanka.There are many literature on corporate governance & dividend policy issues in developed countries; but little attention has been paid so far on corporate governance & dividend policy in developing countries like Sri Lanka.Few number of researches are available in Sri Lanka to study the linkage between corporate governance & dividend policy.Dividend policy & corporate governance play a crucial role in the Companies in Sri Lanka. This research becomes very significance due to the limited information regarding corporate governance & dividend policy. The significance of this research stems from the importance of the dividend policy of the organizations to its shareholders.Organizations that are able to balance stable dividend payment are organizations that are more able to finance their growth opportunities.Thus, identifying whether differences in dividend policy across organizations can be explained by changes in their corporate governance mechanism will aid in establishing how the corporate governance mechanism can be efficient.

2: Statement of the Problem

The research questions of the study are as follows.

1. Is there any relationship between Corporate Governance and Dividend Policy in listed manufacturing companies in Sri Lanka?
2. What is the impact of Corporate Governance Variables on Dividend Policy in listed manufacturing companies in Sri Lanka?

3: Objectives of the study

The objectives of the study are as follows.

1. To identify the relationship between Corporate Governance and Dividend Policy in listed manufacturing companies in Sri Lanka.
2. To find out the impact of Corporate Governance Variables on Dividend Policy in listed manufacturing companies in Sri Lanka.

4: Scope and Limitations

The scope of this study is identify the relationship between corporate governance & dividend policy in Sri Lanka using manufacturing companies listed in Colombo Stock Exchange for the period from 2010 to 2016. In this study, all the listed companies in Colombo Stock Exchange were not considered. Only the companies listed under manufacturing sector to see the impact of the chosen variables on the dividend policy. At the same time, few number of variables that explained the corporate governance were taken into account in the model and the study period covers only 7 years. Almost all the listed companies can be considered by the future

researches by expanding the study period. Further, inclusion of allthe variables that describes corporate governance in the model would have led to better results than this research.

5: Review of Literature

Ajanthan (2013) used Board Size, Board Independence, CEO Duality, Return on Assets (ROA) and Debt-to-Total Assets variables align with the corporate governance and dividend policy. The results of the study suggested that only CEO duality is negatively related to dividend payout whereas board size; board independence; return on assets and debt-to-total assets do not appear to be significantly related to the dividend payout.

Asamoah (2005) examined the effects of corporate governance structure on the dividend policy of the firms listed on the Ghana Stock Exchange, panel data was used. It was found that board independence and CEO duality influence firms' dividend policy. Board size was not related to firm dividend policy. It was found out that higher return on equity relate to higher levels of dividend. Compositions of Ghanaian boards are consistent with international best practices. This study provided additional evidence of the applicability of the agency monitoring element of dividend policy in an emerging market such as Ghana. Researcher recommended that shareholders should appoint more independent directors as a way observing as an effective monitoring mechanism on the management. From the findings, it is also recommended that companies should separate the CEO from the board chair as a way of preventing the agent from indulging in opportunistic activities to the detriment of the shareholders.

The study on corporate governance and dividend policy: An Empirical Analysis from Borsa Istanbul Corporate Governance Index was undertaken in Turkey by Aydin & Cavdar (2015) to analyze the potential relationship between corporate governance and dividend policy. Ordinary Least Squares (OLS) panel regression analysis has been performed. The potential relationship between ownership structure and dividend policy has also been analyzed by utilizing the independent variables of ownership concentration, managerial ownership and total foreign ownership. In addition to our independent variables, Researchers also included return on equity (ROE) and firm size to research in order to increase the explanatory power of our model. This study finds an insignificant relationship between corporate governance and dividend policy. On the other hand, researchers obtained significant positive relationship between total foreign ownership and dividend policy and significant negative relationships between ownership concentration and dividend policy and managerial ownership and dividend policy. Finally, researchers obtained significant negative association between return on equity (ROE) and dividend policy and significant positive association between firm size and dividend policy.

Subramaniam & Devi (2011) examined Corporate Governance and Dividend Policy in Malaysia. Research investigates the relationship between Investment Opportunity Set and dividend policy and if board size and board composition moderate this relationship in an emerging economy context. The free cash flow theory is empirically examined using a series of firm characteristics including size, return on assets, duality and debt to assets. The results support the theory that high growth firms make lesser dividend payouts. Further, in the interaction between high growth firms and board size and board composition, there is evidence to show that the negative relationship between Investment Opportunity Set and dividend payout is weaker for firms with a larger board size and with a corresponding larger number of independent directors representing the board.

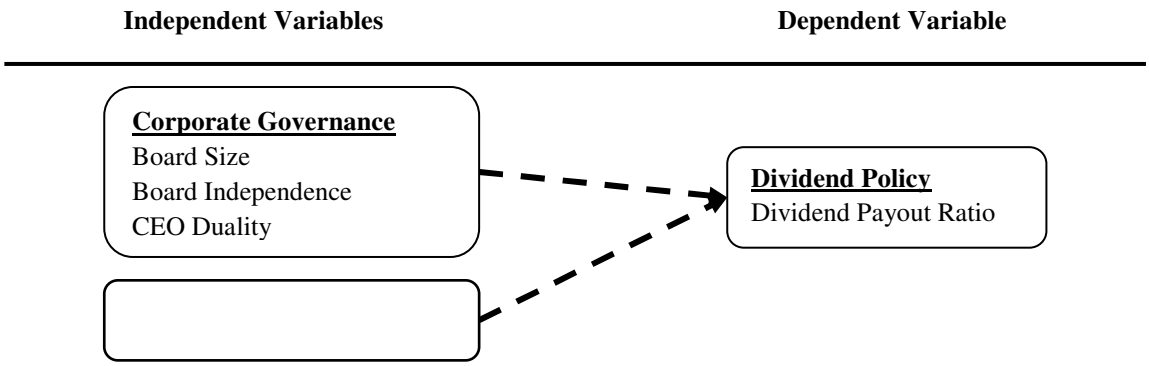
Farinha (2002) has conducted a research to analyze the agency explanation for the cross-sectional variation of corporate dividend policy in the UK by looking at the managerial entrenchment hypothesis drawn from the agency literature. The results on the usage by managers of non-beneficial holdings as an entrenchment vehicle rely on a relatively small number of observations above the critical levels of insider ownership. Insider ownership and size for the 1996 sample suggested that in smaller firms a U shaped relationship between dividend policy and insider holdings might not hold. The hypothesis that liquidity needs on the part of insiders are responsible for the positive association between dividend payouts and insider ownership after the critical turning point was also investigated.

Malik, Wan, Ahmad, Naseem and Rehman (2014) examined the role of board size in Corporate Governance and Firm Performance by applying Pareto approach. A sample consistedof14 listed commercial banks of Pakistan are taken for analysis from 2008-2012. The results of this study are contradictory with the existing literature of corporate governance variables and firm performance. The most prominent result of this paper is the significant positive relationship between board size and bank performance. It is concluded in the findings that a large board size can enhance the bank performance in Pakistani scenario. Statistical results also supported our argument that a large board size accelerates the performance of the enterprises. It is very difficult to manage a large board in firms which causes delays in executing important decisions and creates hidden costs for firms but at the same time it is very beneficial for firm performance for countries like Pakistan in which Seith and Vehdra exploit the rights of minor shareholders.

Naceur, Goaied & Belanes (2006) conducted the research named as the Determinants and Dynamics of Dividend Policy. The authors study the dividend policy of 48 firms listed on the Tunisian Stock Exchange during the 1996-2002 period. The study tested whether managers of Tunisian listed firms smooth their dividends or not. Besides, the study outlined the main determinants that may drive the dividend policy of Tunisian quoted firms. To answer the first question, researchers use Lintner's model in a dynamic setting. The results clearly demonstrated that Tunisian firms rely on both current earnings and past dividends to fix their dividend payment. However, the study shows that dividends tend to be more sensitive to current earnings than prior dividends. To find out the determinants of dividend policy, dynamic panel regressions have been performed. First, profitable firms with more stable earnings can afford larger free cash flows and thus, pay larger dividends. Furthermore, they distribute larger dividends whenever they are growing fast. However, neither the ownership concentration nor the financial leverage seems to have any impact on dividend policy in Tunisia. Besides, the liquidity of stock market and size negatively impacts the dividend payment. The results are somewhat robust to different specifications.

Accordingly, it is clear that issue of dividend policy has been regarded as important in the past. The percentage of earnings that is paid out in the form of dividends, and the impact of this payment toward share price, corporate governance has interested both emerging and developed countries for many years. Different researches and studies has done by the developed countries. But in developing countries like Sri Lanka pay little attention toward the relationship between corporate governance and dividend policy. Limited literature has available in this area in Sri Lanka. Hence this study filled the above research gap by applying the multiple regression model to test the relationship between corporate governance and dividend policy.

After identifying the previous literature, the researchers have constructed following conceptual framework (Figure 1)



According to the previous research board size and dividend payout has a negative relationship. Board independence and dividend payout has a negative relationship. CEO duality and dividend payout has also negative relationship. Return on assets and dividend payout has a positive relationship.

6: Research Methodology

6.1 Data and Data Collection

Secondary data has been used for this study. For that the data can be gathered from the annual reports published by the manufacturing companies listed in Colombo Stock Exchange for 7 years' periods from 2010 to 2016. The sample of this study is confined to the twenty manufacturing companies those financial year end with 31st march for the period of 2010 to 2016. Companies that financial year end with 31st December and companies that have not available in annual reports are excluded from the study. Correlation; multiple regressions& descriptive statistics are used to analyzed the data.

6.2 Research Design

The research study conducted as a hypothesis testing to examine the relationship between Corporate Governance and Dividend Policy. The following hypotheses are formulated for testing,

No	Variable	Null Hypothesis (H0)
01	Board Size	There is negative relationship between Board Size and Dividend Policy
02	Board Independence	There is negative relationship between Board Independence and Dividend Policy
03	CEO Duality	There is negative relationship between CEO Duality and Dividend Policy
04	Return on Assets	There is positive relationship between Return on Assets and Dividend Policy
05	Corporate Governance	There is significant impact of corporate governance on dividend policy

6.3 Variables

Table 1: Dividend Payout

Variable name	Short name	Item get from Financial statements
Dividend Payout	DPO	=(Dividend per Share(DPS) / Earning per share(EPS))

Table 2: Board Size, Board Independence and CEO Duality

Variable name	Short name	Item get from Financial statements
Board Size	BS	Number of directors in the board
Board Independence	BI	Number of independence directors in the board
CEO Duality	CEOD	1 for duality and 0 for separate

Table 3: Control variable - Return on Assets

Variable name	Short name	Item get from Financial statements
Return on Assets	ROA	=Net Profit after Tax / Total Assets

Board Size (BS): According to Asamoah (2005) boards of directors' act as central role in the corporate governance of modern companies. Due to that it is very important to gain a knowledge regarding the board size to get comprehensive idea about corporate governance. There is a public debate on board structure has centered on pressure for smaller board size. But there is an argument about this debate which is although larger board size initially facilitates key board functions, there comes a point when larger boards suffer from coordination and communication problems and hence board effectiveness. Previous research has also supported to this argument.

Board Independence (BI): According to Asamoah (2005) board independence is considered as to be an important and effective governance mechanism. Previous empirical studies show the mixed results regarding value of the board independence. According to the new concept in corporate governance suggest the calls for a majority of board members to be independent from the company. To be independence that person should not be an employer or auditor of that company.

CEO Duality (CEOD): According to Asamoah (2005) CEO Duality means the situation when the CEO also holds the position of the chairman of the board. The board of directors is appointing to monitor managers such as the CEO on the behalf of the shareholders. They prepared compensation contracts and select and remove the CEOs. A dual CEO gains the advantages to firm if that person works closely with the board to create value. It makes easier for the CEO to assert control of the board and as a result make it more difficult for shareholders to control and see the ethics of the management.

Return on Assets (ROA): According to Asamoah (2005) Return on assets (ROA) means an indicator of how profitable an organization is relative to its total assets. ROA provides information regarding how efficient management is at using its assets to generate earnings. Return on assets has calculated by dividing a company's earnings of the year by total assets of the company. Return on assets is presented as a percentage. Sometimes this is called as "Return on Investment".

6.4 Research Model

The dividend payout which measures dividend policy is considered as dependent variable while board size, board independence, CEO duality and return on assets which represent Firm corporate governance as independent variables. The initial regression equation can be written as follows;

$$DPO_{it} = \alpha + \beta_1 BS_{it} + \beta_2 BI_{it} + \beta_3 CEOD_{it} + \beta_4 ROA_{it} + \varepsilon_{it}$$

Whereby; Dividend Payout is a function of Board Size, Board Independence, CEO Duality and Return on Assets.

7: Results and Discussion

7.1 Descriptive Statistics

Table 4: Summary of Descriptive Statistics

	N	Range	Min	Max	Mean	Std. Deviation	Variance	Skewness	Kurtosis
DPO	140	1.67	0.00	1.67	0.3450	0.31698	0.100	1.032	1.496
BS	140	8	4	12	7.98	1.805	3.259	-0.094	-0.230
BI	140	6	0	6	2.73	1.156	1.336	0.407	0.481
CEOD	140	1	0	1	0.25	0.435	0.189	1.167	-0.647
ROA	140	0.68	-0.28	0.4	0.0777	0.08663	0.008	0.112	4.468
ValidN	140								

The table 4depicts the summary of the descriptive statistics of the variables computed from the financial statements and the annual reports of sampled manufacturing companies on the Colombo Stock Exchange in Sri Lanka. According to the range column board size have highest range value as 8. Minimum range shows the

Return on assets as 0.68. Board size has minimum value as 4. Minimum value of dividend payout, board independence and CEO duality are equal to zero. Return on asset has 0.28 minimum value. According to the table highest maximum value has obtained by the board size and lowest maximum value has obtained by the CEO duality. Mean column shows the arithmetic mean across the observations. It is the most widely used measure of central tendency. It is commonly called the average. The mean is sensitive to extremely large or small values. An average of 34.5% of the earnings was paid as dividend to shareholders. This observation shows that approximately 65.5% of the firms' earnings were retained for reinvestment with the probable intention that shareholder wealth may be enhanced in the future. The mean board size was approximately eight, with a maximum of twelve directors. These may suggest that Sri Lankan listed firms have board sizes considered ideal. The mean board independence was approximately 3. This means that for the sampled firms, about 75% of the board of directors was made up of executive directors, suggesting that manufacturing companies on the Colombo Stock Exchange have boards which are highly dependent as they are mostly dominated by executive directors. However, some of these boards were relatively high independent with 50 % being non-executive directors.Only twenty-five occasions out of the one hundred forty observations were the CEO and the board chair positions entrusted to the same personality. With this, one may tend to suggest that agency problems may not be major issues among the Manufacturing companies listed in Colombo Stock Exchange in Sri Lanka. The profitability variable, return on asset (ROA) showed an average of 7.77%. This measures the contribution of net income per Rupee invested by the firms' asset holder. Standard deviation measures the spread of a set of observations.The larger the standard deviation is, the more spread out the observations are. Board size has more spread out and lowest spread out is obtained by the return on asset. Skewness measures the degree and direction of asymmetry.A symmetric distribution such as a normal distribution has a skewness of 0, and a distribution that is skewed to the left, e.g. when the mean is less than the median, has a negative skewness. Board size has negative skewness and other variables have positive skewness. Kurtosis is a measure of the heaviness of the tails of a distribution. In SPSS, a normal distribution has kurtosis 0. Extremely non normal distributions may have high positive or negative kurtosis values, while nearly normal distributions had kurtosis values close to 0. Kurtosis is positive if the tails are "heavier" than for a normal distribution and negative if the tails are "lighter" than for a normal distribution. Return on asset and dividend payout have highest positive kurtosis value therefore its tails are heavier than normal distribution. Board size CEO Duality and board independence have values near 0. Therefore, those are having normal distribution.

7.2 Tests of Normality and Tests of Panel Data Assumptions

Test the Normality

There are two test to identify normality those are Kolmogorov – Smirnov and Shapiro – Wilk test.Shapiro-Wilk Test is more appropriate for small sample sizes (< 50 samples). For this reason, Shapiro-Wilk test was used as my numerical means of assessing normality.

Table 5: Test of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
DPO	.138	140	.000	.900	140	.000

a. Lilliefors Significance Correction

If the statistic value of the Shapiro-Wilk Test is greater than 0.05, the data is normally distributed. If it is below 0.05, the data significantly deviate from a normal distribution. According to the test of normality table here statistic value has get 0.900 therefore this data set is normally distributed because statistics value is greater than the 0.05. Figure 1 shows the dots that are near to the regression line. So it says that this data set is normally distributed.

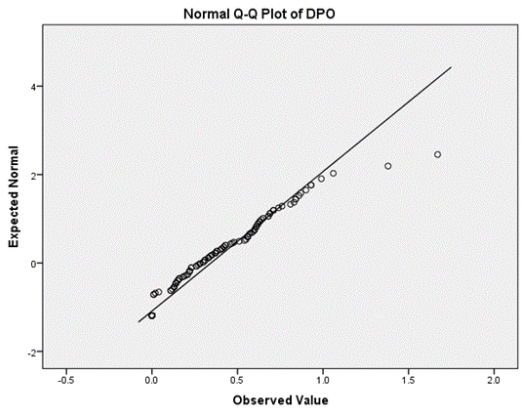


Figure 1: Normal Q-Q Plot of DPO

Linear regression model (in parameters)

Partial regression plots have used to test this assumption. There is a positive linear relationship among board size, board independence, return on assets and dividend payout. CEO Duality and dividend payout represent negative linear relationship.

Zero mean value of error term

There should be a zero mean value of error term to estimate a correct regression model. SPSS can be used to test this assumption. One method of testing the third assumption is using histogram for residuals. According to the below histogram it shows normal distribution of error terms. It proves that error term has zero mean value.

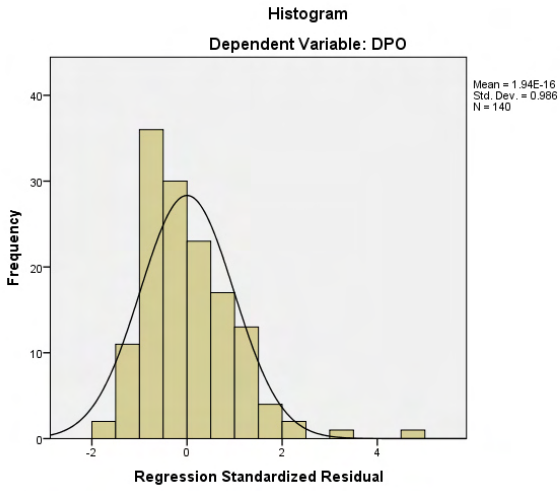


Figure 2: Histogram for residuals

According to the P-P Plot for residuals we can see dots are near the line. Therefore, residuals have zero mean value.

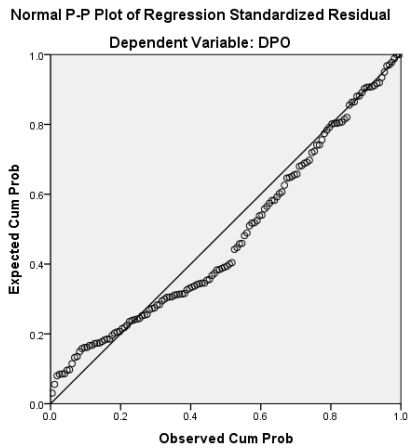


Figure 3: Normal P-Plot for Residuals

Homoscedasticity or equal variance of error term

Glejser Test has used to test the Homoscedasticity. The Glejser test attempts to determine whether as the independent variable increases in size, the variance of the observed dependent variable increases. This is done by regressing the error term of the predicted model against the independent variables. A high t-statistic or low probability value for the estimated coefficient of the independent variables would indicate the presence of heteroscedasticity.The results revealed that the board independence, CEO duality and return on assets shows

low t statistic values and high probability values. Therefore, board Independence, CEO duality and ROA has homoscedasticity but probability value of board size is significance. Therefore, board size has the heteroscedasticity.

No autocorrelation between the disturbances

Run test has used to test the autocorrelation between the disturbances. Following table shows the result has obtained from Run test.

Table 6 : Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.266[a]	.071	.043	.17344	1.963

a. Predictors: (Constant), ROA, CEOD, BS, BI

b. Dependent Variable: Abserror

Table 6 shows the Durbin- Watson value as 1.963. It is near to the 2. Therefore, this model has no autocorrelation between error term.

There is no perfect multicollinearity

This research explains multicollinearity using Pearson correlation. Table 7 shows the result has obtained from correlation analysis using SPSS.

Table 7 : Correlation among variables

		BS	BI	CEOD	ROA
BS	Pearson Correlation	1	.456**	-.103	.154
	Sig. (2-tailed)		.000	.225	.070
	N	140	140	140	140
BI	Pearson Correlation	.456**	1	-.208*	.201*
	Sig. (2-tailed)	.000		.014	.017
	N	140	140	140	140
CEOD	Pearson Correlation	-.103	-.208*	1	.034
	Sig. (2-tailed)	.225	.014		.687
	N	140	140	140	140
ROA	Pearson Correlation	.154	.201*	.034	1
	Sig. (2-tailed)	.070	.017	.687	
	N	140	140	140	140
Tolerance		7.88	7.96	0.951	0.949
VIF		1.269	1.340	1.052	1.054

**. Correlation is significant at the 0.01 level (2-tailed).

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

Board size and board independence have weak positive correlation is 0.456 and it is significant at 1% level, two tailed. Board size and CEO Duality has weak negative correlation is -0.103 and it is not significant. Board size and ROA has weak positive relationship is 0.154 and it is significant at 10% level. Board independence and CEO Duality has weak negative correlation is -0.208 and it is significant at 5% level. Board independence and ROA has weak positive correlation is 0.201 and it is significant at 5% level. CEO duality and ROA has weak positive relationship is 0.034 and it is not significant.According to the above table correlation value among all independence variables are less than the 80%. So there is no multicollinearity among variables. According to the table tolerance values are greater than the 0.2 and Variance inflation factors are less than the 10. Therefore, this model has no multicollinearity.

7.3 Estimation of the Model

The Pooled OLS regression model neglects the cross sections and time series nature of data. Therefore, this research rejects the pooled OLS regression model and pay attention toward other two model. The fixed effect model allows for heterogeneity or individuality among twenty manufacturing companies by allowing to have its own intercept value. The term fixed effect is due to the fact that although the intercept may differ across manufacturing companies, but intercept does not vary over time, that is it is time invariant. Random effect model suggest all twenty manufacturing companies have a common mean value for the intercept. Hausman test is the method for selecting one method of these two methods. The following table provides the details of Hausman test.

Table 8 : Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	29.615771	4	0.0000

According to the above table Probability value is significant. Therefore, this research has used the fixed effect model .Following results have obtained using fixed effect model.

Table 9 : Fixed effect model outcome

Dependent Variable: DPO
Method: Panel Least Squares
Date: 10/31/16 Time: 16:15
Sample: 2010 2016
Periods included: 7
Cross-sections included: 20
Total panel (balanced) observations: 140

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.034153	0.190288	-0.179483	0.8579
BS	-0.003771	0.026223	-0.143789	0.8859
BI	0.097078	0.028040	3.462161	0.0008
CEOD	0.281295	0.123341	2.280640	0.0246
ROA	0.478656	0.260817	1.835217	0.0693

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.601017	Mean dependent var	0.308767
Adjusted R-squared	0.515254	S.D. dependent var	0.271886
S.E. of regression	0.189297	Akaike info criterion	-0.326952
Sum squared resid	3.834182	Schwarz criterion	0.199802
Log likelihood	45.41534	Hannan-Quinn criter.	-0.112908
F-statistic	7.007900	Durbin-Watson stat	2.007782
Prob(F-statistic)	0.000000		

The model can be estimated as follows,

$$DPO = -0.034153 - 0.003771BS_{it} + 0.097078BI_{it} + 0.281295CEOD_{it} + 0.478656ROA_{it} + \varepsilon$$

The result of the regression model is shown in table 9. The model shows the interaction between dividend payout variable and corporate governance variables with the return on assets as control variables. The R2 in the regression model indicated that 60.10% of the variation in dividend payout is explained by the variables in the model. The F-statistics (prob > chi 2) prove the efficiency of the estimated models at 1% level of significance and the value was 0.0000.The results shows that the board size has an insignificant negative relationship with the dividend payout ratio. This means when the board size increases, it influences the firms to pay smaller dividend.The possible explanation for this observation may be that smaller Boards are effective in preventing management from retaining more cash within the firm which they could use to improve their private benefits to the detriment of the shareholders. This result is different from result obtained from Asamoah (2005) and Aydin & Cavdar (2015) but result is same as the research which was conducted by Ajanthan (2013).The outcome of the regression results indicated that both board independence and the CEO duality have a significant positive relation with the dividend payout ratio. The board independence increases, it influences the firms to pay larger dividend. The outcome of the CEO duality relationship means that when CEO doubles as board chair, this certainly results in payment of higher dividend. The result of Asamoah (2005) is different from the results obtain from this research. The result of board independence support to the

result of the research conducted by Ajanthan (2013). Result of CEO Duality is varying from results of Asamoah (2005) and Ajanthan (2013). Furthermore, control variable return on asset has a significant positive relationship with dependent variable and it is statistically significant in 10% level of significance.

7.5 Result of Test of Hypothesis

Hypothesis no 1 -There is negative relationship between Board Size and Dividend Policy

The result obtained from the regression analysis support to the hypothesis where there is a negative relationship between board size and dividend policy in listed manufacturing companies in Sri Lanka. But this result is statistically insignificant. Researcher of this study cannot say that board size is significantly affect to the dividend policy in listed manufacturing companies in Sri Lanka.

Hypothesis no 2 - There is negative relationship between Board Independence and Dividend Policy.

The result obtained from the regression analysis does not support to the hypothesis that there is negative relationship between board independence and dividend policy in listed manufacturing companies in Sri Lanka. In here accept the null hypothesis and research found the positive relationship among board independence and dividend policy in listed manufacturing companies in Sri Lanka. It is statistically significant at 1% level of significance. Researcher can say board independence positively affect to the dividend policy of listed manufacturing companies in Sri Lanka with 99% confidence. It can be concluded that in Sri Lankan context the board independence helps to increase the payment of dividend.

Hypothesis no 3 - There is negative relationship between CEO Duality and Dividend Policy

This hypothesis was built in research methodology chapter based on previous researches. But result obtained from multiple regression analysis does not support to the hypothesis that there is negative relationship between CEO Duality and dividend payout. Therefore, this situation accepts the null hypothesis and this research results shows the positive relationship among CEO duality and dividend payout of listed manufacturing companies in Sri Lanka and it is significant in 5% level of significance. Researcher of this study can say CEO duality is positively affects to the dividend payout with 95% level of confidence

Hypothesis no 4 - There is positive relationship between ROA and Dividend Policy

The result obtained from the multiple regression analysis support to the hypothesis that there is positive relationship between return on assets and Dividend policy. Positive relationship has found between return on assets and dividend payout of listed manufacturing companies in Sri Lanka from the regression analysis and it is significance at 10% level of significance. Researcher of this study can say return on asset affects positively to the dividend policy of manufacturing companies in Sri Lanka with 90% level of confidence.

Hypothesis no 5 - There is significant impact of corporate governance on dividend policy

The result obtained from the multiple regression analysis support to the hypothesis that there is significant impact of corporate governance on dividend policy. Corporate governance variables can explain 51.52% of variation in dividend payout of listed manufacturing companies in Sri Lanka. Overall model is significance in 1% level of significance.

8: Conclusion

The study sought to examine how corporate governance influence dividend policy in listed manufacturing companies in Sri Lanka. Three key corporate governance variables were considered: board size, board independence and CEO duality.The findings show that both board independence and CEO duality have effect on firms' dividend policies. The relationship in both cases is positive and statistically significant. Board size and dividend payout have negative relationship. However, the board size has no significant effect on the dividend payout of firms. The control variable has positive relationship with dividend payout. The overall findings show that corporate governance has a significant impact on the dividend policy.The result suggest that larger board size has negative effect on dividend payout and smaller board size is more appropriate to have higher dividend. There should be more number of independence directors in boards to increase the amount of dividend payout. CEO duality has positively affected to the dividend payout. When we examined the other researches in the same area in Sri Lankan context,the only significant variable is the CEO Duality. But in this research found that board Independence, CEO Duality and Return on asset have significant impact on dividend payout with reference to the listed manufacturing companies in Sri Lanka. But board size is not significant and result is same as previous results.

8.1 Suggestions and recommendations

It is suggested that shareholders should appoint more independent directors as a way of serving as an effective monitoring mechanism on the management. It is recommended that a research should be done to test how corporate governance influences the dividend payout of listed and unlisted firms in Sri Lanka. From the findings, it is also recommended that companies should not separate the CEO from the board chair as a way of preventing the agent from indulging in opportunistic activities to the detriment of the shareholders.

References

Ajanthan, A. (2013),'Corporate Governance and Dividend Policy: A Study of Listed Hotels and Restaurant Companies in Sri Lanka'. International Journal of Management, IT and Engineering, 98-114.

Asamoah, G. N. (2005),'Corporate Governance and Dividend Policy: An Evidence from Ghana'. SSRN Electronic Journal , 1-22.

Aydin, A. D., & Cavdar, S. C. (2015),'Corporate Governance and Dividend Policy : An Empirical Analysis From Borsa Istanbul Corporate Governance Index (XKURY)'. Accounting and Finance Research, 66-76.

Colombo Stock Exchange. (n.d.). Retrieved October, November 2016, from CSE: www.cse.lk

Farinha, J. (2002),'Dividend policy, corporate governance and the managirial entrenchment hypothesis':. SSRN Electronic Journal , 1-43.

Malik, M., Wan, D., Ahmad, M. I., Naseem, M. A., & Rehman, R. U. (2014),'Role of Board Size in Corporate Governance and Firm Performance Applying Pareto Approach, is It Cultural Phenomena?'The Journal of Applied Business Research, 1395-1496.

Meher, A. (2005),'Corporate governance & Dividend policy'. Pakistan Economic and Social Review, 115-128.

Morad, A. H., & Adel, B. (2008),'Corporate governance and dividend policy: an empirical investigation of Jordanian non- financial corporations'. SSRN Electronic Journal , 1-26.

Naceur, S., Goaid, M., & Belanes, A. (2006). On the determinents and dynamics of dividend policy. International Review of Finance, 195.

Securities and Exchange Commission of Sri Lanka. (n.d.). Retrieved November 2016, from SEC: www.sec.gov.lk

Subramaniam, R., & Devi, S. (2011),'Corporate Governance and Dividend Policy in Malaysia'. International Conference on Business and Economics research (pp. 200-207). Kuala Lumpur: IACSIT Press.

Perceptions of Educational Stakeholders Regarding the Effects of Financial Mismanagement on Physical and Teaching/Learning Facilities in Secondary Schools In Gucha District, Kenya.

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Abstract

The government of Kenya allocates between 35 to 40 percent of the total budget to education. It is essential that public funds be directed effectively and used for the purposes for which they are allocated for. However, there have been a number of cases reported mainly through the local print and electronic media regarding mismanagement of finances in public secondary schools. Gucha is one such district that experienced 47 cases of financial mismanagement and consistently taken the last position in KCSE performance in Nyanza province with its mean score averaging 3.970 for the last ten years. This study was therefore set to establish the perceptions of stakeholders on the effect of financial mismanagement on quality education: physical facilities and, teaching/learning materials in public secondary schools in Gucha district. A conceptual framework was used to help focus on financial mismanagement and Quality secondary education. The study employed a descriptive survey design. The study population consisted of 126 headteachers, 126 heads of departments, 126 Board of governors" chairpersons, 126 bursars, 1011 teachers, and 10 quality assurance officers. Stratified random sampling technique was used to select 5 boarding schools, 37 day schools, 42 headteachers, 42 Bursars, 42 heads of departments, 42 BOG chairpersons, 337 teachers while purposive sampling was used to select 10 quality assurance and standards officers. Data was collected by the use of questionnaire, interviews schedule, Focus group discussions and observation forms. Quantitative data collected through questionnaire were analyzed using descriptive statistics in the form of means, frequency counts and percentages. Qualitative data collected through interviews and Focused group discussions were transcribed, organized into themes and sub-themes as they emerged in an on-going process. The study established that financial mismanagement had adversely affected instructional and physical facilities. From the study it was concluded that mismanagement had affected the quality of education negatively. Based on the findings of the study it therefore emerged the need for financial training for all stakeholders involved in financial management directly and indirectly. School board of governors should set up financial advisory committee in schools to assist in financial management. The government should post trained bursars to schools to help headteachers in accounting of finances.

Key words: Financial Mismanagement, Financial Misappropriation, Quality Education, financial Training.

Introduction

Finance is the most basic resource in any enterprise, education sector inclusive, hence everybody is concerned about its management (Okumbe, 1998). Hallak and Poisson (2001) reported that, Seventy-three percent of the World government's social sector expenditure and 40% of the national recurrent expenditure is channeled to the education sector. Households spend between five to seven percent of the GDP on education. Reports from different countries cited USA, Hawaii, China, Mexico and Haryana revealed that there were continuing problems with the financial management systems that called for improvement in certain internal control practices (Hallak & Poisson, 2001; Rasalind & Downes, 2004; National Advisory organization, 2009; Arballo, 2007; Martin, 2009; Ians, 2006).

According to Hallak and Poisson (2001), the survey conducted in Uganda, using a sample of 250 schools revealed that the average level of funding that reached schools was very low and only 13 per cent of those funds were used to serve their intended purpose. It was further reported that financial malpractices increase the transaction costs, reduces the efficiency, quality of services and distorts the decision-making process. Gupta (2002) suggested that such malpractices lowered the quality of education by citing an example of a country in which only 16 per cent of children actually received textbooks, despite the significant financial efforts made by public authorities to provide each child with his/her own learning materials. Hallak and Poisson (2001) reported that financial misappropriation and misuse distort both the quality and availability of education services.

The provision of education requires monetary and non-monetary resources necessary for the teaching and learning process (Republic of Kenya, 1999). Indoshi (1992) pointed out that the availability of enough and relevant resources and teaching materials are important if instruction has to avoid over-emphasis on routine skills. He argued that the use of textbooks was believed to raise academic standards and increase efficiency in the system. Therefore to ensure good performance the principals have to provide required resources to the teachers and learners respectively. On this point, Heyneman (2000) highlighted the contribution of textbooks to academic achievement, and Squire (1991), writing on teachers reliance on textbooks, stated that those seeking to improve the quality of education believed that improvements in instructional materials would inevitably lead to changes in actual teaching. For many teachers, textbooks can provide an excellent and useful resource, without usurping the position of the teacher. While the selection of a textbook has been adjudged to be of vital importance to academic achievement, it is sad to say that relevant textbooks are not available for teaching and learning activities (Oni, 1992).

Gogo (2002) found that students' textbook ratio at the secondary education level was 4:1 which is far from the ideal ratio of 1:1 established by researchers. The textbook ratio affects teaching and learning since learners are not able to do assignment or make necessary references. He further established that poorly equipped laboratories, libraries, Home science and workshops make learners fail to do the necessary practice thus affecting mastery of content as well as leading to poor performance. UNESCO (2005) established a strong causal link between the quality and amount of science equipment and furniture on one hand and the quality of student outcome on the other.

According to Oni (1992), facilities constitute a strategic factor in organizational functioning. He stated that their availability, adequacy and relevance influence efficiency and high productivity.

Writing on the role of facilities in teaching, Fabunmi (1997) asserted that school facilities when provided will aid teaching learning programme and consequently improve academic achievement of students and submitted that no effective science education programme can exist without equipment for teaching. This is because facilities enable the learner to develop problem-solving skills and scientific attitudes. In their contribution, Ajayi and Ogunyemi(1990) reiterated that when facilities are provided to meet relative needs of a school system, students will not only have access to the reference materials mentioned by the teacher, but individual students will also learn at their own paces. The net effect of this is increased overall academic performance of the entire students. In another development, Aliyu (1993) submitted that instructional facilities were indispensible to academic achievement of students in English, Language, Mathematics, Biology and Geography. He concluded that the effect of instructional facilities on students' academic achievement is more felt in pure and social sciences. This implied that the quality, availability and quantity of teaching/learning materials directly correlated with the amount of finance spent on it.

Different authors in their studies found that the quality of education received by the learners in school, to a very large extent is determined by the level of availability of the material resources and of course the overall atmosphere in which learning activity takes place. They reported that Physical, materials, financial and human resources were found to be significantly related to students' academic performance (Adeogun ,2001; Oni,1995; Aghenta, 1999; Sodimu,1998).

Jagero (1999) carried out a study on the factors affecting the quality of education in day secondary schools. The researcher looked at the extent to which school inputs such as laboratories, equipment supplied, instructional material, teacher qualification and influence of principals‟ qualification and experience contributed on affecting quality of education. The study found that schools which supplied more instructional materials performed better in the national examination in the district.

Faize (2011) conducted a study on the effect of the availability and the use of instructional material on academic performance of students in Punjab (Pakistan). The study identified that there is a great deficiency in the availability and the use of instructional material. The study concluded that the less availability, misallocation and the deficiency in the use of instructional material lead to the wastage of resources, the less effectiveness of instructional material and lower academic performance.

Luvega (2007) observes that instructional materials are critical ingredients in learning and the intended curriculum cannot be easily implemented without them. In her study she established that lack of school infrastructure like classrooms, desks and toilets were major hindrances to quality teaching and learning. Roy (2008) observed that developing school infrastructure is necessary in improving school attendance and academic performance. Writing on poor performance of students in public examinations, London (1993) stated that in many developing nations certain physical facilities are none existent, and in those instances where amenities were available many were of sub standard quality.

Statement of the Problem

Cases of financial mismanagement are experienced in secondary schools in Kenya. Gucha is one such district that is experiencing 47 cases of financial mismanagement and misappropriation (Table 1.1) coupled with poor quality education as evidenced in poor KCSE results for the last nine years (Table 1.2). In Gucha district's examinations performance has remained poor especially when compared to Nyamira and Kisii central. Gucha

district has consistently taken the last position in Nyanza province with its mean score averaging 3.970.Where mismanagement and misappropriation of funds is experienced, quality of education is bound to decline. However, from the literature that was reviewed, there was no research done in the district to find out the effect of financial mismanagement and misappropriation on the quality of education. Given that finance plays a major role in the provision of quality education, it is necessary to conduct a study to establish the effect of financial mismanagement and misappropriation on the quality of education in Gucha District.

Table 1.1 Financial Audit report for the year 2008-2009 for Gucha District.

Categories of Reports	Number
Headteachers dropped due to financial misappropriation	07
Headteachers serving interdiction due financial mismanagement	03
Headteachers' financial records with audit queries	15
Headteachers retired on public interest due to financial mismanagement	02
Headteachers transferred due to misuse of funds to give room for investigation	07
Headteachers alleged by the community for mismanagement of school funds	13
Total	**47**

Source: Gucha District Education Office, Audit Department: 2009.

Table 1.2 Nyanza Province KCSE performance per district for the period 2001-2009

DISTRICT	Mean scores in Kenya Certificate of Secondary Examination								
	2001	2002	2003	2004	2005	2006	2007	2008	2009
Kisumu	5.241	5.212	5.293	5.257	5.246	5.300	5.432	5.851	5.824
Homa Bay	5.519	5.384	5.311	5.623	5.580	5.384	5.684	5.894	5.812
Kisii	4.182	4.123	4.119	4.391	4.362	4.208	4.483	4.352	4.498
Siaya	5.665	5.582	5.373	5.874	5.628	5.523	5.776	5.872	5.954
Nyamira	3.996	3.930	3.967	4.315	4.087	4.214	4.501	4.545	4.351
Migori	5.825	5.858	5.621	6.113	5.888	5.471	5.620	5.826	5.855
Suba	4.976	5.671	5.919	6.046	6.014	5.701	5.727	5.791	5.505
Rachuonyo	4.911	4.868	4.973	5.440	5.401	5.001	5.373	5.562	5.958
Gucha	**4.958**	**3.958**	**3.798**	**4.160**	**4.077**	**3.977**	**4.277**	**4.267**	**3.970**
Bondo			5.923	6.112	5.973	6.698	5.935	6.005	6.013
Nyando			5.367	5.846	5.817	5.415	5.626	6.025	6.017

Source: PDE"S office Kisumu (2010)

Research Methodology

Research design

The study explored the effect of financial mismanagement on quality education in secondary schools in Gucha District, Kenya. Descriptive survey design was used. This design was found to be ideal as it enabled an in-depth study of the relevant variables to be made in order to establish existing conditions in the schools. This design is ideal for studies that aim at describing a particular situation at a specific period of time (Vockel & Asher, 1995). Studies that are concerned with what people think and what they do, and different types of educational fact finding, can utilize this research design (Babbie,1979; Frankel & Wallen, 1993).

Area of Study

This study was conducted in Gucha District in Nyanza Province in Western Kenya. According to the 1999 national census, the district had a population of 438,123 persons and a population density of about 1000 persons per Km^2. the number of poor individuals in the district was estimated to be 269,252. This makes 61% of the population to be living below the poverty line. Poverty Index Range per division is between 51%-69% (Republic of Kenya, 2003). The economic activities practiced in Gucha district are crop farming, diary farming, soapstone carvings, brick making and small scale businesses. There are few tea processing factories which offer employment opportuvities to the people. The inhabitants of the area attach great importance to better quality education for their children but this has not been achieved.

Sample and Sampling Techniques

Stratified random sampling technique was used to select the schools and the category of respondents to be included in the sample. The schools were grouped into four categories as follows: Girls' boarding schools, Boys' boarding schools, Mixed Boarding schools and and public Day schools. The sample constituted of 42 schools: 5 boarding schools and 37 day schools. This accounted for 33% of the total public secondary schools. Purposive sampling was used to select teachers and quality assurance officers.

Instruments of Data Collection

Four instruments were used in data collection namely: questionnaires, In-depth interview guide, Focus Group Discussions and direct observation schedule. Questionnaire was preferred for its suitability to this study. It was suitable as a method of data collection because it allowed the researcher to reach a large sample within limited time and ensured confidentiality of the information given by the respondents. We designed four sets of questionnaires for the four categories of respondents who included headteachers, heads of departments, board of governors' chairpersons and bursars/accounts clerks. The four questionnaires sought to solicit information on the effects of financial mismanagement on quality education in public secondary schools in Gucha district.

Interview Schedule

Saidman (1991) points out that interviewing is one of the best instruments for qualitative data generation. In-depth interview schedule consisted of unstructured items. Face to face interviews were administered to two quality assurance at the district and eight field officers. The aim of the interview was to get more information on the effects of financial mismanagement on quality education in public secondary schools. Responses from interviews were recorded under headings emerging from interview with interviewees.

Focus Group Discussions

Focus Group Discussions (FGDs) do not aim for a representative sample of a population; they try to generate talk that will extend the range of thinking about an issue, and this is done by recruiting groups that are defined in relation to the particular conceptual framework of the study (Saile, 2004). According to Cohen (2007) focus groups are a form of group interview … the reliance is on the interaction within the group who discuss the topic supplied by the researcher yielding a collective rather than an individual view – from the interaction of the group, data may emerge that will represent the views of the participants rather than the agenda of the interviewer. A total of 17 FGDs were held which involved 17 teachers each giving a total of 289 teachers. Teachers were considered to be useful in this case since they understood better the distribution of teaching/learning facilities in their respective schools. A focus group discussion guide with a few guiding items was prepared by the researcher.

Direct observation of the school's physical facilities, classroom learning environment, and teaching facilities in general was carried out by the researcher. Particular attention was given to each school regarding the quality, adequacy and availability of school Physical facilities, and instructional facilities. Other aspects which were considered included: gender of respondents, qualification of personnel involved in the study, age of the BOG chairpersons, Bursars, and principals and finally literacy level of the same. The researcher prepared a checklist and administered it personally at the time of visiting each sampled school and proper writer-up made later. Data from observation helped to verify the responses to questionnaires and interviews.

Validity and Reliability of Research Instruments

To make instrument valid, Cohen and Marion (1994) stress that the validity of research instruments should be determined by experts. To validate the instruments, questionnaires and interview guide, Focus group Discussion guide and observation checklist were presented to three experts in the department of Educational Management and Foundation at Maseno University for examination. Their suggestions and comments were incorporated with a view to improve the validity after which a pilot study was conducted in 10 schools in the study area which were not included in the sample to ascertain validity.

Reliability of questionnaires was determined through running a correlation using the Pearson Product moment. Test-retest method was used to confirm the reliability of the instruments. The questionnaires were administered to the same respondents twice within an interval of 2 weeks. The scores of the responses from the sets of questionnaires that were administered on the two occasions were computed and the coefficients

Classroom in poor conditions

Findings obtained revealed that over 21(50%) of the HTs, HODs and bursars were of perception that financial mismanagement had a negative effect (HE) on the quality of classrooms while less than 19(45.2%) of the same respondent perceived that financial mismanagement had no effect (HNE) on the nature of classrooms found in schools (Figure 3). During interviews, with quality assurance and standards officers, one of the officers lamented, "Classrooms in most district schools are in poor conditions as they have no window panes, no doors, leaking roofs and poorly made floors." In this respect one of the teachers said: "For many years classrooms have not been repaired and school property are insecure" from interviews, one of the QUASO said, "There are old and cracked buildings especially in district level schools" while another teacher in a different forum said "come and see heaps of broken furniture which have taken many years being rained on." During FGDs teachers were of opinion that the quality of their classrooms was low as the floor has cracked and cleaning them took learners‟ time and a lot of dust from them made classroom un-conducive environment to work from.

Observation on the nature of classrooms indicated that classes were congested, equipped with a few number of desks, without window panes and not well ventilated. The floors in such classes were in poor conditions and had a lot of potholes an indication that sometimes in the past were well made. In other schools the floors were dusty and walls were not plastered or painted.

Poor state of classroom implied that funds meant for maintenance was not properly used and the nature of classrooms directly correlated with the amount spent on it. When classroom situation is un-conducive, teachers' morale is lowered and students' performance may be affected. The amount of learning that takes place is proportionate to the quality of resources available in the classrooms. For instance desks and lockers when of good quality make seating comfortable for learners to learn. This finding is similar to that of Akintayo (1997) who made observation that crowded classroom conditions not only make it difficult for students to concentrate on their lessons, but inevitably limit the amount of time teachers can spend on innovative teaching methods such as cooperative learning and group work or, indeed on teaching anything beyond the barest minimum of required material. In addition, because teachers must constantly struggle simply to maintain order in an overcrowded classroom, the likelihood increases that they will suffer from burnout earlier than might otherwise be the case. Republic of Kenya (2003) found that a situation where there are overcrowded classrooms with insufficient number of desks and benches have negative effects on teaching and learning environment in the class. Farombi (1998) found similar finding to this study that the classroom learning environment in some schools was poor. He cited examples of schools without chalkboard, absence of ceiling, some roofing sheets not in place, windows and doors removed among others, a situation which the researcher regarded as hazardous to healthy living of the learners.

Schools had very few Toilets

The results obtained on Figure 3 revealed that 24(57.1%) of the HTs, 23(54.8%) of HODs and 21(50%) of the bursars were of the perception that financial mismanagement had an effect (HE) on the quality and quantity of toilets in schools while 18(42.9%) of the HTs, 19(45.2%) of the HODs and 21(50%) of bursars perceived financial mismanagement to have no effect (HNE) on toilets. During FGDs one of the teachers remarked, "The quality of students' toilets is poor as they have bad smell, they are full and lack cleaning detergents"

while another teacher said: “Girls’ toilets lack privacy and they are ashamed to queue as the number of toilets are few” and another teacher reported “Sanitation facilities especially for district schools are not accommodative as there are fewer toilets for students forcing them to queue and waste a lot of learning time.” However, at another FGDs one of the teachers reported: “School toilets were enough before the implementation of Free primary Education which resulted to increased enrolments at secondary schools.”
Absence of adequate toilets influences poor time management on the side of learners and the retention of girls in schools. Where funds meant for construction of new toilets and repair of the old ones are misused, schools are likely to have un-accommodative environment for studies and this may influence students‟ performance. This finding is similar to that of Rihani (2007) who reported that the impact of safe, clean toilets in schools in Africa had been documented. A study by UNICEF reports that from 1997 to 2000, enrolment rates for girls jumped 17% after improvements in school sanitation, and the dropout rate among girls fell by even greater percentage. Luvega (2007) found similar findings to this study that lack of necessary sanitary facilities may lead to outbreak of diseases making the learning environment not conducive.

Dormitories in poor conditions

Findings obtained revealed that 13(31%) of the HTs and HODs, and 12(28.6%) of the bursars perceived that financial mismanagement had an effect (HE) on dormitories while 29(69%) of the HTs and HODS, and 31(73.8%) of bursars felt that financial mismanagement had no effect (HNE) on dormitories (Figure 3). All respondents agreed that the quality of dormitories had been affected by financial mismanagement while 21(50%) of the HODs and bursars/accounts compared to less than 16(38.1%) of the HTs involved in the study who indicated that furniture and school plant had been affected by financial mismanagement. From FGDs very few teachers were of opinion that financial mismanagement had affected the quality of dormitories. One of those teachers from boarding schools reported: “dormitories in schools are poor conditions as they have broken window panels, doors are not lockable and the drainage system is very poor” Another teacher said: “A few dormitories in schools are congested and the lighting system is bad.”
Poor dormitories conditions attract insecurity and endangered the life of students. Congested dormitories made it difficult for students to clean them and this wasted learners' time for learning and eventually their performance. This finding is similar to that of Roy (2008) who observed that developing school infrastructure is necessary in improving school attendance and academic performance. He grouped school infrastructure into three: basic, supportive and activity based. He however noted that all the three categories are essential in the provision of quality secondary education.

Schools have one laboratory for science subjects

The findings obtained revealed that 22(52.4%) of the HTs, 34(81%) of the HODs and 27(64.3%) of the bursas were of the opinion that financial mismanagement has an effect (HE) on the quality of laboratories while 20(47.6%) of the HTs, 8(19%) of HODs and 15(35.7%) of bursars felt that financial mismanagement had no effect (HNE) on laboratories (Figure 3). During interviews, one of the QUASO had a perception that “the quality of school facilities could have improved if funds received were put into proper use” while another QUASO reported: “School facilities are in poor states quo as before schools received subsidized secondary education funds”. During FGDs, one of the teachers stated: “Wait until the time for examinations, when a

crisis comes up and learners go in for practical in trips until midnight." Another teacher confirmed: "This has affected our performance due to lack of frequent practical activities." The findings from observation on physical facilities in schools involved in the study revealed that all district day schools (37) had poorly equipped laboratories and libraries as there were no water systems, no gas and preparation rooms were dark. Available science equipments were dusty and disorganized an evidence that no regular practical or experiments were carried on.

All the 37 day schools involved in the study had one laboratory for all science subjects. Observation on physical facilities revealed that in 23 out 42 schools involved in the study, there was only one laboratory being used for the three science subjects and also for optional subjects. A school should have at least 2 laboratories for teaching biology and physical sciences. Ideally a school should have 3 laboratories for teaching biology, physics and chemistry since each discipline need different sets of equipment and facilities.

In a situation where a school has only one laboratory, students did not have enough time to do experiments and practical let alone time to familiarize themselves with the laboratory equipment and reagents. All these had an impact on the student achievement. This finding is similar to that of Adeogun (2001) who carried out a study to establish a relationship between school resources and student achievement. He found out that, physical resource of a school was significantly related to students‟ academic performance while Yadar (2007) suggested that practical work ought to be carried out by individuals either in science laboratories or in classes. Thus practical work forms an important feature in any science and mathematics course (UNESCO, 2008). Similarly, Adesoji and Olatunbosun (2008) described that laboratory adequacy was also found to enhance achievement through attendance at chemistry workshop.

Libraries not well stoked

The result obtained in Figure 1 revealed that over 21(50%) of the HTS, HODs and bursar were of the opinion that financial mismanagement had an effect on the quality of libraries in schools. During FGDs one of the teachers noted, "libraries are non-existent in schools as a few books are kept in Deputy principals‟ offices" Another teacher reported: "In some schools one of the classrooms have been converted to be libraries" while another teacher remarked, "There are occasions when we see books brought to schools and then disappear to nowhere, since there are no rooms set aside for their storage." Findings from observation indicated that in all 42 schools involved in the study, library rooms existed. In seven schools out of 42 such rooms were in use and served the right purpose as books were kept there. However, in 33 schools there were no books in the library and instead they were kept in the deputy principals‟ office not even arranged per subject. In the five boarding schools, books of the old education system were heaped together in one corner and some in bags. It was revealed that due to the provision of lunch in all schools, firewood and cereals were stored in what would be library rooms.

The quality of libraries and books kept therein reflected the amount of finances spent on them. Where funds are not put into library use, the availability of such buildings and books will be affected. Lack of rooms for storage of books influences theft cases and reduction of the number of books in schools. This denies students and teachers a chance to access teaching and learning materials. This is likely to affect the learner‟s performance as they lack extra reading materials apart from what teachers give them. Teachers are unable to give additional assignment to students and also affect syllabus coverage. This finding is similar to the views of Shodimu (1998) that many schools operate without libraries and noted that total absence of an organized school library would continue to spell dooms for thousands of secondary school students. Ojoawo (1990) described a library as an essential factor in teaching-learning process. It forms one of the most important educational services. It must be properly supported financially to fund materials and services among others. On this respect, Ola (1990) made observation that a well equipped library is a major facility which enhances good learning and achievement of high educational standard. In his words, Farombi (1998) suggested that school libraries may not be effective if the books therein are not adequate and up-to-date as its impact may only be meaningful if the library could be opened to the students always for a considerable length of time in a school day.

4.4.2.6 School plant in poor state

The results obtained in Figure 3 revealed that 16(38.1%) of the HTs, 19(45.2%) of HODs and 21(50%) of bursars agreed that financial mismanagement had an effect on the state of school plant. The findings from observation revealed that school plant in over 25 schools was in poor conditions as there were no staffrooms for teachers, schools had no strong fences, drainage system was poor while in some schools buildings had cracked and were deteriorating in quality. In respect to this one of the teachers lamented, “From a glance on the quality of physical infrastructure, one may tell the quality of education provided” while another teacher stated, “We work under poor conditions until the morale is gone.”

Findings from observation on general school plant revealed that all (5) provincial schools had modern type of gates and adequate offices as well as staffrooms. From the district schools only 11 out 37 schools had quality gates. In 13 out 37 district schools involved in the study school building were of good quality and the lawn together with flower beds were well done. The study established through 5 out of 10 quality assurance officers that in five schools A,B,C,D and E where finances were managed properly, facilities such as classrooms, textbooks, laboratories and libraries had greatly improve as well as their examination performances. However, they lamented that due to poor facilities in majority of public schools, students kept on transferring from one school to another. In this respect one of the QUASO remarked, “A student learns in four different schools in four years while searching for better teaching/learning facilities.”

Where funds were not used properly to improve infrastructure, performance could be affected due to poor facilities. This finding is similar to Hallack (1990) who discovered that learning experiences were fruitful when there were adequate quantity and quality of physical resources and unattractive school buildings, crowded classrooms, non availability of playing ground and surroundings that had no aesthetic aspect could contribute to poor academic performance. Stockard and Mayberry (1992) noted that the specific physical environment of the school could influence student achievement and found that a strong tie existed between the physical condition of school buildings and expenditures. In Virginia, both Cash (1993) and Hines (1996) concluded that secondary students in both rural and urban areas performed better in higher quality school

buildings. Honeyman (1998) noted that postponed structural repairs such as roofing could lead to costly cosmetic repairs as roofs leaked and damaged ceilings, walls, floors, or carpeting had to be replaced. Lemer (1995) also discussed the issue of deferred maintenance. By postponing needed repairs into the future, administrators had allowed school buildings to deteriorate and had robbed future generations of both adequate facilities and needed funds. He also noted that even without deferred maintenance issues, the natural obsolescence of facilities would necessitate extensive spending on schools as programs changed, technology advanced, and school populations grew. They were often poorly heated, dilapidated, unsafe, poorly equipped and furnished, and inadequate (Lackney, 1994).

A Genre Analysis of Linguistic Vocabularies, Word Choices and Dictions in Job Interviews by the Judicial Service Commission Kenya in 2011

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Abstract

The purpose of this research article is to identify and describe the linguistic vocabularies, word choices or dictions that are used in the job interviews conducted by the Judicial Service Commission of Kenya during the vetting process to recruit or maintain public office holders in Kenya, in 2011. The Kenyan judiciary has been facing a lot of challenges since the country got its independence in 1963. These challenges range from corruption, incompetence, violation of human rights to dishonesty among others, Makwera, M. et al (2011). So when the new constitution was promulgated in 2010, one of the components of the new constitution was the vetting of public office holders. Vetting is a process that involves finding out publicly about a person's past life, experiences, academic qualifications, one's personality in general and any other attribute. The vetting process is done using language as a tool of communication and therefore enhances good values including integrity, transparency and accountability. However, sometimes the language used may act as an impediment to the achievements of the set goals. The methods of data collection included library research and internetsearch. This article therefore investigates how the use of linguistic vocabularies, word choices or dictions promote the positive values that are meant to improve the judiciary or how they contradict, contravene or violate some of the values enshrined in the Kenyan new constitution. The findings and results reveal that some of the vocabularies, word choices and dictions used in the interviews by the JSC promote the positive values while others contradict the same values as enshrined in the Kenyan new constitution. The article attempts to offer solutions to the language challenges that emerge when participants in an interview use linguistic terms that violate the rights of others.

Key words: genre, linguistic vocabularies, diction, promulgated, vetting process, enshrined.

1.0 Introduction and background

For the purpose of this article, three interviews have been selected from a total of ten interviews for Chief Justice by the Judicial Service Commission of Kenya, 2011. The video clips have been downloaded from the JSC's website and the transcripts have been transcribed for purposes of analysis. The extracts containing some of the linguistic vocabularies, word choices and dictions that are meant to be analyzed have been extracted from the interviews and they include those that are meant to promote the positive values and those that contradict the same values as enshrined in the new constitution. The use of Genre Analysis theory as described by Swales' 1990 has proved to be very useful in identifying and describing the linguistic vocabularies, word choices and dictions in the interviews conducted by the JSC of Kenya.

Some of these linguistic features play double roles of promoting the positive values (like integrity, transparency and accountability, competence and efficiency among others) and at the same time contradicting the said values. The outcome has seen a number of participants including interviewees complaining that their rights have been violated as some questions were intended to reveal their privacy and expose their past life, the injustices people experienced when they had cases before them and many others, Makwera, M. et al, (2011). Some of these claims were mere allegations but they were publicly exposed and this was a violation of human rights. It means that the ones who felt their rights were being infringed on could easily take legal action against their offenders. It also means that language was seen as a tool that could be used to improve an institution like the judiciary. The recommendations that are made in this article are to improve on the language use in order to control the way questions are asked and the way they are responded to as this can help to promote democracy, equality and human rights. Language should be used to build relationships and not to destroy them.

1.1 Theoretical framework

The theory of Genre Analysis as designed by Swales (1990) and as developed by Bhatia (1993) has been employed in the study and writing of this article. The theory explains how any genre can be analyzed in terms of moves or phases, rhetoric strategies and linguistic features(including the use of lexis or vocabularies, syntax and discourses). It explains the use of personal pronouns, modality, vocabulary, phrases, active and passive voice among other linguistic items. Swale's theory has been used to define and describe the linguistic items used in the interviews by the Judicial Service Commission. Bhatia's approach to genre analysis has been employed as it involves studying the institutional context and levels of linguistic analysis such as investigating the lexico-grammatical features and text patterning or textualization and structural interpretation of the text genre. Bhatia suggests that a linguistic analyst should perform the linguistic analysis of a genre text on one or more of the linguistic realizations or levels of analysis taking into consideration the specific linguistic features dominating a given text. This is usually done by making an analysis of representative sample of the text in question within a given genre.Bhatia suggests seven steps that can be used to analyze any form of genre. They include, firstly, placing the genre-text in a situational context; secondly, surveying the existing literature; thirdly refining the situational and contextual analysis to obtain the whole image; fourthly, selecting corpus; fifthly, studying the institutional context and levels of linguistic analysis such as investigating the lexico-grammatical features and text-patterning. The sixth one involves the structural interpretation and finally, the seventh one involves checking specialist information with experts in genre analysis to avoid some mistakes.

This theory is relevant because, in the analysis of interviews, different steps are taken into consideration. The linguistic features used at each step is determined by the intentions of the participants, their attitude and feelings, thus the terms used during the interviews are generated from the understandings, beliefs and attitudes of the participants.

1.2 Research Methods

The study has used qualitative method in the analysis and the sampling procedure involves purposive sampling which is considered to be selective or subjective. The non-probability method of sampling has been used and it is characterized by deliberate efforts to get representative samples by including groups or typical areas in a sample. Two interviews have been selected through convenience sampling procedures.

1.3 Data collection method

The method of data collection employed in this study include: library research and internet search. Library research has been used to select different newspapers that contain the different interview texts that have been used for this study. Due to the fact that the interviews were carried out through televisions in full glare of the public, it was possible to obtain full texts of all the interviews conducted by the judicial commission of Kenya in 2011.The internet search has been used to download the interview texts from the video clips from the JSC's website.

1.4 Significance of the article

This article is significant as it highlights how the use of language can promote certain positive values that are required in certain contexts or certain institutions like the judiciary. It also acts as an eye opener to the fact that as much as we believe that language is a tool for improving certain institutions, it can also contradict or contravene certain values as enshrined in a country's constitution. The recommendations made are meant to help transform some of these institutions without violating the rights of some individuals who may feel hurt and even seek legal actions against their offenders.

1.5 Analysis Results

1.5.1 Linguistic Vocabularies /Word Choices/Dictions

A vocabulary refers to 'all the words that a person knows or uses', or 'all the words in a particular language', or 'the words that people use when they are talking about a particular subject', or 'a list of words with their meanings'- Dictionary.com (Oxford Advance Learner's Dictionary p.1662) . Diction also refers to the choice or use of words in literature (*ibid, p.404).* A vocabulary, or wording of a text gives an indication of how the speaker or writer sees the world through his or her wording. Fairclough (2006) argues that different groups of people see the world differently in different times and places as they use their wordings differently to describe the world. One way to make an analysis of vocabulary is to look upon alternative wordings and their political and ideological significance. For instance, using the term "freedom fighters" instead of the word "terrorists" connotes different views on ideology which is also referred to as *rewording*. Rewording occurs when one existing, dominant, and naturalized wording is systematically replaced by an opposing wording,

Fairclough *(2006).* The lines below that are taken from the interviews by the JSC give the examples of how certain words are used in certain contexts:

1. *Could you say that you were not too harsh on the plaintiff particularly on issue of gender?(Extract 1, line 1)*

2. *Burials have to be dealt with under the customary law, that is the constitutional position. There was no other law to deal with issues of burials. (Extract 1, line 2)*

3. *And if this case came back to you today, and if you were to set a way forward for every other judge as head of the judiciary, how would you handle it?(Extract 1,line3)*

4. *Those customary practices which run contrary to human rights are not to supersede the position of human rights.(Extract 1, line 4).*

5. *Your CV paints the picture of a great judge. You say you have given land mark rulings. What are landmark decisions? (Extract 2, line 2)*

6. *There's a view that you are not fit to be a chief justice because you have a problem with grasping the law, you are temperamental and not the right person to reform the judiciary. (Extract 2, line 13)*

7. *There is also a view that as much as you have good judicial career, you are impatient and you shout.(Extract 2, line 15)*

8. *Questions about what l see as the judiciary in the transition, l talked about that collective intellect, you know, which in a supreme court, for example, you are going to have judges who have different philosophies.(Extract 3, line).*

9. *And are you a homosexual…?(Extract3, line 6)*
10. *I am not a homosexual and having said that, let me say l don't discriminate against people who are homosexuals. (Extract3, line 6)*

In example 1, the interviewer uses the expression '*too harsh'* to mean the judge might have made an earlier ruling harshly or in a cruel manner. This is from his judgment and it portrays some elements of one's attitude towards something or somebody. If the speaker wanted to portray the action that was done positively, then he or she would have used terms like '*strict' or 'firm'* instead of '*harsh*' which portrays the negative aspect of the action. *Harsh* in this case would imply that the candidate violated the rights of the plaintiff, especially human rights thus contradicting the intention of having a clean judiciary where positive values are meant to be promoted or enhanced. Also in the same line, the interviewer uses the term the 'plaintiff', which is a legal term meaning a complainant in a court of law. This term would seem irrelevant if the job interview was done in another context not for a judicial position. The wording in this case is done in accordance with the context

in which the interview is conducted and that is why the term 'plaintiff' is used as a vocabulary to bring out a legal connotation, thus placing the utterance in the appropriate context.

The issue of gender has also featured in example 1 and it actually shows that discrimination against people because of their gender should not feature when a judge is making his judgment and this is a constitutional requirement. In response to the question made in example 1, the interviewee refers to constitutional position concerning burials and customary laws. Example 3 and 4 are emphasizing the role of customary law in the presence of a more superior law, in the new constitution, and what it has concerning human rights. The choice of words by the
Interviewer in examples 6 & 7, portraying the interviewee as temperamental, impatient and proud without proper evidence can also hurt the person being interviewed. If such words must be used, they should be accompanied with concrete evidence before damaging one's reputation in public. However such expressions are indicators that the participants are serious about solving the problems and challenges in the judiciary and that is why they are promoting positive values such as patience, humility and soberness through their speech. So, the linguistic features, such as vocabulary, can be used to promote, enhance and express positive values meant to improve the judiciary. On the other hand, such features can also violate certain articles in the new constitution, especially when the users of language are not experts.

Also the question in example 5 concerns *landmark* ruling. This is the use of vocabulary to create an image in the mind of the listener or reader. It is a form of metaphor that is meant to create a lasting image on the listener and the
reader. It implies uniqueness, competence and independence on the side of the interviewee and these are positive attributes hence are meant to promote positive values in the mind of the listeners or readers including members of the public. It is therefore clear that the participants in the interview are aware of the positive values of respect, competence, independence, obedience to the laws of the land, being gender sensitive in making judgment among other values enshrined in the new constitution. On the other hand they are aware that harshness on a plaintiff, discrimination against people on the basis of gender, incompetence, disrespect and many other negative values should not be encouraged in a democratic society.

In example 8, the candidate also responds indirectly to the questions asked by the interviewer. From his choice of words or diction, he uses expressions such as '….*judiciary in transition'* which implies that the institution of justice is in the process of changing from one state or condition to another. He goes further and talks about '*collective intellect'* which is a digital communication analytic platform addressing the needs of the marketers and researchers *(http://www. Collectiveintellect.com)* to help surface consumer opinion, measure impact, identity customer sentiment and manage corporate firm. It is used by marketing professionals to assist with marketing efforts at the industry, company, brand campaign and messaging levels. The intellectuals involve those that are also expected to be having different philosophies and this implies that they should be people who think deeply and independently before they act or speak. It is for these reasons that he feels some people can as well come from outside and initiate changes in the judiciary. To this end, he is seen as a promoter of positive values of competence, independence and integrity through his choice of words.

So the use of selective pronouns and diction or choice of words or phrases is intentionally driven to gain the confidence of the public through language use and this is one of the reasons why open and public vetting was introduced in Kenya. For instance, in example 9, the applicant is asked to give clarification on an issue

that is in the air or is going round in some context and is touching on his personality. It is true that the personality who was being interviewed was at one point thought of by the public as belonging to the gay community majorly because of his ear stud and his lifestyle. In the context of the interview and in the wider context, which is the Kenyan society, lesbians and the gay homosexuals are seen to be people who are out to degrade the moral standards of the society and therefore introduce a culture that is seen to be alien or foreign to the citizens. It means that the interviewers are concerned with the morality of the Kenyan people and therefore whoever takes charge of the judiciary must be one who can uphold the moral practices as designed in the new constitution. In response to the question on homosexuality, in example 10, the interviewee does not want to be associated with the homosexuals but he does believe that their rights should not be violated by discriminating against them. So this means that the participants are aware of the positive values that should be promoted in the judiciary, such as values of respect, dignity, uprightness and many others. However, according to MLA (2012), candidates in an interview should not be asked questions about age, socio-economic status, marital status, children, medical or disability status, sexual orientation or nationality. To this end the candidate could claim that his rights were violated in the process, through the choice of words or vocabularies and this could mean that some articles of the new constitution were contravened or violated through the use of language.

1.6 Solutions to the problems

Matters to do with language should be addressed by among others, language experts. These are people who will maintain the principles of conversation but pass the right information to their audience. The committee involved in the vetting process should use the right polite expressions but pass the same information that would otherwise be expressed by some people who are arrogant and proud. This article suggests that those who use language as a tool for improving certain institutions should pick their wordings and vocabulary well without causing disharmony by using inappropriate terms, phrases, clause and even wider discourses.

1.7 Closing remarks

This article has analyzed the linguistic features that are used in job interview to get qualified personnel in certain institutions like judiciary. The language used should be that which promote positive values like integrity, justice, competence among other values. However the interviews conducted by the JSC of Kenya have tended to incorporate certain features that are hurting to the candidates hence cannot be used to transform such institutions like the Kenyan judiciary.

References

Bhatia, V. K. (1993). *Analysing Genre: Language Use in Professional Settings*. London; New York: Longman.

Fairclough, N. (2006). *Language and Globalization. Routledge*. London, UK..

Fairclough, Norman. (2003). Analysing Discourse: Textual Analysis for Social Research Routledge, London, UK

Mwakera, M. Barasa,L. & Mathenge, O. (2011 ,13th may). *JSC Nominates Candidates*. Daily Nation .Nation Media Group, .Nairobi.

Swales, J. M. (1990). *Genre analysis*: English in academic and research settings, Cambridge: Cambridge University Press.

Fate of Lambda-Cyhalothrin in Kales, Tomatoes and Cabbage from Rural setting in Kenya.

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Abstract

A vegetable is any part of a plant that is consumed by humans as food as part of a savory course or meal. They are highly nutritious and form as key food commodity in the human consumption. They are also highly perishable due to their low shelf life. A diet rich in vegetables and fruits can lower blood pressure, reduce risk of heart disease and stroke, prevent some types of cancer, lower risk of eye and digestive problems. When researchers combined findings from the Harvard studies with several other long-term studies in the U.S. and Europe, and looked at coronary heart disease and stroke separately, they found a similar protective effect: Individuals who ate more than 5 servings of fruits and vegetables per day had roughly a 20 percent lower risk of coronary heart disease and stroke, compared with individuals who ate less than 3 servings per day. Pesticide residues are the major contaminants found in vegetables. Pesticides are used in management of pests and diseases in Agricultural and Horticultural crops. They can leave adverse effects on the nervous system. Some harmful pesticides can cause several hazardous diseases like cancer, liver, kidney, and lung damage. Certain pesticides can also cause loss of weight and appetite, irritability, insomnia, behavioral disorder and dermatological problems. There are many pesticides in use today including; insecticides, acaricides, nematocides, herbicides, and avicides. Pyrethroids are the most commonly used insecticides. The pyrethroids in use include; deltamethrin, lambda-cyhalothrin and chismethrin. Lambda-cyhalothrin was analyzed in some selected vegetables (kales, cabbages and tomatoes) in this study. The samples were obtained from different sellers in some rural setting in Kenya known as Makuyu, during the dry and wet seasons. They were extracted for the lambda-cyhalothrin using organic solvents. The residues were then determined using high performance liquid chromatography (HPLC). The analysis of the data was done using t-test, regression analysis and ANOVA. In this case, lambda-cyhalothrin was analysed in vegetable samples obtained from the urban area (Nairobi Markets) during the dry and wet seasons. It was observed that the samples analysed during the dry season had higher residue levels of lambda-cyhalothrin (ranging from 0.0300 mg/kg to 0.3400 mg/kg), than those analysed during the wet season which, ranged between 0.0001 and 0.0040 mg/kg. The difference between the two seasons was significant at 95 % confidence level, ($t_{(8, 0.05)}$ = 2.31 and $t_{calculated}$ =4.30). Almost all the samples analysed during the wet season had undetectable levels of lambda-cyhalothrin. The residue levels observed during the dry season were higher than the FAO/WHO's ADI of 0.02 mg/kg, but less than the FAO/WHO's MRLs of 0.2 mg/kg (FAO/WHO, 1996), while the levels of lambda-cyhalothrin obtained during the wet seasons were all lower than the two bodies' set standards.

Keywords : Vegetables, Rural setting, Pyrethroids, Lambda-cyhalothrin and HPLC

1.0 Introduction

The term *vegetable* is somewhat arbitrary, and largely defined through culinary and cultural tradition. It normally excludes other food derived from plants such as fruits, nuts, and cereal grains, but includes seeds such as pulses. The original meaning of the word *vegetable*, still used in biology, was to describe all types of plant, as in the terms "vegetable kingdom" and "vegetable matter" (Hillman, 1996).

Originally, vegetables were collected from the wild by hunter-gatherers and entered cultivation in several parts of the world, probably during the period 10,000 BC to 7,000 BC, when a new agricultural way of life developed. At first, plants which grew locally would have been cultivated, but as time went on, trade brought exotic crops from elsewhere to add to domestic types. Nowadays, most vegetables are grown all over the world as climate permits, and crops may be cultivated in protected environments in less suitable locations. China is the largest producer of vegetables and global trade in agricultural products allows consumers to purchase vegetables grown in faraway countries. The scale of production varies from subsistence farmers supplying the needs of their family for food, to agribusinesses with vast acreages of single-product crops. Depending on the type of vegetable concerned, harvesting the crop is followed by grading, storing, processing, and marketing (Hillman, 1996).

Living organisms evolve and increase their resistance to biological, chemical, physical or any other form of control. Unless the target population (for example the pests) is completely exterminated or is rendered incapable of reproduction, the surviving population will inevitably acquire a tolerance of whatever pressures are brought to bear - this results in an evolutionary arms race. A pest is "a plant or animal detrimental to humans or human concerns (as agriculture or livestock production)" (Merriam, 2012). Alternative meanings include organisms that cause nuisance and epidemic disease associated with high mortality (specifically: plague). In its broadest sense, a pest is a competitor of humanity (Pest Vermin, 2016). There are now many chemicals with which pests, diseases and weeds can be controlled. It would be reasonable to state that neither could we have achieved nor can we maintain the standard of living, which we enjoy today without the use of these chemicals. Almost all these chemicals are poisonous to creatures besides those, which they are intended to kill. Thus, they can be very dangerous to the life of humans, animals, fish, and birds. There is therefore, need for monitoring the levels of pesticides residues in the vegetables. The class of pesticides commonly used on vegetables is the insecticides, and mostly the pyrethroids insecticides such as lambda-cyhalothrin (Shan, 1989).

In this study, therefore, Lambda-Cyhalothrin residues levels were investigated in vegetables. Cyhalothrin is an organic compound that is used as a *pesticide* (Cameo Chemicals, 2008). It's a class of man-made insecticides that mimic the structure and insecticidal properties of the naturally occurring insecticide pyrethrum which comes from the flowers of chrysanthemums. Synthetic pyrethroids, like lambda-cyhalothrin, are often preferred as an active ingredient in insecticides because they remain effective for longer periods of time. Pyrethroid is a colorless solid, although samples can appear beige, with a mild odor. It has a low water solubility and is non-volatile. It is used to control insects in cotton crops (Robert, 2002). The crops on which it may be applied include cotton, cereals, ornaments, potatoes and vegetables. Its molecular formula is $C_{23}H_{19}C1F_3NO_3$.

Lambda-cyhalothrin is a colourless solid at room temperature. Lambda-cyhalothrin is rapidly hydrolysed under alkaline conditions but not in neutral or acidic media. The minimum detection limit of lambda-cyhalothrin during the analysis done by FAO/WHO joint is 0.005 mg/kg (FAO/WHO, 1986). Trade names for products containing lambda-cyhalothrin include charge, excaliber, grenade, hallmark, icon and karate (Hart, 1984). In

Kenya, it has the trade name karate. Lambda-cyhalothrin is known to produce an effect described as subjective facial sensation (SFS) in some people who work with this compound (Hart, 1984). The extent of sensation is more likely to be related to the amount of the chemical that comes into contact with the facial skin (Hart, 1984). Signs of intoxication are characteristic of type II pyrethroid toxicity and include piloerection, subdued behavior, ataxia, unsteady gait, salivation, incontinence, scouring, and chromodacryorrhoea (Nixon *et al*., 1981). High levels of these insecticides on consumable foods can be injurious to the population and hence the need for continued monitoring of the levels of pesticides residues in vegetables.

2.0 Methodology

2.1 Sample collection and pre-treatment

The vegetable samples analysed were obtained from different vegetable dealers in Makuyu Market in Kenya, during the dry season and wet seasons. They include; kales (sukumawiki) (*Brassica Oleracea C.),* cabbage (*Brassica Oleracea A.)* and tomatoes (*Lycopersicon Esculentum*). These are the most commonly consumed vegetables in the Kenyan markets today. The vegetables were then sorted out, weighed and then homogenized to make a representative sample. The samples were finally put in clean polythene bags, labeled and then stored safely in a refrigerator at -4^{o}C awaiting extraction and analysis. Plate 1, shows different types of vegetables consumed globally.

2.2 Cleaning of glass and plastic containers

All the glassware used in this study were soaked for 12 hours in freshly prepared chromic acid. They were then rinsed with distilled-deionised water. They were then soaked in distilled-deionised water for about 6 hours to leach off any adsorbed chromic ions. Finally, they were dried in oven after rinsing them with fresh distilled-deionised water. Plastic containers were thoroughly cleaned with detergents and then rinsed several times with 6M Analar nitric acid. They were then rinsed thoroughly with distilled-deionised water and dried in an open rack. They were then stored safely in a clean environment till required.

2.3 Reagents and solvents

All the chemicals and reagents used in this research were of analytical grade and included;

1

i. Hexane-Glass distilled–from Kobian distributors limited (Nairobi, Kenya)
ii. Acetone- Glass distilled–from Kobian distributors limited (Nairobi, Kenya)
iii. Florisil–from Kobian distributors limited (Nairobi, Kenya)
iv. Diethyl ether- Glass distilled–from Kobian distributors limited (Nairobi, Kenya)
v. Analytical standard for deltamethrin-from Britain at Aldrich limited (Britain)
vi. Acetonitrile- HPLC grade–from Kobian distributors limited (Nairobi, Kenya)
vii. Water –Distilled and deionised HPLC grade

2.4 Preparation of the standards and the calibration curve

Stock standard solution (of Lambda-Cyhalothrin standard) was prepared using isooctane. Working standards for HPLC/DAD calibration were prepared by serial dilution of the stock standard solutions using isooctane. The series consisted of eight calibration levels each with different concentration as shown in Table 2.2 below:

Table 2.2: Serial dilutions of the stock standard

Vial	**Concentration of Lambda-cyhalothrin standards**
1.	0.80
2.	0.64
3.	0.50
4.	0.34
5.	0.12
6.	0.10
7.	0.05
8.	0.01

The purpose of the calibration was to ascertain the relationship between the amount of standard injected and peak area at the specific retention time for the pesticide.

The Spectra for Lambda-Cyhalothrin was used to ascertain the compound, identified by virtue of its abundance and mass to charge ratios. A spectrum in this case refers to a fragment unique to a certain molecule; while the fragments represent various masses, which are unique to the compound. In this case a library with specific spectra for pesticides was used, which has about 600 pesticides.

2.5 Statistical Analysis

The data was evaluated using mean, the standard deviation, t-test and one-way [1]ANOVA. The significant tests were done at p= 0.05 (Miller and Miller, 1992).

3.0 Results and Discussions

The Lambda-cyhalothrin was determined using [2]HPLC-DAD in all the samples, after a column clean-up with florisil. Table 1 and Figure 1 shows the results obtained.

Table 1: Mean residue levels of lambda-cyhalothrin in mg/kg in the samples from the Makuyu during the dry and wet seasons (Mean ± SD, n=10)

Vegetables	Dry season	Wet season	$t_{(8, 0.05)}$	$t_{calculated}$	Difference
Kales	0.0130±0.0200	0.0018±0.0040	2.31	1.20	Not significant
Cabbages	0.0500±0.0300	0.0050±0.0400	2.31	2.00	Not significant
Tomatoes	0.0500±0.0400	0.0020±0.0045	2.31	2.67	Significant

The mean residue levels of lambda-cyhalothrin in the samples, ranged between 0.0130 mg/kg and 0.0500 mg/kg during the dry seasons, and between 0.0018 mg/kg and 0.0020 mg/kg during the wet season. The results are as shown in the Tables 1. Cabbage and tomatoes had higher levels of lambda-cyhalothrin than kales. It can be also being observed from the same table that the mean residue levels of lambda-cyhalothrin in the samples analysed during the dry season were higher than those analysed during the wet season, with the graphical presentation as shown in Figure1.

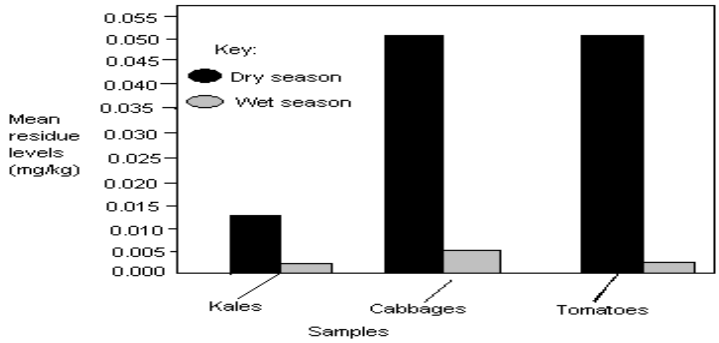

Figure 1 Graphical presentation of mean residue levels of lambda-cyhalothrin in samples analysed from the rural areas during the dry and wet seasons

3.1 Levels of lambda-cyhalothrin in kales

During the dry season, the lambda-cyhalothrin mean residues levels of 0.0130 mg/kg were higher than the residues found during the wet season of 0.0018 mg/kg (Table 1 and Figure 1) in the kale samples analysed. However, there was no significant difference between the two mean residues levels ($t_{(8, 0.05)}$ = 2.31 and $t_{calculated}$ = 1.20). The two levels were less than the ADI by FAO/WHO (1996) of 0.02 mg/kg and still they were both less than the MRLs by FAO/WHO (1996) of 0.2 mg/kg.

[1] ANOVA- Analysis of Variance
[2] High Performance Liquid Chromatography coupled with Diode Array Detector

3.2 Levels of lambda-cyhalothrin in cabbage

Looking at the results of lambda-cyhalothrin for cabbage samples from rural areas, it was found that they had higher mean residue levels of 0.0500 mg/kg during the dry season than during the wet season which was 0.0050 mg/kg (Table 1 and Figure 1). There was no significant difference between the two lambda-cyhalothrin mean residue levels ($t_{(8,\ 0.05)}$ = 2.31 and $t_{calculated}$ = 2.00. The samples analysed during the dry season had higher levels of residues than the ADI of 0.02 mg/kg and less level than the MRLs of 0.2 mg/kg (FAO/WHO, 1996). On the other hand, the residues during the wet season were found to be less than the ADI of 0.02 mg/kg and still less level than the MRLs of 0.2 mg/kg (FAO/WHO, 1996).

3.3 Lambda-cyhalothrin in tomato samples

The tomato samples analysed from during the dry season had higher residues levels of lambda-cyhalothrin of 0.0500 mg/kg than those analysed during the wet season of 0.0020 mg/kg (Table 1 and Figure 1). There was a significant difference between the two mean residue levels ($t_{(8,\ 0.05)}$ = 2.31 and $t_{calculated}$ = 2.67). The tomato samples analysed during the dry season had higher residue level than the ADI of 0.02 but are less than the MRLs of 0.2 mg/kg (FAO/WHO, 1996). On the other hand, the residues determined during the wet season were less than both the ADI of 0.02 mg/kg and MRLs of 0.2 mg/kg (FAO/WHO, 1996).

4.0 Conclusion

The study revealed that Lambda-cyhalothrin was detected in all the vegetable samples analysed during the dry and wet seasons. The Cabbage and the tomato samples analysed during the dry seasons had higher residue levels of Lambda-cyhalothrin than the ADI set standards, by FAO/WHO, 1996 while the Kales samples had less levels both during the dry and wet seasons. It's therefore, advisable for the farmers to wait for the elapse time before harvesting the vegetables after the pesticides application. This problem can also be curved if the farmers follow the label instructions by applying the right amount of the pesticides as is recommended by the manufacturers. The consumers on the other hand should make sure they wash their vegetables thoroughly before consumption.

5.0 Acknowledgement

We the Authors of the paper, acknowledge God for making the ideas of this study come to reality. We also thank Dr. Kithure. A. K for supporting this study financially. We are also grateful to Kenyatta University Chemistry Department and International Centre of Insect Physiology and Ecology (ICIPE) for material support.

6.0 References

[1] Cameo Chemicals, (2008). "Cyhalothrin". United States National Oceanic and Atmospheric Administration. Retrieved 2008-05-08.

[2] FAO/WHO., (1996). Pesticide residues in food – Maximum residue limits. 2B. Second Edition. 1996. Codex Alimentarius.

[3] FAO/WHO., (1986). Cyhalothrin: In: 1986 Evaluations of some pesticide residues in food, Part 1: Residues, Rome, Food and Agriculture Organisation of the United Nations. pp *78.*

[4] Hart, T.B., (1984). Review of adverse skin reactions associated with the use of synthetic pyrethroids (Report No. TMF2530., submitted to WHO by ICI).

[5] Hillman, G. C. (1996) "Late Pleistocene changes in wild plant-foods available to hunter-gatherers of the northern Fertile Crescent: Possible preludes to cereal cultivation". In D. R. Harris (ed.) The Origins and Spread of Agriculture and Pastoralism in Eurasia, UCL Books, London, pp.159-203.

[6] Merriam (2012). Webster dictionary, accessed 22 August 2012.

[7] Miller, J C., Miller, J. M. (1992). Statistics for Analytical Chemistry. Ellis Horwood West Sussex England.

[8] Nixon, J., and Jackson, S.J., (1981). Cyhalothrin: Acute toxicity (Report No. CTL/T/1555, submitted to WHO by ICI).

[9] Pest vermin (2016). *Britannica*. Retrieved 24 August 2016.

[10] Robert L. Metcalf "Insect Control" in Ullmann's Encyclopedia of Industrial Chemistry" Wiley-VCH, Weinheim, 2002**. doi:**10.1002/14356007.a14_263.

[11] Shan, M. K.G., (1989). Production technology of vegetable crop. Academic press, New York. pp 27-38.