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Evaluating the risk element of the supply chain of Ghana national fire service

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Abstract

This research is undertaken to evaluate the risk element of the supply chain of Ghana National Fire Service. The world is alerted to risk and disaster in a way that would have seemed negative and moody just ten years ago. The combinations of 'global' shocks that have been experienced in the last few years and their consequential social, environmental and political implications have been a 'wake-up' call to the inherent weakness of our complex networked economies. (Committee for European Banking Supervisors 2005)

In the context of the supply chain, the experience of disturbance of supply from the variety of shocks has been felt in terms of social welfare, employment, economic activity, and ultimately in corporate and global wealth. The risk points at the corporate level are better understood when external dependencies are considered, for example a supplier base can include a large number of companies of differing size located on different continents. If you add to this picture, the geo-political and economic dependencies that are represented by the rush to global sourcing and resource exploitation, the conceptual complexity is increased exponentially. (Centre for Logistics and Supply Chain Management, Cranfield, Bedford, United Kingdom Mk43 0AL - 2003)

The term supply chain is defined in this research as the network of organizations, which are involved through upstream and downstream linkages in different processes and activities that create value in the form of products and services in the hands of customers (Christopher, 1998 cited in Peck, 2005). Supply Chain Management seeks to enhance competitive performance by closely integrating the internal cross-functions within a company and effectively linking them with the external operations of suppliers, customers, and other channel members to be successful (Otcereet al., 2013a; Lambert, James and Elram, 1998; Kim, 2006; Tan, Kannan, and Hadfield, 1998).

The complexities of the modern world and the single-minded pursuit of efficiency within supply chains have inadvertently increased the weakness of those same supply chains to unforeseen disturbances. There are many forms of risk, and many theories, too, but only one overriding principle. This means that executives planning for and managing vulnerability face a difficult task since problems can arrive from many different directions. (Department of Transport and Logistics – Cranfield University, 20013)

Keywords: Risk Evaluation, Risk Management, Risk in Supply Chain

Introduction

The world is alerted to risk and disaster in a way that would have seemed negative and moody just ten years ago. The combinations of 'global' shocks that have been experienced in the last few years and their consequential social, environmental and political implications have been a 'wake-up' call to the inherent weakness of our complex networked economies. (Committee for European Banking Supervisors 2005)

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A company that has an understanding of where potential supply chain risks may occur will be to some extent forearmed and in a position to make a more informed response should the necessity arise. But while companies would be wise to identify and plan for vulnerability and resilience in their supply chains, research has shown that there are few support tools that provide analytical or methodological support for this task. (& Centre for Logistics and Supply Chain Management, Cranfield, Bedford, United Kingdom MK43 0AL - 2003)

Recent events have highlighted the exposure that companies have to risk in their supply chains. The impact of external and internal shocks on people, as consumers and employees, and on companies in terms of sustaining operations is now seen to be, perhaps, more profound than had previously been understood. (Federation of European Risk Management Associations 2003)

A number of high profile corporate failures have highlighted that a key part of running a business lies in evaluating and controlling risk element. Part of the solution to this lies in having an adequate system of internal controls, including internal audit. There are many types of risk that can threaten business continuity and organisations will have intrinsic resilience to these at different levels. This means that executives planning for and managing and evaluation of risk face a difficult task since problems can arrive from many different directions. (Hess, S.M, Gaertner, J. P. 2006.)

It is in view of this that the researcher is undertaking the study to evaluate the elements of risk management in the supply chain of Ghana National Fire Service be to some extent forearmed and in a position to make a more informed response should the necessity arise to identify and plan for risk and resilience in the supply chains. (Joint Committee of Structural Safety (JCSS) 2008)

Literature Review

Definition of Supply Chain Management

The term supply chain is defined in this research as the network of organisations, which are involved through upstream and downstream linkages in different processes and activities that create value in the form of products and services in the hands of customers (Christopher, 1998 cited in Peck, 2005). Supply Chain Management seeks to enhance competitive performance by closely integrating the internal cross-functions within a company and effectively linking them with the external operations of suppliers, customers, and other channel members to be successful (Otchereet al., 2013a; Lambert, James and Elram, 1998; Kim, 2006; Tan, Kannan, and Hadfield, 1998). The basis of Supply Chain Management is characterised by cooperation, collaboration, information sharing, trust building, partnerships, shared technology, and a fundamental shift from managing individual functional processes to managing integrated chains of processes (Otchereet al., 2013a; Vickery, Jayaram, Droge and Calantone, 2003; Kahn 1998; Pagell, 2004).

The global market environment, including the fire control industry is becoming increasingly competitive. This has huge influence on business activities. Apparently, Supply Chain has become a key business process model for organizations to be able to compete favourably in the market place, both locally and internationally. Given the turbulent nature of the international business environment as well as trade restrictions and barriers imposed on organizations in various countries such as strict regulation on export, Supply Chain then becomes one of the effective drivers for firms to compete and improve performance (Ouet al., 2010; Baharanchi, 2009).

In the Fire Control Sector (Ghana Fire service), the roles Supply Chain plays include coordination in the supply network, alignment with customer satisfaction and sustainability of the overall competency throughout the supply chain (Faisal and Banwat, 2006, Chopra and Sodhi, 2004). This requires close and seamless coordination among all the members of the supply chain. Thus, effective fire control Supply Chain requires the coordination of the Ghanaian Citizens, regulators (Ghana Fire Service), local and international controllers and other stakeholders.

Supply Chain Risk Management

Large number of links that need to be created between members of the Supply Chain has increased the possibility of risks being transmitted along the chain, so that a small incident in one distant area can grow into adverse consequences for other associates within the Supply Chain (Christopher et al., 2006, Otchereet al., 2013a; Faisal & Banwat, 2006; Chopra and Sodhi, 2004). Because of Supply chain's vulnerability and exposure to many internal and external risks, most businesses have started to realize the need for mechanism to identify and assess those risks in early stages and then manage them in the most effective way to survive the adverse consequences that may come about especially when introducing new products to the market. The ultimate results that arise from effective risk management is to ensure improved productivity within the fire control supply chain (Hainmueller et al., 2011; Anim-Kwapong et al., 2004). Supply Chain risks vary based on the type of industry and the level of complexity of the SC network, however, it could be seen that most of the SC related risks are common in most industries. The frequent occurrence of natural disasters, labour disputes, uncertain supply and demand, supplier bankruptcy, political changes, war and terrorism have led to deeper concerns about risk management for the supply chain (Ritchie and Brindley, 2007; Mallman, 1996; Giannakiset al., 2004; Ellegard, 2008; Christopher and Lee, 2004).

It is important to develop a framework of risk mitigation strategies for supply chains, in order to create a sustainable fire control so that the target set by the Ghana government will be reached. Risk management strategies may be categorized into what is termed the four 'Ts':

- Tolerate or accept the risk
- Transfer or spread the risk
- Terminate or avoid and,
- Treat, mitigate, minimize or control (Chartered Institute of Purchasing and Supply (CIPS), 2012).

Tolerating risk has to do with a situation where no further action (or deliberate action) needs to be taken to deal with the risks if the assessed likelihood or impact of the risk is

negligible or within acceptable level. Transfer or spread of risk has to do with sharing the risks impact with other parties or partners. This could be by taking insurance cover or engaging in contract terms where risk is borne by the partner. For example using defect liability clauses in contracts. Terminating also has to do with avoiding the risk completely when the likelihood of impact is costly than the returns. For example, backing off from a project that has high risks with low reward; Treating risks are where a deliberate mitigation process is undertaken to minimize or control the impact According to CIPS (2012), risk mitigation could be explained in terms of control application. Control application could take any of the following forms:

- Preventive control which is designed to limit the negative impact;
- Directive control which is designed to ensure desired outcome;
- Detective control which is also used to identify whether an undesired risk event has occurred and
- Corrective control designed to mitigate the impact of undesired outcome when it has already happened.

The assertion concludes that risk analysis could be undertaken by quantitative technique which is subject to or based on people's perception, and quantitative technique which is objective and uses statistical analysis such as Failure Modes and Effects Analysis. A qualitative technique could take the form of scenario analysis which involves the use of "what if" questions or brainstorming to stimulate the identification of possibilities in the supply chain (CIPS, 2012).

The Concept of Risk

The concept of risk has been studied in several business contexts. There are numerous definitions of risk propounded by various authors. Some of them are Sitkin and Pablo (1992), who define risk as uncertainty about potential outcome, whether it is momentous and/or insignificant in the decision that occurred. On the other hand, Faisal et al. (2006) define risk as consumer's perceptions of the insecurity and undesirable consequences for buying products or services. In another development, Mitchell (1999) describes risk as "the likelihood of loss and the implication of that loss for the individual or organisation". He formulated a principle of risk to assess the probability of loss (P) and the significance (I) of that loss as; $\text{Risk} = P(\text{loss}) \times I(\text{loss})$. This concept has been advanced by further studies. For example Zsidsin (2003) suggests that risk contains three dimensions which are outcome uncertainty, outcome expectations, and outcome potential.

Ritchie and Brindley (2007) also indicate that there are three dimensions of risk:

- Likelihood /probability of occurrence of certain outcomes;
- consequences/severity from the occurrence of particular events;
- causal pathways leading to the events.

Ritchie and Brindley (2007) and PMBOK (2009) also consider risk as the multiplication of likelihood of a risk event, the severity of a risk event, and the ability to detect the risk. It is formulated in the notation as $\text{Risk} =$

$\text{Likelihood} \times \text{severity} \times \text{Detection}$. Risk management always relates to those three dimensions of risk (Ritchie and Brindley, 2007). There are different types of risks, ranging from market associated risks including demand, cash flow, technical or operational related risks to institutional risks such as regulation related risks, customer acceptance risk, and independent risk (Miller, 1992).

Risk

Ritchie and Brindley (2007), Risk is unavoidable and present in every human situation. It is present in daily lives, public and private sector organizations. Depending on the context (insurance, stakeholder, technical causes), there are many accepted definitions of risk in use. The common concept in all definitions is uncertainty of outcomes. Where they differ is in how they characterize outcomes.

According to Zsidsin (2003) some describe risk as having only adverse consequences, while others are neutral. One description of risk is the following: risk refers to the uncertainty that surrounds future events and outcomes. It is the expression of the likelihood and impact of an event with the potential to influence the achievement of an organization's objectives. The phrase "the expression of the likelihood and impact of an event" implies that, as a minimum, some form of quantitative or qualitative analysis is required for making decisions concerning major risks or threats to the achievement of an organization's objectives (Otchereet al., 2013a; Vickery, Jayaram, Droge and Calantome, 2003; Kahn 1998; Pagell, 2004). For each risk, two calculations are required: its likelihood or probability; and the extent of the impact or consequences.

Finally, it is recognized that for some organizations, risk management is applied to issues predetermined to result in adverse or unwanted consequences. For these organizations, the definition of risk which refers to risk as "a function of the probability (chance, likelihood) of an adverse or unwanted event, and the severity or magnitude of the consequences of that event" will be more relevant to their particular public decision-making contexts.

Risk Management

Two different safety management principles are possible: consequence based safety management will claim that the worst conceivable events at an installation should not have consequences outside certain boundaries, and will thus design safety systems to assure this. Risk based safety management (usually called risk management) maintains that the residual risk should be analysed both with respect to the probabilistic and the nature of hazard, and hence give information for further risk mitigation. This implies that very unlikely events might, but not necessarily will, be tolerated. Risk management is not new tool and a lot of standards and guidance documents are available (ACT 2004, AZ/NZS 2004, Committee 2004, DGQ 2007, FAA 2007, HB 2004, IEC 2008, ON 2008, Rio Tinto 2007, Treasury Board of Canada 2001). It is an integral component of good management and decision-making at all levels of an organization. All departments in an organization manage risk continuously whether they realize it or not, sometimes more rigorously and systematically, sometimes less. More rigorous risk management occurs most visibly in those departments whose core mandate is to protect the environment and public health and safety. At present, a further generic standard on risk management is in

preparation as a common ISO/IEC standard (IEC 2007) describing a systemic top down as well as a functional

bottom up approach. (See figure I) This standard is intended to support existing industry or sector specific standards.



Fig I (Source: ISO/IEC Data 2007)

As with the definition of risk, there are equally many accepted definitions of risk management in use. Some describe risk management as the decision-making process, excluding the identification and assessment of risk, whereas others describe risk management as the complete process, including risk identification, assessment and decisions around risk issues.

One well accepted description of risk management is the following: risk management is a systematic approach to setting the best course of action under uncertainty by identifying, assessing, understanding, acting on and communicating risk issues. In order to apply risk management effectively, it is vital that a risk management culture be developed. The risk management culture supports the overall vision, mission and objectives of an organization. Limits and boundaries are established and communicated concerning what are acceptable risk practices and outcomes. Since risk management is directed at uncertainty related to future events and outcomes, it is implied that all planning exercises encompass some form of risk management.

There is also a clear implication that risk management is everyone's business, since people at all levels can provide some insight into the nature, likelihood and impacts of risk. Risk management is about making decisions that contribute to the achievement of an organization's objectives by applying it both at the individual activity level and in functional areas. It assists with decisions such as the reconciliation of science-based evidence and other factors; costs with benefits and expectations in investing limited public resources; and the governance and control structures needed to support due diligence, responsible risk-taking, innovation and accountability. A typical decision support for risk and safety management at strategic, normative and operational level is provided in (JCSS 2008).

Integrated Risk Management

The current operating environment is demanding a more integrated risk management approach (Bolvin et al. 2007 and Treasury Board of Canada 2001). It is no longer sufficient to manage risk at the individual activity level or in functional silos. Organizations around the world are benefiting from a more comprehensive approach to dealing with all their risks. Today, organizations are faced with many different types of risk (e.g., policy, program,

operational, project, financial, human resources, technological, health, safety, political). Risks that present themselves on a number of fronts as well as high level, high-impact risks demand a co-ordinated, systematic corporate response. Thus, integrated risk management is defined as a continuous, proactive and systematic process to understand, manage and communicate risk from an organization-wide perspective. It is about making strategic decisions that contribute to the achievement of an organization's overall corporate objectives. Integrated risk management requires an on-going assessment of potential risks for an organization at every level and then aggregating the results at the corporate level to facilitate priority setting and improved decision-making.

(Cagno, E., Caron, F., Mancini, M. 2007) Integrated risk management should become embedded in the organization's corporate strategy and shape the organization's risk management culture. The identification, assessment and management of risk across an organization helps reveal the importance of the whole, the sum of the risks and the interdependence of the parts. Integrated risk management does not focus only on the minimization or mitigation of risks, but also supports activities that foster innovation, so that the greatest returns can be achieved with acceptable results, costs and risks. From a decision-making perspective, integrated risk management typically involves the establishment of hierarchical limit systems and risk management committees to help to determine the setting and allocation of limits. Integrated risk management strives for the optimal balance at the corporate level. However, companies still vary considerably in the practical extent to which important risk management decisions are centralised (Basel Committee on Banking Supervision 2003).

Safety Management

Apart from reliable technologies, the operational management of an industrial plant with high risk potential is also a highly important factor to ensure safe operation. Owing to the liberalisation of the markets and resulting cost pressure to the industries, the importance of operational management is growing since cost savings in the areas of personnel and organization result in reducing the number of personnel together with changes in the organizational structure and tighter working processes. For small- and medium-sized companies, specific support is necessary and

provided in (Rheinland-Pfalz 2008). Experience with accidents in different branches of industry shows the importance of safe operational management. Today, effective safety management is seen as one crucial element of safe operational management (Hess & Gaertner 2006). The term safety management subsumes the entirety of all activities relating to the planning, organization, management and supervision of individuals and work activities with a view to the efficient achievement of a high degree of safety performance, i.e. the achievement of a high quality of all activities that are important to safety, and to the promotion of a highly developed safety culture. Safety management is not limited to certain organization units but comprises the entire safety-related organization of the company. Safety management is the responsibility of the management level of a company. For example in case of nuclear power plant in Germany (ICBMU 2004), the licensee is according to the Atomic Energy Act responsible for the safety of the plant he operates. To fulfil the conditions associated with this responsibility, he has to implement an effective safety management system that complies with the requirements of the current regulations and with international standards. Typical management systems in nuclear power plants are described in (GRS 2007). Sometimes risk management and safety management are seen as the same type of management, but in practice safety management is a main and important part of the risk management which also covers, e.g. financial risks.

Risk Management Steps and Tools

The risk management steps (see Fig. 2) are:

- Establishing goals and context (i.e. the risk environment),
- Identifying risks,
- Analysing the identified risks,
- Assessing or evaluating the risks,
- Treating or managing the risks,
- Monitoring and reviewing the risks and the risk environment regularly, and
- Continuously communicating, consulting with stakeholders and reporting. Some of the risk management tools are described in (IEC 2008) and (Oehmen 2005).

Establish Goals and Context

The purpose of this stage of planning enables to understand the environment in which the respective organization operates, that means to thoroughly understand the external environment and the internal culture of the organization (Sitkin, S. B. and Pablo, A. L. 1992). The analysis is undertaken through:

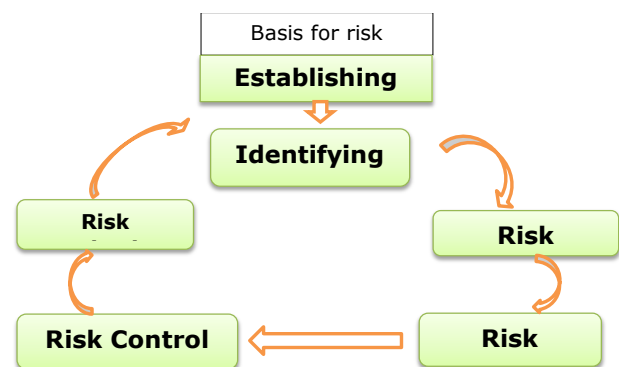
- Establishing the strategic, organizational and risk management context of the organization, and
- Identifying the constraints and opportunities of the operating environment.

The establishment of the context and culture is undertaken through a number of environmental analyses that include, e.g., a review of the regulatory requirements, codes and standards, industry guidelines as well as the relevant corporate documents and the previous year's risk management and business plans. Part of this step is also to develop risk criteria (Tan KC, Kannan VR, Handfield RB, 1998.).

The criteria should reflect the context defined, often depending on an internal policies, goals and objectives of the organization and the interests of stakeholders. Criteria may be affected by the perceptions of stakeholders and by legal or regulatory requirements. It is important that appropriate criteria be determined at the outset. Although the broad criteria for making decisions are initially developed as part of establishing the risk management context, they may be further developed and refined subsequently as particular risks are identified and risk analysis techniques are chosen. The risk criteria must correspond to the type of risks and the way in which risk levels are expressed.

Methods to assess the environmental analysis are SWOT (Strength, Weaknesses, Opportunities and Threats) and PEST (Political, Economic, Societal and Technological) frameworks, typically shown as tables. (Phillips-Mora W, Ortiz CF, Aime MC. 2006)

Fig II



(Source: ISO/IEC Data 2012)

Identify the Risks

Using the information gained from the context, particularly as categorised by the SWOT and PEST frameworks, the next step is to identify the risks that are likely to affect the achievement of the goals of the organization, activity or initiative, it should be underlined that a risk can be an opportunity or strength that has not been realised.

Key questions that may assist your identification of risks include:

- For us to achieve our goals, when, where, why, and how are risks likely to occur?
- What are the risks associated with achieving each of our priorities?
- What are the risks of not achieving these priorities?
- Who might be involved (for example, suppliers, contractors, stakeholders)?

The appropriate risk identification method will depend on the application area (i.e. nature of activities and the hazard groups), the nature of the project, the project phase, resources available, regulatory requirements and client requirements as to objectives, desired outcome and the required level of detail. (Vickery S, Jayaram J, Droge C, Calantone R, 2003.)

The use of the following tools and techniques may further assist the identification of risks:

- Examples of possible risk sources,
- Checklist of possible business risks and fraud risks,
- Typical risks in stages of the procurement process,

- Scenario planning as a risk assessment tool ,
- Process mapping, and
- Documentation, relevant audit reports, program evaluations and / or research reports.

Specific lists, e.g. from standards, and organizational experience support the identification of internal risks. (Ritchie, B. and Brindley, C. 2007)

To collect experience available in the organization regarding internal risks, people with appropriate knowledge from the different parts of the organization should be involved in identifying risks. Creativity tools support this group process. The identification of the sources of the risk is the most critical stage in the risk assessment process. The sources are needed to be managed for pro-active risk management. The better the understanding of the sources, the better the outcomes of the risk assessment process and the more meaningful and effective will be the management of risks. (PMBOK, (2009) Project Management Body of Knowledge New York)

Key questions to ask at this stage of the risk assessment process to identify the impact of the risk are:

- Why is this event a risk?
- What happens if the risk eventuates?
- How can it impact on achieving the objectives/outcomes?

Risk identification of a particular system, facility or activity may yield a very large number of potential accidental events and it may not always be feasible to subject each one to detailed quantitative analysis. In practice, risk identification is a screening process where events with low or trivial risk are dropped from further consideration. However, the justification for the events not studied in detail should be given. Quantification is then concentrated on the events which will give rise to higher levels of risk. (Singh PJ, Power D, 2009.)

Fundamental methods such as Hazard and Operability (HAZOP) studies, fault trees, event tree logic diagrams and Failure Mode and Effect Analysis (FMEA) are tools which can be used to identify the risks and assess the criticality of possible outcomes. An example of a systematic method for identifying technical risks of a plant is the elaboration of a risk register where different types of risks and damage classes are correlated to local areas of a plant (Otchere, A. F., Annan, J. & Anin, E. K., (2013a)

Analysing the Risk

Risk analysis involves the consideration of the source of risk, the consequence and likelihood to estimate the inherent or unprotected risk without controls in place. It also involves identification of the controls, an estimation of their effectiveness and the resultant level of risk with controls in place (the protected, residual or controlled risk). (Lee, S. K. and Kader A. A. Kader, 2000)

Qualitative, semi-quantitative and quantitative techniques are all acceptable analysis techniques depending on the risk, the purpose of the analysis and the information and data available. Often qualitative or semi-quantitative techniques can be used for screening risks whereas higher risks are being subjected to more expensive quantitative techniques as required. Risks can be estimated qualitatively and semi-quantitatively using tools such as hazard matrices, risk graphs, risk matrices or monographs but noting that the

risk matrix is the most common. Applying the risk matrix, it is required to define for each risk its profile using likelihood and consequences criteria. (Lambert DMS, James R, Elram L, 1998)

Typical definitions of the likelihood and consequence are contained in the risk matrix. Using the consequence criteria provided in the risk matrix, one has to determine the consequences of the event occurring (with current controls in place). To determine the likelihood of the risk occurring, one can apply the likelihood criteria (again contained in the risk matrix). As before, the assessment is undertaken with reference to the effectiveness of the current control activities. To determine the level of each risk, one can again refer to the risk matrix. The risk level is identified by intersecting the likelihood and consequence levels on the risk matrix. Complex risks may involve a more sophisticated methodology. For example, a different approach may be required for assessing the risks associated with a significantly large procurement. (Anim-Kwapong, G.J., and E.B. Frimpong 2004)

Evaluate the Risk

Once the risks have been analysed they can be compared against the previously documented and approved tolerable risk criteria. When using risk matrices this tolerable risk is generally documented with the risk matrix. Should the protected risk be greater than the tolerable risk then the specific risk needs additional control measures or improvements in the effectiveness of the existing controls. The decision of whether a risk is acceptable or not acceptable is taken by the relevant manager.

A risk may be considered acceptable if for example:

- The risk is sufficiently low that treatment is not considered cost effective, or
- A treatment is not available, e.g. a project terminated by a change of government, or
- A sufficient opportunity exists that outweighs the perceived level of threat.

If the manager determines the level of risk to be acceptable, the risk may be accepted with no further treatment beyond the current controls. Acceptable risks should be monitored and periodically reviewed to ensure they remain acceptable. The level of acceptability can be organizational criteria or safety goals set by the authorities. (Chartered Institute of Purchasing and Supply CIPS, 2012)

Treat To the Risk

An unacceptable risk requires treatment. The objective of this stage of the risk assessment process is to develop cost effective options for treating the risks. Treatment options), which are not necessarily mutually exclusive or appropriate in all circumstances, are driven by outcomes that include:

- Avoiding the risk,
- Reducing (mitigating) the risk,
- Transferring (sharing) the risk, and
- Retaining (accepting) the risk.

Avoiding the risk - not undertaking the activity that is likely to trigger the risk.

Reducing the risk - controlling the likelihood of the risk occurring, or controlling the impact of the consequences if the risk occurs

Factors to consider for this risk treatment strategy include:

- Can the likelihood of the risk occurring be reduced? (through preventative maintenance, or quality assurance and management, change in business systems and processes), or
- Can the consequences of the event be reduced? (Through contingency planning, minimizing exposure to sources of risk or separation/relocation of an activity and resources). Examples for the mitigation activity effectiveness are described in (Wirthin 2006).

Transferring the risk totally or in part - This strategy may be achievable through moving the responsibility to another party or sharing the risk through a contract, insurance, or partnership/joint venture. However, one should be aware that a new risk arises in that the party to whom the risk is transferred may not adequately manage the risk! Retaining the risk and managing it - Resource requirements feature heavily in this strategy. The next step is to determine the target level of risk resulting from the successful implementation of the preferred treatments and current control activities. The intention of a risk treatment is to reduce the expected level of an unacceptable risk. Using the risk matrix one can determine the consequence and likelihood of the risk and identify the expected target risk level. (Christopher M, Peck H, & Towill D, 2006)

Monitoring the Risk

It is important to understand that the concept of risk is dynamic and needs periodic and formal review. The currency of identified risks needs to be regularly monitored. New risks and their impact on the organization may be taken into account. This step requires the description of how the outcomes of the treatment will be measured. (Anim-Kwapong, G.J. and E.B. Frimpong 2004). Milestones or benchmarks for success and warning signs for failure need to be identified. The review period is determined by the operating environment (including legislation), but as a general rule a comprehensive review every five years is an accepted industry norm (Ellegaard, C. 2008).

This is on the basis that all plant changes are subject to an appropriate change process including risk assessment. The review needs to validate that the risk management process and the documentation is still valid. The review also needs to consider the current regulatory environment and industry practices which may have changed significantly in the intervening period.

The organisation, competencies and effectiveness of the safety management system should also be covered. The plant management systems should have captured these changes and the review should be seen as a 'back stop'. The assumptions made in the previous risk assessment (hazards, likelihood and consequence), the effectiveness of controls and the associated management system as well as people need to be monitored on an on-going basis to ensure risk are in fact controlled to the underlying criteria. For an efficient risk control the analysis of risk interactions is necessary (Fabbe-Costes N, Jahre M, 2008).

This ensures that the influences of one risk to another is identified and assessed. Usual methods for that purpose are a cross impact analysis, Petri nets or simulation tools.

A framework needs to be in place that enables responsible officers to report on the following aspects of risk and its impact on organizations' operations (Chopra, S. & Sodhi, M. S., 2004):

- What are the key risks?
- How are they being managed?
- Are the treatment strategies effective?
- If not, what else must be undertaken?
- Are there any new risks and what are the implications for the organization?

Communication and Reporting

Clear communication is essential for the risk management process, i.e. clear communication of the objectives, the risk management process and its elements, as well as the findings and required actions as a result of the output. Risk management is an integral element of organization's management. However, for its successful adoption it is important that in its initial stages, the reporting on risk management is visible through the framework. The requirements on the reporting have to be fixed in a qualified and documented procedure, e. g., in a management handbook (Faisal, M. N., Banwet, D. K. et al. 2006).

Documentation is essential to demonstrate that the process has been systematic, the methods and scope identified, the process conducted correctly and that it is fully auditable. Documentation provides a rational basis for management consideration, approval and implementation including an appropriate management system. A documented output from the above sections (risk identification, analysis, evaluation and controls) is a risk register for the site, plant, equipment or activity under consideration. This document is essential for the on-going safe management of the plant and as a basis for communication throughout the client organisation and for the on-going monitor and review processes. It can also be used with other supporting documents to demonstrate regulatory compliance (Fantazy KA, Kumar V, Kumar U, 2010).

Research Methodology

This study comprises of two parts, the methodology part and the organizational profile part. The chapter also describes the methods and the tools employed by the researcher in collecting data for this work and how objectives were investigated to ascertain

Methodology

The methodology part, focused on research design, the study area, sources of data, target population and sample size, sampling techniques, data collection instruments, reliability and validity, data analysis procedures and finally the conclusion. It also describes in details the methods the researcher employed for the collection of data and the various ways used in analyzing the data as well as the sample size used.

Research Design

The research design was the outline or devise employed by the researcher to help structure and design the work in order to suit the objectives and the aims of this research work. The researcher adopted a research design which helped to give best responses to the research questions which governed the study.

More so the researcher used personal observations and informal interviews to confirm facts and figures gathered already from field survey as well as the deployment of evaluations and assessments since the researcher needed to

find out all the facts pertaining to the study in order to make healthier judgments and give the appropriate recommendations at the end of this study

Sources of Data

Both the primary and the secondary sources were exploited by the researcher in obtaining facts which were relevant to this work.

• **Primary Source of Data**

Data from the primary source enabled the researcher to acquire first-hand information and materials on the topic under study. The primary data was gathered through the use of questionnaires, personal observation and in addition an informal interview to supplement the secondary source. The main aim was to collect ample information which was relevant to the purpose of this work personally.

• **Secondary Source of Data**

The secondary source expansively refers to the available data already gathered by other writers on the area or issue under study. These were information tapped from textbooks, library books, magazines and the website which helped to provide extra information pertinent to the study. On top of it all, the secondary data goes with the literature review which was captured earlier on in chapter two (2) of this research work. This enabled the researcher to gather adequate information on the research topic.

Target Population and Sample Size.

For the purpose of this work, the researcher targeted the staff of the Ghana Fire Service in that the researcher wanted to identify the key risk element in the supply chain of the GNFS, what factors contribute to the risk, and the measures in place to mitigate the effect of the risk factors. Specifically some selected departments within the organization whose major activities could have direct influence on the topic under discussion were considered. This included the procurement unit, the accounting unit, the engineering unit and the stores unit, bringing the sample size to twenty (20).

The researcher used purposive sampling in gathering relevant information for this work. Thus the researcher sampled out those units within the organization for a purpose since it is not all the units in the organization which have direct link with the topic under study and for that matter can help answer the researcher's questions.

The use of the Purposive sampling technique mostly depends on the verdict of the researcher and the aim is to work directly with those units/departments which have great interest in this case so that the required data can easily and conveniently be gathered.

Sampling Technique

In obtaining data from the staff of the selected units within the above mentioned organization, the researcher decided to use the purposive sampling technique. This sampling method was used for this work because the researcher identified those departments to be more convenient in providing accurate and adequate facts and figures which could best answer the questionnaires administered for the successful compilation of the whole research work.

Data Collection Instruments

The data collection instruments adopted for this work were questionnaires, personal observation and an informal interview.

• **Questionnaires**

A set of clear and uniform questionnaires were designed and administered to some selected departments in Ghana Fire Services. These questionnaires were designed in simple in English for easy understanding and answering. In all twenty(20) questionnaires were sent out of which six (6) were given to the procurement department of the assembly to be completed by both senior and junior staff, again five (5) given to the accounting department within the assembly to be completed by both senior and junior staff, five (5) went to the stores department and the remaining four (4) were administered to the engineering department to be responded to by both senior and junior staff. Questions were subject to open and close ended ones which helped the researcher to get the vital information needed for this work. The responses were very satisfactory as most of them turned to meet the objectives set for this study. The questionnaires sought, among others, to examine how to evaluate the risk element of the supply chain of GNFS. The responses obtain with respect to the above questions will all cross-examine in relation to the study.

This tool will used because the researcher deemed it a major source of obtaining data since they were designed to meet the objectives of the study.

• **Personal Observation**

A visit to the GNFS will help the researcher to have a general view of the key risk element in the supply chain of the GNFS, what factors contribute to the risk, and the measures in place to mitigate the effect of the risk factors.

Personal observation was used as another instrument in gathering data because the researcher wanted to obtain additional information which were not asked in the questionnaires and also could not asked during the informal interview.

• **Informal Interview**

After developing and administering the questionnaires and the personal observation, an informal interview was held with some personnel's within the organization which enabled the researcher to collect additional facts which served as a confirmation to some of the responses provided in the questions and more so had the chance to ask so many questions which helped to enrich this work and further enlightened the researcher.

Reliability and Validity

For the reliability and the validity of this work, the researcher structured the questions to suit the subject matter. Again questions were designed using simple English language ranging from close to open-ended ones. However the close-ended questions dominated to avoid the tendency of over burdening the respondents and also not to bore them. Furthermore for the authenticity of this work, the researcher used other instruments such as personal observations and informal questions for confirmation. This however helped to ensure the validity and the reliability of the responses and also enhanced the efficiency of the data instruments used.

Data Analysis Procedures

Statistical Package for Service Solution (SPSS) was used in analyzing the data collected. Tables were drawn based on frequency count and percentage equivalent. The qualitative analysis gave a vivid explanation of the subject matter while evaluative analysis assigned values and figures to describe the data collected. The analyses were based on the assessment of the data collected.

Data Presentation and Analysis of Finding

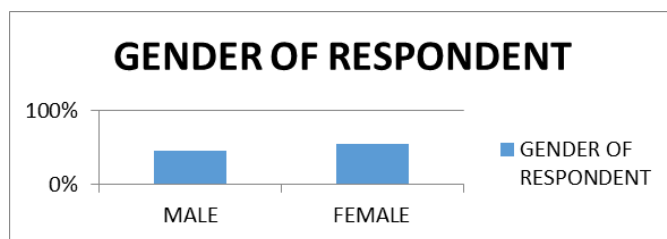
The aim of the study is to carefully and thoroughly evaluate the risk element of the supply chain of the Ghana National Fire Service. Thus, this chapter presents an analysis of the data collected from the field of survey with the help of tables and charts. Out of the fifty (50) management and staff targeted questionnaire sent out on the field, the same fifty were retrieved. The analysis would therefore be based on the questionnaires from the field survey.

Gender of Respondents

Table 1: Gender of Respondents

Gender	Frequency	Percentage %
Male	18	45.0
Female	22	55.0
Total	40	100.0

Chart 1: Bar Chart Representing the Gender of Respondents



Source: Field Survey, August 2015

From the bar chart 1, 18 respondents were males, representing 45% and 22 respondents were females, representing 55%. This makes up the total number of response gathered from the Staff of Ghana National Fire Service. This is illustrated graphically in the chart above.

Age of Respondents

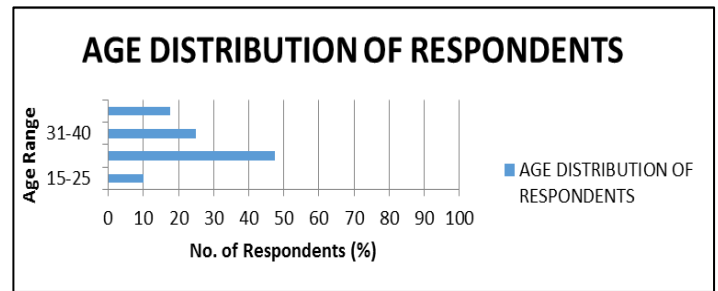
Table 2: Age Distribution of Response

Ages	Frequency	Percentage (%)
18- 25	4	10.0
26- 30	19	47.5
31- 40	10	25.0
41 and above	7	17.5
Total	40	100.0

From table2 ,4 (10%) respondents fall within the ages of 18-25, 19 (47.5%) falls within the ages of 26-30, 10 (25%) falls within the ages 31-40 and the ages 41 and above constituted 7 (17.5%).

This shows that majority of the respondents were young Staff within the ages of 26-30.

Chart 2: Bar Chart Representing the Age Distribution of Respondents



Level of Education

Table 3: Level of Education of the Staff in the Supply Chain Department

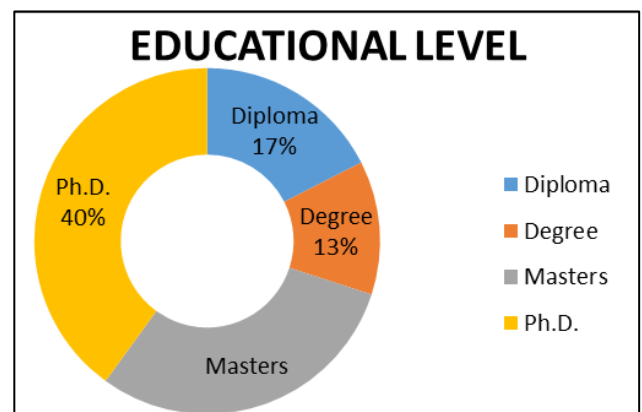
Respondents	Frequency	Percentage (%)
Diploma	23	57.5
Degree	17	30
Masters	5	12.5
Doctorate	0	0.00
Total	40	100.0

Source: Field Survey, August 2015

From table 3, all 40 respondents educational level, 23(57.5%) were respondents who hold Diploma certificate, 17 (30%) were respondents who hold First Degree, 5 (12.5%) were respondents hold Master's Degree and 0 (0%) were respondents who hold Ph.D.

The figure below illustrates this.

Chart 3: Level of Education of the Staff in the Supply Chain Department



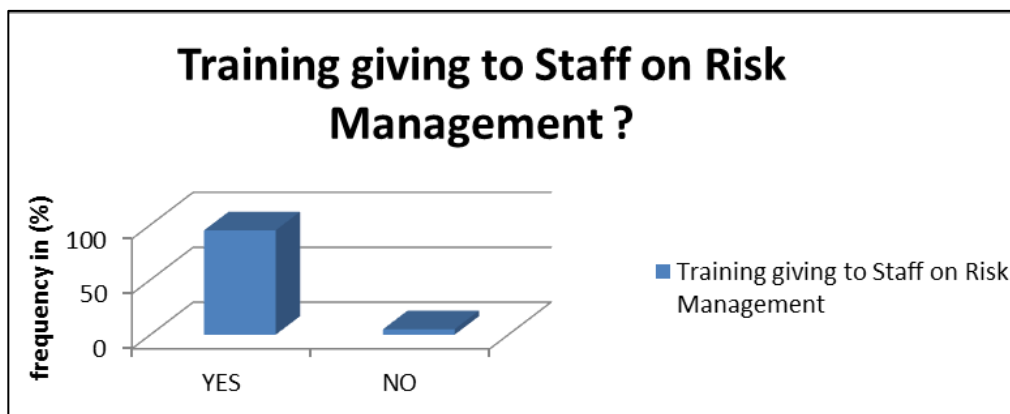
Training Staff

Table 4: Training giving to Staff on Risk Management in Purchasing and Supply Department

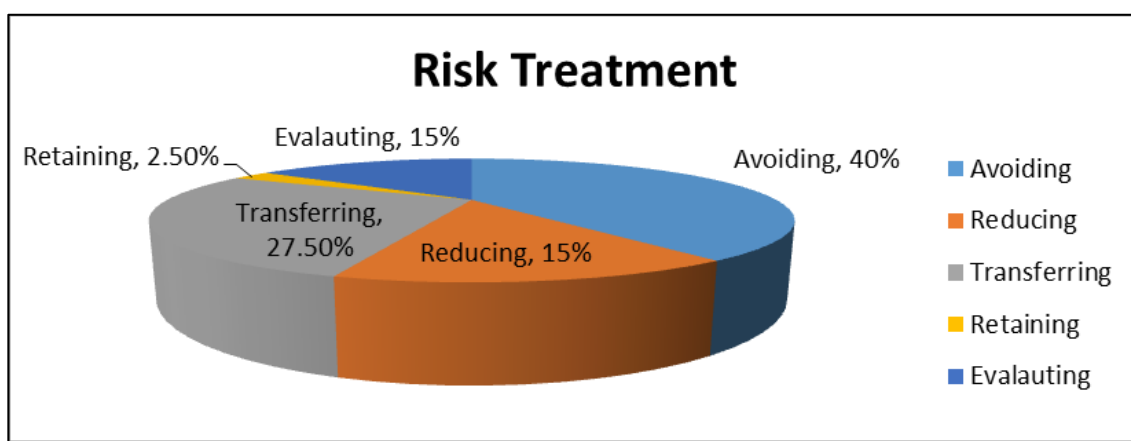
Dissatisfaction	Frequency	Percentage %
Yes	38	95.0
No	2	5.0
Total	40	100.0

Chart 4: Training giving to Staff on Risk Management in Purchasing and Supply Department

From chart 4 above, 38(95%) respondents had not experienced staff training frequently and 2 (5%) had experienced staff training on Risk Management in Purchasing and Supply Department

**Table 5:** Treatment of Risk in the Supply Chain

Risk	Frequency	Percentage %
Avoiding	22	55.0
Reducing (Mitigating)	6	15.0
Transferring (Sharing)	11	27.5
Retaining (Accepting)	1	2.5
Evaluating	6	15.0
Total	40	100.0



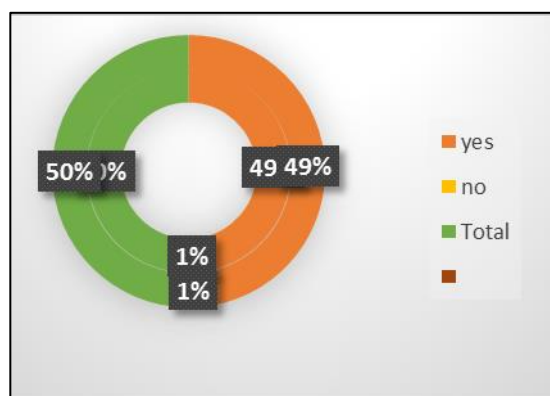
Treatment of Risk
Field Source Survey, August 2015

From the pie chart 5 above, 40% represent Risking Avoiding, 15% represent Risk Reduction, 7.5% represent Risk Transferring, 2.5% represent Retaining Risk and 15% represent Risk Evaluation

Analysing the Risk Element

Table 6: Analysing the Risk Element in Supply Chain Management of Ghana National Fire Service

Issues	Frequency	Percept
Yes	39	97.5
No	1	2.5
Total	40	100.0

Chart 6: Distribution on Analysing the Risk Element

From the bar chart 6 above, 39 (97.5%) respondents had issues with MTN services rendered and 1 (2.5%) had no issue with the services rendered by MTN. This is graphically shown above.

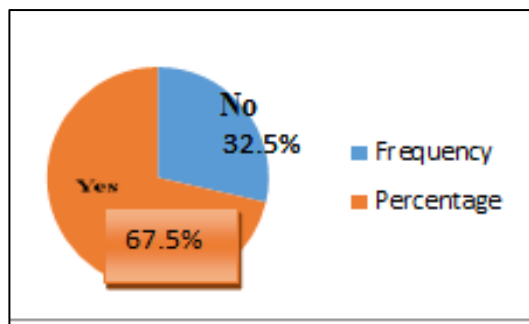
Communication and Reporting of Risk

Table 7: Number of respondents who did/did not lodge a complaint

Responses	Frequency	Percentage (%)
Yes	27	67.5
No	13	32.5
Total	40	100.0

Source: Field Survey, August 2015

Chart 7: Respondents who lodged and did not lodge a complaint



From the pie chart 7 above, out of 40 respondents, 27 (67.5%) respondents lodged complaints and 13 (32.5%) did not lodge any complaint.

Means of Reporting or Communicating Risk

Table 8: Distribution on means by which Report or Communication were lodged by Staff

Responses	Frequency	Percentage (%)
Calling the Heads	22	55.0
Going To Their Office	8	20.0
Through A Friend	3	7.5
Other	7	17.5
Total	40	100.0

Source: Field Survey, August 2015

From Table above, 22 (55%) Staff lodged their complaints through the customer service number, 8 (20%) Staff went to their office to lodge complaints, 3 (7.5%) Staff lodged their complaints through a friend and 7 (17.5%) remaining Staff lodged through other means.

Risk Evaluation

Table 12: Distribution on Risk Evaluation in the Supply Chain of Ghana National Fire Service

Responses	Frequency	Percentage (%)
Yes	33	82.5
No	7	17.5
Total	40	100.0

Source: Field Survey, August 2015

From the table, out of the 40 respondents, 33 (82.5%) respondents who said GNFS Supply Chain Department evaluate their risk identified and remaining 7 (17.5%) were respondents who said they don't. This is illustrated below.

Risk mitigation in the Supply chain

The identified risks could be managed through diligent operational activities and contractual arrangements. Mismanagement of funds could be dealt with through close monitoring of individuals responsible in managing funds at

all stages of the supply chain. Auditing and internal control mechanisms could also be intensified to reduce, if not prevent, the incidence of funds mismanagement. The use of ICT could again be used to reduce the human interface to strengthen internal controls.

The issue of smuggling risk could be managed operationally by close monitoring of the activities of members of the supply chain, especially those close to the farm gate and boarder areas. The supply chain may collaborate with government to offer competitive price of the cocoa produce to discourage farmers and dealers from taking their produce to the neighbouring countries.

Again effective co-ordination through information sharing could be an effective mitigation tool to dealing with smuggling. Logistics breakdown risk could be managed by outsourcing the non-core activities such as transportation with effective and appropriate contractual arrangements in place to discourage non-performance of parties and to ensure effective relationship management.

Exchange rate, input price and interest rate volatility risks could be managed through the use of hedging or derivatives (example, hedging against exchange rate, input price and interest rate volatilities) and other forms of insurance. For the production related risks, possible mitigation strategy could be by providing training to the farmers to improve their knowledge in managing crop related diseases. The supply chain could also provide support to farmers to ensure that farmers get access to quality farm inputs such as fertilizers and other chemicals. The supply chain may also embark on continuous research that will help develop new and improved approaches to managing crop related diseases and ensure that there is effective knowledge sharing on risk mitigation to reduce the likelihood of production related risk events occurring.

Summary, Conclusion, and Recommendation

This study is devoted to the summary of findings, recommendations and conclusion of the research study. This chapter attempts to draw policy intervention or implications for the problem. The findings are grouped under the objectives formulated for the conduct of the special study. Conclusions are the researcher's opinions depending on the outcome from the data analysed as per the objectives of the study.

Summary Findings

The discussions and survey results indicate that evaluating the risk in supply chain is a tool for achieving value for money in the public sector.

In addition, the researcher found out that, it is helpful to consider, the probability of long-term risk management, the probability of cost reimbursement, the level of resource scarcity, the level of resource importance, the level of measurement difficulty, vendors dependability on government, and the level of asset specificity.

The research further concludes that; critical factors for evaluating risk are- Right Specification, Availability of Resources, Effective Project Supervision, trust & understanding.

Finally, the researcher concludes that risk must necessarily be considered when the actual physical work has been completed or the goods delivered. The true end of the risk may be the end of a warranty, retention or defects liability period

Conclusion

This study was set out to evaluate the various categories of risks within the Ghana National Fire Service supply chain in the Greater Accra. The study revealed that systematic risk, unsystematic risk and other SWOTS related are the major related risks facing the Ghana National Fire Services. Major commercial/market risks found included Exchange rate volatility, price volatility and interest rate volatility whilst improper tendering, mismanagement of funds and logistics breakdown were found to be the major environmental related risks facing the sector. These identified risks could be managed through diligent operational activities, the involvement of third party and contractual arrangements as well as effective SC co-ordination and integration.

Recommendation

Based on the above findings, it is recommended that the staff in the Supply Chain Depart should be given training to avoid, reduce, and mitigation of risk in the service.

It is also recommended that staff should be assisted financially and technically by the various purchasing companies in acquisition of various inputs and application of chemicals.

It is again recommended that government and Public Procurement Act Implementers should offer competitive pricing and incentives meet the standard of Procurement to reduce the financial risk.

Further, trust building and information sharing among the supply chain players should be improved as it is one of the drivers of building effective supply chain resilience. This will also improve coordination and integration of the supply chain and consequently reduce the negative impact of these risks.

Finally government should improve upon the Supply Chain networks, especially among the GNFS operating areas in order to reduce risk

References

- Anggara, A. R. (2008). Implementation of Risk Management Framework in Supply Chain: A Tale from a Biofuel Company in Indonesia. Available at <https://research.mbs.ac.uk/innovation/Portals/0/docs/Anggara.pdf>, (Accessed February 2 2013). Anim-Kwapong, G.J., and E.B. Frimpong (2004).
- CRIG, New TafoAkim. Baharanchi SRH, 2009. *Investigation of the Impact of Supply Chain Integration on Product Innovation and Quality Transaction. E: Industrial Engineering*, 16(1): 81-89.
- Chartered Institute of Purchasing and Supply (CIPS) (2012). *Managing risks in supply chains (core unit), the official CIPS course book*, Lincolnshire: Profex Publishing Limited.
- Chopra, S. & Sodhi, M. S., (2004) *Managing risk to avoid supply-chain breakdown*. MIT Sloan Management Review, Vol.46, No. 1, P.52-61.
- Christopher, M. and H. Lee (2004). *Mitigating supply chain risk through improved confidence* International Journal Physics Distribution & Logistics Management, 34(5), 388-396.
- Christopher M, Peck H, & Towill D, 2006. A Taxonomy for selecting global supply chain strategies. International Journal of Logistics Management, 17(2): 277 - 287.
- Crow, Kenneth (2002) *Failure Modes and Effects Analysis (FMEA)*: online: URL:<http://www.npd-solutions.com/fmea.html>; [28.04.2005]
- Ellegaard, C. (2008). *Supply risk management in a small company perspective*. Supply Chain Management, 13(6), 425-434.
- Fabbe-Costes N, Jahre M, 2008. *Supply chain integration and performance: a review of the evidence*. The International Journal of Logistics Management, 19(2): 130-154.
- Faisal, M. N., Banwet, D. K. et al. (2006). *Supply chain risk mitigation: modeling the enablers*. Business Process Management Journal, 12(4), 535-552.
- Fantazy KA, Kumar V, Kumar U, 2010. *Supply management practices and performance in the Canadian hospitality industry*. International Journal of Hospitality Management, 29(4): 685-693. Ghana COCOBOD, 2011. Executive Diary. Ghana Cocoa Board (2009). *Cocoa is Ghana, Ghana is Cocoa*. Mini Diary, P.14
- Giannakis, M., Croom, S. and Slack, N., (2004). *Supply chain paradigms*, in New, S. and Westbrook, R. (Eds), *Understanding Supply Chains*, Oxford University Press, Oxford, P. 1-22.
- Hainmueller J, Hiscox M, Tampe M. (2011). *Sustainable Development for Cocoa Farmers in Ghana*. MIT and Harvard University.
- Kahn KA 1998. *Marketing's integration with other departments*. Journal of Business Research, 42(1): 53-62.
- Kaplinsky, R. (2004). *Competitions Policy and the Global Coffee and Cocoa Value Chains*. Institute of Development Studies University of Sussex, and Centre for Research in Innovation Management, University of Brighton
- Khan, O., Burnes, B. (2007). *Risk and supply chain management: creating a research agenda*. International Journal of Logistics Management, Vol. 18 No. 2, P.197 – 216.
- Lambert DM, (2008). *An Executive Summary of Supply Chain Management: Processes, Partnerships, Performance*. Supply Chain Management Institute Vol. 3.
- Lambert DMS, James R, Elram L, (1998). *Fundamentals of Logistics*. International Edition, Singapore:
- McGraw Hill, 13. Lee, S. K. and Kader A. A. Kader, (2000). *Pre-harvest and post-harvest factors influencing vitamin C content of horticultural crops; Postharvest Biol. Technol.* 20:207-220.
- International Journal of Humanities and Social Science Vol. 3 No. 19; November 2013
- 201
- Mallman, C. (1996), *Risk and organizational behaviour: a research model*, *Disaster Prevention and Management*, Vol. 5 No. 2, P. 12-26.
- Miller, K. (1992). *A framework for integrated risk management in international business*, Journal of International Business Studies, Second Quarter, P. 311-331.
- Mitchell, V. (1999) *Consumer perceived risk: conceptualisations and models*, European Journal of Marketing, Vol. 33 No. 1/2, P.163 - 195

26. Monczka RM, Morgan J, 1997. *What's wrong with supply chain management*, Purchasing, 69-72. Otchere, A. F., Annan, J. &Anin, E. K., (2013a) *Achieving Competitive Advantage through Supply Chain, Integration in the Cocoa Industry: A Case Study of Olam Ghana Limited and Produce Buying Company Limited*. International Journal of Business and Social Research (IJBSR).3(2), 131-145
27. Otchere, A. F., Annan, J. &Quansah, E., (2013b) *Assessing the Challenges and Implementation of Supply Chain Integration in the Cocoa Industry: a factor of Cocoa Farmers in Ashanti Region of Ghana*. International Journal of Business and Social Science (IJBS).4(5), 112-123
28. Ou CS, Liu FC, Hung YC, Yen DC, 2010. *A structural model of supply chain management on firm performance*. International Journal of Operations &Production Management, 30(5): 526-545. Pagell M, 2004. *Understanding the factors that enable and inhibit the integration of operations, purchasing and logistics*. Journal of Operations Management, 22(5): 459-87.
29. Peck, H. (2005). *Drivers of supply chain vulnerability: an integrated framework*. International Journal Physics Distribution & Logistics Management, 35(4), 210-232. Pegge, S., 2003.
30. Pineapple and Partners, MSc. *Thesis, Management Studies Group*, Wageningen University, the Netherlands.
31. PMBOK, (2009). *Project Management Body of Knowledge*. New York: Project Management Institute
32. Phillips-Mora W, Ortiz CF, Aime MC. 2006. *Fifty years of frosty pod rot in Central America: chronology of its spread and impact from Panama to Mexico*. 15th International Cocoa Research Conference, San Jose,Costa Rica. Ritchie, B. and Brindley, C. (2007). *Supply chain risk management and performance*. International Journal of Operations and Production Management, 27(3), 303-322
33. Singh PJ, Power D, 2009. *The nature and effectiveness of collaboration between firms, their customers and suppliers: a supply chain perspective*. Supply Chain Management: An International Journal,14 (3): 189-200.
34. Sitkin, S. B. and Pablo, A. L. (1992). *Reconceptualising the Determinants of Risk Behaviour*, Academy of Management Review, Vol. 17, No. 1, P. 9-38.
35. Tan KC, Kannan VR, Handfield RB, 1998. *Supply chain management: supplier performance and firm performance*. International Journal of Purchasing and Materials Management, 3: 2-9.
36. Tutu K, 2009. *Trade for Sustainable Development: The Story of Cocoa, Gold and Timber*, Accra: IEA.
37. Van der Vaart T, van Donk DP, 2008. *A critical review of survey-based research in supply chain integration*. International Journal of Production Economics, 111 (1): 42-55.
38. Vickery S, Jayaram J, Droge C, Calantome R, 2003. *The effects of an integrative supplychain strategy on customer service and financial performance: an analysis of direct versus indirect relationship*. Journal of Operations Management, 21: 523-525
39. World Bank Report (2012). *The Supply Chain Risk Assessment: Cocoa in Ghana*.
40. Zsidsin, G. A. (2003) *A grounded definition of supply risk*. Journal of Purchasing & Supply Management: 9, 217- 224