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**EXPLORING DYNAMIC SYSTEMS ANALYSIS TO SUPPORT RISK BASED
AUDITING OF QUALITY ASSURANCE STANDARDS FOR FOOD CHAINS IN
GHANA**

BY

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DEDICATION

Everything well achieved is only with determination dedicate this work to the Almighty God as a token of gratitude for the wisdom, strength and determination he has granted me throughout my work. I also dedicate this work to my lovely baby boy whose birth confirms the existence of God almighty.

My sincere gratitude goes to my wife Audrey for all the support she gave me in these challenging times. Also to Mr. Ofosu for not giving up on me. I will like to specially thank my supervisor Dr. Herman Lutterodt and Dr. **Emmanuel de-Graft Johnson Owusu-Ansah**, for believing in me and staying on my case through the stormy days.

God richly bless you.

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Exploring dynamic systems analysis to support risk-based auditing of quality assurance standards for food chains in Ghana

ABSTRACT

There is an increasing demand to ensure worldwide food safety due to the expanding global economy and international trading of foodstuffs. The most significant driving force for increased attention to food safety has been the continued surge in new food borne pathogens, chemical contaminants and different food borne accidents. The purpose of food safety audit is to verify that the food producer have developed, documented and implemented a food safety management system. This is because food quality management system increases the security and safety for employees and management of the company as well as the general well-being of a nation. The study population were some selected government and regulatory bodies and manufacturing companies. The population was taken from Accra and Tema Metropolis. The sample size for this study is 100 respondents purposively chosen from the selected organizations. The random sampling method and purposive sampling method were used in selecting the sample size for the study as well as the respondents respectively. The literature revealed that there are still challenges with the certification of many manufacturing companies because safety standards are not the same all over the world to facilitate working with food safety for producers and retailers, especially those that have a common foundation of requirements. Finally, based on the findings and conclusion of the study, it came out clearly that current food safety standards designed on checklist does not give party assurance. The grey areas revealed in a risk based audit exposed serious lapses in the current pre-requisites issued out by regulatory bodies in Ghana. The researcher recommends the following interventions; (keywords). These are; companies should partner themselves to obtain local regulatory bodies should team up with international certification bodies and review existing blue prints on Ghana food safety.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

The increase in food exports demand an advanced familiarity of analyzing potential risk in its production. There should be a developed and continually updated document that assesses risk in food production. Risk analysis can be based on numerous methods, principles and standards. A risk may be explained to be the likelihood of an event's occurrence; the event is mostly unpleasant due to its resulting negative consequences while risk management is a systematic approach where there is a critical evaluation to ensure a better way of handling risks related to an operation. The establishment of food can be dated to be centuries ago and in the Pentateuch decrees, policies regarding the hygienic conditions of food were recorded and this was to protect consumers from unsafe foods due to its poor quality and food prices that have been overstated.

There are many safety issues in the food chain and the major ones start with its transportation from their production center to where consumers can purchase them and the disposal of waste foods. Along this food chain various farms, communities, food industries and people are involved hence a need for some policies to enhance safety (Neff et al., 2009). A food safety standard is therefore needed to coordinate these activities through guidance so that the distribution channels are operated in accordance to set protocols with very minimal or acceptable deviation.

The move towards consumption of food amongst others, organically produced food, sustainably produced foods, and care about social aspects of food production has stimulated the production of food with specific labels, such as FAIR TRADE, MCS (Marine Stewardship Council Scheme), Carbon Foot Print, just to mention a few. However, recent

issues with sustainability labels has increased consumer's skepticism towards these quality seals and emphasized the desire for trustworthy labeling. As a consequence, assurance of label reliability has put additional pressures on the quality management systems of companies. A common strategy to evaluate the effectiveness and performance of quality systems is by auditing. Internal auditing is conducted by internal company experts and external auditing by competent authorities or certified bodies to check the compliance of quality assurance requirements. These audits are often costly and time consuming, and do not always provide the full guarantees they aim for.

Organic labeling is used for crops when the agricultural methods and practices used in the cultivation of the crop has been approved by the U.S. Department of Agriculture (USDA) and its National Organics Program (NOP). The production of organic crops stands as one of the appropriate steps taken to maintain food quality as well maintain an environment friendly farming method. In the administrations of organic regulations, the main focus is on monitoring and controlling farming practices and food production steps that when put under careful consideration can improve food quality due to decreased risk of food contamination. In USDA organic guidelines for instance, there is complete prohibition of fertilizer application using sewage sludge, genetic engineering, irradiation on the farm land and others such as use of synthetic chemicals; examples are pesticides and herbicides (National Organics Standards Board, 2011). The unfortunate issue is that; the USDA organic program does not assess the sustainability of the organic farming rather it limits its focus to the agricultural methods that will be a prerequisite for a crop to be labelled organic. Should there have been an evaluation of the natural water cycles and mineral cycles, it might have shown how organic farming may not be quite easy to sustain (Bier A.H, 2008). The bottom line is that organic food production may be argued to be environmentally safer and healthier for human consumption than the methods currently used in food production but challenges which

surface when practising organic farming include sustainability and this is less commented on (Greene C, Dimitri C, Lin BH et al., 2009).

Fair trade labelling has also become one of the labels of food produce. For a crop produce to be labelled as such, there is the need for it to satisfy some basic principles. They include their cultivation by laborers with very good working conditions, the use of sustainable methods of cultivation and use of genetically modified crops are also not accepted. Fair trade also promotes, based on its principles, the consumer and the producer are able to have direct relationship without the interruption of faceless middle men. The common foods which are often certified under fair trade labels include coffee, tea, cocoa, sugar, banana, etc.

1.2 PROBLEM STATEMENT

The responsibility rests on food manufacturers to develop labels that meet all the know legal food labelling requirements. The labels of the food products must not be deceptive nor misleading. To introduce food into interstate commerce for example, Good Manufacturing regulations insists that the food's production should be under safe and sanitary conditions. For the sake of all these, there is the need for dynamic systems of analysis to ensure the quality assurance standards for food chains in Ghana are observed. This becomes more important as certain food may have additional requirements because some foods have peculiar attributes and some even possess intrinsic hazards hence needing special manufacturing processes. Currently, there is the tendency to change from traditional auditing towards risk-based auditing (RBA) in the food supply chain but this cannot be done exclusively based on risk concepts which should be integrated into the strategies and approaches used for management systems.

The uncertainty regarding the safety standards of foods observed and the quality of foods displayed for sales has become a major problem for consumers and regulatory bodies; hence the need to explore dynamic systems analysis to support risk-based auditing of quality assurance standards for food chains in Ghana.

1.3 GENERAL OBJECTIVE

To explore dynamic systems analysis to support risk-based auditing of quality assurance standards for food chains in Ghana.

1.3.1 Specific Objectives

The specific objectives of the study are;

1. To outline the difference between traditional auditing and risk-based auditing in the food supply chain
2. To examine the level of increase in food export demands due to Fair Trade
3. To find out the benefits of labeling in the production and sale of food products
4. To identify legislations regarding food safety and hygiene to protect consumers from poor quality

1.4 RESEARCH QUESTIONS

This work seeks to provide answers to some research questions which include:

1. What is the difference between traditional auditing and risk-based auditing in the food supply chain?

2. What is the level of increase in food export demands due to Fair Trade?
3. What are the benefits of labeling in the production and sale of food products?
4. What are the legislations regarding food safety and hygiene to protect consumers from poor quality?

1.5 SIGNIFICANCE OF THE STUDY

The quality of seals used for labeling and the assurance of label reliability can put additional pressures on the quality management systems of companies in food production business. Risk-based internal and external auditing has become a common strategy of evaluating the effectiveness and performance of quality systems. As such, it is important to first of all make a comparison between traditional and risk based auditing system, look at the grey the latter tends to expose. This will enable local legislation to review existing laws to drive food safety issues to a reduced rate.

1.6 SCOPE OF THE STUDY

The study is focused on exploring dynamic systems analysis to support risk-based auditing of quality assurance standards for food chains in Ghana. In this work, the study will take a cursory look at the legislations and regulatory frameworks governing the quality assurance standards of food manufacturing companies in Ghana and how their activities are supervised to ensure that they produce and sell wholesome foods to the general public.

1.7 LIMITATIONS OF THE STUDY

There is the likelihood that respondents at a point may feel reluctant to positively respond to all the questions asked them. They may assume the study has for its purpose to expose them to regulatory bodies. Such thoughts when sustained are likely to negatively affect the outcome of the study. Time also posed as a challenge for the whole research work since it was short.

1.8 ORGANIZATION OF THE STUDY

In five chapters, this work has been organized. The first chapter focused on the introduction which consists of a background to the study, problem statement, objectives of the study and the research questions. It also includes the significance of the study, scope of the study, limitations and organization of the study. Chapter two deals with the literature review -what has been written about the topic in terms of theories or concepts and scientific research studies conducted. Chapter three covers methodology of the study. It describes the research design, population, sample and sampling procedures, data collection instruments and data presentation and analysis tools. Chapter four contains the presentation and analysis of findings. All the data gathered are transcribed and assembled in narrative forms and also as tables. These are analyzed using descriptive statistics in the form of figures, frequencies and percentages. Chapter five looks at the summary, conclusions drawn from the findings and the appropriate recommendations to the study.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

The purpose of this chapter is to undertake a review of literary materials in the areas pertinent to the study, in order to make sound arguments based on the views expressed by other scholars and theories. It also provides a theoretical understanding of the dynamic systems analysis to support risk-based auditing of quality assurance standards for food chains in Ghana. It gives a general account on the subject as already documented by other research works.

2.2 THEORETICAL FRAMEWORK

Public health acts have been developed and they are set to manage the food handling methods, the food production premises and even gives rules when special cases are to be recognized (e.g. in the processing of milk, eggs, meat, fish, etc.). In Sweden for instance, the first legislation that concerned food safety as was described in 1622 had to regulate various slaughterhouses (Brådenmark, 1998). It was then that the institution of the slaughter of animals to be done only public slaughterhouses under the supervision of superintendents was established.

Food legislations have been set to have two main objectives. They are to safeguard consumers from hygienic hazards as well as economic hazards (Ågren, 1991). As there has also been continuous developments and modifications in the food industry, the legislations have been reorganized to have the reflection of such changes. The requirements of any standard fulfilling demands of legislation concerning food is for it to regulate its handling but an additional benefit is the value it adds to the production (Miljöstyvningsrådet, 2007). When

these standards are established and in use, they serve as an approach to prevent the occurrence of crisis in industries and their adherence assure the meeting of limits set by regulatory bodies and satisfies market demands (Lusk et al, 2011). An observation that has been noticed is that, though some food companies have incorporated extensive quality management into their production system, they have no certification to that effect. This in turn puts them out of competition on the market since some benefits the certified companies enjoy will be a disadvantage to them (Miljöstylningsrådet, 2007).

In the discussions of food quality, the aspects highlighted on mainly include the sensory, nutritional and economic aspect of the food product (McDonald et al, 2005). Producers are expected to give assurance to consumers of his product concerning its safety and that it will not lead to any harm on consumption. This has been the result of consumer's knowledge of the connection that exist between human dietary choices and health. In the quest of producers to meet the demand of their consumers, many adopt the Hazard Analysis Critical Control Point (HACCP) system. HACCP is a system that was developed by National Aeronautics and Space Administration (NASA) with the goal to eliminate the risks during the production. It is highly recognized internationally as a potent control system to assure quality (Mårdén, 1995). The HAACP system with quality supervision and practices as integrated form the basis of standards such as BRC, ISO 22000 and IFS.

The World Health Organization (WHO) reports of about two million deaths resulting from the consumption of unsafe foods each year. Illness that are food-borne have also been documented to be one of the leading challenges especially among persons who are poor and ignorant and cannot afford food services that have assured safety. There has been the emergence of new risks due to the global changes in the production patterns of food have. Food sales are often within the ranks of many small-scale producers where the facility to

enhance safety in production are unavailable; there is no accessibility to clean water, no appropriate storage systems, etc., and this is what many Ghanaians consume almost on a daily basis (Barrientos S, Asenso-Okyere K., (2009).

In the absence of any physical, chemical and/or biological hazards, food may be called safe and this is only a reality when there is a constant use of safety systems in the process controls from the farm where the produce was cultivated to the final consumer. As this be a necessity, every food business operator has to be registered under a body that will take charge of the supervision of activities. The launching of a National Food Safety System which will be the basis for food laws to operate and the establishment of a National Food Safety policy with clear objectives, principles, priorities and responsibilities will be very needful. As these are set forth, the already existing regulations should be reviewed and made to harmonize with international standards. Risk Analysis may also be needful to be considered in this, where there will be assessment, management and communication to create the space for the identification and execution of priority actions to rapidly respond and appropriately addressing matters that may arise (Barrientos S, Asenso-Okyere K., (2009).

Food businesses (especially the small and many medium scales) often have no institution that put them in checks. There should be an established program or system that subjects the various food businesses to take responsibilities and adopt some of the known Food Safety management system like HACCP, BRC standards and SQF. When these are in place, the activities of the systems, like monitoring, inspections, sampling and testing, audits, verifications, etc., will ensure the safety of the food. Food business managers will then be registered by these systems and work only by their approval. In this case, certain regulation, like medical checks to test health status of personnel, training of the personnel, etc., are most likely to be keenly adhered. The system should also ensure education of stake holders

including Administrators since a clear understanding of all makes compliance easier. As Ghana is a developing country, the lack of infrastructure and resources, outdated strategies, policies and legislation, improper usage of agrochemicals, unavailable standards for local domestic markets though there are standards for international markets and others are the challenges faced in the developing and implementing of control systems for food safety. Again since many of the food industries are less equipped on food safety practices and do not have registration with the regulatory bodies, their assessment and continual check becomes very difficult (Fold N., 2008). There should also be the establishment and enforcement of laws that will require every food business operator to a food safety plan, like HACCP, irrespective of it been small, medium or large. The FDA working with other stakeholders have put together a draft on Food Safety Policy to target bringing various legislative bodies in the food sector together, expanding the efficiency capacity of these bodies, strengthening their inspection activities and upgrading their laboratory services. This policy when accepted to be implemented will address the issues of overlap in the works of the various regulating bodies with FDA coordinating their activities and also has the goal of encouraging the establishment of several laboratories that are private owned to support the services of the government owned laboratories. In the adoption and the implementation of such a policy, the National Food Safety, it is most likely the long-term vision of managing food safety could be made a reality which will in turn win the confidence of consumers, assure their healthy living and increase how competitive products can be on global markets. In all, a commitment on the part of the government, especially financially, will enable a holistic nationwide approach to food safety and security (Barrientos and Asenso-Okyere, 2009).

2.2.1 Quality Management Systems

In 1995, Mårdén indicated that, competitive advantages are reaped by producers when they take the production line through certification since many suppliers look out for such certification before they enter into partnership with processing companies. It has also been documented that most of the European retailers have it as their requirement that, every of their suppliers should have a certification (Det Norske Veritas, 2009). This is because, it is believed a certification proves the industry's commitment to the production of safe foods hence making it a disadvantage to all uncertified. Even in instances where an incident relating food safety arises, legal defense could be sorted. Again, when the industry is with a certification, the supplier it partners with is able to create and manage a system that has the capacity to continually help the industry to easily meet the safety and quality standards that of the countries where their products are finally consumed. Due to the activities involved in certification, there is reduction in the waste generated and product recalls become easier. With all these noted, Færgemand (2008) then argues that, when the same methods and interpretation are implied, quality management system management will become easier and food safety will be enhanced, maximum utilization of resources will be achieved and risk of critical errors and misunderstandings will be reduced.

2.2.2 Legislations On Food Safety

Sweden in becoming a member of the European Union in 1995 began to influence all the other member states to take up its legislation (SLV, 2006). Starting from the 1st January in 2006, all European Union member states began to fully recognize the food safety regulations as can be found in EC-regulations. The EC-regulation emphatically and clearly holds every food producer to be solely responsible for the complete safety of its products. The producers are to establish control plans as described by HAACP principles and also strictly adhere to all hygiene rules set. This covers every stage the product goes through before the consumers'

table because (EC) 178/2002 (Article 17, paragraph 1) requires the production, processing and distribution chain to guarantee that they produce to meet every requirement stated. Every state that is a member is tasked to create and manage a system to control their safety issues that is practical in their situation.

2.2.3 Global Food Safety Initiative (GFSI)

In the quest to improve the safety of food and better guarantee consumer protection, several international retailers felt the need to work together as one. The Global Food Safety Initiative, was finally instituted in 2000 under the Belgian law. The GFSI is a bedrock of many leading retail companies around the world with one objective, to benchmark the standards that are used during the certification process of production systems so as to enhance its competence making it more consistent and effective. This is because, when the standards regarding the safety of foods are the same around the world, producers and the retailers are able to easily adhere to them.

In the giving of a formal recognition to a standard by GFSI, it becomes accepted worldwide by both local and international retailers. GFSI creates the basis for a platform where there is exchange of knowledge and stakeholder collaborations. In the operation of GFSI, several standards including BRC, FSSC 22000, IFS and Dutch HACCP Standard. GFSI inspires innovation and creation of several standards which will still meet their utmost requirements of safety. That notwithstanding, certification activity is not carried out solely by GFSI and its management on daily basis is undertaken by the Consumer Goods Forum.

2.2.4 Risk-Based Audits

Among quality parameters, food safety remains the most important within the agri-food sector. Though there are rapid and continuous innovations in food processing technologies and various quality management approaches, incidences of food safety are increasing. The demand for food safety is continually on the increase due to the international trade of

foodstuff. This stems out of the fact that there could be chemical contaminants, unknown food-borne pathogens and several food-borne accidents. In the application of Food Safety Managements system industrially, the most effective approach is conducting a scientific evaluation of the associated food borne hazards and their appropriate measure to control them along the food chain.

The concept of Risk Analysis has long been introduced in many fields of work. Due to the continuous occurrence of major food safety hazards and their relating adverse health effects, the concept of Risk Analysis was brought formally into the food industrial system. This is with the utmost focus of protecting human health as acceptable risk level are noted for careful consideration. More to controlling of human health and preventing some food diseases, risk analysis within food processing can become a tool useful in enhancing productivity, research and development, optimizing quality costs and technical installations.

Food safety auditors have the role to assess food producers before the producer earns any specific standard's certificate. In many of the auditing bureaus, their services include inspection, testing, examination and consultations concerning the safety of the food without sidelining profitability. An audit is a thorough assessment of a food industry's working environment, equipment and procedures with all its personnel as they are matched against the required regulations of food hygiene or a standard (Souness, 2000). Audits seek to inquire whether the organization has appropriately developed a detailed documentation and implementation plan of its food safety management system. Though planned at in some instances, it could be conducted unplanned but a written procedure is followed and proper documentation are done.

In three sections, the food safety management systems are grouped; there is the first, followed by a second then a third party audit. The audit is termed first party is when the audit is conducted by the company's own internal auditor but in a second party audit is conducted, a

government organization takes the position as the auditors responsible whereas the third party audit is that which another independent institution (well recognized audit institution) performs the activity. In the audit, the auditor's main responsibility is to authenticate the efficiency of the program adopted by the industry for ensure food safety. It is expected that, important and appropriate records and documents are readily made available to the auditor. When the industry has a HACCP plan, the various documentation showing critical control points and their critical limits as well as the laid down corrective action procedures should be made available for assessment. For the frequency of taking audits, consideration including the size, and nature of the industry as well as the potential risk they may pose are first examined. For an industry to have BRC certification of Global Standard for Food Safety, it first has to develop verified food safety plan that is efficient as it is expected to demonstrate its commitment to satisfy all the Global Standard for Food Safety requirements. An internal audit program, the establishment of prerequisite and HACCP programs are all to be in place well planned and strictly adhered to so as to enhance and assure safety.

2.2.5 Good Manufacturing Practices (Gmp) And Good Hygiene Practice (Ghp)

In the preparation of any industry for certification, many considerations are to be made (Det Norske Veritas, 2009). When an industry plans well to give itself time and space enough to implement the requirements of the certification body, they reaped its accorded benefits. The establishment of management systems of products and processes is essential for every producer of food (Mårdén, 1995). The concept of Good Manufacturing Practices (GMP) in simple words can be explained to be the act of observing good housekeeping in all food production activities and procedures (Bernhardt and Raschke, 1998). It facilitates the production of foods that are safe with consistency in quality attributes. It also reduces waste enhancing profits of the industry. At the beginning, the GMP guidelines were set for only pharmaceutical industry but along the line, as it was reorganized to suit the production of all

kinds of food. When implemented, GMP's routine becomes operational in the management of the sites of production, raw material, equipment hygiene and etc. are well documented and becomes a part of the company's culture (Mårdén, 1995).

In working with accordance to systems as HACCP or ISO 22000 or BRC, clearly outlined GMPs do not become optional. A management needs to be well convinced of how important it will be for their industry to implement GMP to make its adoption into their system more effective (Bernhardt and Raschke, 1998). When they appreciate all the necessities needful to make GMPs introduction work, success can be a reality.

In the concept of Good Hygiene Practice, the emphasized theme is the hygiene aspects of the production line; this includes personnel hygiene, equipment and working surface hygiene, etc. (Buncic, 2006). Though both GMP and GHP could be used interchangeably, GMP focuses mainly on technical aspects of the production process but both have become prerequisite programs needful to be effected before the introduction of a HACCP plan.

2.2.6 Brc Global Standard For Food Safety

In Britain, retail companies have come together to form an association, the British Retail Consortium (BRC), and they have standards developed for food industries who take their private British Retail Consortium product label (Bergström and Hellqvist, 2004). In 1998, the first edition of the standard which is called BRC Global Standard for Food Safety was issued. Its basic role is to help the retail companies to meet their constitutional requirements hence guaranteeing and providing safe foods to consumers. Food industries are therefore required to evaluate their developed operational procedures to suit the requirements of BRC. The BRC also has its foundations based on GMPs, HACCP and systems for quality management. Internal audits and supplier assessments are conducted routinely using the content of the managements systems as set requirements. These requirements in utmost details explain the measures to be taken for all actions that regard production. BRC certification is gained by a

food industry only after careful audits have been conducted by BRC, a third party audit body (BRC Global Standards, 2011). Audits bureaus approved by BRC as their certification body have some set requirements they meet. The spheres of BRC mainly cover areas in Britain, Scandinavian countries and some companies in Sweden (Aranea, 2011; Isodelen, 2012).

2.2.7 Traceability

Implementing a traceability system in a food distributing system is mandatory to safeguard the safety of food and allow the easy working out of procedures of corrective actions should there be a chance of the occurrence of any risk (EC 178/2002). Traceability could be explained to be ability to follow an item in a reverse direction through all its stages of production, processing and distribution. Information on all raw materials and their origin carefully recorded and documented is very necessary in the food industry (Bergström & Hellqvist, 2004). When the outline laid for traceability well ordered, recalling any product deemed hazardous becomes very easy, less costly and reduces waste. In the council of Bergström and Hellqvist (2004), the order to enhance traceability should not only be linked from raw material acquisition to end of production but also there should be a traceable path throughout the distribution of the finished product even till it gets to the consumer; both a forward and a backward traceability plan should be made. In the case of the forward direction, the information about where exactly and how many of the finished products were distributed is key information where as in the backward direction, the possible cause of problem is assessed especially as raw materials sources are identified and examined. The ability to have clearly defined information, as least, a step backward in their production process and a step forward after their production process is a responsibility of every food industry. For this reason, there is a need for the industry to set up its own identification system arranging its products in batches to facilitate the efficiency and effectiveness of every traceability process.

2.2.8 Principles Of Hazard Analysis Critical Control Point (Haccp)

To control potential hazards in food production, a system called Hazard Analysis Critical Control Point (HACCP) was developed. This system is also able to assure the safety of the product as it goes through the food chain, even to the point where it is finally consumed (Bergström and Hellqvist, 2004). It may be important to note that, HACCP has become one of the foundational stones for almost all standards in food systems. For example; the articles 5, 7 and 8 of (EC) 852/2004 regulation, articles 3.7, 3.9, 3.14 and 14 of (EC) 178/2002 regulation and the (EC) 853/2004 regulation all have it emphatically directed that, HACCP system should be established in every food production system. To even adopt BRC standards into a food production system, to have a HACCP plan has been noted to be a prerequisite (BRC Global Standards, 2011). In 1960, when the need arose for the food of astronauts who were travelling to space to be kept safe throughout their explorations, the HACCP system was developed (Bergström and Hellqvist, 2004). The HACCP system is said to consist of seven main principles as according to Codex Alimentarius Basic Texts on Food hygiene, which are the foremost objectives to assure the producing of safe foods which are free from all potential hazards (Bergström and Hellqvist, 2004).

The seven principles of the HACCP system are;

1. Conduct a hazard analysis.
2. Determine the Critical Control Points (CCPs).
3. Establish critical limit(s).
4. Establish a system to monitor control of the CCP.
5. Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control.
6. Establish procedures for verification to confirm that the HACCP system is working effectively.

7. Establish documentation concerning all procedures and records appropriate to these principles and their application.

Benefits of Certification

When an industry establishes a quality management system in its production process, there is increased security and safety for both workers and their management (Bergström and Hellqvist, 2004). This is because, there is the documentation of every procedure and the various responsibilities of individuals and the persons in commanding positions are clearly defined making no individual confused on what to do. Both workers and the management continually gain a rising consciousness various products' demand, production process and all the industries activity.

Again, to add to the advantage of having certification in food producing industries, there is enhanced business-to-business relations. Where customer request for certain certification before their purchase, the only way out on wanting to maintain them is the adopt and implement the standards to look out for. This also boosts the credibility of the food industry.

Challenges of Certification

Almost every time, details concerning standards are dictated by certification organizations or accreditations firms. Though there is one of the information, there still are some undesirable facets of certification. An example is the idea of 'soft grading' where the food industry in question who per customer requirement needs to adopt a particular standard into his process, the industry choose the convenient approach to getting that certification (Hellqvist, personal message, 2012). This may in a way weaken the credibility of the standard and open doors to incapable certification organs (Hellqvist, personal message, 2012). Though standards could be the catalyst to trade in some instances, they could at certain times also acts as obstructions

to trade (Lusk *et al.*, 2011). Due to some factor also, there could incidences of either ‘under’ or ‘over-standardization’ during its adoption and implementation. Third party auditors are therefore involved so as to act as controls as they monitor and endorse the implemented standards in the food production process (Stigzelius, 2009). In Eriksson’s study in 2009, there was a negative development among the dairy producers because double costs and double reviews resulted. The supervision by the certification bodies as well as that by municipal controllers were also considered similar. Food producers have been noted to be undergoing several audits as different standards are adopted mainly due to the fact that there is no universal standard for every food audit.

2.3 EMPIRICAL REVIEW

There has been the emergence of several food standards especially the private food safety and quality modules and this has resulted in discussions to consider whether these have become setbacks for some industries of developing countries, the small scale producers, making it a challenge to the alleviation of poverty via agri-foods exportations. Even though the indications are not conclusive, exiting literature struggles with its limitation which is due to it not considering the effect of industrial structure as it relates the private standards and the smallholders.

In the introduction of Global Value Chain (GVC) method, there is no neglect of industrial structure in the discussions concerning the standards of food and the assurance of quality in smallholders; how the industrial structure contribute to the effect of the adopted standard is investigated. As the case stands, the several various value chain structures create the jumbling of the standards and the outcomes becomes very different from one another in the ways the positions of the industry are affected. The capacity and the chain actor’s incentives for adopting and establishing any standard explains the degree of market concentration and the

lead firm's characteristics. The situations of the smallholders that fall into the value chain structure are adjusted by the chain, and this gives them a platform with several opportunities to select from in the instances they meet challenges as they seek to adhere to requirements they should comply with. Four mappings for smallholders are discussed in diverse chain of governance situations (Henson and Reardon, 2005).

As agri-food supply chains have been taken to expanded to a global sphere, retail power merged together and there is the institution of quality-based competitions, significant transformations have been observed in the position of the smallholders in the system and the mode of operation of agri-food system.

Firstly, agri-food supply chains have a global reach. As there are advances in technology coupled with liberal International trade and foreign investment, more agri-food products whether they are in their raw state or processed are easily distributed across national borders. The small growers are systematically incorporated into networks of global sourcing by Multinational agri-food firms. The ease to source diversified products at high-volume and low-price annually as well as integrating varying agri-food regulation systems have been improved by the extensive supply chain (Hammoudi *et al.*, 2009).

Secondly, retailers have the shift in globalized agri-food chains to their advantage. Retailers and supermarkets as are continuously enlarging have taken the position as lead firms around the world linking various grocery shops to small scale farmers, thus driving the agri-food chain. Due to their well-known consumer brands and huge purchasing power, they are able to push for measures to cut cost and improve the standards to their suppliers. Another key role is taken by exporters as they act as intermediaries and organizers in the food chain, and they also indicate how the suppliers will be able to satisfy the demands of the supermarkets. In some instances, the complex requirements set by the retailers turn to become hurdles for smallholders. This powers shift has also taken place in both countries producing and

consuming. Structural adjustments and the influx of agri-food multinationals into countries that produce have led to weakened government capabilities, hence undermining the power of the producers in developing countries' distributive power as compared to global buyers which ends in the decline in the returns earned by the developing nations in the world of agri-food trade (Hammoudi *et al.*, 2009).

Lastly, the vertical harmonization of the food chain by retailers are strengthened by quality-based competitions. Products that allow partnership with lead firms possess competitive advantages as compared to undifferentiated commodities with price-based transactions, and are distinguished from the competitors and have the potentials to satisfy the expectations of sophisticated consumers who are also willing to pay premium price. These lead firms are poised to enhance food safety and quality hence take the concept and establishment of traceability systems seriously and therefore only cooperate with suppliers who have the capacity to satisfy their stringent requirements which can be expensive (Henson and Reardon, 2005).

2.3.1 Food Labelling Requirements

Standards in food labelling are derivatives of the percentage composition using of organic ingredients in a product. To label a product as "100% organic", it must contain only organic ingredients while products with the label "organic" must have at least 95 percent composition of organic ingredients. In the case of processed products where at least more than 70% organic ingredients have been used are permitted to use the phrase "made with organic ingredients" and this will require a list of up to three of the organic ingredients on the key display panel. An offense in any of these attracts a fine levied on the culprit (the one who sells or labels the product).

Food manufacturers must develop labels (including nutrition information) that satisfy the requirement of standard food labelling. All labeled products must not mislead consumers

especially when they are FDA-regulated. Proper labelling, taking into consideration labeling allergens as well as nutritional profile, is obligatory for most of the foods prepared. If Ghana or any US interstate will be the point of sale of the product, the label must be in English. FDA provides technical guidance as to how manufacturers are to develop and make use of nutrition database and this is described in their Nutrition Labelling Manual. The necessities governing the labelling of the products include;

- ❖ Federal Food, Drug and Cosmetic Act
- ❖ Fair Packaging and Labelling Act
- ❖ Nutrition Labelling and Education Act
- ❖ Food Allergen labelling and Consumer Protection Act 2004
- ❖ FDA's regulation on food labelling

Food Labelling and Packaging

Label on food and drinks must be:

- a) Simple to read due to its clarity
- b) Long-lasting
- c) Simple to comprehend
- d) Easily noticeable
- e) Not ambiguous or misleading

There are other voluntary labels for livestock products, such as meat and eggs that are regulated by USDA:

Free-range - This label shows that during the lifecycle of the animals, they were kept in shelter with continuous access to food, water and were allowed outdoors. The outdoor area may or may not be fenced and/or covered with netting-like material.

Cage-free - This label shows that the animal was able to freely roam a building, room, or enclosed area with unlimited access to food and fresh water during their life cycle.

Natural - As required by USDA, meat, poultry, and egg products labelled as "natural" must be minimally processed and contain no artificial ingredients. However, the natural label only regards processing of meat and egg products and does not include any standards regarding farm practices.

Grass-fed – These receive most of their nutrients from grass throughout their production cycle. Also USDA regulated, the grass-fed label does not limit the use of antibiotics, hormones, or pesticides. Meat products may be labelled as grass-fed organic.

Pasture-raised - Due to the number of variables involved in pasture-raised agricultural systems no labelling policy for pasture-raised products has been developed.

Humane - Multiple labelling programs make claims that animals were treated humanely during the production cycle, but the verification of these claims varies widely.

2.3.2 History Of Organic Foods

In the United States, organic food production has long been practiced since 1940. Since then the industry has expanded from trial garden plots to large farmland where excess products were sold on the market with a unique organic label. Some food producers developed organic processed products and many retail marketing chains dedicated themselves to "organic" product sales. As at the later years of 1980s, the organic industry petitioned to develop an act, Organic Foods Production Act (OFPA), with which they could define the word 'organic' after an attempt to establish a consensus of certification standards and production procedures. This increased awareness inspired a need for verification that products are indeed produced according to claims. This in effect gave birth to the organic certification industry. Over 40 private institutions and state organizations currently certify organic food in the USA, but there are differences in their standards for cultivating and labelling organic foods. While

some may permit use of certain fertilizers or pesticides, a different institution may prohibit its usage in the growing organic of food.

Among the various categories of foods, organic foods have gained a lot of popularity in the world. In the USA, laws regulating the sale and use of organic foods were passed by most states even before the federal government came in. Voluntary organic certification systems set up farmers before the establishment of the various state laws. The use of “transitional organic” in food labeling also implies that, the food producer’s attempt to fully comply with the standards established by the state are not completely met; as it takes time for the absolute elimination of unwanted substances present in the soil even if they are no longer in use for the process of production.

Less than 4% of all food sold in the USA are from organic foods, however, this is a representation of \$26.5 billion of total food sales. This is because, a significant proportion of the foods produced in the USA are not produced organically. There has been strong pressure on organic regulations to accommodate non-organic techniques and within the 1990’s, suggestions were made to permit the use of sewage sludge, irradiation and genetic engineering in the production of foods with organic certification. This suggestion was however not approved in a partial response to greater than 250,000 letters that USDA received in disagreement to the regulatory changes. Currently, pressure from consumers continue to remain important in maintaining genetic engineering, irradiation, and sewage sludge out of the production of organic food crops. The scale of production of organic foods explains the expensive price of these foods when on sale and this cannot be compared to conventionally grown foods. Significant differences in production volume of organic foods makes it impossible for organic foods to compete in price with conventional foods. However, in some planting seasons, the prices of organic foods can be virtually similar to that of the conventionally grown ones. This situation which happens in some countries is rare but does

exist. The use of food additives such as sulfites, nitrites and nitrates in the processing of certified organic foods is forbidden and storage of these foods in containers that contain banned synthetic fungicides or fumigants by food handlers is prohibited. Containers that have in the past come into contact with banned constituents may not be reused in the storage of foods with organic certification. To be able to produce organic certified crops, farmers must prove to the USDA that their farmland, at least within the last 3 years, has not had contact with the prohibited substances. In addition, they must agree to employ activities that will improve soil's nutrient characteristics, such as crop rotation and composting. The use of composted manure in organic crop production is permitted by the USDA; however, standards are set for composting and these are stricter in organic food production than in non-organic. Establishment of buffer zones around all certified organic fields is necessary to prevent synthetic farming chemicals; pesticides and fertilizers, used on non-organic farmlands.

2.3.3 Governance Value Chain (Gvc) Structure And Agri-Food Standards

The value chain structures can be grouped in four; depending on the degree of concentration in food productions; that is, farmers and manufacturers, and in food retail; that is, supermarkets and other food retailers.

In considering the motivation and interest, retailers as well as manufacturers have varying targets in the agri-food standards. For retailers, there is more interest in the safety of the product and the reputation of the brand but manufacturers concentrate on standards that differentiates between products in terms of safety in both social and environmental concerns. The primary interests of retailers lie in managing possible risks of several nodes long as the GVC so as to secure the confidence of consumers but manufacturers have to communicate and convince both retailers and consumers of how better their product is as compared to other brands.

Unique gathering of food standards that reflect the qualities of its lead firms are noted to be associated with each type of the value chain structure. In most agri-food sectors, buyer driven chains are noted to have emerged as retailers in developed economies are on the increase. With a focus on food safety, retailer led private standards together with public standards have prevailed although there is a rise in quality standards (Henson and Reardon, 2005).

The role of exporters and wholesalers is to mediate in the collecting of products from many farmers for supply to large retailers who usually have a highly centralized buying decision. Common instances of this situation is seen in the chains which are moved by export, such as Fresh Fruits and Vegetables (FFVs). Food processors play an important role in producer driven chains where they organize supply chains which although increasingly challenged by large retailers, finds its power in supplying and processing important commodities such as high-value bean crops (coffee, cocoa) or key ingredients for a wide variety of processed foods (processing tomatoes). The intervention of manufacturers in on-farm activities as well as the control of international trade of large-scale commodities greatly affects small scale producers. Private standards which focus on quality, social and environmental standards are expected to emerge considering the demand for differentiated products.

Another important influence is that on smallholders as it is very key in buyer-driven and producer-driven value chains. It is however less in bilateral oligopolies; that is, instances where traders may be vertically integrated or simply buying agents for large producers.

2.3.4 Industry Structure And Sustainable Value Chains

Arguably the effect of agri-food requirements and the returns of smallholders mainly depend on the type of Governance and Value Chain (GVC) in which they are involved. Unlike other studies on standards and smallholders in buyer-driven export chains, this study highlights different opportunities and constraints facing smallholders in diverse chain structures. Although the rise of consolidated lead firms is a driving force that cuts across different

sectors, global agri-food chains have divergent governance structures whose effects on food standards and smallholders vary widely. Given the differing emphasis of buyer and producer driven chains on standards, distinct opportunities are provided by both for small holders. Safety-focused standards are of utmost importance to the buyer driven chains and quality focused standards to the producer driven chains. In buyer driven chains, upgrading happens to be greater due to the lack of strong midstream actors who are advancing their control over the producer driven chains. The least beneficial to small holders are bilateral oligopolies and this is because of their strict requirements and the direct control by lead firms. Smallholders in traditional markets on the contrary have more autonomy with a wider control of the activities. They however lack adequate support for upgrading because even domestic chains have been increasingly subjected to enhanced standards and supply consolidation (Bier, 2008).

Another topic left to be explored is the difference in structures of governance and strategies that keep upgrading across the country. Across countries and regions, there is a variation in the production systems and their upgrading strategies which is far from unitary. In spite of the increasing reputation of private governance in the global economy, there still remains the major role of public institutions in agri-food chains. Countries that opposed private governance happen to enjoy the greatest benefits from it as seen by the government owned; Ghana Cocoa Board. The benefits of local supporting institutions for export driven chains is seen in the Peruvian and Mexican cases where regulatory and legal institutions regarding land use, labor and environmental standards are crucial for sustaining local capabilities. Provided the impact of private standards is often limited to “standard-certified enclaves” such as fair trade-certified banana plantations, collective arrangements to regulate agri-food trade at the global level for example; having an International Banana Agreement, should be included in

future discussions to protect smallholders from market modifications so as to compliment private governance schemes (Bier, 2008).

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

In this chapter, the research design, the research methods, sampling techniques and the means of data collection are elaborated.

3.2 SOURCES OF DATA

In the gathering of data, both primary and secondary data were gathered using questionnaires from a sample in the population for the study. Closed-ended questions formed a majority of the questionnaire with a few open-ended questions. Reviewing literature, secondary data were gathered; the literature included books, journal, internet, legislations and standardizations to enhance the study.

3.3 STUDY POPULATION

The study population comprised of selected government regulatory bodies and food manufacturing companies from Accra Metropolis and has a sample size of one hundred (100) respondents purposively chosen from the selected organizations. It is believed that these respondents were better exposed to the various system analysis and quality assurance standards for food chains in Ghana.

3.4 RESEARCH DESIGN

In this study, the mixed methods approach was adopted to analyse the data by using both the quantitative and qualitative methods. Though this study used purposive sampling method which makes it unqualified to generalise the result in theoretical sense, however, it should be

understood that the purposive sampling method adopted here is to target the very people who are qualified and have tremendous knowledge to answer and not the general population of the study area. These people are randomly chosen from those purposively sampled, hence the resulting answer could be generalised to represent the views of the population for this study.

The use of both qualitative and quantitative to analyse the results offered differences and gave reasons for the mixed methods approach, thus complementing one another. Both the interview and questionnaire were chosen as the qualitative and quantitative data collection method respectively.

3.5 SAMPLING TECHNIQUE

Probability sampling was used because it gives a range of sampling options to choose from. The purposive sampling method was also used because the respondents have the knowledge to answer the research questions within their purview of experience and exposure. The researcher used random sampling method after using the purposive sampling to select the possible respondents to contact and place questionnaires.

3.6 RESEARCH INSTRUMENTS (Questionnaire and Interview)

The major instruments used to sample the views of respondents in this study are; questionnaire and interview schedule.

The self-administered type of questionnaire was adopted to collect data from the respondents. A set of questions with fixed wording sequence of presentation as well as precise indications of how to answer each question was presented to the respondents in exactly the same way. This minimizes the role and influence of the interviewer thereby enabling a more objective comparison of the results, (Bless & Higson-Smith, 1995). The collection of data was

conducted and made possible as a result of an official letter from KNUST (MSC Food Quality Management Department). The respective heads of the selected institutions were met to explain briefly the purpose of the research. After gaining the approval then the questionnaires were distributed to the respondents. Samples of the questionnaire and interview schedules were also used to explain the academic purposes of the study. Interviews ensured that all items on the questionnaire were considered and respondents did not omit difficult questions as they would likely do if they did not understand and could not interpret the questions.

3.7 DATA ANALYSIS AND PRESENTATION OF RESULTS

As data analysis involves the use of statistical methods to pull together, examine and summarize the data to derive meaning. The data collected from the questionnaire will be analyzed using Statistical Package for Social Science (SPSS). However, analysis begins by checking the number of questionnaires collected from the field to ascertain whether the questionnaires have been properly completed by the respondents.

SPSS was more preferable for quantitative analysis because it was easier to define variables, input data and generate outputs or reports (Healey, 1993). The items and the respective responses from the completed questionnaire were coded and entered on the SPSS spread sheet to obtain data for the analysis. The descriptive analysis tool in SPSS is used in analyzing the coded closed-ended responses to develop tables, frequencies and percentages to answer the related research questions. Bio data representation of the frequency and percentage of the respondents in relation to their age, gender, length of stay at the study area, positions held with current employers, type of employment and their specific trainings related to food safety management.

Table 4.1, talks about the gender of respondents, 60 respondents showing 60% were male with 10 male staff each selected from three major government regulatory bodies and two manufacturing companies while 40 of them representing 40% were female with 10 female staff each selected from three major government regulatory bodies and two manufacturing companies. The two major government regulatory bodies are Ghana Standards Authority, Food and Drugs Authority and the three manufacturing companies are Niche Cocoa, Cargill Ghana Limited, Barry Callebaut Ghana Ltd.

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATIONS

4.1 INTRODUCTION

This chapter presents the analysis and discussion of the results of the responses from the data collected from the study population. Detail results using statistical tools are presented and their interpretations have also been made in addition to the discussions. The analysis was carefully done based on the general objectives and the hypotheses for the study. Detail analysis was conducted to bring out the facts for better interpretation of the findings. Charts, graphs and tables were used with appropriate display of tables and figures for clarity and better understanding. There are 36 questions that are sub-divided into 3 sections (A, B and C); bio data, food safety standards and legislations and regulations of quality assurance standards for food chains in Ghana.

4.2 SECTION A: BIO DATA REPRESENTATIONS

Bio data representation of the frequency and percentage of the respondents in relation to their age, gender, length of stay at the study area, positions held with current employers, type of employment and their specific trainings related to food safety management.

Table 4.1, talks about the gender of respondents, 60 respondents showing 60% were male with 10 male staff each selected from three major government regulatory bodies and two manufacturing companies while 40 of them representing 40% were female with 10 female staff each selected from three major government regulatory bodies and two manufacturing companies. The two major government regulatory bodies are Ghana Standards Authority,

Food and Drugs Authority and the three manufacturing companies are Niche Cocoa, Cargill Ghana Limited, Barry Callebaut Ghana Ltd.

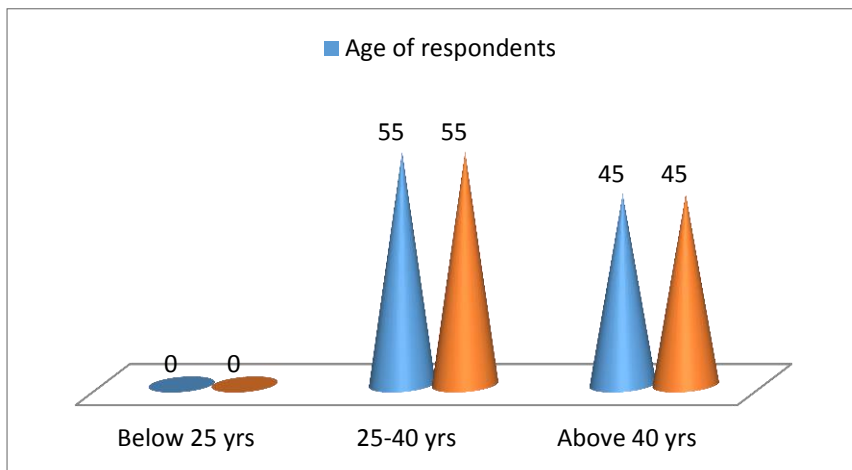
Table 4.1: Gender of respondents

Gender	Frequency	Percentage (%)
Male	60	60
Female	40	40
Total	100	100

Source: Field Data 2016

On the part of the age of respondents as indicated on Figure 4.1 however show the age distribution of respondents, 55 respondents showing 55% were between the ages of 25-40 years, 45 respondents representing 45% were 40 years and above while those below the ages of 25 years recorded no responses. This data signifies that the researcher sought the views of matured respondents whose suggestions, responses and answers are more reliable.

Figure 4.1, Age of respondents (both male and female)



Source: Field Data 2016

In this study, five different companies/agencies were used for the entire study which includes government agencies and private companies in the cocoa industry. Table 4.2 shows the list of companies from which the respondents were selected for the survey. 10 males and 10 females were chosen from the five different companies to give an equal representation of the population. Also of note is the balance representation of responses from both public and private organizations.

Table 4.2: Names of the selected companies for the survey

Company	Frequency	Percentage (%)
Ghana Standards Authority	20	20
Food and Drugs Authority	20	20
Cargill Ghana Ltd	20	20
Niche Ghana Ltd	20	20
Barry Callebaut Gh Ltd	20	20
Total	100	100

Source: Field Data 2016

Moreover, the study went on to find out the specific industry types of the respondents, all the 100 respondents; 20 respondents showing 20% were selected from the certification body like the Ghana Standard Authority, 40 respondents representing 40% were selected from regulatory bodies such as the Food and Drugs Authority and 40 respondents representing 40% (Table 4.3) were selected from manufacturing companies like Niche Cocoa Ltd, Cargill Ghana Limited and Barry Callebaut Ghana Ltd.

Table 4.3: Industry types from which companies are selected

Industry type	Frequency	Percentage (%)
Certification bodies	20	20
Regulatory bodies	40	40
Manufacturing companies	40	40
Total	100	100

Source: Field Data 2016

As indicated, Table 4.4 depicts the responses on the question the current positions held with employer. Here, the researcher chose five major designations that are related to food safety management and risk audit assessment systems. These are Health and Safety Officers, Quality Control Officers, Environmental Officers, Quality Assurance Officers and Documentation Control Coordinators. For each of the categories, 20 respondents were chosen to given an objective opinion from their practical field experiences.

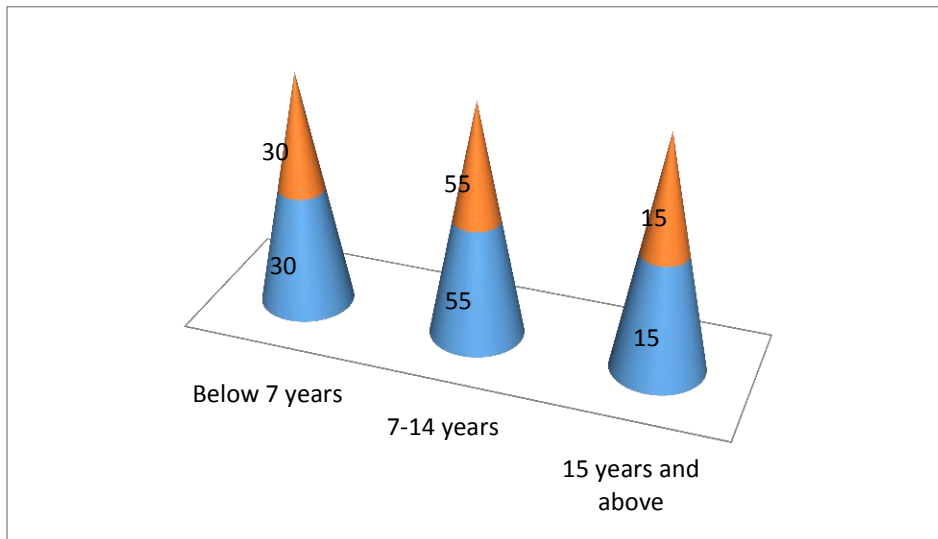
Table 4.4: Current employment positions held

Position	Frequency	Percentage (%)
Health and Safety	20	20
Quality Control	20	20
Environmental Officer	20	20
Quality Assurance Officer	20	20
Document Control Officer	20	20
Total	100	100

Source: Field Data 2016

Respondents responded to the length of stay with their current company. Figure 4.2 shows that 30 respondents showing 30% have worked with their employer below 7 years, 55 of them representing 55% have worked with their employer and 15 of them representing 15% have worked with their employer for 15 years and above. This data shows that majority of the respondents are workers with long years of experience and deep understand of their company's operations and processes.

Figure 4.2: Length of service with employer



Source: Field Data 2016

In the quest to seek the educational background of the respondents, out of the total of 100 respondents, 12 respondents showing 12% have HND/Diploma qualification, 70 of them representing 70% hold first degree qualification and 18 respondents showing 18%. Table 4.5 have other professional qualifications such as masters in food safety management.

Table 4.5, Educational background of respondents

Educational background	Frequency	Percentage (%)
HND/Diploma	12	12
First Degree	70	70
Other Qualifications	18	18
Total	100	100

Source: Field Data 2016

Moreover, when the study zero inn to the specific educational background of respondents in food safety and quality management systems. 30 respondents showing 30% answered to ISO22000, 25 respondents showing 25% answered to ISO90001, 35 respondents showing 35% answered to ISO17025 while 10 of them showing 10% had certificates in food safety management. This further signifies that the researcher chose the right respondents of his survey.

Table 4.6: Educational background in food safety and quality management systems

Education in food safety	Frequency	Percentage (%)
ISO 22000	30	30
ISO 90001	25	25
ISO 17025	35	35
Certificate in food safety	10	10
Total	100	100

Source: Field Data 2016

The study sort to find out the goal and objectives of respondents' organizations. It was found that the three most catchy goals and objectives of some of the companies are; to produce the best confectionary products in Africa and beyond, bringing prosperity to the common man by providing quality products at affordable prices and to become the market leader in cocoa products across Africa.

In order to justify the goals and objectives of the companies, the study again inquired to know the quality certification the companies have. It was found that among the popular quality certificates acquired by the study populations are; ISO 22000, ISO 90001, ISO 17025 and FSSC 22000 which are issued by higher standards and regulatory bodies.

It should be noted that some practices also requires the acquisition of religious certification as well, the study again realized that majority of the respondents do have - Halaal certificate and Kosher certificate which are the most recognized religious certifications given to organizations.

Additionally, when respondents were asked on the question 'Do you agree that food safety standards are important to all organizations' the study revealed that most of the respondents agreed with the assertion thus, 5 respondents showing 5% neither agree or disagree with the question, 15 respondents showing 15% somewhat agree with the question, 35 respondents showing 35% agree and 45 of them representing 45% strongly agree that food safety standards are important to all organizations (Table 4.7). None of the candidates answered to strongly disagree, disagree and somewhat disagree. This is as a result of the assumption on the part of the respondents that food safety standards encourage quality production.

Table 4.7: Food safety standards are important to all organizations

Responses	Frequency	Percentage (%)
Strongly disagree	0	0
Disagree	0	0
Somewhat disagree	0	0
Neither agree or disagree	5	5
Somewhat agree	15	15
Agree	35	35
Strongly agree	45	45
Total	100	100

Source: Field Data 2016

On the part of companies practice and food safety and quality management (Table 4.8) the study shows that respondents were in much agreement to the assertion. 20 respondents showing 20% somewhat agree, 30 respondents showing 30% agree, 50 of them representing 50% strongly agree while there was no responses for strongly disagree, disagree, somewhat disagree and neither agree or disagree. This result shows that most of the respondents are of the view that when companies practice food safety and quality management, the safety of customers will be guaranteed.

Table 4.8: Companies practice on food safety and quality management

Responses	Frequency	Percentage (%)
Strongly disagree	0	0
Disagree	0	0
Somewhat disagree	0	0
Neither agree or disagree	0	0
Somewhat agree	20	20
Agree	30	30
Strongly agree	50	50
Total	100	100

Source: Field Data 2016

Moreover, the study was interested to know if it is important to conduct system assessment of company's quality management system. As indicated on Table 4.9, 62% said it is extremely important, 30 of them representing 30% said it is very important, 3 of them representing 3% said it is moderately important and 5 of them representing 5% were neutral with no records for not at all important, low importance and slightly important. The result means that the respondents believe that conducting system assessment will help strengthen the quality management system.

Table 4.9: Importance to conduct system assessment of company's quality management system

Responses	Frequency	Percentage (%)
Not at all important	0	0
Low importance	0	0
Slightly important	0	0
Neutral	5	5
Moderately important	3	3
Very important	30	30
Extremely important	62	62
Total	100	100

Source: Field Data 2016

Again, in Table 4.10, 2% of the respondents strongly disagree to the assertion that it is better to understand what risk based auditing process is about whereas, 4 respondents showing 4% disagree, 3 of them representing 3% somewhat disagree, 5 respondents showing 5% neither agree or disagree. Nevertheless, 16 respondents showing 16% somewhat agree, 45 respondents showing 45% agree and 25 respondents showing 25% strongly agree that most people do not understand what risk based auditing process is.

Table 4.10: Understanding of what risk based auditing process is about

Responses	Frequency	Percentage (%)
Strongly disagree	2	2
Disagree	4	4
Somewhat disagree	3	3
Neither agree or disagree	5	5
Somewhat agree	16	16
Agree	45	45
Strongly agree	25	25
Total	100	100

Source: Field Data 2016

Table 4.11 depicts the results of how some food manufacturing companies passing conventional food safety audits without satisfying food safety standards, it was realised that 10 respondents showing 10% disagree, 20 respondents showing 20% somewhat disagree, 5 respondents showing 5% somewhat agree 50 of them representing 50% agree and 15 respondents showing 15% strongly agree. No respondent answered to strongly disagree and neither agree or disagree. This implies that majority of the respondents agreed, some food manufacturing companies do not fully satisfy food safety standards by way of risk assessments but yet still pass conventional food safety audits because they pay their ways through.

Table 4.11: Food manufacturing companies passing conventional food safety audits without satisfying food safety standards

Responses	Frequency	Percentage (%)
Strongly disagree	0	0
Disagree	10	10
Somewhat disagree	20	20
Neither agree or disagree	0	0
Somewhat agree	5	5
Agree	50	50
Strongly agree	15	15
Total	100	100

Source: Field Data 2016

Nevertheless, the call to switch from conventional system assessment to risk based auditing process was accepted by the respondents, as indicated on Table 4.12, the result shows that 3 respondents showing 3% strongly disagree, 7 respondents showing 7% disagree, 5 respondents showing 5% neither agree or disagree, 15 respondents showing 15% somewhat agree, 40 respondents showing 40% agree and 30 of them representing 30% strongly agree. This data proves the fact that majority of the respondents are calling for the switch from conventional to risk based auditing that ensures that food safety and quality management focuses on avoiding risk related factors.

Table 4.12: Call for a switch from conventional system assessment to a risk based auditing process

Responses	Frequency	Percentage (%)
Strongly disagree	3	3
Disagree	7	7
Somewhat disagree	0	0
Neither agree or disagree	5	5
Somewhat agree	15	15
Agree	40	40
Strongly agree	30	30
Total	100	100

Source: Field Data 2016

In the quest to know the feasibility of the risk auditing process, the study further asked the respondents whether they agree that the switch from conventional system assessment to a risk based can solve the flaws identified in the conventional system. The results gathered shows that 10 respondents showing 10% strongly disagree, 15 of them representing 15% disagree, 8 of them representing 8% somewhat disagree, 7 of them representing 7% somewhat agree, 35 of them representing 35% agree and the remaining 25 respondents showing 25% strongly agree. This means that while some people disagree, majority of them have agree that if conventional system assessment is changed to risk based auditing it will solve the flaws identified in the conventional system (Table 4.13).

Table 4.13: Results on the switch from conventional system assessment to a risk based to solve the flaws identified in the conventional system

Responses	Frequency	Percentage (%)
Strongly disagree	10	10
Disagree	15	15
Somewhat disagree	8	8
Neither agree or disagree	0	0
Somewhat agree	7	7
Agree	35	35
Strongly agree	25	25
Total	100	100

Source: Field Data 2016

Moreover, on the effectiveness of the switch if done could equally work for other certifications the study finds that, 10 respondents showing 10% strongly disagree, 50 respondents showing 50% disagree, 5 respondents showing 5% somewhat disagree, 30 respondents showing 30% agree and 5 of them representing 5% strongly agree (Table 4.14).

Table 4.14: The switch if done would be equally effective for other certifications

Responses	Frequency	Percentage (%)
Strongly disagree	10	10
Disagree	50	50
Somewhat disagree	5	5
Neither agree or disagree	0	0
Somewhat agree	0	0
Agree	30	30
Strongly agree	5	5
Total	100	100

Source: Field Data 2016

In Table 4.15, the study shows that 40 respondents showing 40% said food quality and safety certification processes is too expensive, 60 respondents showing 60% said food quality and safety certification processes is too cumbersome while no responses were recorded for those who think the food quality and safety certification processes is too simple.

Table 4.15: Food quality and safety certification processes in Ghana

Responses	Frequency	Percentage (%)
Too expensive	40	40
Too cumbersome	60	60
Too simple	0	0
Total	100	100

Source: Field Data 2016

Again, on the question; do you agree that food safety and quality certification should be recommended to any company who has not yet done so, 25 respondents showing 25% somewhat agree, 40 respondents showing 40% agree and 35 of them representing 35% strongly agree. There was no responses on strongly disagree, disagree and neither agree or disagree. This data shows that every manufacturing company should undertake food safety and quality certification (Table 4.16).

Table 4.16: Recommendation for food safety and quality certification

Responses	Frequency	Percentage (%)
Strongly disagree	0	0
Disagree	0	0
Somewhat disagree	0	0
Neither agree or disagree	0	0
Somewhat agree	25	25
Agree	40	40
Strongly agree	35	35
Total	100	100

Source: Field Data 2016

The study has shown that respondents though agree to the critical roles certification play in ensuring food safety and standards practices, it was also realised that they do have some concerns on the food certification itself. The study found that the dominant flaws highly associated with conventional food safety auditing include the following;

- Conventional food safety auditing does not go beyond the standards.
- Conventional food safety auditing does not consider risk related issues.
- Conventional food safety auditing does not have in place penalty for companies flaunting risk audit processes but only the accepted standards.

Additionally, out of the responses gathered, the dominating advantages of risk food safety auditing are that; there is an increasing demand to ensure worldwide food safety, protection of human health from acceptable food risk and effective scientific evaluation of food borne hazards and their adequate control measures.

On the issue of identifying risk lapses solved with conventional audit process method, the various responses from the respondents indicated that there should be a total review of the existing standards to cover risk assessment elements. The audit scope should also be stretched to cover risk elements such as frequency and probability of occurrence as well as its impact on food safety. This would go a long way to ensure that major non conformities which would not have been an issue with conventional audit are brought up on time for redress.

In Table 4.17, the study found out that the level of awareness on quality management requirement in Ghana has improved with majority of the respondents agreeing to it. 10 respondents showing 10% disagree that the level of awareness on quality management requirement in Ghana has improved, 15 of them representing 15% somewhat disagree, 70 respondents showing 70% agree that the level of awareness on quality management requirement in Ghana has improved and 5 respondents showing 5% strongly agree that the level of awareness on quality management requirement in Ghana has improved due to education and publicity from the regulatory and standard authorities.

Table 4.17: Level of awareness on quality management requirement in Ghana

Responses	Frequency	Percentage (%)
Strongly disagree	0	0
Disagree	10	10
Somewhat disagree	15	15
Neither agree or disagree	0	0
Agree	70	70
Strongly agree	5	5

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

This chapter deal with the general summary, conclusions and recommendations of the study. The purpose of the study was to explore dynamic systems analysis to support risk-based auditing of quality assurance standards for food chains in Ghana. It is the fervent wish of the study that the recommendations are considered for improved food safety management, environmental and health policy analysis.

5.2 SUMMARY OF FINDINGS

This study focuses on exploring dynamic systems analysis to support risk-based auditing of quality assurance standards for food chains in Ghana. It is interesting to note that the major safety issues with food start with the transportation of food from its production site to the market for consumer purchase and consume then to the disposal of waste foods. This includes production, processing, distribution, preparation, marketing, access, consumption and disposal of food.

The study found out that it is legally accepted by all manufacturing companies that there should be standards to regulate the operations of all industry player in order to encourage food safety as well as bring to book companies that do not operate according to standards.

Furthermore, the study revealed that there are different types of certifications that can be obtained by manufacturing companies namely ISO 22000, ISO 9000, ISO 17025 and Certificate in food safety.

Moreover, is a great difference between conventional food safety auditing and risk based auditing because conventional food safety auditing does not go beyond the standards, it does not consider risk related issues and does not have in place penalty for companies flaunting risk audit processes but only the accepted standards but risk food safety auditing ensure worldwide food safety, protection of human health from acceptable food risk and effective scientific evaluation of food borne hazards and their adequate control measures.

5.3 CONCLUSION

In conclusion, the study findings indicated that standardization has the capacity to outline a feasible way of inhibiting potential crisis and complications. It can also manage the food safety requirements expected to be satisfied by authorities, the market and others which has its main objective to provide safe food for consumer consumption.

Firstly, as big brands start seeing the value in Fair Trade the recognition of the brand among consumers increase along with its growth potentials. Despite the many benefits of Fair trade, it is not without some flaws. For instance, if a producer network seeking a Fair Trade certification is made up of dozens or even hundreds of farmers in the co-operative network, auditors allow for a "group certification" rather than inspecting every individual.

Secondly, the sensory properties, nutritional value as well as the economic value of various food products have been used as indicators of food quality. Food quality also hinges on the safety of the product on consumption as there is assurance of no harmful health effects. To realize all these mentioned where potential risks are eliminated, an effective system to be established in the industry's system is a HACCP plan.

Again, another major setback with any certification is the flexibility given as 'soft grading' which allows the industry to choose the most convenient approach to be granted certification to implement a standard to the satisfaction of their consumers. This in a way questions the

credibility of that standard creating an avenue for certification organs with less seriousness. There also could exist a possibility of ‘under’ or ‘over-standardization’ in implementation of a standard in an industry’s production process and this may result from numerous factors. For this reason, third party monitoring and standard accreditation should be well controlled. Finally, emergence of BRC, ISO 22000 and IFS as international standards are results of the increased expectations of consumers and authorities. These mainly compose of a HACCP plan, Good Manufacturing Practices and a well outlined monitoring procedure.

5.4 RECOMMENDATIONS

Based on the above findings and conclusion, the following recommendations have been raised. These are; companies should partner themselves to obtain certification, government should reduce or subsidise the cost of certification, regulatory bodies should ensure that modern food safety practices are adhered to by all manufacturing companies and increase training in food security by regulatory bodies.

5.4.1 Companies Should Partner themselves to Obtain Certification

Since most manufacturing companies see the cost of certification as too expensive, companies should partner themselves to conduct the certification in order to have a split cost that will not burden individual companies particularly the smaller companies.

5.4.2 Government Should Reduce or Subsidies the Cost of Certification

To encourage majority of the manufacturing companies to obtain the right certificates in food safety, the government should consider reducing or subsidizing the cost of conducting and undergoing certification.

5.4.3 Increase Training in Food Security by Regulatory Bodies

The regulatory and standard authorities should intensify the training of manufacturing companies on food security and safety that will ensure a healthy nation.

5.4.4 Regulatory Bodies should ensure that Modern Food Safety Practices are adhered to

Although many companies flaunt the food safety regulations and requirements, they do not feel compelled because they are not penalized. It is therefore important that the regulatory bodies ensure that modern food safety practices are adhered to by all manufacturing companies.

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QUESTIONNAIRE

EXPLORING DYNAMIC SYSTEMS ANALYSIS TO SUPPORT RISK-BASED AUDITING OF QUALITY ASSURANCE STANDARDS FOR FOOD CHAINS IN GHANA

Dear Sir/Madam,

This is a study being conducted by Michael Marmon-Halm, a final year student of the department of Food Science and Technology; KNUST, Kumasi. This questionnaire is intended to seek your opinion on exploring dynamic systems analysis to support risk-based auditing of quality assurance standards for food chains in Ghana. It would be appreciated if you could spare some time to complete this questionnaire. Information provided will be used for academic work only. Your confidentiality is assured.

SECTION A: BIO DATA

Kindly indicate the most appropriate response.

1. What is your gender? A. Male [] B. Female []

2. What is your age? A. 20-25yrs [] B. 25-40yrs [] C. Above 40yrs []

3. What is the name of your company?.....

4. Which industry type does your company belong to?.....

5. What position/role do you play with your current employer?.....

6. How long have you been working with your employer? A. Below 7yrs [] B. 7-14yrs [] C. 15yrs and above []

7. What is your highest educational background? A. HND/Diploma [] B. First Degree []
C. Other Trainings/Qualifications []

8. What is your educational background with regards to food safety and quality management systems?.....

9. What is your company's goal and objectives?
.....

10. Which quality certification does your company have?
.....

11. Which religious certification does your company have?
.....

SECTION B: FOOD SAFETY STANDARDS

Kindly indicate the most appropriate response.

12. Do you agree that food safety standards are important to all organizations?

- (1) Strongly disagree (2) Disagree (3) Somewhat disagree
(4) Neither agree or disagree (5) Somewhat agree (6) Agree (7) Strongly agree

13. Do you agree that all company must practice food safety and quality management?

- (1) Strongly disagree (2) Disagree (3) Somewhat disagree
(4) Neither agree or disagree (5) Somewhat agree (6) Agree (7) Strongly agree

14. Is it important to conduct system assessment of your company's quality management system?

- (1) Not at all important (2) Low importance (3) Slightly important
(4) Neutral (5) Moderately important (6) Very important (7) Extremely

important

15. Do you agree that most people do not understand what risk based auditing process is?

- (1) Strongly disagree (2) Disagree (3) Somewhat disagree
(4) Neither agree or disagree (5) Somewhat agree (6) Agree (7) Strongly agree

16. Some food manufacturing companies do not fully satisfy food safety standards by way of risk

assessments but yet still pass conventional food safety audits.

- (1) Strongly disagree (2) Disagree (3) Somewhat disagree

(4) Neither agree or disagree (5) Somewhat agree (6) Agree (7) Strongly agree

17. Do you agree to the call for a switch from conventional system assessment to a risk based auditing process? (1) Strongly disagree (2) Disagree (3) Somewhat disagree
(4) Neither agree or disagree (5) Somewhat agree (6) Agree (7) Strongly agree

18. Do you agree that the switch can solve the flaws identified above?

(1) Strongly disagree (2) Disagree (3) Somewhat disagree
(4) Neither agree or disagree (5) Somewhat agree (6) Agree (7) Strongly agree

19. Do you agree the switch if done, would be equally effective for other system certifications

such as religious certifications? (1) Strongly disagree (2) Disagree
(3) Somewhat disagree (4) Neither agree or disagree (5) Somewhat agree
(6) Agree (7) Strongly agree

20. What do you think about food quality and safety certification processes in Ghana? A.

Too

expensive [] B. Too cumbersome [] C. Too simple []

21. Do you agree that food safety and quality certification should be recommended to any company who has not yet done so? (1) Strongly disagree (2) Disagree
(3) Somewhat disagree (4) Neither agree or disagree (5) Somewhat agree
(6) Agree (7) Strongly agree

22. Indicate three flaws associated with conventional food safety auditing process
- i.
 - ii.
 - iii.
23. Indicate three advantages associated with risk based food safety auditing process
- i.
 - ii.
 - iii.
24. How is the issue of identified risk lapses solved with conventional audit process method?
-
25. What other certification systems relating to food or quality do you know?
- i.
 - ii.
 - iii.

SECTION C: LEGISLATIONS AND REGULATIONS

Kindly indicate the most appropriate response.

26. Do you agree that the standard authorities are on top of their job?
- (1) Strongly disagree (2) Disagree (3) Somewhat disagree
- (4) Neither agree or disagree (5) Somewhat agree (6) Agree (7) Strongly agree
27. Do you agree the level of awareness on quality management requirement in Ghana has

improved? (1) Strongly disagree (2) Disagree (3) Somewhat disagree
(4) Neither agree or disagree (5) Somewhat agree (6) Agree (7) Strongly agree

28. If no, what do you think should be done?

.....

29. If yes, what do you think has changed?

.....

.....

30. How should companies who flaunt food safety standards be dealt with?

.....

.....

31. Indicate three flaws associated with conventional food safety auditing process

i.

ii.

iii.

32. Indicate three advantages associated with risk based food safety auditing process

i.

ii.

iii.

33. What other certification systems relating to food or quality do you know?

i.

ii.

iii.

34. Mention 3 challenges companies face with quality system certifications.

i.

ii.

iii.

35. Indicate 3 possible ways to overcome the above challenges

i.

ii.

iii.

36. Who is responsible for quality in an organization?.....

Thank you for your time.