



Sudan University of Science & Technology

Collage of Graduate Studies



**Role of implementation of food safety system certification 22000 on food
safety culture**

دور تطبيق نظام شهادة سلامة الغذاء 22000 في ثقافة سلامة الغذاء

**A thesis submitted in Partial Fulfillment for the Master Degree in Total
Quality Management & Excellence**

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Dedication

In the name of Allah, most gracious.

I dedicate this dissertation to my supportive mother, thank you for always reminding me that —nothing is impossible with Allah, and for your support, prayers, understanding and patience

To my brothers, sisters and friends thank you for your support, encouragement and inspiration.

To the pure soul of my father I supplicate Allah to keep your soul in imperishable life in nirvana.

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Abstract

The worldwide food safety management systems implementation and certification has significantly increased during the last few years on the food industry sector, according to that the attention increased to the food safety culture, this study was aimed to study the role of implementation of food safety system certificate FSSC 22000 on food safety culture in food industrial sector. This study imposition of a set of hypotheses to test the effectiveness of implementation of FSSC 22000 and his impact on food safety culture, to the validity of this hypotheses a questionnaire was designed containing 9 questions, the target sample is Wheata industrial company employees, A total of samples 110 samples were distributed and analyzed. The data was analyzed by using SPSS V.16, Chi- square test and liner regression. The result showed that there is a positive and significant effect on the effective implementation of FSSC 22000 on Wheata company . Also affirmed the positive and significant effect of implementation of FSSC 22000 on food safety culture.

المستخلص

زاد تنفيذ وإصدار شهادات نظم إدارة سلامة الأغذية في جميع أنحاء العالم بشكل كبير خلال السنوات القليلة الماضية في قطاع صناعة الأغذية ، وفقاً لذلك زاد الاهتمام بثقافة سلامة الأغذية ، تهدف هذه الدراسة إلى دراسة دور تنفيذ شهادة نظام سلامة الغذاء FSSC 22000 علي ثقافة سلامة الغذاء في قطاع صناعة الأغذية. وهدفت هذه الدراسة لإختبار فعالية تطبيق نظام FSSC 22000 وتأثيره على ثقافة سلامة الغذاء ، وللتأكد من صحة هذه الفرضيات تم تصميم استبانة تحتوي على 9 أسئلة ، العينة المستهدفة هي موظفي شركة ويتا الصناعية ، تم توزيع وتحليل 110 إستبانة وتم تحليل البيانات باستخدام SPSS إصدار 16، وأظهر تحليل مربع كاي و الانحدار الخطي البسيط أن هنالك فعالية في تطبيق FSSC 22000 في شركة ويتا الصناعية وأن تطبيق نظام FSSC 22000 له تأثير إيجابي علي ثقافة سلامة الغذاء .

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Introduction:

The concept of food safety culture has received increased attention in recent years from both academics and practitioners, the focusing on studying food safety culture is very important, the potential gains from a company culture focused on food safety are vast, also businesses who are leaders in food safety culture stand out from the rest and are given a competitive advantage, which also brings potentially huge benefits commercially (William, 2018). From another aspect the importance of studying food safety culture increased, most of food safety problem comes from lack of food safety culture on food industries, the world health organization estimated that, they are 1 in 10 people is sickened by eating food processed or prepared by others, and approximately 50 % of cases of foodborne illness are due to failures in the culture of the organizations responsible for the safety of products. Food safety is an issue of both food science and behavioral science (Yiannas, 2009). Foodborne illness outbreak result from not only issue relating to the infrastructure of a food business but also from the behaviors of managers and employees. The effectiveness of food safety management system (FSMS) such as ISO 22000 can be influenced by the belief, commitment and behavior of both managers and workers (Ball *et al.*, 2009). The implementation of food safety systems can be very strong tool to reinforce and enhance the food safety culture, many researchers discuss the food safety culture based on food safety systems and they demonstrated the positive impact for implementation of food safety management systems. (Griffith, *et al.*, 2010b), Yiannas (2009) trusted the concept to the forefront, with the publication “Creating a Behavior-Based Food Safety Management System”, he demonstrate the food safety management systems has major role on

enhance the food safety culture on food industries. Food Safety System Certification FSSC 22000 it is a comprehensive, founded on ISO, globally recognized accreditation standard for assessing and certification of food safety in the entire supply chain. The scheme employs the current standards ISO 22000, and technical requirements for section pre-requisite programmers ISO/TS 22002-1:2009, which were developed through an extensive and open discussion with a large number of associated firms (FSSC 22000, 2014).

The Objectives of the study:

- To study a relation between implementation of food safety system certification FSSC 22000 and food safety culture.
- To examine if the implementing of FSSC 22000 has positive effect on food safety culture.

CHAPTER ONE

LITERATURE REVIEW

1 Food safety system:

1.1 Food Safety System Certification FSSC 22000:

FSSC 22000 is a Global Standard established for use in certification of food safety management systems for food manufacturers. It encompasses the requirements of ISO 22000:2005 (Food Safety Management Systems requirements) and ISO/TS 22002-1:2009 (prerequisite programmes on food safety for food manufacturing, and additional requirement. The Global Food Safety Initiative (GFSI) recognizes the FSSC 22000 system. GFSI is the organization that coordinates global food safety requirements. GFSI also works with other food safety management systems like the British Retail Consortium (BRC), International Featured Standards (IFS) and Safe Quality Foods (SQF). FSSC 22000 has a strong component of ISO 22000:2005 which enables it to be in line with other broad management schemes as the ISO 9001 and ISO 14001. This ensures great system integration (Food Safety System Certification 22000, 2014). NQA (2014) noted that FSSC 22000 offers one of the most complete approaches to a food safety management system for manufacturers of food items. Due to its foundation in ISO 22000:2005, the scheme seamlessly integrates into other quality management systems like ISO 9001, ISO 14001 and OHSAS 18001, making it an essential element of any food manufacturer's ability to enhance quality and guarantee safety. Manufacturers that are already ISO 22000 accredited can attain full, GFSI acknowledged FSSC 22000 endorsement by meeting the requirements of technical specifications for section pre-requisite programmes and other scheme requirements.

1.2 FSSC 22000 scope:

The scheme was established for the accreditation of food safety schemes of firms in the food industry. These include food manufacturers that process or manufacture: perishable animal products, apart from slaughtering and pre slaughtering, perishable vegetal products, products with extended shelf life at ambient temperature and biological products for food manufacturing Conveyance and storage in the facility and as part of the process are incorporated in the requirements. The scheme is relevant to all food manufacturing firms in the above classes, irrespective of capacity and complexity, whether commercial or noncommercial and whether public or private (NQA, 2014).

1.3 The requirements to be met in order to achieve FSSC 22000 certification:

The main component are ISO 22:000, prerequisite programmes PRPs ISO/TS 22002-1:2009 and the additional requirements; (management of services, product labelling, food defense, food fraud prevention, logo use, Management of allergens, Environmental monitoring, formulation of products and management of natural resources) (NQA, 2014).

1.4 ISO 22000

ISO 22000 is an international, auditable standard that specifies the requirements for food safety management system by incorporating all the elements of Good Manufacturing Practices (GMP) and Hazard Analysis Critical Control Points (HACCP) together with a comprehensive management system (Pillay and Muliylil, 2005). Food safety experts have found that well-functioning prerequisite programmes (PRPs) simplify and strengthen the HACCP plan. ISO 22000 is a HACCP-type standard based on

and fits very well with ISO 9001 especially developed to assure food safety. ISO 22000 will dynamically combine the HACCP principles and application steps with prerequisite programmes, using the hazard analysis to determine the strategy to be used to ensure hazard control by combining the prerequisite programmes and the HACCP plan (Faergemand and Jespersen, 2007).

1.5 ISO/TS 22002-1:2009:

It is specifies detailed requirements to be specifically considered in relation to ISO 22000:2005, 7.2.3: a) to assist in controlling food safety hazards, it cover construction and layout of buildings and associated utilities, layout of premises, including workspace and employee facilities, supplies of air, water, energy, and other utilities, supporting services, including waste and sewage , suitability of equipment and its accessibility for cleaning, maintenance and preventive maintenance, management of purchased materials, measures for the prevention of cross-contamination, cleaning and sanitizing, pest control, personnel hygiene. In addition, ISO/TS 22002-1:2009 adds other aspects which are considered relevant to manufacturing operations; rework, product recall procedures, warehousing, product information and consumer awareness ,food defense, biovigilance, and bioterrorism. (NQA, 2014).

1.6 What FSSC 22000 adds to ISO 22000:2005 and ISO/TS 22002-1:2009:

Sansawat and Muliyil (2010) pointed that FSSC 22000 entails further conditions which give emphasis to the standards already covered under the element requirements to which manufacturers and suppliers must conform. These extra stipulations have a number of implications. Manufacturers are required to have an inventory of applicable foreign, monitoring and legislative requirements on food safety, comprising those relating to: raw materials; services provided; and goods produced and delivered. Additionally, the

producer has to conform to the code of practice touching on food safety and any other extra requirements on food safety defined by the customer. The manufacturer needs to make sure that all services comprising utilities, transport and maintenance, which may affect food safety, are covered by defined conditions. The manufacturer is required to have effective management of the employees in the right application of the food safety standards and practices relating to their duties and responsibilities. Lastly, the food safety scheme has to guarantee and exhibit adherence to these conditions.

1.7 Benefits of adopting FSSC 22000:

Sansawat and Muliylil (2010) noted that FSSC 22000 is the most inclusive food safety management systems standard because it incorporates food safety management straight forwardly with other management schemes like quality, environmental and safety management systems. The scheme wholly integrates ISO 22000:2005, ISO/TS 22002-1:2009 Pre-requisite Programmes (PRPs), HACCP, and the application steps of codex. In terms of universality, FSSC 22000 has a good standing as it is fully recognized by the Global Food Safety Initiative, (GFSI). The scheme's approach is proactive and preventive as opposed to being reactive. The practices are put in place lessen/eliminate food safety hazards and supports continuous improvement on Food Safety Issues. Reduction of operating costs comes here as well by way of continuous improvement of processes and increase in efficiencies. Pre-requisite programmes, OPRPs and HACCP are integrated with the Plan-Do-Check-Act ideas of ISO 9001 to increase the success of the scheme. FSSC 22000 ensures legal compliance in whatever environment the organization is set. This is because it encompasses a number of other standards which adequately cover legislative requirements. As far as food safety is concerned, traceability of any

product from the source to end is fundamental. This is another area where FSSC 22000 is strong and it increases transparency all through the food supply chain (Food Safety System Certification 22000, 2014). Thus, there is increased risk management. The standard is designed in such a way that it enables small and/or less advanced firms to implement it. A firm implementing FSSC 22000 gains in the marketplace. Consumers have confidence in its products because of the proven enactment and on-going maintenance of the system. As firms along the supply chain adopt FSSC 22000 or become subject to customer controls along the food supply chain, the market attains guarantee that there are no weak links in the food chain.

1.8 Impact of implementation of food safety system certification FSSC 22000 on food safety culture:

There are benefits within the organization that adopts FSSC 22000, the firm's employees have confidence that they have done the right things to provide control over activities that have an effect food safety (Food Safety System Certification 22000, 2014).

2 Food safety culture:

2.1 The Culture:

Culture may be one of those terms that seems a little fuzzy or abstract, it is difficult, because it is a soft science one of the best definitions that I've come across (Coreil et al., 2001) stated, culture is patterned ways of thought and behavior that characterize a social group, which can be learned through socialization processes and persist through time. (Yiannas, 2009).

2.2 Who Creates Culture?

An organization, food safety is a shared responsibility. But when it comes to creating, strengthening, or sustaining a culture within an organization, there is one group of individuals who really own it – they’re the leaders. Yiannas (2009) said, organizational cultures are created by leaders, and one of the most decisive functions of leadership may well be the creation, the management, and – if and when necessary – the destruction of culture.

The strength of an organization’s food safety culture is a direct reflection of how important food safety is to its leadership. A food safety culture starts at the top and flows downward. It is not created from the bottom up. If an organization’s food safety culture is less than acceptable, it’s the leaders who are ultimately responsible and who own it (Yiannas, 2009).

2.3 Food safety:

Food refers to any substance consumed to provide nutritional support for the body, it is usually of plant or animal origin and contains vital nutrients such as carbohydrates, fats, proteins, vitamins or minerals. Food is ingested by an organism and assimilated by the organism's cells to produce energy, maintain life, or stimulate growth (British Broadcasting Corporation, 2014).

2.4 Food safety culture definition:

The definition of food safety culture is “the aggregation of the prevailing, relatively constant, learned, shared attitudes, values, and beliefs contributing to the hygiene behaviors used within a particular food handling environment” (Griffith *et al.*, 2010a). The concept of food safety culture has attracted large amount attention from researcher and stakeholder along the food supply chain. In food business, food safety culture is a component of the organization culture. It is away in which a food business and it is employee

deal with and value food safety. Ideally, employees and management need to take personal responsibility for food safety. The food safety culture can fundamentally impact day - to- day decision, behaviors and practices that help to effectively implement a food safety management system (Seward *et al.*, 2012). Based on research by Whiting and Bennett (2003) about how 65 leading companies in the U.S. developed their safety culture. Yiannas (2009) reviewed relevant components of a food safety culture. He was suggested five core components of food safety culture adapted from this review: leadership, employee confidence, management support, accountability, and sharing of knowledge and information. He distinguished food safety management from food safety leadership and highlighted the role of leaders in influencing others and leading the way to safe food handling. Other researchers have viewed food safety culture as a broad and multidimensional concept, which could be extended to a multicultural environment. By including relevant elements of culture from management, international business and psychology. Taylor (2011) proposed that food safety culture is influenced by 20 elements in four broad factor categories: knowledge factors, attitude/psychological factors, external factors, and behavioral factors and he asserted that these factors are inter-connected within and between different categories and should not be viewed separately.

2.5 Core Elements of food safety culture:

Food safety culture can be said to have the following elements:

1. Priorities and attitudes: Food business's attitudes towards food safety and the degree to which food safety is prioritized within the organization.
2. Perceptions and knowledge of food hazards: management and staff perceptions and knowledge of the hazards associated with food hygiene in

food businesses. This includes awareness of whether they are significant enough to justify requirements.

3. Confidence in food safety requirements: the extent to which the business perceives the food hygiene regulations and requirements to be valid and effective.

4. Ownership of food safety responsibilities: The extent to which a business sees food hygiene to be the responsibility of the regulator, thus adopting a reactive approach, versus accepting that the business should be taking the lead.

5. Competence: Knowledge and understanding of food safety hazards and associated risk management throughout the organization.

6. Internal leadership: The extent of clear and visible management commitment and leadership in food safety.

7. Employee involvement: The extent of involvement, ownership and accountability for food safety of staff at all levels of the business.

8. Communications within businesses: Levels of open communication and freedom to challenge and discuss practices. (Yiannas, 2009, Powell, 2011 and Griffith, 2015).

CHAPTER TWO

MATERIALS AND METHODS

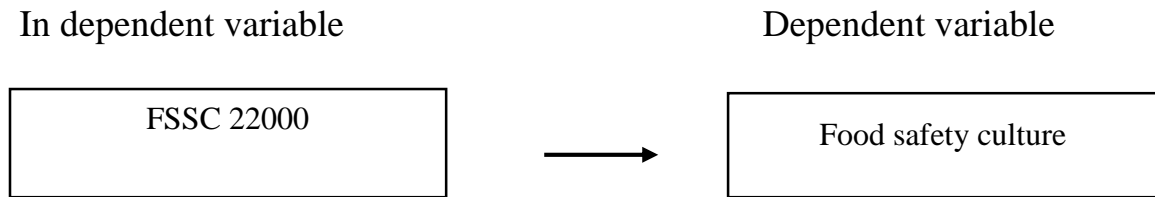
2.1 Research Methodology:

Creswell (2005) asserted that quantitative research is a type of educational research in which the researcher decided what to study, asks specific, narrow questions, collects numeric (numbered) data from participants, analyzes these numbers using statistics, and conduct the inquiry in an unbiased, objective manner. Variables can be defined as attributes or characteristics of individual groups or sub-groups of individual Creswell (2005). Quantitative approach is one in which the investigator primarily uses postpositive claims for developing knowledge i.e., cause and effect relationship between known variables of interest or it employees strategies of inquiry such as experiments and surveys, and collect data on predetermined instruments that yield statistics data (Sekaran, 2003). The quantitative method is a study involving analysis of data and information that are descriptive in nature and qualified (Sekaran, 2003). This study based on quantities' design using a hypothesis testing approach.

2.2 Conceptual framework

In this study food safety system certification FSSC 22000 is the independent variable. The dependent variable is food safety culture was explored.

The variables of the study and their relationship are shown in figure (1):



2.3 Development of Hypotheses

According to the provided literature in chapter one and previous studies findings mentioned in relation to the constructs under the study (Two Main) hypotheses were developed following the flow illustrated in the framework section to examine the hypotheses within (Wheata industrial company).

Newslow (2013) provided the procedure that can be used to evaluate the effectiveness of food safety systems , that can be used to investigate the dependent variable FSSC 22000 adopted in Figure 1. Yiannas (2009) provided the procedure that can be used to investigate the dependent variable food safety culture adopted in Figure 1.

2.4 Hypotheses of the study:

-Wheata implemented effective food safety system certification FSSC 22000.

-Implementation of food safety system certification FSSC 22000 has a positive effect on food safety culture.

2.5 Study design:

The descriptive quantities approach was followed to provide the relationship between FSSC 22000 and food safety culture. The study adopted a descriptive survey design to collect data for analysis (quantitative scale). Personal

scanning tool was used (questionnaire). The questionnaire included 9 items, 4 items for measuring the independent variable, 5 items to measure the dependent variable. Respondents were required to assess their agreement or disagreement with the statements provided in the questionnaire using a 4-point Likert scale (1=strongly agree; 2= neutral; 3= strongly disagree; 4=I don't know) to obtain feedbacks about the opinions of participants on different variables, and it was distributed to 110 employees in a wheat industrial company.

2.6 Study area:

This study was conducted in a wheat industrial company, which represents a major part of the Araak group. Wheat is one of the largest flour mills in the region with a current capacity of 2750 tons per day. The company plays a dynamic role in supplying the community with wheat flour, which is a major food commodity in Sudan. All efforts are employed to maintain its supply to the community, hence assisting in the achievement of food security at the national and household levels. The company was established in 2001, and its products include: Traditional Bread Flour, French Bread Flour, All Purpose Flour, Cake and Biscuit Flour, Semolina, Noodles Flour, Special bran, Feed bran, KFC and Pizza hut Flour. Since 2005, Wheat has both voluntarily and uniquely adopted the practice of fortification of wheat flour with Iron and Folic Acid (Vitamin B9). Wheat believes that safe food is a non-negotiable human right and these fundamentals are instilled throughout all our activities. Corresponding to this concern, we scientifically planned and implemented a food safety management system in compliance with the international standard ISO 22000 in July 2009 as the first food manufacturing company in

Sudan achieved ISO 22000 certification, and on 2018 Wheata made upgrade to FSSC 22000 to be a first flour mill company adopt FSSC 22000 on Sudan.

2.7 Study population:

The first stage in sampling process was to clarify the target population (Taherdoost, 2016). In this study the target population from all departments of Wheata industrial company. Population commonly related to total number of employees (500 employees), which it is one of the companies that has the FSSC 22000 certification in Sudan.

2.8 Sampling:

In order to answer research question, it is no doubtful that should be able to collect data from all cases. Thus, there is need to select a sample. The sample of this case study at Wheata industrial company that has FSSC 22000 certification.

2.9 Sampling procedure

Respondents sample will be determined using random sampling technique.

2.10 sample size:

Sekaran (2003) mentioned that “a sample size larger than 30 and less than 500 are appropriate for most researchers”. In the shadow of this, a total of samples were 110, all samples were received and analyzed.

2.11 Data collection procedures

Primary data collected using structured questionnaires. The questionnaire was initially written In English language and then translated to Arabic. Next, the questionnaire was reviewed by three academics to ensure that content and translation was appropriate for the research purpose. Based on the received

comments, the questionnaire was revised as needed. The questionnaire was distributed by the researcher on wheata industrial company employees, and then it was collected for analysis.

2.12 statistical analysis

The data collected was coded, and analyzed through SPSS (statistical package for social sciences) version 16. Descriptive statistics such as Normal distribution test, graphs, frequency distribution of answers, percentages and mediator, and the chi-square to denote the differences between the answers, was used to describe dependent, independent, and linear regression coefficients was used to test the hypotheses.

Test the validity of the study hypotheses:

In order to answer the study questions and verify its hypotheses, the median calculated for each questionnaire statement which showed the opinions of the study samples, where the grade (1) was given as weight for each answer "strongly agree", and grade (2) as the weight for each answer "neutral", A score of (3) as the weight of each answer is "strongly disagree", and a score of (4) for each answer was "I don't know." To determine the direction of response, the mediator was calculated. All of the above, according to the requirements of statistical analysis, is to convert the nominal variables into quantitative variables, and then used the chi-square test to find out the differences in the answers of the study sample on the statements of each hypothesis.

2.13 Reliability test of study constructs:

To evaluate the reliability of the constructs, Cronbach's α -coefficient was used.

Table 1: Summary of statistics of the reliability of the study:

Number of questionnaire questions	Coefficient of alpha cronbach
9	0.76

It is noted from Table 1 that the value of the coefficient of Fakronbach 76%, which was greater than 60% and this indicated that the questionnaire questions were consistent and honest.

CHAPTER THREE

RESULTS AND DISSUASION

3.1 Descriptive statistical Analysis of the Study questions:

3.1.1 General Data Description:

3.1.1.1 Qualification of the worker (n= 110) in Wheata industrial company:

Table 2 showed the iterative distribution of the study samples according to the educational qualification variable.

Table 2: Qualification of the worker (n= 110) in Wheata industrial company

Qualification	Frequency	Percentage
Secondary	21	%19.1
Bachelor	65	%59.1
Master	23	%20.9
PHD	1	%0.9
Total	110	100%

It is clear from Table 2 showed that the educational qualification of the majority of the study sample (Bachelor) where their number 65 individuals (59.1%), Followed by those who have a scientific qualification (Master) and their number are 23 individuals (20.9%). Secondary people their number are 21 individuals (19.1%), followed by those who have a scientific qualification (PhD) and number was1 individual (0.9%). According to above the scientific level of the respondents who can answer scientifically the phrases in the questionnaire which enhances the credibility of the statistical analysis

3.1.1.2 Years of work in the food industry:

Table 3 showed the frequency distribution of the study sample according to the variable years of work in the food industry sector.

Table 3: Years of work in the food industry (n= 110) in Wheata industrial company:

Years of work in the food industry	Percentage	Number
Less than one year	9.1%	10
1 -5	48.2%	53
6 -10	13.6%	15
More than 10year	29.1%	32
Total	%100	110

It is clear from Table showed that the majority of the respondents in the food industry sector (1-5) numbered 53 individuals (48.2%), followed by those who worked in the sector. Food manufacturers (more than 10 years) with (32) individuals (29.1%), followed by those who worked in the food industry sector (6-10) with 15 individuals (13.6%), followed by those who worked in Food industry sector (less than one year) with 10 individuals (9.1%).

3.1.1.3. Frequency distribution of job position in Wheata industrial company (n= 110):

Table 4: Frequency distribution of job position in Wheata industrial company (n=110)

Job position	Percentage	Number
Employee I, do not supervise other employees	%54.5	60

Employee but also supervise other employees	%36.4	40
Manager	%9.1	10
Total	%100	110

It is clear from Table (4) showed that the majority of the samples of the research staff their job position (not supervisor) their numbers 60 individuals (54.5%), followed by those whose job (were supervisor) and their numbers 40 individuals (36.4%), followed by the (Manager) and their numbers 10 individuals (9.1%).

3.2. Responses of the samples to the first hypothesis:

The first hypothesis of the study states that: Wheata implemented effective food safety system certification FSSC 22000.

Table 5: Frequency distribution of the answers of the study samples to the statements of the first hypothesis

#	Phrase	Repetition And ratio			
		I don't know	Strongly disagree	neutral	Strongly agree
1	The company has an integrated clear and applied food safety management system	1 %0.9	2 %1.8	26 %23.6	81 %73.6
2	Management provides food safety training /Awareness about practices to maintain the related	5 %4.5	14 %12.7	33 %30.0	58 %52.7

#	Phrase	Repetition And ratio			
		I don't know	Strongly disagree	neutral	Strongly agree
	food safety requirements effectively.				
3	There is a good cooperation among departments to ensure that food safety requirements were implemented and maintained.	7 %6.4	11 %10.0	37 %33.6	55 %50.0
4	Management provides safety policy and procedures help to ensure that the organization committees all food safety requirements.	3 %2.7	5 %4.5	31 %28.2	71 %64.5

Table 5 showed the repetitive distribution of the responses of the study samples to the statements of the first hypothesis. The respondents strongly agreed with the statements, which means strongly agree that there was a statistically significant relationship of effective implementation of the FSSC 22000 on Wheata. "

Table 6: Summary of the chi- square test for respondents in Wheata industrial company (n=110):

#	Phrase	Explain the direction of the responders	Mean	Sig	Df	The value of the chi-square
1.	The company has an integrated clear and applied food safety management system	Strongly agree	1.6	0.00	3	153.3
2.	Management provides food safety training /Awareness about practices to maintain the related food safety requirements effectively.	Strongly agree	1.7	0.00	3	59.9
3.	There is a good cooperation among departments to ensure that food safety requirements were implemented and maintained.	Strongly agree	1.7	0.00	3	55.9
4.	Management provides safety policy and procedures help to ensure that the organization committees all food safety requirements.	Strongly agree	1.5	0.00	3	109.5
5.	All phrases	Strongly agree	1.3	0.00	3	332.2

The results of the table 6 showed interpreted as follows:

The value of squared as any calculated to denote differences between the numbers of the sample of the study on what came in the first statement (153.3) and the value of sig (00.0), which is less than the level of significance (0.05) at the degree of freedom (3) and depending on what is shown in table 6. This indicates that there are statistically significant differences at the level of 5% between the answers of the respondents in favor of those who strongly agree that the company has an integrated and clear system and applied to food safety.

The value of the chi square calculated to indicate the differences between the numbers of the sample of the study on what came in the second phrase (59.9) and the value of sig (0.00), which is less than the level of significance (0.05) at the degree of freedom (3) and depending on what is shown in table 6. This indicates that there are statistically significant differences at the level of (5%) between the responses of the respondents and in favor of those who strongly agree that the administration provides training and awareness about the behavior necessary to provide safe and secure products.

The value of the chi- square calculated to indicate the differences between the numbers of the sample of the study on the third phrase (55.9) and the value of sig (0.00), which is less than the level of significance 0.05 at the degree of freedom (3) and depending on what is shown in table 6. This indicates that there are statistically significant differences at the level of 5% between the answers of the respondents and in favor of those who strongly agree that there is interdependence and interdependence between the various sections within the institution to apply the requirements of product safety and maintenance.

The value of the chi- square calculated to indicate the differences between the numbers of the sample of the study on the fourth phrase (109.5) and the value of sig (0.00), which is less than the level of significance 0.05 at the degree of freedom (3) and depending on what is shown in table 4-10. This indicates that there are statistically significant differences at the level of 5% between the responses of the respondents and in favor of those who strongly agreed that the administration provides a food safety policy and food safety procedures through which the institution ensures the application of all food safety requirements suitable for industry.

The value of chi- squared calculated for the differences between the numbers of the sample of the study on all the terms of the first hypothesis (332.2) and the value of sig (0.000), which is less than the level of significance (0.05) at the degree of freedom (3) and depending on what is shown in the table 6. This indicates that there are statistically significant differences at the level of 5% between the answers of the respondents and in favor of those who strongly agreed with what was stated in all the statements of the first hypothesis.

From table 6 the mediator of the statements (1 to 2). This indicates that the responses of the respondents tend to strongly agree. In the same table we find that the value of the test as any 332.3 and the value of sig (0.00) less than the level of significance at the degree of freedom (3) and this evidence of the existence of statistically significant differences between the respondents' answers and in favor of those agree that there is a statistically significant relationship to effective implementation of the FSSC 22000 on Wheata. "

3.3. Summary of the results of the second hypothesis:

The second hypothesis of the study states that:

“Implementation of food safety system certification FSSC 22000 has a positive effect on food safety culture.”

Table 7: Frequency distribution of the responses of the study sample to the statements of the second hypothesis

#	Phrase	Repetition And ratio			
		I don't know	Strongly disagree	Neutral	Strongly agree
1.	I believe it is important for us to follow all the food safety rules even it is not a part of my job	2 %1.8	1 %0.9	7 %6.4	100 %90.9
2.	All necessary information for food safety related to our industry is available to me	5 %4.5	8 %7.3	28 %25.5	69 %62.7
3.	I know food safety problems can happen if I do not do my job correctly and if I do not consider the food safety requirements.	0 %0	5 %4.5	13 %11.8	92 %83.6
4.	I know what I should do when I saw any food safety problem and I know who I should call for help	2 %1.8	1 %0.9	16 %14.5	91 %82.7

#	Phrase	Repetition And ratio			
		I don't know	Strongly disagree	Neutral	Strongly agree
5.	The senior management of the company is committed to applying the requirements of the FSSC 22000 standard which has helped to enhance food safety culture.	0 %0.0	7 %6.4	17 %15.5	86 %78.2

From Table 7 the respondents strongly agree with the statements, which means strongly agreed on Implementation of food safety system certification FSSC 22000 has a positive effect on food safety culture.

Table 8: Summary of the chi- square test for respondents (n=110) in Wheata industrial company:

#	Phrase	Explain the direction of the responders	Mean	Sig	DF	The value of the chi-square
1.	I believe it is important for us to follow all the food safety rules even it is not a part of my job.	Strongly agree	1.1	0.00	3	255.6
2.	All necessary information for food safety related to	Strongly agree	1.5	0.00	3	94.9

#	Phrase	Explain the direction of the responders	Mean	Sig	DF	The value of the chi-square
	our industry is available to me					
3.	I know food safety problems can happen if I do not do my job correctly and if I do not consider the food safety requirements	Strongly agree	1.2	0.00	2	126.1
4.	I know what I should do when I saw any food safety problem and I know who I should call for help	Strongly agree	1.2	0.00	3	200.6
5.	The senior management of the company is committed to applying the requirements of the FSSC 22000 standard which has helped to enhance food safety culture.	Strongly agree	1.3	0.00	2	100.9
	All phrases	Strongly agree	1.3	0.00	3	726.4

The results of the table 8 can be interpreted as following:

The value of the chi- square calculated to indicate the differences between the numbers of the sample of the study on what came in the first statement (255.6) and the value of sig (0.00), which is less than the level of significance (0.05) at the degree of freedom (3) and depending on what is shown in table 8. This indicates that there are statistically significant differences at the level of 5% between the responses of the respondents and in favor of those who strongly agreed that aware of the importance of abiding by food safety laws even if they are not part of my work.

The value of the chi- square calculated to indicate the differences between the numbers of the sample of the study on the second phrase (94.9) and the value of sig (0.00) which is less than the level of significance 0.05 at the degree of freedom (3) and depending on what is shown in Table 8. This indicates that there are statistically significant differences at the level of 5% between the answers of the respondents and in favor of those who strongly agreed that all food safety information related to the nature of this work and the manufacture.

The value of the chi- square calculated to denote the differences between the numbers of the sample of the study on what came in the third statement (126.1) and the value of sig (0.00), which is the lowest level of significance 0.05 at the degree of freedom (2) and depending on what is shown in table 8. This indicates that there are statistically significant differences at the level 5% between the responses of the respondents and in favor of those who strongly agreed and some problems related to food safety may occur if I do not care about the concepts of food safety.

The value of the chi- square calculated to indicate the differences between the numbers of the sample of the study on what came in the fourth statement (200.6) and the value of sig (0.00), which is less than the level

of significance 0.05 at the degree of freedom (3) and depending on what is shown in table 8. This indicates that there are statistically significant differences at the level of 5% between the responses of the respondents and in favor of those who strongly agree that I know how to act if I see any violation of the concepts of food safety or who should be contacted to resolve them.

The value of the chi- square calculated to indicate the differences between the numbers of the sample of the study on the fifth phrase (100.9) and the value of sig (0.00), which is less than the level of significance 0.05 at the degree of freedom (2) and depending on what is shown in table 8. This indicates that there are statistically significant differences at the level of 5% between the responses of the respondents.

The value of the chi- square calculated to indicate the differences between the numbers of the sample of the study on all the terms of the second hypothesis (726.4) and the value of sig (0.000), which is less than the level of significance (0.05) at the degree of freedom (3) and depending on what is shown in the table(8) This indicates that there are statistically significant differences at the level of (5%) between the answers of the respondents and in favor of those who strongly agreed with what was stated in all statements of the second hypothesis.

From table 8 median of the statements is 1 to 2 and this indicates that the answers of the respondents of the samples tended to agree strongly. In the same table we find that the value of the test as any (217.7) and the value of sig (0.000) at the degree of freedom (3) and this is evidence of the existence of statistically significant differences between the responses of respondents and in favor of strongly agreed Implementation of food safety system certification FSSC 22000 has a positive effect on food safety culture”

3.4 Regression analysis:

H0 hypothesis:

"There is no statistically positively and significant effect by independent variables (FSSC 22000) on the dependent variable (food safety culture). At significant level 0.05

H1 hypothesis:

"There is a statistically positively and significant effect of the independent variables (FSSC 22000) on the dependent variable (food safety culture). At a significant level 0.05

To test this hypothesis, liner regression analysis is used to verify the effect of independent variables (FSSC 22000) on the dependent variable (food safety culture). (Table 9).

Table 9: liner regression analysis of independent variables (FSSC 22000)

The dependent variable	(R) connectivity	The coefficient of determination	F calculated	(DF) Degree of Freedom		Sig	Regression coefficient		T calculated	Sig
Food safety culture	0.89	0.80	17.8	Regression	1	0.00	FSSC 22000	0.28	4.2	0.0
				The error	218					
				total	219					

From Table 9 the model is significant because the probability value sig (P = 0.00) is less than the level of significance 0.05, as well as the coefficient of determination which represents the percentage of the contribution of the independent variable in making changes in the dependent variable (0.80). A high percentage and standard error indicates that the model accurately describes the data and the total changes in the 800 FSSC 22000.

The value of F to denote the differences between the independent variable (FSSC 22000) and the dependent variable (food safety culture) (17.8) and the value of sig (0.00), which is less than the level of significance (0.05) and depending on what Table 9 indicates that there are statistical positively and significant differences at the level of 5% between the variable (FSSC 22000) and the dependent variable (food safety culture).

It is noted that the probability value of the independent variable (FSSC 22000) was less than the level of significance (0.05), which indicates the significance of the regression coefficient of the independent variable (FSSC 22000) has an effect on the dependent variable (food safety culture) and this confirms the null hypothesis, which states that there is no statistical positively and significant effect by independent variables (FSSC 22000) on the dependent variable (food safety culture) is rejected at a significant level (0.05). "It accepts the alternative hypothesis which states:

"There is a statistical positively and significant effect by the independent variables (FSSC 22000) on the dependent variable (food safety culture) at a significant level (0.05)."

CHAPTER FOUR

CONCLUSION AND RECOMMENDATION

4.1 Research limitations:

Some respondents might be unwilling to provide accurate information due to confidentiality bearing in mind the level of importance attached to quality. Moreover, the research explored only one food industrial company, that's because the FSSC22000 standards not wide implemented on Sudan, so the results findings can't be generalized to whole food industries. This study was partial coverage of the organizational culture dimensions and characteristics, the measure cannot be seen as a complete measure of food safety culture but must be regarded as an important piece of the integrated interdisciplinary measure of food safety culture can't be generalized to whole food industries.

4.2 Conclusion:

This research is conducted to investigate the role of implantation of FSSC 22000 on food safety culture in Wheata industrial company, descriptive research design was used to conduct the study. The target population consisted from Wheata employees a total of samples were distributed 110, and, 110 were analyzed, Random sampling technique was used to select the respondent. Questionnaire was designed and used to collect data for the study. Data collection lasted for tow month. The data were edited, coded, presented and analyzed using statistical tools such as Normal distribution test, graphs, frequency distribution of answers, percentages and mediator, and the chi-square, and linear regression analysis was used to test the hypotheses. The finding of this research affirmed the positive and significant effect that

Wheata effectively implement FSSC 22000. The results affirmed the positive and significant effect the implementation of FSSC 22000 has a positive effect on food safety culture.

4.3 Recommendation future research

- This study focused on the role of implementation on FSSC on food safety culture in food industrial company. Future research should be extend to study it on others food service providing company.
- This research focused only on food safety culture. Future research may explore other affect to implementation of FSSC 22000 on all food chain.

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Appendices

Appendix 1: Questionnaire

Questionnaire to understand the Impact of Implementation of Food Safety System certificate FSSC 22000 on Food Safety Culture in (Wheata Industrial Company).

صمم هذا الاستبيان لفهم دور تطبيق شهادة نظام سلامة الغذاء FSSC 22000 في ثقافة سلامة الغذاء بشركة وينا الصناعية المحدودة.

Section One:

Basic Questions:

1- What is your education qualification?

- A) secondary
- B) Bachelor
- C) Master
- D) PhD

2- How many year have you worked in food manufacturing field?

- A) Less than one year
- B) 1 - 5 year
- C) 6 - 10 year
- D) More than 10 year

3- What is your current position at this organization?

- A) Employee , I do not supervise other employees
- B) Employee , but also supervise other employees
- C) Manager

Section Two:

H1:

Wheata implemented effective food safety system certification FSSC 22000.

Statements	Strongly agree	Neutral	Strongly disagree	I don't know
The company has an integrated clear and applied food safety management system				
Management provides food safety training /Awareness about practices to maintain the related food safety requirements effectively.				
There is a good cooperation among departments to ensure that food safety requirements were implemented and maintained.				
Management provides safety policy and				

procedures help to ensure that the organization committees all food safety requirements.				
The company has an integrated clear and applied food safety management system				

H2:

-Implementation of food safety system certification FSSC 22000 has a positive effect on food safety culture.

Statements	Strongly agree	Neutral	Strongly disagree	I don't know
The company has an integrated clear and applied food safety management system				
Management provides food safety training /Awareness about practices to maintain the related food safety requirements effectively.				

<p>There is a good cooperation among departments to ensure that food safety requirements were implemented and maintained.</p>				
<p>Management provides safety policy and procedures help to ensure that the organization committees all food safety requirements.</p>				

Appendix 2: Reliability test

Reliability Statistics

Cronbach's Alpha	N of Items
.764	9

Appendix 6: Regression

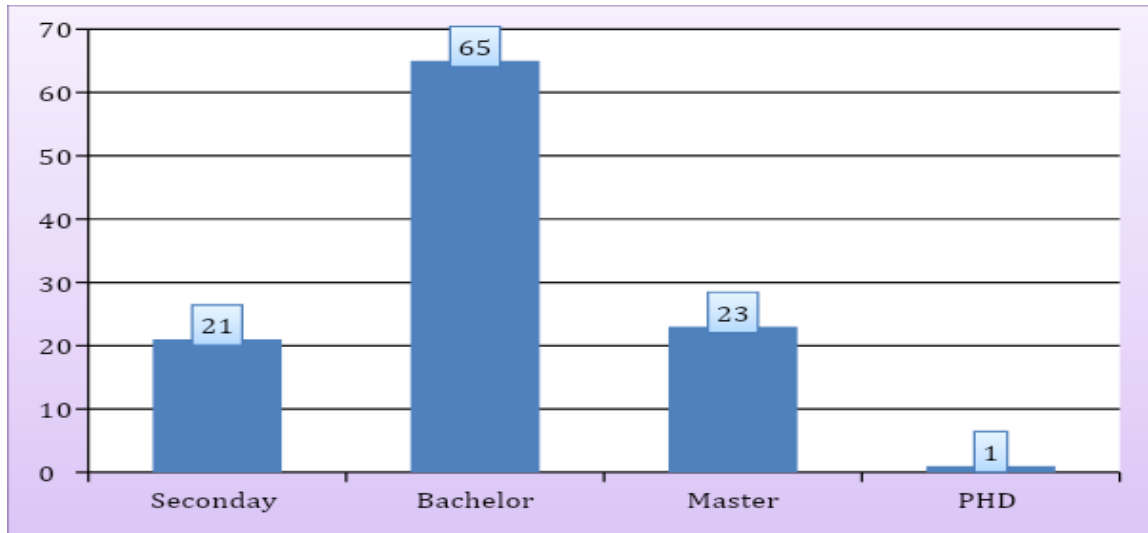
ANOVA^s

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	12.644	1	12.644	17.813	.000 ^b
	Residual	154.738	218	.710		
	Total	167.382	219			

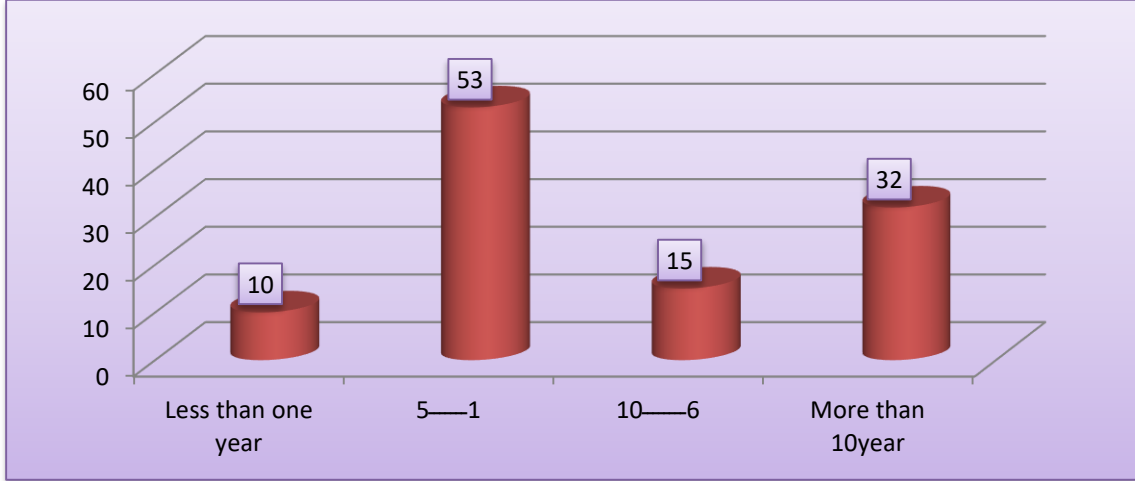
Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.158	.142		8.133	.000
	management system	.427	.101	.275	4.221	.000

Appendix 7: Qualification of the worker (n=110) in Wheata industrial company



Appendix 8: Years of work in the food industry (n= 110) in Wheata industrial company



Appendix 9: Frequency distribution of the study sample according to the variable job position

